POPULAR MECHANICS

SHOP NOTES

FOR

1905

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SHOP NOTES

1905

Compiled from the "Shop Notes" Department of Popular Mechanics Magazine, and "Written So You Can Understand It;" Tells Easy Ways to Do Hard Things.

VOLUME I.

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1905

EDITED BY
H. H. WINDSOR

Popular Mechanics Shop Notes

TREATMENT OF BURNS.

In treating burns of a serious nature, the first thing to be done after the fire is extinguished is to remove the clothing. The greatest care must be exercised, as anything like pulling will bring the skin away, too; so, if the clothing is not thoroughly wet, be sure to saturate it before attempting to remove it, says Health.

If portions of clothing will not drop off, allow them to remain. Then make a thick solution of common baking soda and water, dip soft cloths in it and lay them over the injured parts, and bandage them lightly to keep them in position. Have the solution by you, and the instant any part of a cloth shows signs of dryness, squeeze some of the solution on that part. Do not remove the cloth, as total exclusion of the air is necessary, and little, if any, pain will be felt as long as the cloths are kept saturated. This may be kept up for several days, after which soft cloths dipped in oil may be applied, and covered with cotton batting. If the feet are cold, apply heat and give hot water to drink, and if the burns are very serious send for a doctor as soon as possible. The presence of pain is a good sign, showing that vitality is present.

ON THE USE OF VALVES.

A writer in the Practical Engineer in discussing the use and abuse of valves, says:

When a valve is wanted near a right-angle turn in a pipe line, it is generally a good idea to use an angle valve instead of a globe or a gate valve, and an ell, as it calls for less joints to make and keep tight, and it makes a better looking job; also because less friction will be caused by water steam passing through the line.

On pipe lines that are to convey superheated steam from one point to another, it is not wise to use valves with hard rubber disks in them as the heat will dissolve them in a short time. Use only brass or gun metal valves for such places, or remove the hard rubber disks and substitute one made of bronze.

This does not necessarily mean that a separate superheating device is to be used in the plant, as some of the water-tube or pipe boilers supply steam that is superheated enough to dissolve the best hard rubber disks now in the market.

Devices have been contrived for removing worn-out disks, but the need of them is not apparent. A small cold chisel and hammer seems to answer every purpose for large valves, and when the bonnet of a small one is removed and the disk held in a gas jet for about two minutes, it can be removed very easily with a stout knife.

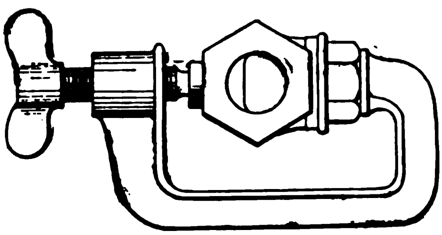
The bonnets of large valves are usually held on with bolts, hence are easily removed, but small ones sometimes cause trouble, as the brass is soft, so that when an attempt is made to remove them the wrench rounds the corners off without removing the bonnets. The largest available wrench should always be used for such work, because a small one will spring and damage the bonnet more than a large one. Screw the jaws up as tight as possible, then strike the handle a smart blow with the hand or a mallet.

TO DETECT WORKING OF CHECK VALVES.

If your check leaks or "backs up," it is liable to bind from expansion. When your check becomes inoperative from any of the above causes, it may become necessary to take off the bonnet in order to make repairs or clean the valve out. If you take a piece of stout wire about 12 or 14 inches long, placing one end of the wire on top of the check and the other end in the ear, you will hear every stroke of the pump or check and soon become accustomed to the regular or irregular action of the same. In like manner, you can form a pretty fair idea of the action of the pump valves by placing one end of the wire on the cover of the water end of the pump and listening. While listening, it is a good idea to cover the ears with the hands, allowing the wire to pass through the fingers of the hand; this excludes other noises and enables one to hear the action of the valves more distinctly.

SECURING WORN-OUT CAP OF CHECK VALVE.

An excellent temporary repair of a check valve with worn-out cap is given in the



Method of Repairing Valve

Engineer and illustrated herewith. The cut explains itself.

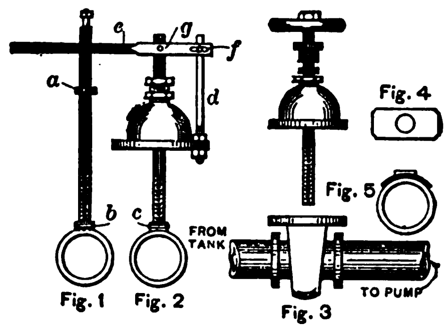
A MADE-OVER GATE VALVE.

Mr. H. A. Greene, of Boston, describes how he made over some gate valves as follows:

I had four large gate valves, in three of which the threads of the screw had become stripped or worn out, while in the fourth the thread had become jammed in such a manner that the stem could not be screwed into or out of the disk. As it would have been an expensive job to take the valves out, a quick repair job was made as follows:

The bonnet of each valve was unbolted and the bonnet, stem and disk removed. On the stem was a solid shoulder or collar, a, Fig. 1, which prevented the stem from rising or lowering when it was being used. This collar was sawed off with a hacksaw and the stem filed down smoothly. A hole was drilled at b through the disk and stem and a brass pin c put in to hold the two together. The stem was then put back through the bonnet without the hand wheel.

A piece of round iron d with two nuts on one end was put through one of the bolt holes in the flange of the bonnet and



A MADE-OVER GATE VALVE.

served for a lever post. A piece of ¾-inch pipe e, flattened at one end and slotted for the pins f and g, answered for a lever and I thus had four good lever valves.

I also had an 8-inch gate valve in a suction pipe to an elevator pump. This valve could not be operated far enough to jam the disk, and when the pump was running it clattered and was very noisy, causing no end of trouble.

As there was no other valve between this and the tank and it was necessary to keep the tank full to supply other pumps, the removal of this valve was impossible. To remedy the trouble I first closed the valve tight, then, taking out the stuffing-box gland, I unscrewed the stem from the disk, leaving the disk in place of the valve body.

The bonnet screws were then taken out and bonnet, stem and all removed from the valve. A piece of double-thick leather, Fig. 4, having a hole large enough to pass over the hub on the disk was then placed on the back of the disk, as shown in Fig. 5. The stem, bonnet and stuffing-box were then replaced.

Now when the valve is opened the disk can be raised until it cushions on the leather and there is no noise whatever. Our illustration is from Power.

NEW SOLDER FOR ALUMINUM.

Hjalmar Lange, a Danish inventor, has taken out a patent in Denmark for a process of soldering aluminum which consists of first coating the aluminum surface to be soldered with a layer of zinc. On top of the zinc is melted a layer of an alloy of one part aluminum to two and one-half parts of zinc. The surfaces are placed together and heated until the alloy between them is liquefied.

SOLDERING ALUMINUM.

A perfect solder for aluminum is yet to be found. An apparently well-soldered joint will frequently corrode after a few months' exposure to the atmosphere.

Small surfaces of the metal can be soldered by the use of zinc and Venetian turpentine. Place the solder upon the metal together with the turpentine and heat very gently with a blowpipe until the solder is entirely melted. The trouble with this, as with other solders, is that it will not flow gently on the metal. Therefore large surfaces cannot be easily soldered.

J. S. Sellon patents the following method: Clean the aluminum surfaces by scraping, and then cover with a layer of paraffine wax as a flux. Then coat the surfaces by fusion, with a layer of an alloy of zinc, tin and lead, preferably in the following proportions: Zinc, five; tin, two; lead, one. The metallic surfaces thus prepared can be soldered together either by means of zinc or cadmium, or alloys of aluminum with these metals. In fact, any good soldering preparation will answer the purpose.

A good solder for low-grade work is the following: Tin, 95; bismuth, five.

A good flux in all cases is either stearin, vaseline, paraffine, copaiva balsam, or benzine.

In the operation of soldering, small tools made of aluminum are used, which facilitate at the same time the fusion of the solder and its adhesion to the previously prepared surfaces. Tools made of copper or brass must be strictly avoided as they would form colored alloys with the aluminum and the solder.

SOLDER FOR ALUMINUM.

In a paper read before the Society of Arts, Prof. E. Wilson recommends the following composition as a successful solder for aluminum. The constituents are 28 pounds of block tin, three and one-half pounds lead, seven pounds spelter, and 14 pounds of phosphor-tin. The phosphor-tin should contain 10 per cent phosphorus. Clean off all dirt and grease from the surface of the metal with benzine, apply the solder with a copper bit, and when the molten solder covers the metal, scratch through the solder with a wire brush.

TO TEST SOLDER.

Good solder is easier bought than made, but if some distance from base of supplies, buy block tin and cut it up into about 1-pound pieces, weigh it and put in an equal weight of lead. Melt in a ladle, stir it and run it off into a mold to cool. To test solder and find out whether it is of good quality, hold it up near your ear and bend it. If you can hear it cringe, or a crackling noise, it is good, and if not, it is poor—too much lead and not enough tin in it.

RESIN FOR SOLDERING.

An excellent method of preparing resin for soldering bright tin is given as follows: Take one and one-half pounds of olive oil and one and one-half pounds of tallow and 12 ounces of pulverized resin. Mix these ingredients and let them boil up. When this mixture has become cool, add one and three-eighths pints of water saturated with pulverized sal ammoniac, stirring constantly.

SOME RULES FOR CASTING ALUMINUM.

Pour this metal as cold as possible. Of course, thin castings have to be poured hotter than those of heavier section, but on general principles this rule holds good in all cases. A convenient way of ascertaining the temperature of the metal is as follows: If its color is red, stir with a pig of aluminum until it is white. The melting of the pig will serve as a guide so far. Then dip the end of a cold pig three-quarters of an inch or so into the metal, when the aluminum will chill around the pig, and when the latter is withdrawn from the melted metal, remains like a little cup on the surface of the metal. The time required for this chilled metal to melt gives a good idea of the temperature of the metal in the crucible.

Use sand as dry as possible, and avoid sponging a mould. A little filing on the casting where the mould tears up is more to be preferred than a lost casting. Small bodies of sand nearly surrounded by metal,

[illegible]

[illegible] WROUGHT-IRON FORGE

[illegible] wrought-iron [illegible] by John [illegible] blacksmith. He [illegible] mail-order house [illegible] down in Texas, cost [illegible] I got an old binder [illegible] wheel, of the old style [illegible] spokes, tore all the [illegible] and took out the rim. [illegible] inches in diameter, which [illegible] hearth, $^{3}/_{16}$ of an inch [illegible] inches wide. To this I [illegible] round iron legs of suit- [illegible] with a nice curve at the bot- [illegible] I then made a shoulder five inches [illegible] top of each leg for the edge of the [illegible] on. One and three inches from [illegible] shoulder I drilled two 5/16-inch [illegible] the legs to the tire. I [illegible] of the leg at right angles [illegible] another 5/16-inch hole [illegible] of the old holes that was [illegible] cleats were fastened [illegible] I then drilled another [illegible] the hole in the legs, and [illegible] tire on the inside. [illegible] ting up on legs, [illegible] next got two old wagon [illegible] long enough to [illegible] to the other, bolting [illegible] side of the right [illegible] cutting the pieces [illegible] of the forge. [illegible] called an old binder [illegible] forge.) Across these two bars I put [illegible] more running the other way, cutting them six inches longer, so as to bend down, [illegible] right angles, three inches from each [illegible] with a 5/16-inch bolt hole in each end [illegible] to circle of forge, making them level [illegible] the top of the legs, as the first two [illegible] bolted under the angle ends of the [illegible]. I also had them wide enough apart at the center of the forge to make a square [illegible] large enough to fit the tuyere iron snugly with the pipe connection under the bars. Now, I put a ¼-inch bolt where these bars cross each other, making the forge perfectly solid. Next I took a pair of tinner's shears and sheet iron. I began cutting out the lining for the forge, or the bottom, having filled in on the bars with lighter old tire where it was necessary to keep the sheet iron from swagging. This bottom or lining I cut to fit snugly up to the tuyere iron and the circle of the forge. After the first layer was down, I put on a heavy coat of coal tar, then cut the second layer and reversed the pieces, thus, crossing the seam of the first two and pressing them down on the coal tar; then another coat of tar, and then another layer of iron, then tar. Next was the fire pot. A cement was made of clean sand, lime and water. Pouring this in on the tar, and rounding in around the tuyere and fire pit, and leveling it off, the forge is ready for work when the hearth is dry. I still have two inches of iron above the hearth. Next I connect my blower. When this is done I get some good green carriage paint and a brush, wash off all dirt from the new forge, and when dry put on three coats of this paint as fast as it will dry. I then have a complete forge at a cost all told of five or six dollars, which it would have cost me eighteen or twenty dollars to have bought."

CEMENT FOR REPAIRING CAST-IRON TANKS.

[illegible] for repairing cast-iron tanks is [illegible] at a low heat (so as [illegible] brimstone catching fire) five [illegible] two parts of black lead [illegible] cast-iron filings. Be- [illegible] cement, warm the metal [illegible] iron over it. The metal [illegible] dry so as not to generate [illegible] up the damaged part [illegible] applied in a soft state by [illegible] in an iron ladle.

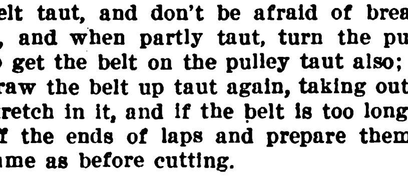
POLISHING GLASS WITH GLASS.

Not all opticians know that glass can be used to grind glass. A small jeweler's polishing lathe is all that is needed to try the experiment. An ordinary empty wooden reel (such as ladies use for sewing cotton) is screwed upon the lathe as a chuck. To the end of the reel is cemented, by shellac or other suitable substance, a watch glass with its concave surface next to the cement, says the British Optical Journal. This, properly centered and set, is made to revolve rapidly by means of a foot wheel attached to the lathe, and upon its rapidly-rotating surface the edge of a spectacle lens can be both quickly ground and smoothly finished. Grooving can also be done upon the edge by means of a suitable hand-rest.

TO MAKE A BELT ENDLESS ON PULLEYS.

It often happens that both pulleys over which a belt must pass are on shafting which is supported on pulley blocks. This necessitates the joining of the ends of the belt in place. To do this a belt clamp is generally used, in the following manner:

Place each end of the belt in the clamps, as shown in the cut. Be careful to place the ends of the belt in the clamps with a square; screw down the nuts tight so the clamps cannot slip on the belt. In drawing the ends together draw both sides equally



To Make a Belt Endless on Pulleys

so as to make a straight joint. Draw the belt taut, and don't be afraid of breaking it, and when partly taut, turn the pulleys to get the belt on the pulley taut also; then draw the belt up taut again, taking out any stretch in it, and if the belt is too long, cut off the ends of laps and prepare them the same as before cutting.

The best clamps for cementing are made of two pieces of 4 or 5-inch scantling, with a bolt through each end; cement the width of the clamps; slip the clamps over the part cemented, and draw them down by the bolts in the ends and let them remain a minutes, then cement as much more, moving the clamps over the new cement and draw down as before, and so on till all is cemented. It is best to have the clamps crowned in the middle so as to make equal pressure across the joint.

Warm the glue or cement in any ordinary glue pot, and apply very hot with a brush. If the proper cement is used, no rivets will be necessary.

HOW TO MAKE A WOODEN PULLEY.

In case of emergency it is possible to build a fairly good wooden pulley of inch boards. Small pulleys can be cut out of a single block, split with the saw and bolted over the shaft.

Set the pulley on the shaft, start up the engine and then turn the face of the pulley to a true circle, with the center crowning so as to hold the belt.

BABBITTING PULLEY SLEEVES.

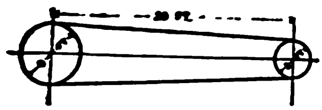
A correspondent of Steam Engineering gives the following method of babbitting pulley sleeves, which he says is a good one, if the sleeves are turned on the outside:

Take a piece of shaft the size of the shaft on which the pulley runs, or, say 1/64 inch larger. Take two collars and bore them the size of this arbor. Countersink one end of each and put one collar on the arbor with the countersunk side up. Place the two halves of the sleeve on the arbor resting on the countersunk part of the collar, then slide the other collar down on the sleeve, catching the sleeve the same way. Have two holes drilled through the top collar, one on each side, to pour the babbitt through; separate the two halves with strips of tin well coated with white lead, or something of that kind. It will be seen that the collars will bring the sleeve central with the arbor. When the rig is adjusted one side can be poured and then the other. All that is required to hold them in place is something to press down on the top collar.

TO FIND THE LENGTH OF A BELT.

When pulleys are small or about the same diameter, add the diameters of the two pulleys together, divide the result by two and multiply the quotient by three and one-seventh. Add the product to twice the distance between the centers of shafts, and you have the length required, says the

Peerless Rubber Co. For illustration take the following example:



5 ft diam one pulley	20 ft dist. between centres.
3 " " "	2
8 sum of diameters	40 ft
4 = ½ sum	12 57
3.14	52 57 ft =
12.57 ft	52 ft. 6⅞ in.—length of belt.

In putting on belting it should be stretched as tightly as possible; and with wide belts this can be done best by the use of clamps secured firmly to each end of the belt, and drawn together by clamp rods running parallel with and outside the edges of the belt. There is no danger of breaking, as a belt 6 inches wide and 3 ply thick will stand a direct strain of 5,000 pounds, and other sizes in proportion.

ABOUT LOOSE PULLEYS.

A contributor to the Wood Worker has this to say regarding the loose pulley: Put the tight pulley on the end of the shaft. Put the loose pulley on another shaft, and when the machine is idle, let this loose pulley shaft turn, instead of remaining idle. Where there is room this method does away with the loose pulley. The belt can be shifted just the same.

SPEED OF PULLEYS.

The diameter of the driven pulley being given to find its number of revolutions: Multiply the diameter of the driving pulley by its number of revolutions, and divide the product by the diameter of the driven pulley, the quotient will be the number of its revolutions.

The diameter and revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time: Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of revolutions of the driven; the quotient will be its diameter.

To find the diameter of the driver: Multiply the diameter of the driven by the number of revolutions which it is required to make, and divide the product by the revolutions of the driver, the quotient will be the size of the driver.

In ordering pulleys observe the following data: Diameter of pulley; face of pulley; bore of pulley; whether crowning, or straight face; whether whole, or split pulley; whether for single, or double belt; whether keyed, or set-screwed; whether cast-iron, wrought-rim, or wood-split pulley.

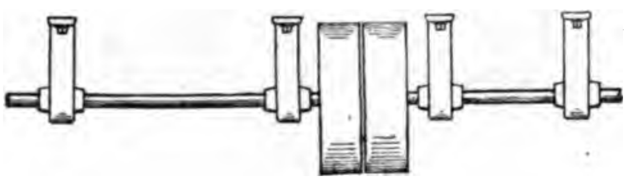
HOW TO BREAK OFF A SOLID PULLEY FROM ITS SHAFT.

Frequently a solid pulley becomes so rusted to its shaft, that its removal is a matter of great difficulty. Chas. Herman, writing in Power, tells how to remove the pulley when ordinary means fail, and with less time and labor than by using a cold chisel and hammer. He says:

To simplify the explanation, I shall take the pulley in Fig. 1 (6 inches length of hub, 2 inches bore, 4½ inches diameter, making the hub 2½ inches thick), and break it, theoretically, on its shaft.

Into its hub, down to the shaft, drill ½-inch clearing holes in a straight line (one hole to every 1½ inches of hub length), diametrically opposite the weakest part of the hub, i. e., the part fitted with the set screws or key, as shown in Fig. 2.

These holes may be drilled by the use of a ratchet and a shafting drill post, after breaking off the pulley face and arms; or by wedging in the ratchet between the hub and pulley rim, as shown in Fig. 3; or by



Positions of Tight and Loose Pulleys

improvising a shafting drill post, where the pulley is too small for wedging in the ratchet and no regular shafting post is to be had, as in Fig. 4. Clamps AA being tightened up, hold the drill post securely without injury to the shaft.

Having drilled the requisite holes, put a pin wedge, Fig. 5, into each hole. The pulley rim being broken away, so that you can get a square blow at them, proceed to drive them home. Keep all the pins moving together, that is, tap or hit each in succession. Doing this divides up the wedge function between them and enables you to split the hub without undue exertion by the use of a machine hammer, or, at the most, a small hand sledge.

The pins should be round and tapering and so proportioned that ⅛ inch for 2½ inches thickness of hub to ¼ inch for 3½

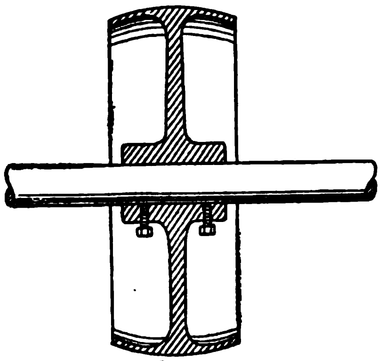


Fig. 1

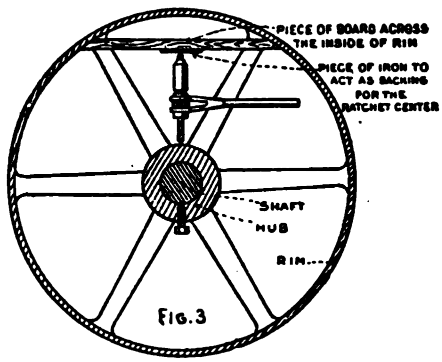


Fig. 3

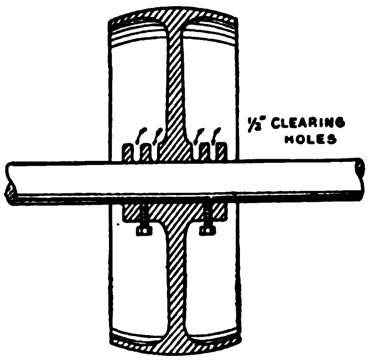


Fig. 2

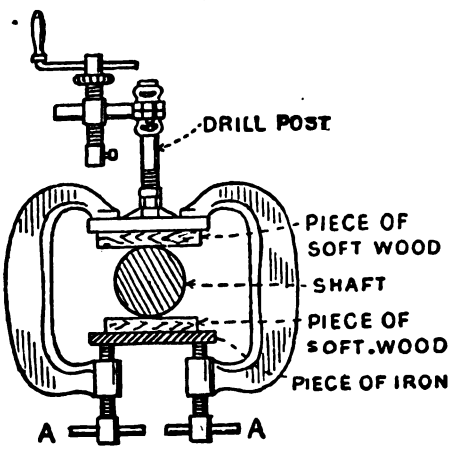


Fig. 4.

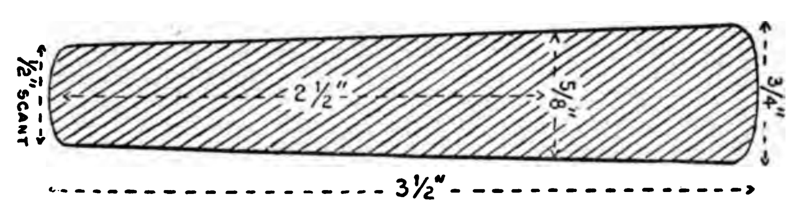


Fig. 5

to 4 inches thickness of hub shall be the most above the size of the drilled holes that the pin shall taper. They should be tempered to a peacock blue. If hit squarely when in use they can be used for an indefinite number of jobs; but if hit side and glancing blows they will snap off on account of temper. The pulley hub cracks under above treatment, slowly but surely, giving ample time to look out and prepare for the final break.

TO CLEAN CLOGGED WATER PIPES IN GASOLINE AUTOS.

The pipes in the water circulating system of gasoline engines used on automobiles often clog up and refuse to work. This is often caused by using water containing much vegetable matter which deposits a thick slime. The Motor Age says the pipes may be cleared by filling the tank with a strong, hot solution of either Babbitt's potash or common soda. Run the engine for a few minutes to allow the solution to do its work, then draw off the solution and refill with water. Again run the engine until the water becomes hot and then draw off. This should be done about once a month to keep the pipes clean under the conditions stated.

NEW WAY TO ETCH ON GLASS.

A new method of etching on glass or porcelain has been patented by Herr Retzlaff, of Berlin. The usual German process consists in cementing a sheet of tinfoil, and washing away the cement. The improved plan is to perform this operation more simply and perfectly by chemical means. The pattern is printed or stenciled in grease colors on the tinfoil, which is then fastened to the glass by asphalt; and the prepared plate is placed in an acid bath that dissolves out the exposed parts of the foil. The asphalt is then washed off, when the glass is ready for etching in the usual way.

HOW TO FIGURE ON PAINT.

As good a rule as any in estimating the amount of paint needed for any given surface is to divide the number of square feet by 200. The result will be the number of liquid gallons needed for two coats. Go over any spots, particularly if they are greasy, with a saltpeter wash before the paint is put on. They will then take the paint.

HOW TO WRITE INSCRIPTIONS ON METALS.

Take one-half ounce of nitric acid and one ounce of muriatic acid. Mix, shake well together, and it is ready for use. Cover the place you wish to mark with melted beeswax; when cold, write your inscription plainly in the wax clear to the metal with a sharp instrument; then apply the mixed acids with a feather, carefully filling each letter. Let it remain from one to ten minutes, according to appearance desired; then throw on water, which stops the process and removes the wax.

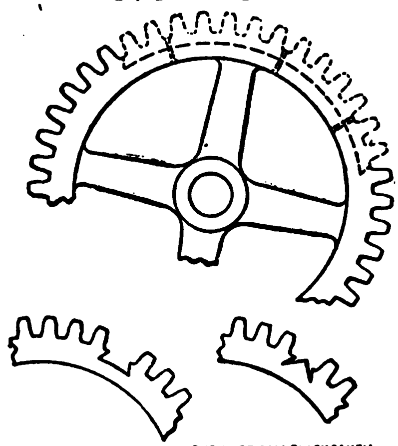
CARE OF RESERVE GAUGE GLASSES.

Comparatively few engineers realize how sensitive a gauge glass is to internal injuries. Many keep their spare glasses strung upon a nail somewhere out of harm's way. When this method of preserving them is adopted, nothing harder than a copper wire should be used. Glasses that are strung upon an iron or steel wire are very apt to break subsequently and apparently without cause, from the effects of the slight friction of the iron wire against their inner surfaces as they are strung upon it. The experiment of rubbing the inner surface of a gauge glass slightly with the end of an iron wire has been tried many times. The glass seldom breaks immediately, but however carefully it is put away, even when wrapped in cotton and placed in a receptacle where the temperature will be quite uniform, it is likely to break spontaneously in the course of time. This fact, which is abundantly established by repeated trials, will hardly be believed by those who have not made the experiment themselves.

REPAIRING BROKEN COG WHEELS.

It takes a skilled workman to mend a broken cog wheel and do it properly. A writer in the American Blacksmith tells how he repaired one:

Now it does not do to dovetail cogs when several are broken in the casting, side by side, as there is not metal enough left to hold them, so the only possible way is to make one continuous plate with the requisite number of cogs on it, and fit it in the body of the wheel by chiseling enough off the casting to allow a plate, in this case ½ by 3 inches with 13 cogs on it, to fit in the space thus made. I dovetailed the ends of plate and in addition put three rivets through the plate and flange, and that was all that was required to hold it there firmly. To make the plate and cogs I proceeded as follows: I took a plate of Norway iron of the required length, forged the requisite number of cogs, punching a hole through



METHOD OF REPAIRING BROKEN COG WHEELS.

each one and riveting them to the plate the proper distance apart. Then I took a welding heat on part of them and continued until all were welded on. I next shaped the plate to the curve of the wheel and fastened on as stated above. The figure will show the way the job was done.

In a break of only two cogs, dovetailing will be sufficient, but for three or more it is better to fasten with an additional rivet besides the dovetailing, making the whole of one piece. In the case of a single cog, when the rim is of sufficient thickness to stand a chiseled notch, a dovetailed cog inserted will be all that is required. In preparing a wheel for a cog to be inserted make the notch first. If the rim is heavy, use sharp chisels and start as shown in the illustration. Then with a narrow chisel cut out the center and dovetail on both sides, after which fit in the cog so that it will drive in reasonably tight, and if necessary clinch on top and bottom in the dovetailed part. In smaller cog wheels where the rim is too light to admit of chiseling, the file must be substituted to make the notch, and the cog after fastening slightly can be brazed on, but great care must be exercised or the wheel will be melted up before the spelter fuses.

In the case of bevel gearings, a broken cog is harder to insert on account of the thinness of rim not giving or leaving enough metal to admit of sufficient notching to hold the cog securely. In that case I first rivet a plate across the part where the cog is to be inserted on the under side parallel with the wheel, thereby strengthening the same, so that it will stand having a good dovetailed notch filed in it. I rivet the inserted cog on top and bottom after it is driven in place.

Sometimes the wheels are very greasy, and in that case the burning of the greasy matter on the forge is first necessary before the article can be handled. In doing that, however, care must be taken that the wheel is heated all over in an even manner or a bursted rim will be the result.

ROLLING SEAMLESS TUBES.

A recent issue of Stahl und Eisen contains a paper read by Mr. Ehrhardt, of Dusseldorf, on his method of making seamless cylinders and tubes. His experiments began in 1883, but were not successful until 1896, when he was able to pierce large ingots weighing three and one-half tons. The process is as follows:

The piercing of the rough ingot is first performed in a hydraulic press of great power, after which it is placed on the mandrel of a drawing press and drawn out through dies to a length corresponding to that of the finished tube. It is also essential that the sectional area of the material forming the blank should be exactly equivalent to that which it is desired ultimately to give to the tube in its final shape. During these preliminary operations the material undergoes mechanical treatment of a most severe nature, more especially in the

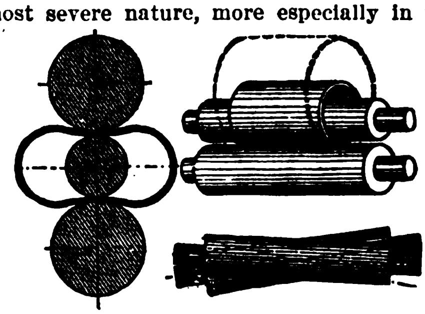


FIG. 1. FIG. 2.

direction of its longitudinal axis. After forming the cylindrical blank it is placed in a pair of rolls, the upper one of which can be easily unshipped from its bearings to enable the hollow cylinder to be slipped over it, while the lower one is held up to its work by hydraulic rams which exert an absolutely uniform pressure on the piece during the process of rolling. To expedite the operation, and also to diminish the amount of pressure which it is otherwise necessary to put upon the rolls, the bottom roll is arranged to oscillate sideways, during rolling, about a point exactly midway between its bearings, Fig. 2. This confers the advantage of being able to reduce the pressure on the rolls, because instead of having to exert an even pressure over the whole length of the blank, the lower roll, when swung out at both ends, bears only in the center, and in like manner, on coming back into line with the upper roll, the ends of the blank, in their turn, are subjected to the pressure. The real value of the oscillating motion, however, lies in neutralizing the effect produced by the bending of the rolls themselves. This tendency to bend must be reckoned with, particularly in the case of the somewhat smaller upper roll, Fig. 2, because the wall of the tube is liable to assume a slight convexity of form—that is to say, it will become thicker at the center than at the outer extremities. By imparting a continuous oscillating movement to the lower roll it is found, however, that this tendency can be completely obviated.

The true circular form of the blank is preserved during rolling by means of guide rolls, which are capable of ready adjustment to the successive variations in the diameter of the cylinder.

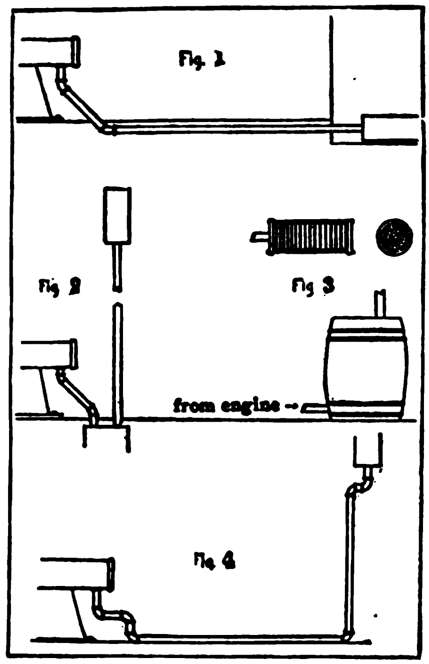
EXHAUST PIPING OF GASOLINE ENGINES.

One of the greatest troubles in the use of gasoline engines is to overcome the noise of the exhaust.

The odor of the burned gases is disagreeable, requiring considerable length of pipe to remove them, and increasing the back pressure. The evil of long piping can be overcome by making the pipe large, and with 45-degree elbows instead of 90-degree elbows, as shown in Fig. 1, given herewith. The fewer bends the better.

The end of the pipe should not be below a window or near enough to the ground to annoy pedestrians. An elevation of 10 to 15 feet usually is sufficient. The open end of the pipe never should be placed where dirt or sand can be sucked into the cylinder, with certain damage to the cylinder and piston from grinding by the grit.

Exhaust mufflers are attached when the noise of the explosions is annoying. The construction of the ordinary exhaust muffler is shown in Fig. 3. A dozen perforated cast-iron plates are held together by four iron rods. The inner plates are grooved to fit together. When the perforations in the plates have been stopped up by long use, or feeding too much lubricating oil, the plates should be taken apart and heated in a wood fire until the grease has been burned off. A barrel loosely filled with bricks



Arrangement for Exhaust Piping

makes a cheap and practical muffler. A short length of pipe should extend up from the cover of the barrel.

A drip cock should be placed at the lowest point of the exhaust pipe near the engine, to drain any moisture which may collect in the pipe during the night by condensation, and run back into the engine when it is started.

Fig. 4 shows a pipe with too many turns. When many bends are unavoidable, and the pipe is long, the remedy, aside from making the pipe large, is to put in an exhaust pot, as shown in Fig. 2. An exhaust pot is a large cast-iron vessel, placed as close to the engine as convenient and buried in the ground. The larger the capacity of the pot in comparison with the size of the engine cylinder the more effective is it, not only in diminishing the back pressure, but in silencing the noise of the exhaust.

Never lead the exhaust pipe close to wood or other material likely to ignite, as the pipe sometimes becomes hot enough to char, and may start a fire.

SIMPLE METHOD OF LINING AN ENGINE.

In Power, W. E. Crane gives a simple method of ascertaining to what extent, if any, an engine has gotten out of line. Mr. Crane says: Take out all the reciprocating parts and put a line through the cylinder reaching to front of the crank. This line should be a fine, braided line, preferably of silk. It can be fastened and centered in the back end of the cylinder with a stick bolted with one bolt, as in Fig. 1, or can

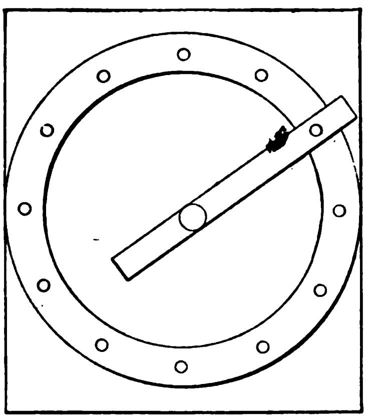


FIG. 1.

reach across and be fastened with two, as in Fig. 2. In front of the crank set a stake that can be adjusted sideways, as shown in front and side views in Figs. 3 and 4. Put the line as near central of the cylinder as possible and draw it tight so that there shall be no sag. Commence at the back end of the cylinder and center the line.

The best thing to use for caliper is a pine stick nearly sharp at one end and a pin in the other that can be drawn out or pushed in for adjustment. Have one for the end of the cylinder and one for the stuffing-box, moving the line at its support at the stake in front of the crank. When central here, try the back end of the cylinder and so alternate until the line is central at both points. It is then in line with the cylinder and all other parts should be in line with it. Try the guides. One builder had most of the engines that he built and erected crooked at the point *A*, Fig. 5, and shims

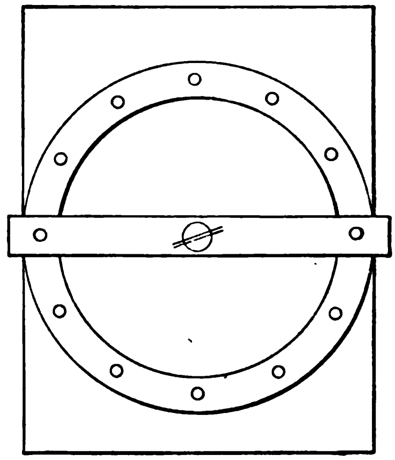


FIG. 2.

were required to throw the cylinder around into line with the guides.

Bring the crank-pin down to the line, or if the crank is down, which is the better position, bring it up to the line and see if the line is central to the pin. Turn the crank around to the other center. If the line is central at both points, it is all right; if the line comes one side of the center on one side and on the other side on the other, the outside journal wants swinging around, if a single engine; if double, one of the cylinders may have to be moved. If the line

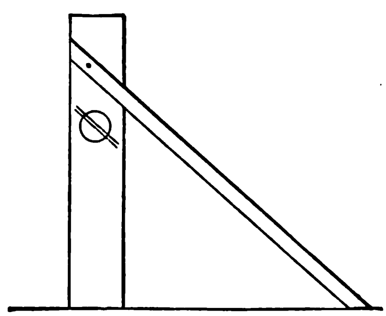


FIG. 3.

comes to the same side of the center of the pin when the crank is in both positions, then the shaft is not set right.

The cheapest and quickest way to overcome this is to take off the required amount of metal from the crank-pin boxes and

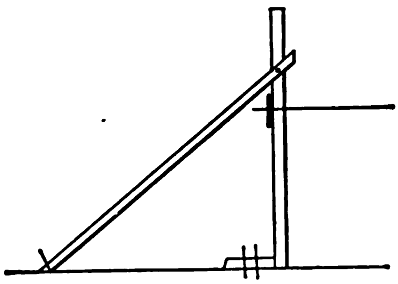


FIG. 4.

sweat or solder an equal amount on the other side.

A temporary alignment can be made without taking the engine apart by putting the engine on the back center and putting a line alongside the engine parallel with the piston rod and then measuring off to the crank-pin from that line.

Be sure the pulley (which may be perfectly true) is put on the shaft true.

WORKING VULCANITE.

As is well known, vulcanite, or ebonite, is greatly used in electrical industries on account of its high insulation resistance, as well as for the better finish which can be given to it; and although many articles come from the factory in a finished state, it is met with in the workshop mostly in the form of rods and sheets, and must be worked with the same tools as are used for working metals. The best qualities, says the American Electrician, show on fracture a lustre something of the nature of jet, and the poorer qualities show a corresponding dullness. Although easy to machine, it is hard on tools and in sawing, turning, planing or milling the best speed is that at which brass is machined, and milling should always be accompanied by a free use of soap and water. In turning or sawing, lubricants should be avoided, on account of the spattering around of ebonite cuttings and soapy water.

ROCK DRILL AS POWER HAMMER.

The engineer at one of the Cripple Creek mines improvised a power hammer out of a rock drill by substituting a hammer for the drill point. An ordinary anvil was placed below the machine, which had been taken from its tripod and set up in a vertical position. It was driven with compressed air, and while it did not strike a ton blow, the strokes were rapid and effective. The machine could easily be changed again to a drill at any time.

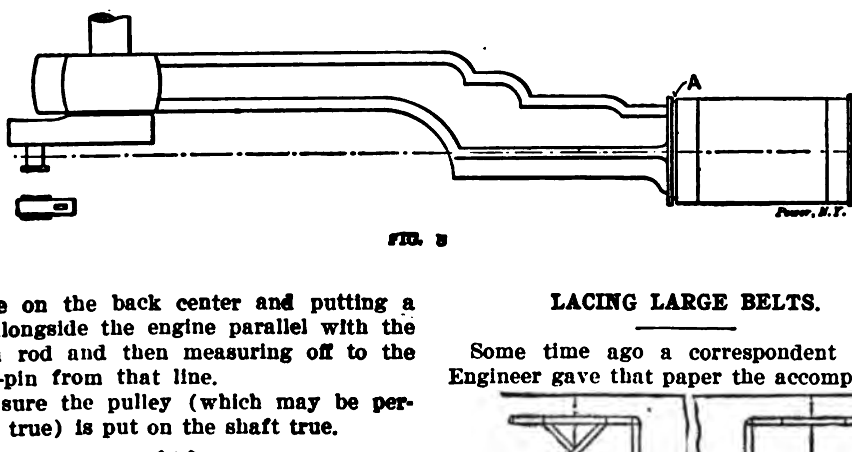
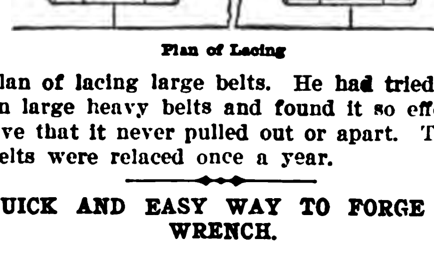


FIG. 5

LACING LARGE BELTS.

Some time ago a correspondent of the Engineer gave that paper the accompanying



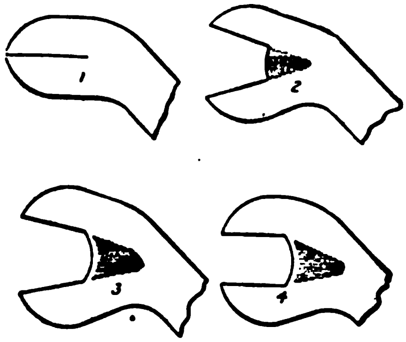
Plan of Lacing

plan of lacing large belts. He had tried it on large heavy belts and found it so effective that it never pulled out or apart. The belts were relaced once a year.

QUICK AND EASY WAY TO FORGE A WRENCH.

A simple and expeditious method of forging a wrench is described herewith. A

¾-inch wrench of medium weight is mentioned for the sake of convenience. Take a piece of steel ½ by 1⅛ inches, says B. E. Pease in the American Blacksmith, bend to shape and round the corners, then split, as in Fig. 1, back ¾ of an inch. Next take ⅝-inch fuller (if you do not have one at hand, use a ⅝-inch round iron) and fuller



METHOD OF FORGING A WRENCH.

in a little to spread the jaws. Fuller on one side only. Then with a ¾-inch fuller spread the jaws wider, as in Fig. 2. Next drive the fuller in between the jaws until they are spread the right width, Fig. 3. Then turn the jaws and forge the handle to suit the work required.

NEW ENGLISH OIL BURNER.

A new oil burner attracting much attention in England is known as the "Hydroleum." The London correspondent of the Automobile Review says of it:

The cut shows clearly the form of this burner, with which Texas oil, that can be bought here at 2 pence per gallon in lieu of gasoline at 14 pence, can be employed. It is only necessary to raise steam to a pressure of five pounds to the square inch to

"HYDROLEUM" BURNER. NOW ATTRACTING MUCH ATTENTION IN ENGLAND.

start the burner and this is done by means of an auxiliary burner, using methylated spirit. The fierceness of the fire is then entirely under the control of the steam jet, which induces a flow of the heavy oil from a float feed chamber exactly in proportion to the velocity of the steam jet. The mingled steam and atomized oil impinge on a dash brick suitably placed and there igniting, from a mass of flame in a fire pan placed beneath the boiler in the situation occupied by the gasoline burner as at present used. I have seen steam raised in a boiler with this system from cold to 200 pounds per square inch in 12 minutes, and it is stated that the steam and fuel have been cut off and reignited by the heat of the system after standing two hours. The future of this fitting, as applied to light cars, is being watched with the greatest interest.

PAINTING THE SMOKESTACK.

R. P. King tells in the American Machinist how he painted five stacks ranging from 35 to 58 feet in height at an expense of only $16.60. Of this $6.56 was for labor and $10 for 10 gallons of graphite paint. The apparatus used to get a line to the top of the stack is interesting. He says:

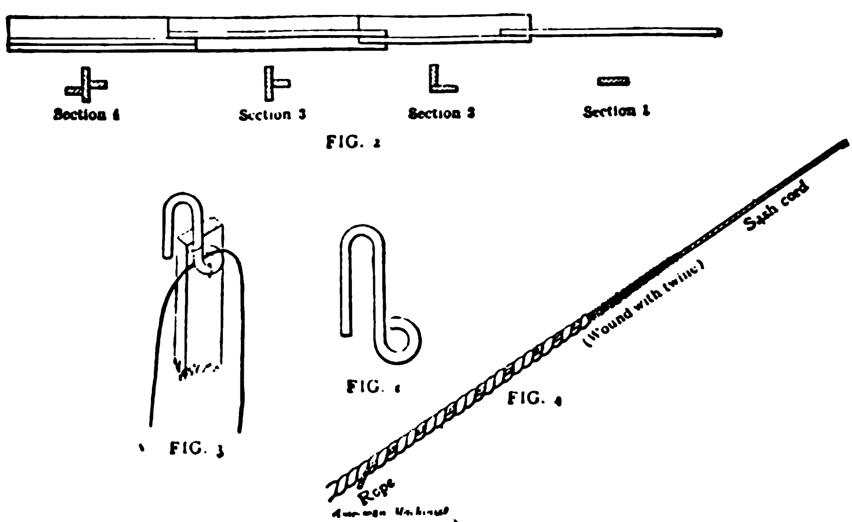
First I visited the blacksmith and had him make five hooks of ⅝-inch round iron, like Fig. 1.

It will be noticed that the end of the hook is very deep—about 5 inches—to prevent any possibility of its jumping off the chimney. The eye was about 1¼ inches in diameter to allow plenty of play for the passage of the rope.

Next, I told the millwright I wanted him to help me, and we made the pole which I have tried to illustrate in Fig. 2. This pole was constructed on what one might call a scientific principle, and was, perhaps, the most noteworthy part of the job. As the highest chimney was a trifle less than 60 feet high, the pole was very conveniently made of 16-foot strips. The upper section was a strip ⅞ by about 2 inches; the second section was a strip ⅞ by 2 inches, with a ⅞ by 1½ strip nailed to it to form an angle shape; section three was a ⅞ by 3-inch strip, with a ⅞ by 1½-inch strip nailed on to form a T; section four was in the form of a cross, made by nailing two ⅞ by 1½-inch strips to a ⅞ by 3-inch. The laps were about two feet, making a pole some 58 feet long. This pole was very light and stiff, and was successful in every way.

A pole as long as 100 feet could be constructed in the same way, which would be strong enough for the purpose and at the same time easily handled. If the sections were screwed together, the pole could be stored in a small space and used from year to year.

The hook was then hooked over the top of the stack and one man took hold of the ends of the sash cord to prevent the reaction jumping the hook off when the twine was broken. Another man pulled strongly down on the pole, breaking the lashing and leaving the hook at the top of the stack. A set of light blocks was lashed to the free end of the rope, and by means of a long pull and a few gentle shakes, the rope was pulled through the hook taking the blocks to the



PAINTING THE SMOKESTACK.

Four small holes were next bored in the top of the pole and the hook was lashed to it with twine in such fashion that, while it would stay in place, the lashings were not so strong but that they could easily be broken. A hank of sash cord was procured and run through the eye of the hook, all as shown in Fig. 3.

One end of a long rope was unlaid and the strands cut out to make a good taper about two feet long and an end of the sash cord was spliced into the taper. This was in turn wound with twine to make a smooth connection between the rope and the sash cord. The taper was then well covered with soap to make it slide easily through the eye of the hook. Fig. 4 shows this.

It would seem that the next problem was to get the hook up over the top of the chimney, but this was very easy. We placed the top end of the pole on one of the guys and by a proper manipulation of the bottom end had it in an upright position in no time.

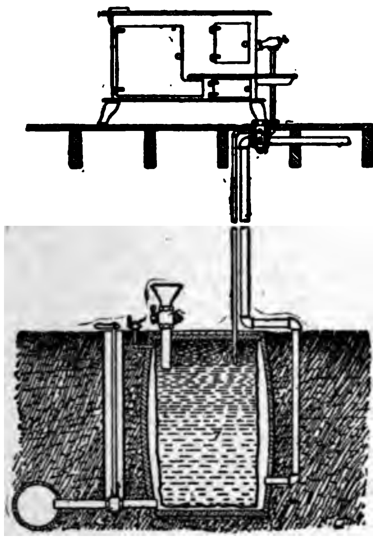
top of the stack. The end of the rope was fastened to a post, a board seat was hooked on to the tower end of the fall and we were ready to paint. A whitewash brush on a long handle was used, after removing the rust and scale with a wire brush.

NOVEL METHOD OF CLIMBING TALL STACKS.

Recently the steel smokestack of the electric light plant at Canton, Pa., 100 feet high, needed painting. The fireman made a sort of kite or parachute which snugly fitted inside the stack. He attached a string to the parachute; the draft in the stack carried it and the string with it up through the stack and out, the parachute coming down outside the stack. A small rope was next tied to the string and pulled up, and finally a rope strong enough to hold a man. Then tackle was arranged to haul up a man to do the painting.

TO BURN FUEL OIL WITHOUT PUMP.

Where fuel oil is burned under steam boilers it is sprayed with considerable pressure, either by steam from the boiler itself or by means of a powerful pump. Either of these methods is impractical for domestic purposes. To burn fuel oil in cook stoves, John C. Quinn, of Port Costa, Cal., has invented a system by which the oil is placed in a barrel buried in the ground; water from the city mains or a windmill tank is let into the barrel, thus forcing the oil up into the burners. When all the oil is used the water is shut off, the barrel emptied into the sewer, and then refilled with oil.



Burning Oil in Cook Stove

STRIPPING SILVER FROM PLATED ARTICLES.

When a silvering operation has failed, or the silver is to be stripped from old silvered articles, different methods have to be used according to the nature of the basis-metal, says American Electrician.

Silvered iron articles are treated as the anode in a potassium cyanide solution in water (1 to 20), the iron not being attacked by potassium cyanide. As cathode, a few silver anodes, or a sheet of copper rubbed with an oily rag is suspended in the solution. The silver precipitates upon the copper sheet, but does not adhere to it. Articles, the basis of which is copper, are best stripped by immersion in a mixture of equal parts of fuming sulphuric acid and nitric acid. This mixture makes the copper passive, while the silver is dissolved. Care must, however, be taken not to introduce any water into the acids nor to let them stand without being hermetically closed, since by absorbing moisture from the air they become dilute and may then exert a dissolving effect upon the copper.

SOLDERING A STRAINER ON A WELL PIPE.

A New York plumber was employed to solder a perforated brass wire strainer over a 10-foot length of 6-inch galvanized iron pipe which was perforated with 180 holes of 1½-inch diameter. To do the work with hot coppers alone would be a tedious job, as the perforated wire was in sections of 14 inches and the big pipe was cold. The Metal Worker tells how the man did the work in one-fourth the usual time.

In addition to the seams where the ends met, the brass had to be soldered to the pipe at each end throughout the entire circumference. In order to expedite matters two fire pots were used, one for heating the soldering coppers, while the other pot was placed immediately under the pipe, which was supported conveniently for the purpose. By this means the heat of the fire pot heated up the pipe so that comparatively small coppers were capable of soaking the solder into the sections so as to make a substantial and durable job.

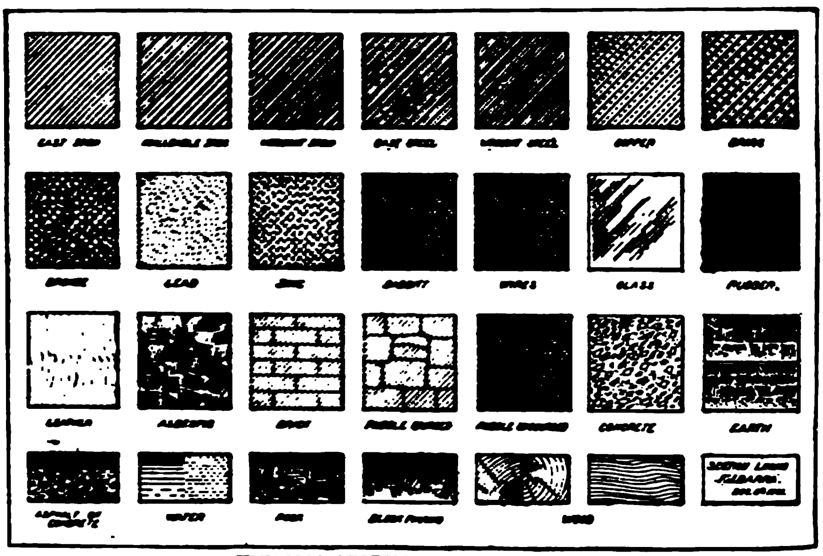
GRINDING STOP COCKS.

To grind a stop cock of any kind, first see that the plug fits the barrel before it is taken from the lathe. Run a half-round smooth file up and down the barrel to break any rings that may be in it; a few rubs of a smooth file back and forth over the plug will break any rings or tool marks on it. Wipe both parts clean. Use for grinding material fine molders' sand sifted through a fine sieve. Mix with water, in a cup, and apply a small quantity to the parts that bear the hardest. Turn rapidly, pressing gently every few turns; if the work is large and the lathe is used, run slowly; press and pull back rapidly to prevent sticking and ringing; apply grinding sand with water until a bearing shows on another part, then use no more new sand, but spread the old that has worked out over the whole surface. Turn rapidly, pressing gently while turning, withdraw the plug and wipe part of the dirt off, and rub on the place a little brown soap: moisten with water and press the surfaces together with all the force at hand, turning at the same time. Remove the plug and wipe both parts clean: next try the condition of the bearing by pressing the dry surfaces together with great force. If the parts have been kept together closely while grinding, and the plug has not rubbed against the lower part of the barrel, the surfaces will be found bright all over and a perfect bearing obtained. If an iron barrel and brass plug are used, or two kinds of brass, a hard and soft metal, soap should be used freely when finishing up, as the tendency to form rings is greater when two different metals are used.

UNIFORM SYSTEM OF SECTION LINING.

A movement to systematize section lining in mechanical drawings has been started by some of the leading draftsmen and technical journals. The accompanying illustration shows the markings used to designate materials as proposed for a standard system. These linings are now employed by the Central Institute and by most of the 1. ' draftsmen.

ent wood is about the only ma- rhich all draftsmen agree with re- ; lining. Glass, says The Draftsman, is frequently shown with vertical lines instead of on an angle and nearly always in the upper left-hand corner of the window or door drawing. Asbestos could be represented by wavy lines instead of straight, and can be applied to cloth, gum canvas or any composition material, such as pipe coverings, paper maché, etc. No lining should be as heavy as the outline of the object and yet each line should be clear and evenly drawn, and some of the finer work can be put in with a pen.



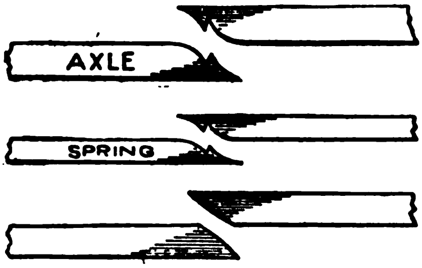
UNIFORM SYSTEM OF SECTION LINING.

TO CLEAN SHOP FLOORS.

In the South Side Elevated Railroad shops of Chicago it has been found that the use of lime aids in cleaning up the shop floors and in keeping them in good condition. This lime is simply swept over the floor every day, in addition to the regular cleaning. Very little remains on the floor after the sweeping, but it is sufficient to counteract the effect of the oil and grease, and to make it easy at the beginning of each day to clean up what has fallen the previous day, as well as to improve the appearance of the floor.

WELDING A BUGGY SPRING.

The old method of welding a spring by dovetailing has the obvious disadvantage of causing a double thickness at the very point which it is desired to heat first, says the American Blacksmith. The usual result is an injury to the spring by getting too hot at each end of the lap. A better way is to upset the ends well, scarf the same as with



Welding Broken Buggy Springs

a steel tire, then take a chisel and cut a groove about ⅛ inch deep across the thick end of the scarf. Finish both ends the same and see that grooves fit each other nicely before welding.

Now heat the ends separately, the same as you would any piece of iron and put your spring well in fire so you do not burn off the thin ends. The grooves will make it impossible for the scarf to slip and you will have no trouble in making a good weld. Each scarf and groove can be made in one heat so there is no lost time and will save much trouble. The scarfs on a spring should be somewhat longer than on an axle. Steel axles may be welded in the same way.

THE PRINCIPLE OF SWAGING.

Many smiths are apt to use too large a swage, says the American Blacksmith. Fig. 1 illustrates the bad effect of doing this. The effect of the blows will be to cause the

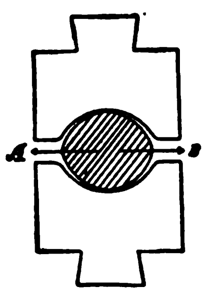


Fig. 1

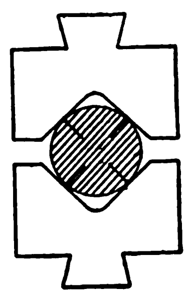
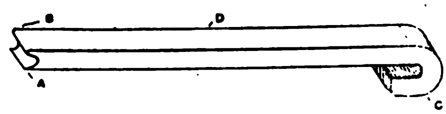


Fig. 2

metal to move sideways in the direction of A B, which will cause loose, spongy forgings, and frequently a hollow center. To overcome this we should use a swage as represented in Fig. 2. If we use this swage the metal is driven towards the center, and as a consequence there is no danger of the work becoming hollow in the center, besides it makes the forging more compact or dense.

CUTTING KEYWAY WITHOUT REMOVING FLYWHEEL.

A correspondent tells in the Engineer how he cut a keyway in a shaft without removing the flywheel, which was constantly working loose. There were two keyways in the hub of the wheel, but only one in the shaft; to remove the wheel was a difficult task. A tool was made of steel, about 14 inches long, ⅝ inch thick, and 1⅛ inch wide at the cutting edge A. The edge B projected a little way beyond A and was rounded so that it would not cut the hub of the flywheel. The end c was rounded over to enable the tool to be withdrawn from the hole. The keyway was started in the shaft with a flat chisel and this tool then put in. Shims were placed on the top of the tool at



D, so that the first cut would be about 1/64 inch deep in the shaft. The tool was driven through the hub by striking on the end c. After each cut the tool was withdrawn and another shim added at D until the required depth of keyway was obtained. By this means the keyway was cut, and the key fitted and driven in less than five hours.

ELECTRIC FANS FOR FROSTY WINDOWS.

If you have an electric fan there is no need of being inconvenienced by frosty windows. Place the fan in the window, so as to diffuse the heated air over the glass as generally as possible. The same fan used for refreshing the air in summer may be used to keep the show windows free from frost in winter.

FROST-PROOF MORTAR.

Frost-proof mortar may be made by taking one barrel Portland cement, one barrel slaked lime, three barrels sharp sand; mix the whole dry, then add sufficient quantity of the carbonate of soda solution to make of proper consistency. The first setting should take place in one hour. After 12 hours good cement should have reached the final setting stage.

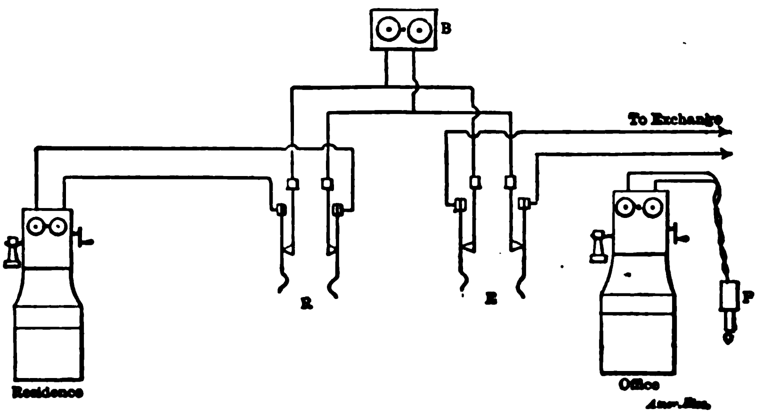
CONNECTING AN EXTRA TELEPHONE.

An arrangement whereby a telephone subscriber can connect his private office or residence on his office telephone, while subscribing for only a single instrument is given herewith: The office telephone set is connected to an ordinary two-wire plug, P, and two spring jacks, R and E, are provided, into either of which this plug may be inserted. With the plug inserted in the jack R, the residence instrument and the office instrument are connected together, leaving only the bridging bell, B, connected to the exchange circuit. With the plug inserted in the jack E, the office instrument is connected to the exchange wires, and the residence line terminates at the bridging bell, B. With the plug removed, as shown in the diagram, the residence instrument is connected straight through to the exchange.

The provision of the bridging bell, B, enables the exchange to call up the office when the office instrument is connected to the residence line, and also enables the residence to call up the office when the office instrument is connected to the exchange line. The plug would be withdrawn from the jacks, leaving the residence connected through to the exchange, only over night and during periods when the office is closed.

PREDICT WEATHER WITH CAMPHOR.

A piece of camphor gum is a very good indicator of what the weather is going to be. If, when the camphor is exposed to he air, the gum remains dry, the weather ry; if the gum absorbs moisture p it is an indication of rain.



CONNECTIONS FOR OFFICE AND RESIDENCE LINE.

HOW TO MAKE A SPARKING COIL.

For a sparking or induction coil strong enough to ignite paper or cloth make a magnet core of a bundle of soft No. 20 iron wire, ¾ inch in diameter and 6 inches in length, wrapped in two thicknesses of strong paper laid with shellac varnish for insulation. Put thin wooden spool heads on the ends of the core wrappings, fastened with shellac varnish, says the Metal Worker.

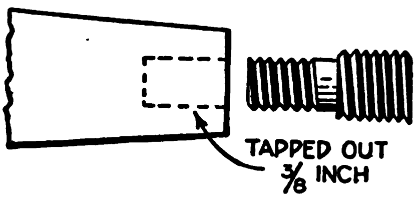
Then wind the spool with four layers of No. 16 cotton-covered copper wire, with shellac varnish on each layer, passing the wire ends through holes in the spool head at the level of the last layer. Cover the coil with four thicknesses of wrapping paper well shellacked for insulation from the secondary current.

For the secondary coil, wind with 12 ounces of No. 34 double silk-covered copper wire, commencing by passing the wire through a hole in the spool head close to the paper winding of the primary coil. Cover each winding of the secondary coil with two thicknesses of wrapping paper, well shellacked to make the insulation perfect against short circuiting of the secondary current. Special care in closing each paper winding against the spool heads is very essential to prevent burning out. Dry the shellac varnish as the work proceeds.

With 10 medium sized dry batteries in series, a 1¼-inch spark may be obtained between wire terminals or a ½-inch hot spark between brass balls of ¾ inch in diameter. With eight Edison-Leclanche cells and a vibrating attachment, a brilliant spark effect may be had between the brass balls.

REPAIRING THE BROKEN THREAD END OF AN AXLE.

A customer came to my shop with the thread broken off his buggy axle, says a correspondent in the American Blacksmith. I took an old axle and cut off the thread end a little above the threads, drew that



REPAIRING AN AXLE THREAD END.

end down to ⅝ inch and cut threads on it, as shown in the cut. I then drilled a hole in the end of the broken axle, tapped it out, screwed in the piece, brazed it, and the result was a solid job.

HOW TO RECHARGE DRY BATTERIES.

Dry batteries which have become exhausted can be recharged by a very simple process. Remove the outer cardboard casing from each cell and drill six small holes in the zinc casing about one inch from the bottom. As four cells are generally used for ignition purposes in connection with the induction coil, get four small glass or stone jars an inch or so larger in diameter than the cells and about three-quarters the height of the same. Dissolve about a half an ounce of powdered sal ammoniac in each jar, in a sufficient quantity of water to bring it almost to the top of the jar when the cell is in it. Get four cells of gravity battery and put them in series with each other by connecting the zinc element of one cell to the copper element of another. Put each dry battery cell in the solution in its respective jar and connect the three binding posts on the zincs together, and the three carbon posts also, by means of insulated copper wire. Then attach the wire from the zincs to the zinc element of the gravity batteries, and the wire from the carbons to the copper element of the gravity batteries. Allow the cells to remain over night, and if they are of good, reliable make they will be found in the morning to be almost as good as new. This process of recharging dry batteries can be repeated at least twice and even three times, but of course, after each successive recharging, their renewed life will be shorter than formerly. After the batteries have been recharged the small holes which were drilled in the casing can be stopped by means of a strip of adhesive tape, covered with bicycle tire cement, and tightly wrapped around the zinc casing over the holes. The cells should be wiped thoroughly dry and then may be replaced in their cardboard casings and are ready for use.

RAISING A STACK.

I had the job to raise a stack 40 inches diameter and 90 feet long, writes a correspondent of the Wood Worker. As the work was done with nothing but a set of ¾-inch blocks and a barely sufficient amount of rope, the details may be of interest to others similarly situated.

The stack, with the wire guy lines attached and all swung clear of the ground, weighed 2,200 pounds, and had to be raised to the top of the boilers and breeching, at a point 15 feet from the ground level. This made a total height for the top of the stack of 105 feet.

The first thing to be done was to get a gin-pole for the stack, and as we were in the midst of a pine forest, it would seem an easy matter. But trees that will make good sawlogs will not make a gin-pole, for those that are straight enough are likely to be too heavy, so we were nearly a mile from the mill when we found a tree straight and slender and of the right height.

The length of the gin-pole needed for this particular job was 66 feet net. Taking half the length of the stack, 45 feet, and add 2 feet for the overbalance, makes 47 feet. To this must be added the height to the top of breeching, 15 feet, making 62 feet. To this add 4 feet for block and rope clearance, making a net length of 66 feet. This length will likely cause the cry of "two blocks" just before you are in position to slip the stack on the breeching, so it is best to add 4 feet as a factor of safety, making the pole 70 feet long. This we did, cutting the stick 70 feet from the straight end of the top, as far up among the limbs as was deemed prudent, leaving the heavy butt at the stump.

Next thing was to get a jack-pole to raise the gin-pole, and following the same line of calculating, it took 35 feet for half the pole, 2 feet for balancing, and 6 feet for clearance, making 43 feet for the jack-pole. This was easily obtained near the larger pole, and when the two were brought together it was a fair load for an ox team. But we were miles away from the camp of loggers and it would take two days to get a team; meantime work was waiting on that stack.

One of the mill "dollies," or rollers, was dragged out to the poles, and turning the dollie over, the two poles were lashed to it at a quarter of their length. With the tackle and 500 feet of line, long hitches were taken from tree to tree, and the two poles ridden into camp in three hours, over a space of a mile, up and down hill and around curves.

Arriving at the mill, it was the work of but two hours to get the poles up and the stack in place, when the raising was accomplished with a windlass made of a piece of one of the poles set between two trees, turned by handspikes, and in seven hours from the time the poles were cut a mile distant from the mill, the stack was up and the guys fastened. Be sure your guy ropes are long enough; if not, you are very apt to drop the stack before it is in place.

WOODEN GASKETS FOR STEAM BOILERS.

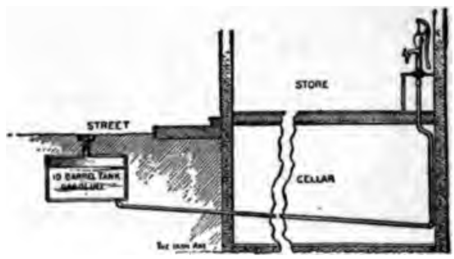
An engineer in the south uses, for his steam boiler hand holes, gaskets sawed out of ⅝-inch white pine boards. They have to be screwed up about twice when heated up, and when taken out are about 5/16 inch thick. As they are cheap a new one is put in each time the boiler is cleaned.

CALKING BOILERS.

If leaks develop in gaskets the bolts holding same should be tightened; if in seams or rivets, so that the water spurts out, the pressure should be dropped not to exceed 50 pounds for high pressure boilers or 25 pounds for tubular boilers, and then the bad places calked with the proper tools. It will do no hurt and is even safer to let the pressure off almost entirely before calking, and this is especially desirable if there are several leaks or continuous leaks in seams. It should never be attempted to calk a boiler under full water pressure, as the boiler is then under heavy strain, and, being full of water, is especially rigid, and a sharp blow may start serious leaks in several places at once. Raise the pressure again, watching the seams as before, and repeat the operation until the pressure is raised to about 50 degrees above the regular steam pressure at which it is to operate, without having any metal-to-metal joints running or spurting water. A small seep or sweat is allowable, as these places will close up as soon as the boiler is heated. All this is really the business of the boiler erector, but sometimes the engineer in charge is supposed to do all this himself.

SIMPLE AND SAFE STORAGE OF GASOLINE.

A dealer who handles a large amount of gasoline at retail put in the system illustrated below, and finds it very satisfactory.

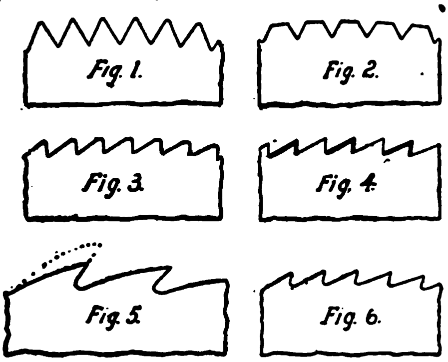


The tank, which in his case holds 10 barrels, can be placed under ground in the street or back yard. A cock is placed at the end of the force pump.

FILING CIRCULAR SAW TEETH.

A writer in the Wood Worker gives his experience in filing the teeth of a circular saw, which was a new one with teeth of the usual shape. Fig. 1. I wanted to use an emery wheel, for my limited experience had been confined to ordinary filers' common work, and I proceeded to file, maintaining the shape pretty much as I found it, but of course, put on a bevel. The foreman put in an appearance after I had filed about a dozen teeth, and made several vigorous remarks about my "pernicious activity," spoiling the saw, etc. Under his directions I went ahead again as follows: The first proceeding was to reduce the teeth to a shape about like Fig. 2, by either raising or filing. By filing it was preferable to make them like Fig. 3, all teeth being filed square across, and level. After they had all been reduced to a general resemblance to Fig. 3, the saw was placed on the mandrel and carefully rased off with an oil-stone, hard brick, or piece of emery wheel. When every point touched, the filing proceeded, the file being held only a trifle lower on the handle end, and pitched back until the teeth showed like Fig. 4. The bevel in most of the saws was very slight, and the front side of the teeth nearly perpendicular with the radial lines of the saw. These saws cut fast, did not "howl," and when properly set made a surface nearly like a block plane.

After I had succeeded in demonstrating my ability to make saws go his way, I still maintained I could make a rip saw go fully as well, and with less expenditure of time, by grinding instead of filing. One day, somewhat to my surprise, they brought me in a bevel-edge emery wheel. I had a new 12-inch saw, with teeth about ¾-inch apart, which had never been filed. I straightway and with much glee proceeded to fix it up on the wheel. I had a lot of sawing to do in 2-inch pine, making small slabs about 3/16 inch thick, and it was necessary that



they should be very smooth on both sides. In most cases they looked as if finished with a wide smoothing-plane. I also won out in an argument to the effect that the number of teeth in a saw was of importance mainly in the point of speed of cut. That is, it is not essential that teeth should be very close together in order to do smooth work. For instance, in ripping, teeth like Fig. 5 will do as smooth work as Fig. 6. For speed, however, the coarser the teeth, and the more gullet, the faster the stock can be crowded against the saw, the cut, of course, being pretty rough. A shallow, stiff tooth, nicely set, will cut as well as a planer saw, and much easier, according to my experience.

PRACTICAL HINTS ON FIRING.

Different methods of firing are shown in the accompanying illustrations, says Power. Fig. 1 is a longitudinal view of a furnace showing the coal high at the center and falling rapidly towards the furnace door and bridge wall. Fig. 2 is a cross-section of Fig. 1 and shows the coal high at the center and thin towards the furnace walls.

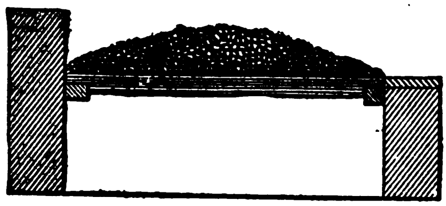


FIG. 1.

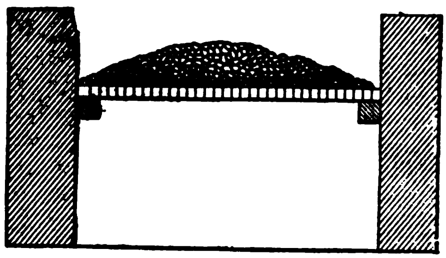


FIG. 2.

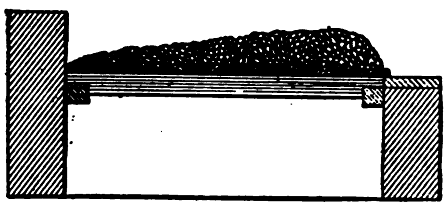


FIG. 3.

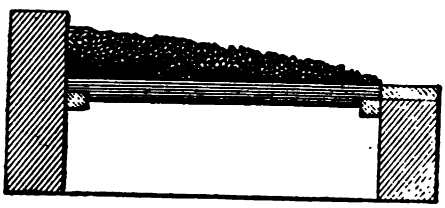


FIG. 4.

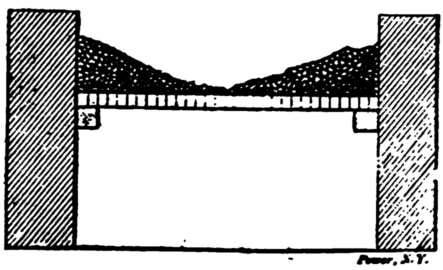


FIG. 5

This method of firing is known as the "[illegible]" and is very wasteful. Fig. 3 is an improvement over Fig. 1 and is known as the "wedge," with the large end nearest the furnace door. Fig. 4 is the reverse of Fig. 3 showing the wedge with its large end toward the bridge wall.

There are many engineers and firemen who religiously believe in the wedge method, some preferring Fig. 3, others Fig. 4. However, the wedge shows the least resistance to the air at its thinnest end, which admits of a large volume of cold air, first assisting to cool the boiler and surroundings at the thinnest end and then being heated to the proper temperature at the expense of the thickest portion of the fire. Fig. 5 is known as the "scoop method," which shows the coal high at the furnace walls and becoming gradually thin towards the center. This method is not an improvement over the wedge, but is an improvement over Fig. 1, providing its center is not too thin. Its bad point is, the center being thin admits large volumes of cold air, which lead directly to a loss of fuel. Fig. 6 shows the "pancake" method of firing, in which the fire is maintained at the same depth all over the entire grate surface. In this method of firing, the resistance offered to the atmosphere in flowing through the coal is almost equal; hence a greater uniformity of heated gases strikes the boiler and passes over the bridge wall, to be carried through the tubes and delivered to the chimney with the greatest amount of heat extracted by the heating surface. In some instructions printed for the use of firemen they are told to carry a light fire where the draft is poor and a heavy fire where the draft is good. The writer is of the opinion that these instructions were printed for plants where no dampers existed.

FIG. 6.

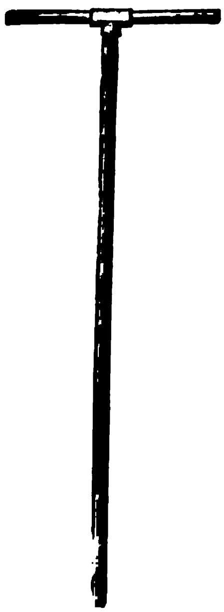


FIG. 7

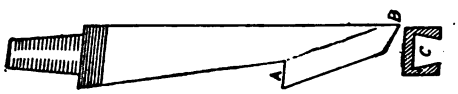
A very handy tool is shown in Fig. 7 for leveling off the fire. A piece of ½-inch pipe long enough to reach the bridge wall with a ½-inch tee screwed on one end, to which is fitted two pieces of ½-inch pipe about 14 inches long or long enough to go across half the fire. By sliding this tool along the top of the fire we can keep it very level and free from humps. Some firemen spread the bank with the rake. This is a very good tool to use in spreading the fire, as it affords an opportunity to pick out any clinkers or dirt during the operation. Fig. 8 shows a furnace fitted with a "dead plate" at the rear end of the grate bars, as shown; if we bank the fire as shown we can push back the bank on dead plate and haul out all ashes and clinkers without danger of mixing them into the bank. This method is superior to banking at the bridge wall, as it enables us to spread the fire immediately after hauling out the ashes, besides there is not so much coal lost in "jumping" over the ...ll during the operation of coaling

8

CORE-DRAWING MORTISING CHISEL.

A writer in the Wood Worker thus describes a handy tool which any mechanic can easily make.

Take an ordinary chisel and file the bottom of groove a trifle wider than top, as in-



dicated at C in sketch, and a trifle wider at A than B, he will have no more trouble with tight cores. A long bevel on inside edges, as indicated by dotted lines, also blunt bevel on lips, will greatly improve the drawing qualities of the chisel.

ATTACHING A LIGHT WATER-JACKET TO GASOLINE ENGINE.

In a paper read before the Institution of Mechanical Engineers, London, Capt. C. C. Longridge described a novel, but simple method of attaching a water-jacket to the cylinder of a gasoline engine. Reference to

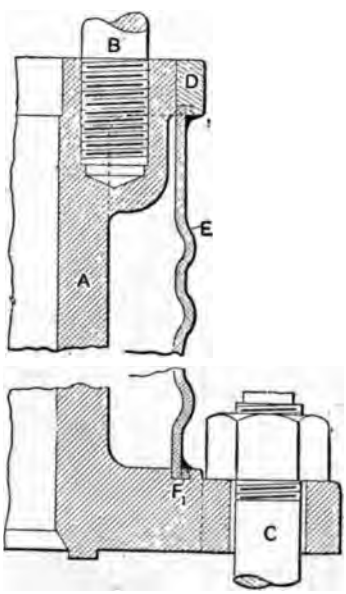


Fig. 1.—Showing How Water Jacket is Attached

the cut, Fig. 1, will make plain the following explanation: A the cylinder; B C studs ing cylinder head and frame; D iron ring forced over the cylinder head red to receive the jacket; E steel et; F F copper wire calked into groove; black surfaces represent solder if added.

He also describes a new combined inlet and exhaust valve for gasoline engines. Referring to Fig. 2: The exhaust valve E is recessed to receive the inlet valve D. F the cap of the exhaust valve spindle, is actuated by a two-to-one shaft and rod, not shown.

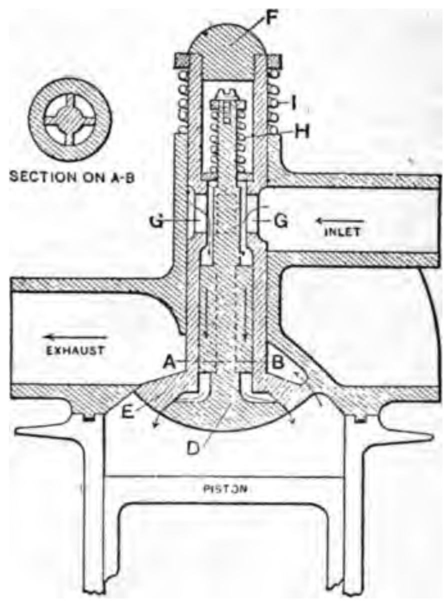


Fig. 2.—D'equevilly Combined Inlet and Exhaust Valve

I is the exhaust valve spring; H a weaker spring for the inlet. The shock of the exhaust spring closing, bounces the inlet valve at the same moment. The inlet valve stem is fluted, as shown in section across A B, forming channels for the charge to the head of the valve.

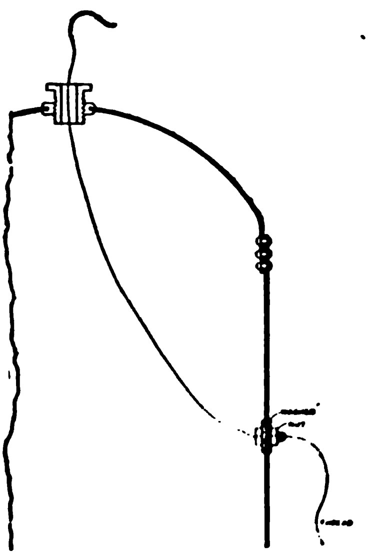
TO KEEP INK BOTTLE IN DRAWER.

To keep the ink bottle, which is only used occasionally, always handy and at the same time out of your way, says the Draftsman, fasten a piece of pine about 1 inch thick and 2½ inches square, with a hole in the center the size of the bottle, in a corner of the instrument drawer; there is no danger of tipping the bottle over here and it is always ready for use.

The turning on of a closed electric light has been found sufficient to ignite vapor ether when in a small room.

REPAIRING A RANGE BOILER.

An ingenious method of stopping a leak in a range boiler, which was too large to solder, is described in the Metal Worker. The plumber made a perfectly round hole at the point of leakage, and large enough to take a ¼-inch bolt with a soft washer in the inside. The bolt and washer were secured together and dropped into the boiler through the hot water opening at the top,



Drawing in the Bolt

a piece of thread being tied to each end of the bolt. The lower end of thread was then fished out through the hole, with a wire; the bolt drawn through and another soft copper washer put in the outside. Cement was freely used and the washers set up tight by tightening the nut. The same scheme can be worked in mending pipes and tanks where the material is too thin to tap and plug.

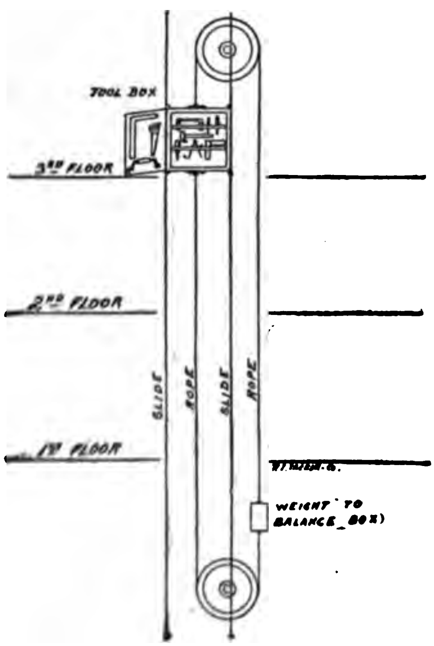
ATTACHMENT FOR LONG FILES

The file attachment illustrated herewith is something which I find very useful especially for heavy work, such as [illegible] filing, says a writer in the American Blacksmith.

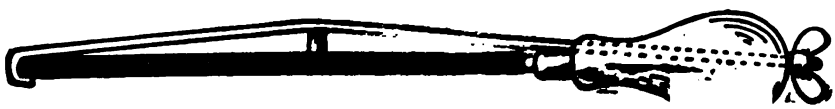
As is clearly shown, the device consists simply of a ¼-inch rod, one end of which is bent to hook over the end of the file, while the other end passes through a hole in the handle and is threaded to receive a nut. By placing a block under the rod and tightening up on the nut, the file may be given a slight bow downward. This opens the teeth and makes the file cut better. In my opinion, also, it will last longer.

A TOOL BOX ELEVATOR.

The accompanying drawing shows an arrangement that will enable the miller to have his tools on any floor he desires by simply pulling a rope, says the American Miller. The device consists of two sheaves on which a rope is placed. A tool box is



fastened to the rope, to run between two guide posts. On the opposite side of the rope a weight is placed to balance the tool box.

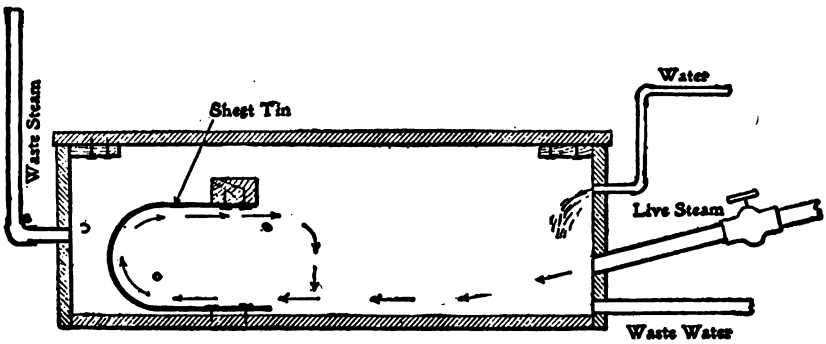


To Strengthen Long [illegible]

DEVICE FOR WASHING OVERALLS.

In the boiler house of the Union Steel Co., at Honora, Pa., the men have constructed a device for washing overalls, which will take the dirt and grease out of the worst possible specimen, and do it quickly. The sketch shows the machine.

The overalls are put in and the lid is closed, a fine stream of cold water is turned on, the live steam is started and they are then left to wash themselves. There must not be over an inch of water in the bottom. The live steam strikes the cloth and carries it in the direction of the arrows to the sheet tin. The cloth is compelled to follow the curve of the tin up and around. Then it drops in the stream of steam and water again, and so on. As it works in practice the cloth is passing around the tin continuously, being kneaded and turned in the hot water until it is perfectly clean. No soap was used, yet no doubt it would have shortened the time. An ordinarily dirty pair of overalls would be cleaned in two or three minutes. The box is about 4 feet long, 3 feet wide and 2 feet deep, but could perhaps be made smaller without harm. If too much water is used in the bottom, the steam tears the cloth instead of moving it.



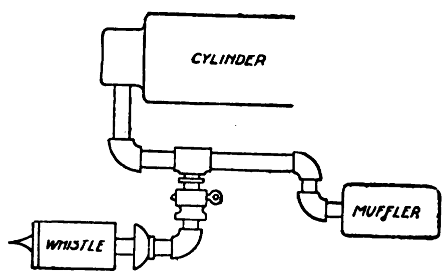
FOR WASHING OVERALLS.

WHISTLE FOR GAS ENGINE.

The most strenuous thing yet in the way of an alarm horn for automobiles has been discovered by S. W. Rushmore, of Jersey City. Beside it the shriek of the fire boat is like a child's whistle and the fog horn would be inaudible if they were blown ...neously. Mr. Rushmore thus tells ...mobile Magazine how he came by ...:

"... muffler of my Winton machine and noticed that a considerable increase of power accompanied the exhaust, and decided to see what gain there would be in cutting out the muffler of my 12-horsepower Packard. I placed a T in the exhaust pipe and to this connected a 1½-inch brass blow-off valve with lever connected to a foot button. I also coupled on an elbow so that the blast is directed backward and does not stir up a dust. Just as I got the thing finished I noticed in the shop a tug-boat whistle with a bell 5 inches diameter and 12 inches long, that exactly fitted on the pipe. I screwed it on, as per sketch herewith.

"When the relief valve was opened the whistle let out the most unearthly shrieks, showing that as the whistle was set for 100 pounds steam the initial pressure of the exhaust in the pipe leading to the muffler exceeded that amount. Each shriek was apparently of shorter duration than the length of a stroke and I thus argue that the ex-



Conection of Whistle

cessive initial back pressure is not due to any defect in the muffler but to the inertia of the gas in the pipe leading to it.

"The thing is a great success in waking up truck farmers that I meet on the road, before they know what they are up against."

A WATERPHONE.

This simple but effective instrument detects leaks in water pipes. The inspector places the end of the rod against the pipe

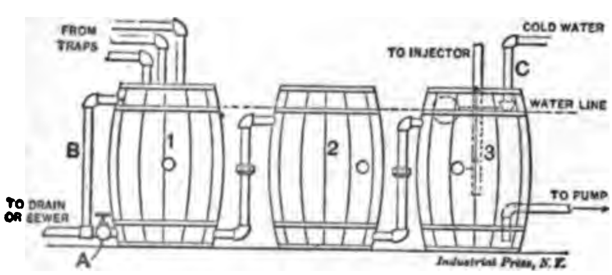
The Waterphone

and holds the "phone" to his ear. If there is any flow or drip it will be distinctly heard.

APPARATUS FOR REMOVING OIL FROM EXHAUST STEAM.

A simple, home-made device for removing oil from the condensation of exhaust steam is described by a writer in Steam Engineering.

This apparatus is to be used where the returns come through steam traps. Get three whisky barrels and connect them by 1¼ or 1½-inch pipe, as shown in the sketch. The drips from the traps flow into barrel No. 1. The barrels are open at the top, as no pressure is carried in any of them.



Simple Apparatus for Purifying Oily Feed-water.

When all the barrels fill to the water line indicated, the oil and scum will be taken off by the overflow pipe B; if enough water does not come from the drips to keep the barrels filled to the water level, the deficiency is supplied from the cold water pipe C. By opening the valve A, barrel No. 1 can be drained out, and also any oil and scum that has worked through into barrel No. 2 will run out through the pipe connection into No. 1. The cold water feed will then wash out barrel No. 1. Of course valves may be put in the bottoms of barrels Nos. 2 and 3 to drain them completely, but I do not consider it necessary.

A HOME-MADE TUYERE.

I have for several years used a simple contrivance for a tuyere in my forges, and they have given every satisfaction, says a correspondent. Take a piece of heavy gas pipe about 1¼ inches in diameter, long enough to reach from one side of the forge to the other. Enlarge one end so as to receive the point of the bellows well, and other other end is brought even with the opposite side of the forge. Drill a ⅝-inch hole at the point where the fire is wanted. Imbed the whole tube at the usual depth in the forge, covering all parts (except fireplace) with brick or clay, or both, and leaving a sufficent space for the fireplace. Insert a wooden plug at end of tube. After using for two or three weeks, some cinders will get in the tube, then simply remove the wooden plug, and using a rod with a small hook at the end, scrape it out clean. When good coal is used, such a tuyere will last for many years and stand quite heavy heats. The joints between bellows and tube make airtight wth putty.

A cooking pot is the first iron casting ever made in the territory which now constitutes the United States. It was made at a small blast furnace near Lynn, Mass., in 1642. The furnace used charcoal for fuel had bog ore and used oyster shells as flux.

REMOVING OBSTRUCTIONS FROM DRILLED WELLS.

To remove a fast bucket from a drilled well, if you know the inside diameter of the bucket, take a piece of square iron that will fit the bucket tightly. Taper the iron so it will easily enter the bucket, and with a chisel cut barbs in each of the four corners. When the iron is driven into the bucket the barbs will catch, and unless it be stuck very fast, the bucket can be drawn up.

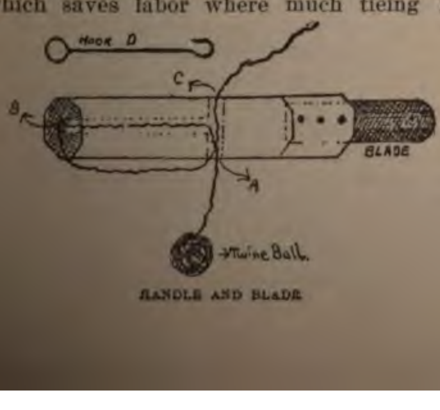
TO REMOVE PIPING FROM DRILLED WELLS.

For removing pipe, take a piece of casing about 3 feet long, rivet a piece of heavy wagon tire to each side of pipe, about 3½ feet long, and bring this together at the top, fastening to a smaller pipe, to which the rope is to be fastened. By driving this down over the pipe, the latter will wedge between the side irons and in this way the pipe can be removed. See illustration.

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

TWINE HOLDER AND KNIFE.

The American Miller describes a home-made device, easy for any one to construct, which saves labor where much tieing is



HANDLE AND BLADE

done with string. The writer says: "For handle use a piece of hardwood 4 inches long, 1 inch wide and ¾ inch thick, and round off the corners. For the knife I used a piece of an old table knife and drilled holes through the handle and blade for

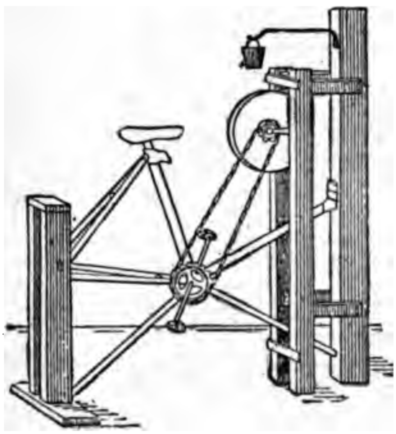
rivets. In about the center of the length of the handle I bored a hole in line with the blade, and then another hole from the end of handle until it connected with the cross hole.

To thread the knife I bent up a wire hook. This I inserted in the hole B, passed the end of twine up hole A and drew it out at B by means of the hook, then passed the twine around to A and drew it out at C, when it was ready for use. I use 4-ply ball twine, and after getting the tool threaded can use the whole ball without cutting off more twine than is needed for each sack as it is tied. To use, take the knife in the left hand, with twine from ball end between the second and third fingers, and proceed to tie the customary knot, which every miller should know how to make.

A GRINDSTONE SCORCHER.

A new use for bicycles has been discovered. It is to run grindstones with them. John Arrowood, the first to transform the wheel into this useful piece of mechanism, tells the American Blacksmith how it is done:

"I had the frame of an old bicycle and used it in connection with the stone. I first cut out the middle brace of the bicycle and with a 2 by 4 timber made the rear support. Next I stapled the front of the bicycle to a stout post and then made the frame of the grindstone. I braced the bicycle frame underneath. By cutting the spokes out of the rear wheels I secured the



A Grindstone Scorcher

small sprocket. I then fitted a small piece of wood into the square hole of the grindstone, bored a hole in the wood the size of the sprocket axle and fitted the axle to the stone. I cut notches in a piece of iron for the axle to rest in and nailed the iron to the frame. As the stone was quite high, it was necessary to obtain two chains and put them together.

"The machine is now a handy ball-bearing grindstone, which runs at lightning speed and costs but little to make."

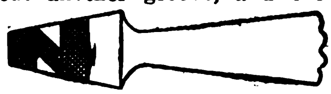
SIMPLE DEFINITION OF COMPOUND ENGINE.

A compound engine is one having two or more cylinders, usually two, however, a high pressure cylinder and a low pressure cylinder, the latter being the larger. The steam from the boiler enters the high pressure cylinder and after performing a certain amount of work, it is exhausted into an intermediate vessel or cylinder, called a receiver, whence it is admitted into the low pressure cylinder; after performing a certain amount of work in this cylinder it is allowed to escape into the condenser, in a compound condensing engine, and into the atmosphere in a non-condensing engine.

LEAD FILE HANDLE.

A correspondent of the Wood Worker gives directions for making a file handle which is worth trying.

Turn up a file handle, cutting away a recess on end for ferrule, skip back about ¼ inch, cut another groove, and then after

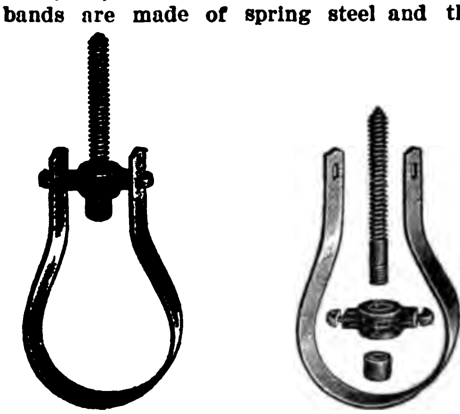


File Handle

connecting these with a couple of "bias" channels about the same width as grooves, wrap a piece of paper around shank and pour in babbitt metal.

SIMPLE PIPE HANGER.

A very simple pipe hanger is being put on the market consisting of a lag screw and yoke, a nut and a hanger band. The bands are made of spring steel and the



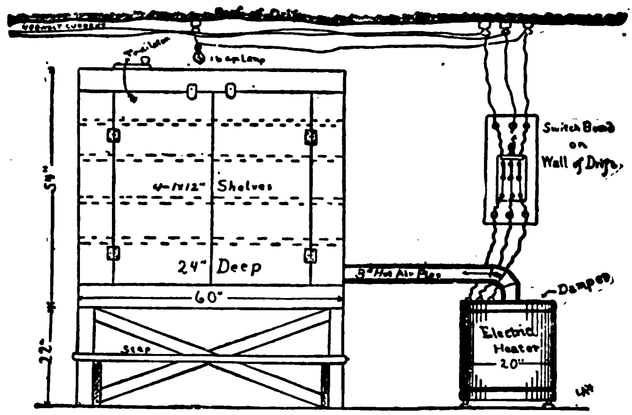
New Pipe Hahger

yokes of malleable iron. The hangers are made to carry pipes of from two to six inches diameter.

ELECTRIC POWDER THAWER.

In an Idaho mine lighted with electricity the chief engineer has devised an arrangement for safely thawing his powder, which, on account of the extreme cold in winter, frequently freezes. The Mining and Scientific Press describes it as a magazine 5 feet long, 4½ feet high and 2 feet deep, set on a stand 22 inches above the floor of the mine.

The powder is placed in galvanized iron trays which are placed on the shelves. The trays are partly filled with sand. A ventilation at the tops allows gases to escape, and two thermometers indicate the temperature, which should be from 70 to 75 de-

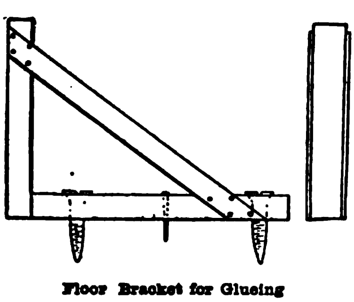


Electric Powder Thawer

grees F. Air is heated in a "stove," which is a galvanized iron drum containing 30 coils of No. 22 tinned steel wire—German silver wire is better, but more expensive. The drum is open at the bottom and stands on porcelain knobs to secure insulation. A voltage of 400 is used. Three hours are required to thaw the powder. The temperature must not rise above 80 degrees.

FLOOR BRACKET.

Chas. Cloukey in the Wood Worker tells how to make a floor bracket for gluing up circles or other bent work of somewhat limited width. The vertical and horizontal pieces are 7/8-inch oak, 1/4 inch wider than

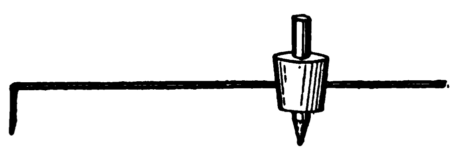


Floor Bracket for Glueing

the jaws of the handscrews to be used, and ...d make the bracket about 7 by 10 ...r ordinary work. It is well not to ...oor pieces too long, as they ob- ...ut into a very small circle. The braces are made of 1/2 by 2-inch oak and nailed on with 6-d common nails. Some users prefer to glue on a solid triangular piece instead of nailing on the strip. One nail to facilitate putting bracket in place, and two screws to hold it there, provide a simple method of fastening. Once when we were crowded for floor space, a workman attached the brackets to pieces of plank, and after the hand-screws were in place, stood the whole business up against the wall to dry.

A CHEAP COMPASS.

To make this inexpensive compass all that is needed is a large cork (or rubber), a piece of stiff wire and a short pencil. The wire should be about 8 inches long and should be bent to a right angle one inch



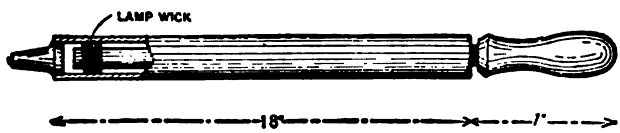
from the end, and the end sharpened. The pencil is fitted vertically in the cork (or rubber), and the latter clamps the wire tightly and may be moved in or out to make a small or large circle, as desired.

TO POLISH BRASS.

Smooth the brass with a fine file and rub it with a smooth fine grain stone, or with charcoal and water. When quite smooth and free from scratches, polish with rotten stone and oil, spirits of turpentine, or alcohol.

HOW TO MAKE A PLUMBER'S FORCE PUMP.

With the aid of a piece of 1¼-inch tubing and a piece of round oak or ash a plumber may make his own force pump that will answer every purpose for removing stoppages from basins and waste pipes. The tubing should be about 18 inches long and may be made from pipe left over in fitting up a closet. An old thimble from a wash



A Home Made Force Pump.

tray can be soldered on one end of the tube for the nozzle. The piece of round oak or ash serves for the plunger. It should have a handle extending about seven inches beyond the chamber. Around the lower end, says the Metal Worker, a recess should be cut about ½ inch wide and ⅛ inch deep, to be filled with twine or lamp wick, to make it fit the chamber tight. If the nose of this is put into a stopped-up waste or service pipe and the chamber filled with water a considerable force can be developed to dislodge the stoppage. On the other hand, a very strong suction can also be brought into effect. Such pump is also very handy for absorbing the water from holes around a drain pipe while making calked points, or for freeing a main where water collects.

A HANDY TOOL.

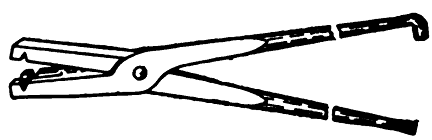
A correspondent of the Blacksmith and Wheelwright sends that paper a sketch of a tool that he uses as a tire puller. If the reader will note its construction he will see that it can be used in a great variety of

situations where it is necessary to "yank" something, and such situations occur in factories sometimes. The device is simp

planation.

USEFUL COMBINATION TONGS.

A useful pair of combination tongs which any smith can easily make is illustrated herewith. The designer says: The tool shown I find of use as a pair of tongs, clip tie and bolt head holder, both at the fire and at the vise. The jaws have a half round swage crease sunk on the inside of each. About one-eighth inch from the outer end of each, I sink a transverse or cross crease suitable for receiving the edge of the head of a bolt. As it is deeper in the center than on either edge, it holds a short bolt firmly in the fire or in the vise when welding, cutting threads, taking off nuts, or running down nuts on plow bolts or carriage bolts. This is done without damage to the heads.



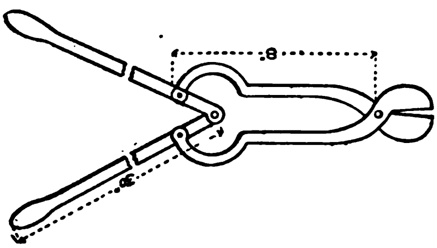
The ends of these tong handles are made, one hooked, the other flat, straight and fitting inside the hook of the other handle. This forms a clip tie. Such tongs will be found a combination which will save a blacksmith many steps during a day's work looking for the tools which it combines. It will also hold flat and round iron.

To make transfer paper, take two ounces of tallow, one-half ounce of powdered black lead

seed oil and the con-

A HOME-MADE BOLT CLIPPER.

J. D. Arrowood says that any blacksmith can make the bolt clipper he describes. In making this clipper, he says, I take two pieces of tool steel ⅜ by 1¼ inches, forging them, as shown in the sketch. The handles are to be formed from pieces ½ by 1¼ inches in size, and for this common iron will do. They should be about 30 inches long as indicated. Half-inch holes are then



Home Made Bolt Clipper

put in the blades and handles at the proper points as shown, using steel bolts or rivets for holding. After the steel jaws have been brought to the proper shape they are to be hardened and brought to a blue. In tempering great care should be used, as only the cutting edge is to be tempered. The size here described is suitable for ½-inch bolts and under.

HOME-MADE FOOT-POWER HAMMER.

A home-made foot-power hammer easily constructed and inexpensive, is described in the American Blacksmith. It is the invention of L. Van Dorin, but is not patented and may be used by anyone. It can be adjusted to strike any point on the anvil; works easily; and the hammer can be removed in half a minute. The maker says:

The base A, is of pine, 6 by 8 by 34 inches, and to it are attached two standards B. These are also of pine 2 by 3 by 30 inches, and are braced by the rods C. The foot lever, of ash, 1¼ by 1½ inches and 54 inches long, is hinged 12 inches from the foot plate end, so as to fold out of the way when not in use. Two angle irons with through bolts serve to secure the standards to the base, as clearly shown in the engraving. On top of the standards are placed the joined boxes, 1¾ by 2 by 4½ inches. These I make of ash, in halves and secure by small strap bolts. A stirrup, represented in the drawing by D. sits over the base to hold it steady, and is itself held by four eyebolts screwed into the floor. The lifting spring which I use is 20 inches long over all, with capacity for swinging a 12-pound sledge, or 100 pounds lifting power.

The two pulleys EE, are connected by leather straps, one with the treadle and the other with the lifting spring. The lower

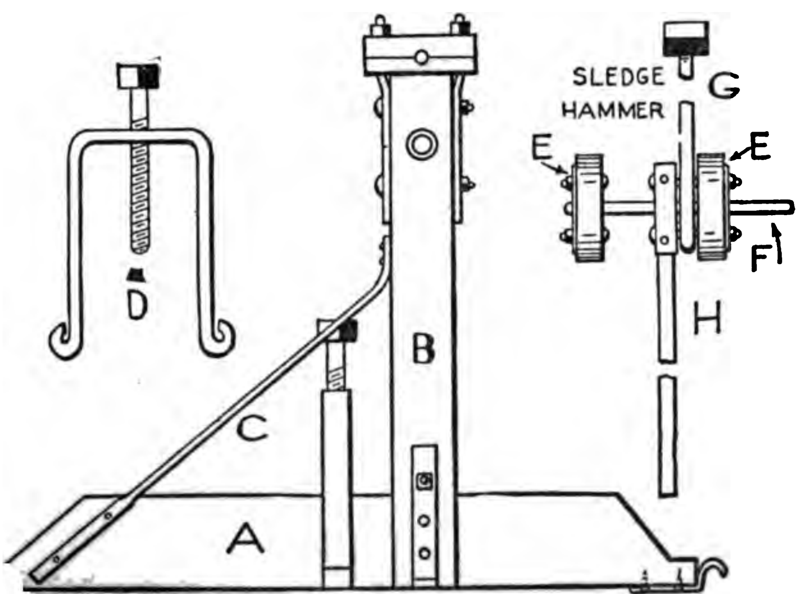


Fig. 1. DETAILS OF FOOT POWER HAMMER.

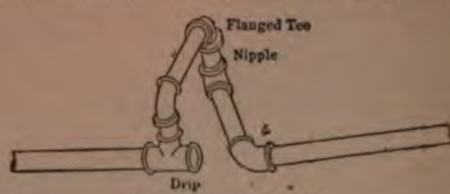
end of this spring engages a hook on the base, as shown. The treadle strap fastens to the pedal just back of the hinge. The pulleys are [illegible] inches in diameter and 2 inches thick, the distance between them being eight inches. They are rigidly fastened

Hammer Complete

to the shaft F. To it are also fastened two blocks, one carrying the sledge hammer handle G, and the other having bolted to it two plates from an old buggy spring. This strikes a block on the base, bringing the hammer and pulleys to a stop on the upward stroke without jar.

NOVEL BUT PRACTICAL EXPANSION JOINT.

An unusual type of expansion joint has been adopted in the power plant of the United Electric Co., of Newark. Thirteen boilers supply steam at 145 pounds per square inch to 9,000 horsepower of engines. The steam mains are small, 14 inches, and the engines are fed from a 12-inch line. Near the throttle of each engine is placed a receiver with capacity three times that of the high pressure cylinder. This insures an abundance of steam, and the drop from



Novel Expansion Joint

boiler to engine is only three and one-half pounds. The expansion joints are unique, being made up of elbows and screwed nipples, as shown in the cut. The joint is very flexible, and contrary to what one might suppose, does not leak steam.

SHOWER BATH FOR ENGINEERS.

A writer in The Engineer tells how he made a shower bath for use at the station. He says: It is placed in one corner of the basement and consists of a pipe piped to the city water as at M. A valve is placed at A. The pipe is connected with steam pipe at B. The end of the pipe is made in a circle as at E, and is capped as at R. The circle is drilled all the way around with ⅛-inch holes, as shown. N is a steam pipe with a valve at A. When ready to take a bath open both valves so as to get the water the right temperature and then all that is necessary is to step under, the water will

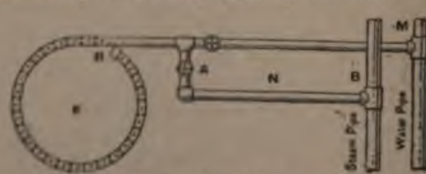


Fig. 1. Shower Bath for Engineers.

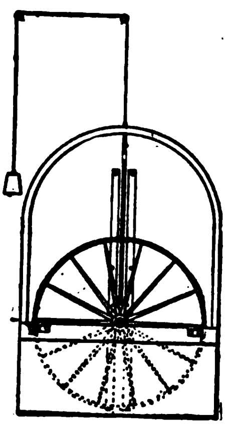
Fig. 2 and 3. Method of Bending Small Pipe.

do the rest. The bath room is 4 feet square and the dressing room 5 feet square.

Fig. 2 shows a good way to bend small pipe. [illegible] in the vise the size of the circle required, place the clamp on the pipe in the vise as shown in Fig. 3, and make the clamp as shown so that the end of the small pipe to be bent can be placed in the part of the clamp at B. I have found it is best to first heat the pipe, if brass, to a dull red. This can be plainly seen by holding it in a dark place; let it cool and it can then be bent easily into a circle.

WHEEL PAINTING MACHINE.

In factories where buggies and wagons are made many parts of the vehicles receive their coats of paint by being immersed in a tank of paint. Here is shown a recent invention for treating the wheels. The wheel is suspended in a covered arched hood and the wheel dipped in the paint tank. Then it is raised out of the paint and the wheel



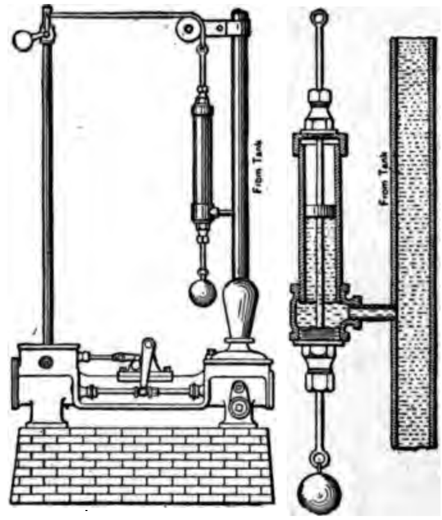
Wheel Painting Machine

rapidly revolved by means of a hand crank. The surplus paint is thrown off against the hood and runs back into the tank to be used again.

HOME-MADE PUMP REGULATOR.

All sorts of devices are in use to regulate the pump for a tank supply. A writer in the Engineer, who had tried both the string and electric telltales with poor results, worked out a good one which he described as follows:

"The discharge from the pump entered the bottom of the tank, so I placed a tee in the pipe and a short piece of pipe to bring the regulator near the steam pipe. On this was a a 1¼ by 2 by 1-inch tee. A piece of e 1 inch long was placed in the ction to form the body of the



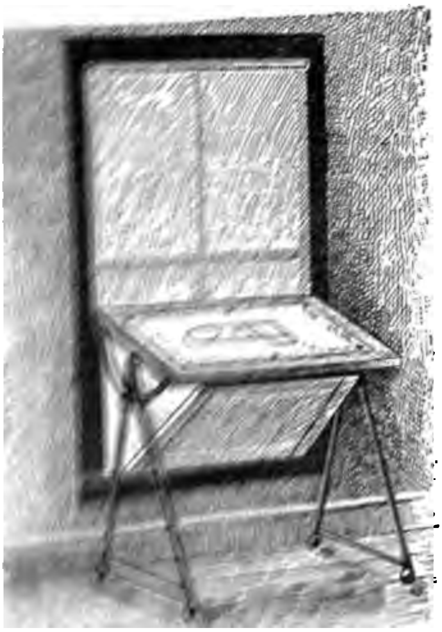
Keeps the Tank Full

regulator, at the top of which was a reducing coupling with a ½-inch close nipple and a reducing coupling on each end to form a stuffing-box for the piston rod. In the lower end of the tee is a reducing bushing, and close and reducing couplings to form a stuffing-box, as in the other end. The inner coupling on this end is carried up as far as possible, so the piston can not close the inlet. The piston is made of lead with a rubber washer on the bottom to keep it tight. The upper rod is fastened to the valve that gives the pump steam, closing it when the tank is full, and opening it when water is taken out. The lower rod is used to place on the weight to balance the pressure in height that is wanted in the tank. When the tank is full the water pushes the piston in the regulator up, which causes the rod to close the steam valve and stop the pump. When the water is drawn from the tank the piston falls and the pump starts.

APPARATUS FOR COPYING DRAWINGS.

Twenty years ago the blue print drawings now made by the thousands, were seldom seen, and not favorably regarded by many European engineers. Hand-made drawings, made one at a time were considered better and usually insisted on. A correspondent of the American Machinist tells of a simple home-made device he used, when given a job many years ago, to reproduce 100 copies of the same tracing, to be "hand-made drawings on white paper." He says:

In place of a drawing board I had an open [illegible] made of soft wood, into which was [illegible] of glass so as to flush with the [illegible] wood. The glass was larger than [illegible] line of the drawing, but smaller [illegible] whole sheet, so that the original [illegible] placed on the glass and the [illegible] over it and fastened by [illegible] in the soft-wood frame.



[illegible]

Steam is a colorless, expansive, invisible fluid, and is produced by heating water or other liquids.

The subjects of steam and heat are therefore very closely connected. We cannot have steam without heat, neither can we have heat without motion, and this is one of its great factors of usefulness to mankind. Our steam engines then are in reality heat engines, and the steam is the medium by which the heat is carried from the coal to completed work at the engine cylinder. We say steam is an expansive fluid, and in this expansion is its great factor of usefulness to us. If we take water at 32 degrees F., and add 180 heat units to it, under one atmospheric pressure it boils, and its temperature is 212 degrees F. Up to this point we can measure the heat with a thermometer; this is called the sensible heat of steam. We also have what is called the latent (or lost) heat of steam; this cannot be measured by the thermometer and comes about in the following manner:

If we take one pound of water at 32 degrees F. and apply a fixed and known quantity of heat to it until it boils, we will assume that it takes 20 minutes, and we have supplied the water 180 heat units, which, added to the 32 contained in the water at the start, makes 212 degrees F. or heat units, and is the sensible heat of steam at atmospheric pressure. Now let us continue the same quantity of heat per minute until all the water has evaporated into steam and we will then find that it has taken five and one-third times as long, or 10 minutes, to do this work. Consequently we have used five and one-third times 180, or 960 heat units; or, to be exact, it is 966 heat units. Now the temperature of the steam is the same as the water from which it was evaporated, or 212 degrees F., and this 966 heat units is the latent heat of steam at atmospheric pressure. All steam has a sensible heat corresponding with the temperature of the water it is evaporated from. If you boil water under a pressure of five atmospheres or 75 pounds pressure, the sensible heat is 306 degrees F., the boiling point at that pressure, but the latent heat has decreased by the same number of heat units that the boiling point increased, so the total is the same in all cases. In the first case we have 212 degre[illegible] 966 or 1,146, and in t[illegible] grees minus 32 [illegible] heat units. [illegible] under [illegible] increased to 1,644 times that of the water in the second case; evaporating under 75 pounds pressure, the temperature also remained the same, 306 degrees F., but the volume is only 295 times that of the water it was evaporated from. This is one of the reasons it pays to run an automatic cut-off engine.

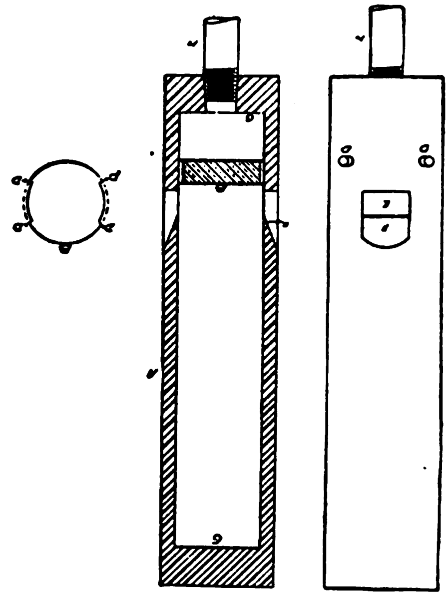
The expansion of steam follows what is called Marriott's law of expanding gases, which summed up means one-half the pressure doubles the volume. So if we let steam into an engine cylinder at 80 pounds pressure, and cut it off at one-fourth stroke, it is at 80 pounds up to the point of cut-off; at one-half stroke, because it has doubled its volume, it is reduced to one-half pressure, or 40 pounds; while at three-fourths stroke the volume has trebled and the pressure has dropped to nearly 27 pounds, and this is why it is economical to run engines that use steam expansively. Steam at 27 pounds pressure is very much cooler than steam at 80 pounds, and this difference in its temperature has been converted into mechanical work by our steam (heat) engine.

Of the latent heat that disappears in the formation of the steam we can recover a great part of it again when steam returns to water, that is, it gives up its latent heat when condensed. That is one reason why steam is a good medium to heat our buildings, and also a good reason why it requires so much cold water to condense the steam back to water quickly as in an engine movement. Steam also has a very rapid movement. It will flow under a pressure of one and one-half atmospheres into the air at a velocity of 67,500 feet per minute, and into a vacuum from a pressure of one atmosphere at the rate of 114,540 feet per minute, or 1,242 feet per second. This is why a steam pipe and the steam ports of a cylinder may have a very much smaller area than the piston itself, and the rate of flow of steam in pipes is how their sizes are determined. The whole science of the intelligent use of steam is to save, utilize and direct its heat. An economical 80-horsepower automatic cut-off engine using 30 pounds steam per horsepower hour, and discharging into the atmosphere at a back ... of one pound per square inch, will ...eat enough to supply 9,000 square ...rface, or enough to heat ... 720,000 cubic feet of

HOME-MADE STEAM WHISTLE.

The accompanying sketch shows how a correspondent of Steam Engineering made a steam whistle from a piece of 3¾-inch boiler tube. Practically the only item of expense was the labor involved and the home-made whistle was found to give as good satisfaction as any regulation whistle would have done.

The drawing shows the construction, A being the piece of boiler tube forming the



Boiler Tube Whistle

bell of the whistle. The center piece B was fitted in place and secured by four studs D. Two sides of this piece were filed away so as to provide passages for the steam. Above the passages, and in line with them, rectangular holes E were cut in the bell, one on either side, the upper edges being filed down, as at F, to form sharp edges. Two solid ends G G were then welded into the bell and the bottom one drilled and tapped for the steam pipe H, after which the whistle was complete.

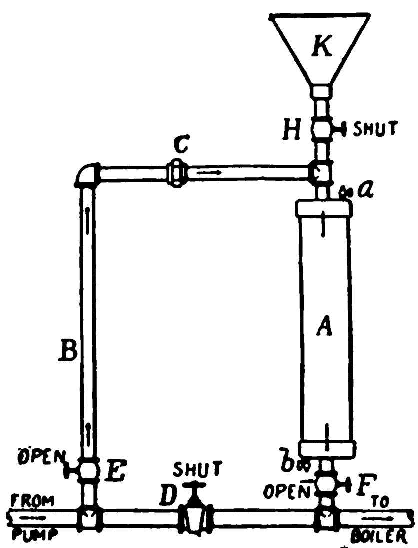
INTRODUCING SOLVENTS INTO BOILERS.

Our illustration shows a simple device, which any engineer can easily construct, for pumping solvents into the boiler without passing through the pump. Referring to the illustration, A is a section of big pipe—say six inches in diameter and thirty inches long

—which is to serve as a reservoir. This connects with the feed pipe running from the pump to the boiler, by means of the pipes B, C and F, which are so arranged that they connect with the feed pipe on opposite sides of the stop valve D. Over the reservoir is a funnel, K, by means of which the reservoir, A, can be filled through the valve H. The reservoir, A, is provided with pet-cocks, a and b, at the top and bottom, so that it may be readily filled and emptied. A union is provided at C, to facilitate the assembling of the piping. (A right-and-left elbow, of course, may be used instead, if it is preferred.)

The device is used as follows: The reservoir A being empty, valves E and F, and pet-cock b, are first closed, and valve H and pet-cock a are opened. The soda ash solution is then poured into K, until the reservoir A is filled. The valve H and the pet-cock a are then closed, as well as the valve D, in the main pipe. Valves E and F are then opened, and the pump is started. The device is then in the condition shown in the engraving, and the water from the pump passes through B, C and A, as shown by the arrows, sweeping the contents of A out into the boiler.

When the pump has been run long enough to thoroughly remove all soda ash

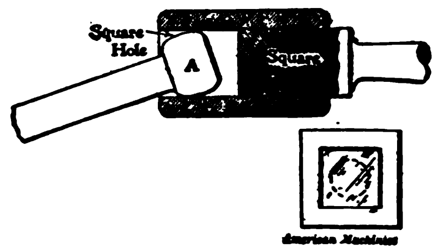


ARRANGEMENT OF PIPING FOR INTRODUCING SOLVENTS.

from A, valve D may be opened, and valves E and F closed. The reservoir A is then emptied by opening pet-cock b and either pet-cock a or valve H, and the device is again ready for operation.—The Locomotive.

SIMPLE UNIVERSAL JOINT.

A correspondent writes: We required a universal joint at short notice for an experimental machine. The sketch, sufficiently



A CHEAP AND SIMPLE UNIVERSAL JOINT.

clear without further elaboration, shows how it was made. The end A was made a rather shaky fit. No machine work was done on it—simply filed up.

HOW AND WHY THE INJECTOR WORKS.

A. E. Rhodes, in the Practical Engineer, writes entertainingly of the injector. He says: The operation of the injector does not involve any principle of a perpetual motion, and is not doing work without consumption of power. Mr. Forney, in his book "Catechism of the Locomotive," states the principle in substantially these words: Steam escaping from under pressure has a much higher velocity than water would have under the same pressure and condition. The escaping steam from the receiving tube unites with the feed water in the combining tube, and gives to this water a velocity greater than it would have if escaping directly from the water space in the boiler. The power of this water to enter the boiler comes from its weight moving at the velocity acquired from the steam, and it is thus enabled to overcome the boiler pressure.

He then goes on to illustrate this by the example of a wooden croquet ball, which will float on the surface of the water, but if thrown violently into the water it will sink before its buoyancy will overcome its momentum, while a very light hollow ball will not sink, no matter how much force we may expend in throwing it into the water, because its momentum or actual energy is much less th[illegible] ball. If steam were sufficient pr[illegible]

Another writer, Sinclair, describes the principle very nicely in the following language:

The principle of the injector's action is that of induced currents. A current of any kind has a tendency to induce a movement in the same direction of any body it passes over or touches. Thus we are all familiar with the fact that a current of air (called wind, passing over the surface of a body of water, sets waves into motion.

In the same way a jet of steam moving rapidly when injected into a body of water, under favorable conditions, imparts a portion of its motion and starts momentum sufficient to overcome the original pressure of the steam. That is how the injector is made to force water into a boiler against the same pressure the steam is starting from. There are many other applications of this principle, the most common of which are: The ordinary locomotive blast, blowers, steam siphon, steam jets, jet exhausters and Argand burners.

Closely examined, its mystery as a source of power disappears; for it is found that an amount of heat equal to the mechanical equivalent work done is used up during the operation of feeding.*

Thus, when a given quantity of heat units pass from the throttle to work the injector, the whole of the heat does not return to the boiler along with the feed water, as was at first supposed to be the case, but a portion of the heat representing the foot pounds of work done is dissipated, besides other losses due to leakage, radiation and connection.

There are many forms of injectors in use, but all of them conform to the above ele-
ry principles in their mode of action.
ent, steam enters from the boiler,
ugh the steam pipe and receiv-
a high velocity, and combining with the water at point W, condenses, but imparts considerable momentum to the water which rushes along into the delivery pipe, raises the check-valve and passes into the boiler. As the current of water for starting the injector could not be induced against the constant pressure on the check-valve, which equals the pressure at the throttle, an overflow is provided, when the water can flow unchecked until the necessary momentum is obtained, when the overflow is closed.

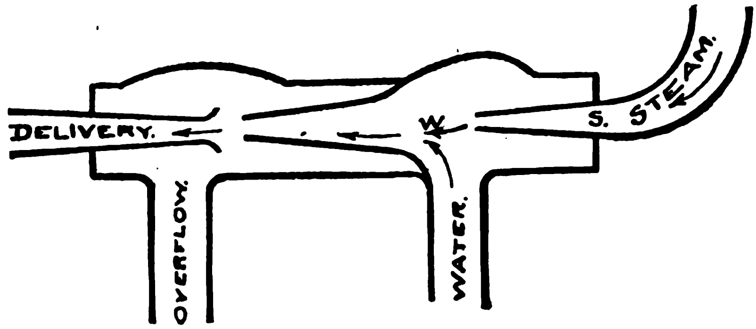


Diagram of the Injector

STRENGTH OF STEAM PIPE.

John B. Berryman in the Engineer gives the results of a large number of tests at the Crane Co., as follows:

Ordinary commercial pipe, 12-inch and smaller, appears to have an ultimate bursting strength in excess of 1,500 pounds per square inch, provided the weld is perfect. We have tested some lengths of 10-inch pipe taken at random out of stock to 2,300 pounds per square inch; 8-inch, 2,000 pounds; 12-inch 1,500 pounds; 16⅜ inches thick, 800 pounds; 24⅜ inches thick, 600 pounds, all without rupture or apparent distortion. We have tested from time to time thousands of pieces of all sizes, 20-inch and smaller, under 800 pounds per square inch, so that as far as strength is concerned, there appears to be no reason why pipe heavier than standard should be used on power plant work. In plants where the feed water is bad, it is economy to run the feed lines of extra strong pipe, and this has become quite a common practice even where the water is comparatively good.

Prussiate of potash in water applied with a hair pencil will restore effaced writing if the paper has not been injured.

CALIFORNIA REDWOOD HARD TO PAINT.

The California redwood makes a handsome piece of lumber, and is largely used in that state in car work. It contains a peculiar acid that acts like alkali and causes the painters all kinds of trouble. Thos. H. Cornish, of the Southern Pacific railway, San Francisco, discusses this peculiarity in the Railway Master Mechanic. A redwood car painted in the usual way will blister and peel off in a few hours' exposure to the sun. Mr. Cornish now prepares the wood by a coat of raw linseed oil containing a pint of benzine to the gallon. Any oil remaining on the surface after two hours is wiped off. After five days put on the next coat.

The next coat of paint after the oil coat is prepared as follows: To 15 pounds of flat lead color, add 15 pounds of litharge mixed as follows: Use enough best coach japan to make the litharge about as thick as mush. It is then poured into the flat lead, the whole mass, well stirred, is then put into the paint mill and ground as fine as possible, then thinned down with turpentine to a proper consistency to work easy under the brush. Give the cars three coats of this mixture (one each day); the coatings form a hard barrier and resist the acid wonderfully.

The next in line is a coat of preparation color to receive the knifing; this color is made in the following manner: 15 pounds of rough stuff ready mixed to 15 pounds flat lead. This combined mixture run through the mill, fine, and thinned to a proper consistency. The car receives one coat of this paint, the reason for using this mixture, which makes a solid hard surface, serves a three-fold purpose. First, the puttying is done on this coating, making it easier to use the block pumice or sand paper, as the rough stuff being in the mixture keeps the stone from clogging up, and also the sand paper. Second, it makes a fine surface to knife upon; there being just enough grit in the color and hard also, the knifing works excellently and much better than if it were all flat lead. Third, it is a great help in using the stone and sand paper on the knifing, which is prepared as follows: 11 pounds dry white lead, separate; 11 pounds rough stuff, mixed to a stiff paste, then add the dry white lead to the rough stuff, then add the following liquids: one pint japan, one pint rubbing varnish. Run the mixture through the mill; it will come out a thick paste; this mixture will be found to be an excellent knifing when used over the preparation color. It fills up all the brush marks, dries hard, cuts easy, does not clog the stone and forms a part of the hard, solid surface with the other coatings which have preceded it. The car, blocked down, is then ready for pullman or any color desired.

HOW A GASOLINE ENGINE WORKS.

How many people who are using a gasoline engine really understand the principles of its operation? And yet the entire process is simple and easy to comprehend. An excellent description appears in London (Eng.) Motoring Illustrated, of how the gasoline engines used on automobiles operate.

A gasoline motor consists essentially of a crank-shaft, a cylinder, and a piston, the cylinder being fitted with some suitable device for introducing the charge of fuel into it, and with a sparking apparatus for igniting this fuel, the heat of combustion and the expansion resulting from such heat being the force which drives the piston forward and turns the crank.

The device for introducing fuel charge by charge for each explosion in the cylinder is an inlet valve which admits a properly proportioned mixture of carbureted or gasoline-laden air. There is also an exhaust, or outlet valve, which permits the discharge (or exhaust) of the products of combustion to escape. The piston, driven out of the cylinder by the sudden enormous expansion resulting from the heat given off by the ignited charge of gasoline and air, is in connection with a crank shaft, which again is connected with the driving wheels of the car in such manner that the wheels are set in motion by its revolutions. From the gasoline tank, by means of a float for regulating the fuel level, and a needle valve for adjusting the proportion, the gasoline is admitted to the fuel mixer or carburetor, where it commingles with air. The carburetor communicates with the cylinder by means of a valve. This, opening under suction with each forward movement of the piston, admits the mixed gasoline and air ("the charge") into the cylinder. But the expansion resulting from the firing of charge by means of
is taken as being
ignition), whi

the same time closes the valves, until the cylinder is once more ready for the next charge.

Before the cylinder is ready for the next charge, however, it must be freed of the hot products of combustion, which, having accomplished their work of pushing the piston, have no further use. They are therefore, an "exhausted charge"—got rid of through the outlet valves, which are opened

—Intake, Compression, Explosion, and Exhaust of the Gasoline Process.

Each period is illustrated by two diagrams placed on the same level; the first showing the early, the second showing the completed, stage.

In Fig. I, the Intake Period is illustrated. In the first diagram the piston is pushed to the extreme end of the cylinder; the Exhaust Valve, having discharged the ex-

FIG. 1. INTAKE PERIOD.

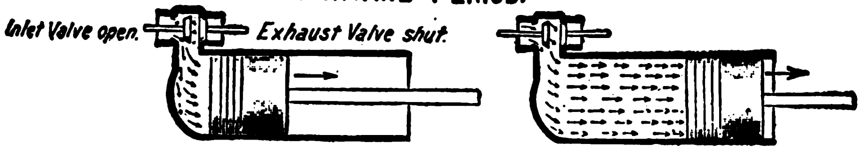
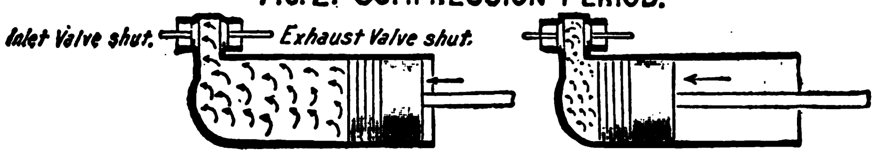


FIG. 2. COMPRESSION PERIOD.



for this purpose by a cam operating at every second revolution of the motor.

The cylinder being thus freed, another charge of gasoline and air sucked in by the outward stroke of the piston through the inlet valves is compressed by the inward stroke of the piston. The electric spark once more ignites it, explosion of gases and expansion occur, and once again the piston,

haust, is now shut tight; the Inlet Valve opens, admitting the charge, which, with its direction, is shown by the small arrows. The second diagram shows the completed stage of the same process, the cylinder being now quite filled, the sucking action of the receding piston having drawn in the charge.

Fig. II shows the Compression Period.

FIG. 3. EXPLOSION PERIOD.

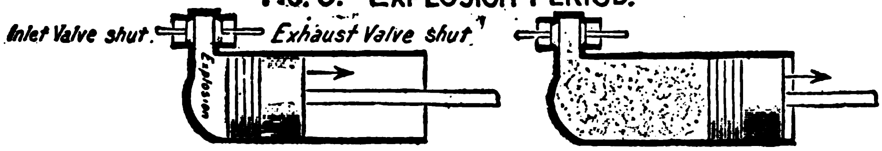
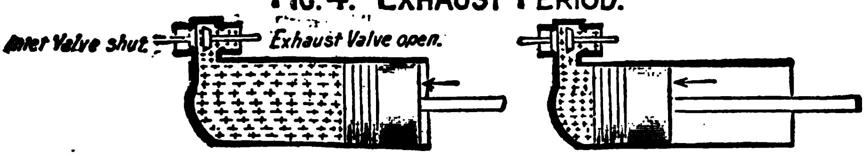


FIG. 4. EXHAUST PERIOD.



driven violently out of the cylinder, turns the crank shaft, which in its turn transfers the power to the road wheels. Again the is emptied through the outlet d again is ready for another

ies of diagrams ex- e periods

The Inlet Valve, having admitted the charge, is, as the piston returns into the cylinder, closed by the pressure thus exerted. The second diagram shows the piston once again well into the cylinder, compressing the charge. Should the inlet valve be defective, the charge will, under this compression, be driven out through it, and so that then a proper charge will remain for explosion.

Fig. III illustrates the Explosion Period. The compressed charge is now ignited by the electric spark. Immediately combustion of the explosive gasoline-and-air mixture takes place, with sudden, immense expansion of hot liberated gases. Inlet and outlet valves being tightly closed, the whole force of the explosion expends itself upon the piston, driving this violently out of the cylinder. The second diagram shows the cylinder filled with the heated products of combustion, having driven out the piston to its furthest limit.

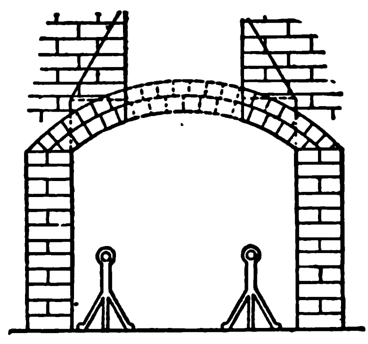
Fig. IV is the Exhaust Period. By the operation of a cam the exhaust valve is now opened. The hot products of combustion rush out into the exhaust-box, and are further driven out as the piston returns into the cylinder. The second diagram shows the piston far back in the cylinder, the exhaust gases being still thrust out through the opened valve. Then the process starts over again from Fig. I. The exhaust valve closes, the piston being withdrawn once more from the cylinder by the revolution of the crank-shaft; the inlet valve is again sucked open; a charge withdrawn; and so the periods are repeated.

Thus it will be seen the engine makes two complete strokes or revolutions for each explosion, hence the necessity of a fly-wheel to carry it over one stroke or cycle. The spark to ignite the charge may be furnished from an accumulator or battery, or by a small magneto driven by a belt from the flywheel. In order to temper the great heat resulting from the repeated explosions in the cylinder, it is surrounded by an outer wall called the water jacket; through this space water constantly circulates by means of a small pump. To prevent the loud explosive noise made by the exhaust it is passed through a receptacle called a muffler. The failure of any valve to work exactly as and when it should, imperfect sparking, or too much or too little lubrication will prevent the engine from working.

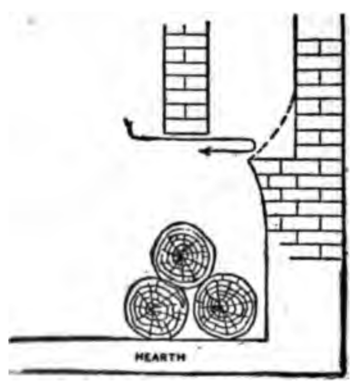
SMOKY FLUES—OPEN GRATE DRAFTS.

Cold drafts dangerous to health are caused by open hearth fireplaces, says "Old Tasinhead" in the Metal Worker. If you must have these ornamental pneumonia breeders avoid a bad construction.

Some grate flues are supposed to have a down draft when they have not, and the first example shows how this can be. I have remedied this defect, as shown by the dotted line, by slipping a heavy curved piece of sheet iron in on the shelf behind, and on the top of the grate back. The construction, shown in the next view, is better, but I believe that shown in the third is best, although it is not apt to radiate as much heat. The throat should be narrow in order not to admit more air than the flue can carry up. The gases dodge around the point of the throat rapidly, but after they are past they move more sluggishly. Yet there is no danger of their coming back, as



Connection of Fire Place Flue.

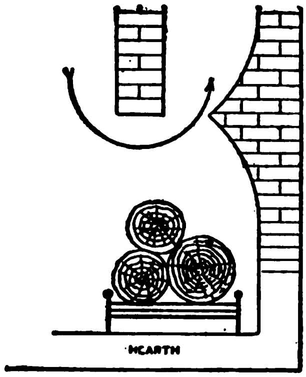


Construction that Produces a Down Draft

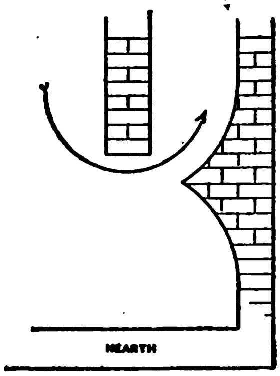
the gases immediately behind push them on. Openings into the flue should not be narrowed up, as shown by the dotted line, but by the slanting solid lines, as indicated in the fourth example.

The great trouble with grates and fire places is that the opening permits so much air other than that which is required for combustion of the fuel. to crowd itself in the flue. t'
the s

is required for the purpose unless the construction makes it easier for the gas to escape than for the air to rush in. This is



The Correct Construction.



A Better Construction.

the warm air of the room, which is needed for comfort, and its escape to the end of ventilation is what some people call "healthy."

FEEDING BOILER COMPOUNDS.

In Power, J. P. Cosgre describes a device he has made and used with good results for feeding solvents into boilers. He says:

By observing the gage glass the feed can be regulated quite accurately, and once the desired average flow is obtained, the handwheel on the globe feed valve D should be marked for future reference.

The flow of the feed water about the tip F in the direction indicated seems to create an increased rate of flow of the solvent, as more water is delivered through the feed ... has not been accurately deter... tendency has been in that ... observed. The tip F is ... full size, 1/8 inch.

Water for mixing is obtained by opening C. After receiver has been emptied of the solvent, the remaining water should be drawn off, leaving the receiver quite empty,

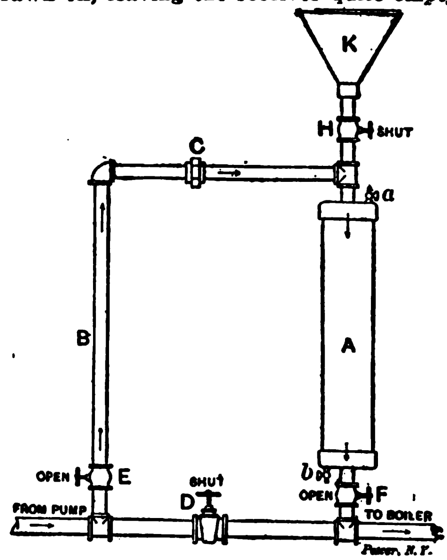


FIG. 1.

then with valves E and D shut and valve A open, fill receiver with the solvent mixed to the proper consistency, air cock B allowing the air to escape, then close A and B, open E and give D about a quarter turn open and the machine will deliver its contents slowly and steadily.

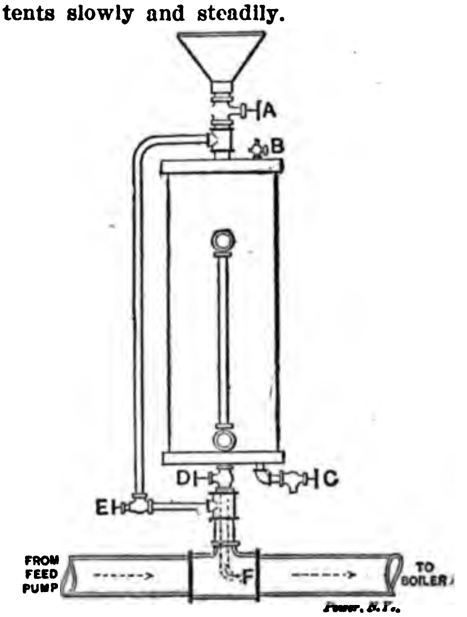
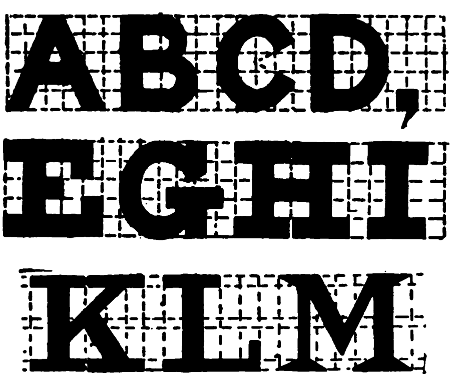


FIG. 2.

SHOP NOTES

HOW TO MAKE BLOCK LETTERS.

Beginners who desire to master the art of making block letters will find the following suggestions of great assistance. Draw six horizontal lines forming five spaces, each of exactly the same width. Then divide



these with vertical lines, says the Draftsman, forming small square blocks of equal size. Then practice on the plain letters as shown in A, B, C, D. The same series of square blocks will answer for the style shown in E, G, H, I. For letters K, L, M, N, etc., lay out the vertical guide lines same as before, but run the horizontal lines as shown in the cut. These consist of two parallel lines at top and bottom and one pair across the middle.

CIRCULATING HOT WATER AT LOW PRESSURE.

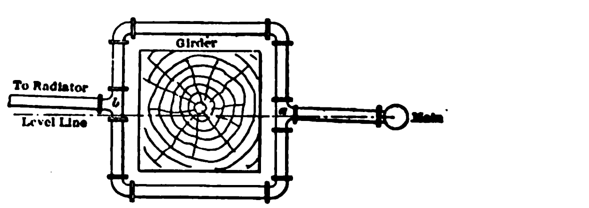
A florist who was greatly troubled by freezing of the hot-water pipes which heat his greenhouse cured the trouble as related in the Florists' Review. He used a pump to circulate the hot water. This pump requires 10 pounds steam pressure to work. In the fall or spring the pressure occasionally went below 10 pounds in the night, the pump would stop and the house get frosted. The trouble was cured by reducing the water plungers one-half, which doubled the power of the pump and enabled it to work on as low as three pounds' pressure. The circulation was all that was required for *fall and spring temperatures,* and the water *returned hot.*

SUGAR AS A WOOD FILLER.

Filling the pores with sugar has somewhat surprising effects upon wood. The process, as devised by W. Powell of Liverpool, consists of immersing the wood in heated sugar solution for some hours, the time varying with the wood, and then driving off all moisture in an oven. No previous seasoning is necessary. The spongy fibre is converted into a compact ligneous substance and it acquires greatly increased durability and strength, with resistance to changes of temperature and moisture and even fire. A special advantage is that the softer and cheaper—and even defective—woods can be made to serve many purposes in place of expensive hardwoods. The sugar does not dissolve out, and it does not promote fermentation and the growth of destructive organisms, but it produces some remarkable chemical or physical transformation in a manner not yet understood.

PIPING AROUND A GIRDER.

The cut shows how to run a one-pipe system of hot water heating around a girder without having a noisy pipe. The Metal Worker says: As will be seen from the accompanying sketch, the branch from the main enters the tee a close to the girder. The pipe is then made to form a loop en-



Piping Around Girder

circling the girder, where the two branches come together again at the tee b. This tee is, of course, placed slightly higher than the branch tee a. The condensation will then fall back to the tee b and completely fill the loop. The overflow passes out through the tee a and back to the main, and from there directly to the heater, giving a clear main without impairing its heating qualities in the least.

WASHING RUBBER TIRES.

Michelin, the French maker of automobile rubber tires, states that while moisture is harmful to the tires, and weakens them, it is better to wash the tires than to allow mud to slowly dry.

PRESERVING COPPER TRIMMINGS.

For preserving the color of copper trimmings, such as cornices and leaders, there is probably no better application than to paint with boiled linseed oil, to which may be added a small amount of Venetian red to give it a color tone, but not enough for an ordinary paint. For coloring the copper only to a dark brown, says the Metal Worker, a solution of one ounce of sulphate of copper, one ounce hypophosphate of soda, two drams of muriatic acid to one pint of water, or larger quantities in proportion, may be used to wash the copper surface once or twice, when the color may be preserved by a boiled linseed oil coat rubbed or brushed on.

TO STRENGTHEN OLD BUGGIES.

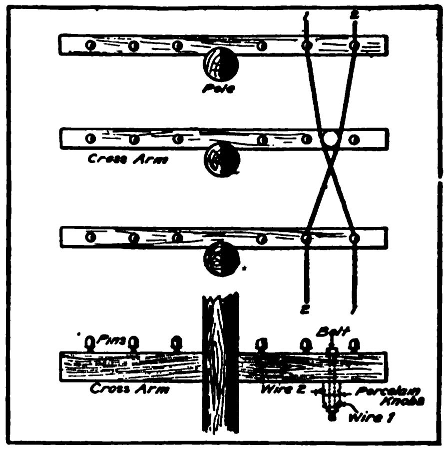
I suppose all parts of the country are filled with a cheap grade of buggies which, after being used a year, will come loose at the corners, the side panels split and spring down below the bottom of the bed, says a writer in the American Blacksmith. Take a piece of two-inch band iron, from six to ten inches long, drill a hole for first bolt in loop, and insert between the bottom of the bed and the loop, so it will come all but flush with outside of panel. Tighten up the bolt. This will draw the panel up to place and will always have something to hold it there. Put a screw in the back end of the iron to keep it straight.

HOW TO MEASURE THE HEIGHT OF INTERIORS.

A simple method of measuring heights in the interior of churches and other buildings consists in attaching a fine silk or linen thread to one of the small balloons which for toys and sending it up. The the thread is then easily meas- lf Education for Mechanics. ested the use of a tape line ring, but the ordinary toy carry up many feet of such a heavy article. The same method may also be used in measuring the height of cavern roofs.

METHOD OF TRANSPOSING WIRES WITH KNOBS.

When compelled by circumstances to use porcelain knobs on the underside of a cross-arm on which to support wires and it is desired to transpose, the method illustrated will be found to work well, says the American Telephone Journal. The writer has



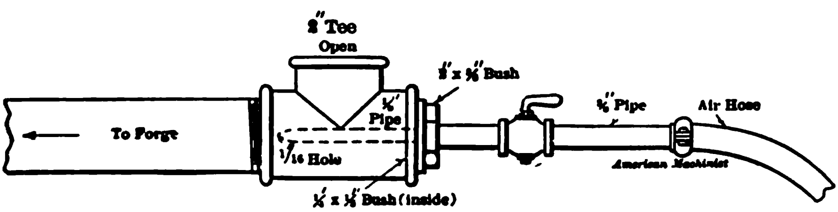
found a 5-16 inch x 8 inch bolt and No. 4 porcelain knobs satisfactory. In putting the arrangement in place, bore a hole for the bolt through the arm, put in the bolt and then put on the two knobs and washer and tighten up the nut.

HIGH-SPEED TOOL STEEL.

That there are several sides to the question of high-speed tool steel was clearly indicated in the discussion of Mr Suplee's paper before the Institute of Mechanical Engineers at Leeds, and there was by no means unanimity of opinion as to the possible advantages that could be gained by its use, says Mechanical Engineer, London. Attempts to force the pace of an ordinary lathe is liable to cause the work to be polygonal instead of circular. One speaker said he had tried reducing a shaft from 4 ins. to 2½ ins. in diameter at one cut, but found this possible only near the fixed head, the springing of the shaft preventing it 6 inches or so from the end, but with four cutting tools at once the job could easily be done at a cutting speed of 50 feet a minute.

HOW TO MAKE A PORTABLE AIR-BLAST.

In plants doing work of an engineering character it is often necessary to have a good hot fire in places remote from the fan-blast system, says the American Machinist. Structural steel works, boiler shops, etc., need this for heating rivets, special flanging jobs, fitting crow-feet braces, etc.; machine



A PORTABLE AIR BLAST.

and blacksmith shops often need it in the exigencies that arise, and in a hundred different ways the need of it is realized in such establishments.

The necessary blast can be obtained in any place where you can take a light compressed-air hose, by the simple arrangement of standard pipe fittings shown in the accompanying sketch. The amount of air used is trifling, as the volume is supplied by the outside air which rushes in at the open side of the tee. The sizes shown on the sketch are used on rivet forges and give ample blast.

HARDENING AND TEMPERING STEEL.

To one gallon of common fish or whale oil, take one pound each of beeswax and resin. Put into a kettle and heat till it comes to a boiling point, stirring it once in a while. When thoroughly mixed it is ready for use.

To harden in this solution, heat the steel till the scale rises a little, then immerse in the oil. When cool, heat over a clean fire till cherry red in the dark, says the American Blacksmith.

The foregoing, with a little practice, is recommended as one of the best, if not the best, compositions for hardening steel tools for use in cutting iron or wood, or even steel. Care must be taken as to the amount of resin in the oil, as resin hardens the steel, whereas beeswax and tallow toughen it. If a person prefer to temper in daylight, clean the steel or tool, polish it, and draw to a deep straw color, if for cutting iron or steel, ◦ if for wood-cutting tools, such as plane irons, cutters, etc. With this composition, 'tis said, a better temper can be had for wood-cutting tools than with any other composition.

MAKING AN ENGINE LIFT ITSELF.

A most curious and unusual case is reported in the Engineer, of how a hoisting engine was made to lift itself across a creek. The engine was used for hoisting and laying stone on the sides of the creek. When it became necessary to have the engine on the other side there was no bridge near or anything to make one of, so it was determined to hoist it over on the same rigging it was on.

This was done in the following manner: The rope which controlled the boom was made fast to the rear drum when the boom was as nearly vertical beside the mast as it could be placed; the hoisting rope was fastened on a chain just back of the rear drum so as to balance the engine. The engine was started and, as it began to rise, the boom began to lower until they almost met, when the engine was swung over the creek and lowered by letting out on both ropes.

When moving any engine in this way, great care must be taken that the engine

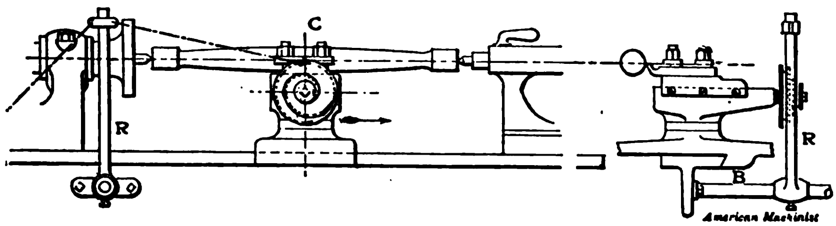
Moving the Hoisting Engine

does not strike
ground, for if
disastrous

the engine before starting, which was 12 feet away from the mat, and the position of swinging across the creek which was 30 feet, also the position of the guide ropes used for controlling the engine while being moved.

A "BARREL" TAPER ATTACHMENT.

The handy attachment here described can be attached to any existing lathe having an ordinary compound slide rest for shaping large connecting rods, etc., says the American Machinist. These tapers, not being straight lines, are sometimes known as "barrel tapers," and as the rods have to be a good finish they require to be a first-class job, without the ridges generally seen on hand work. A vertical rod R is fixed on a bar B, the latter terminating in a foot fixed to the side of the lathe bed. To the rod R a length of weight chain is attached by a collar and set screw, and to prevent any tendency to drag over the chain is carried beyond the upright to the left and the end fastened to the lathe bed. To produce the convex outline on the rod a cast-iron scroll is made from 8 inches to 12 inches diameter, of four or five convolutions, to fit the end of the cross screw, the cut is taken from the center C, and by traversing the carriage toward the tailstock the chain gradually unwinds, giving an increasing traverse to the top slide and producing the required contouh automatically.



A BARREL TAPER ATTACHMENT.

HOW TO BECOME A MILLIONAIRE IN A MONTH.

It seems easy. Just save a cent today, two cents tomorrow, four cents the third day, and continue through the month doubling each day the savings of the pre- day. At the month's end you would -millionaire. Try it on paper; any is impractical, of course, and eople get rich is on paper.

TO HARDEN FILES—WELDING TRICK.

The American Blacksmith says: To harden files dip the file in red-hot lead, handle up. This gives a uniform heat and prevents warping. Run the file endwise back and forth in a box of salt water. Set the file in a vise and straighten it while still warm. Apply water to the part straightened until cold, and you have a good file.

A welding trick is given by a correspondent of the same paper, as follows: I know that a great many smiths—and good ones, too—look upon steel welding with something little short of fear. The way I go about it is first to be sure my fire is perfectly clean, and then to take my heats very carefully, getting as good and even heat as possible without overheating the steel. After proceeding in this way, and using borax only for a flux, if one does not succeed, let him try mixing some fine borings with the borax and covering the weld with this. I find that borax and fine steel borings from my drill are a splendid compound for steel welding.

PETROL ENGINES ON AUTOMOBILES.

"Genie Civil," a French publication, says: "In a recent paper on the subject of petrol engines on automobiles, M. Guillardet gave about 70 pounds per square inch as the best compression, and from 11½ feet to 14¾ feet per second as the best piston speed. M. Pozzy in a paper on springs for the vehicles, recommended for the front axles of light vehicles, springs deflecting from .43 inch to .49 inch per hundredweight whilst the back springs should deflect from .49 inch to .59 inch under the same load. For heavy vehicles the front springs should deflect .39 inch to .43 inch per hundredweight, and the back ones .45 inch to .55 inch. For motor freight wagons he recommended springs deflecting from .19 inch to .24 inch per hundredweight at both front and back."

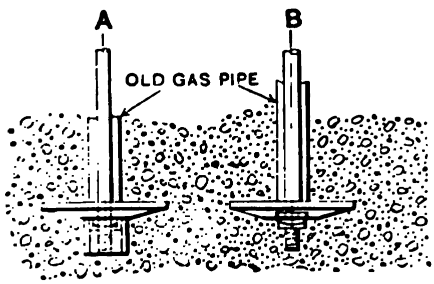
CONCRETE FOUNDATIONS FOR MACHINERY.

An interesting article appears in the August number of Machinery on making concrete foundations for machinery. In selecting the sand, on which much of success depends, use a bank or pit whose grains are angular or sharp. If mixed with clay or loam the sand must be washed before using. The gravel used in this work is usually found with the sand. In good gravel the stones are hard, and irregular in shape and size. Broken stone makes better concrete than gravel but is more expensive. The stone should be graded from ¼ to 1 inch in diameter.

The cement used should be of good quality; as a rule the heavier are the best: it should weigh about 375 pounds to the barrel for Portland, 300 for Rosendale and 265 for Louisville. The more finely ground the cement the better for this work. Natural cement should not take its first set in less than 10 minutes, nor require more than six hours for final set.

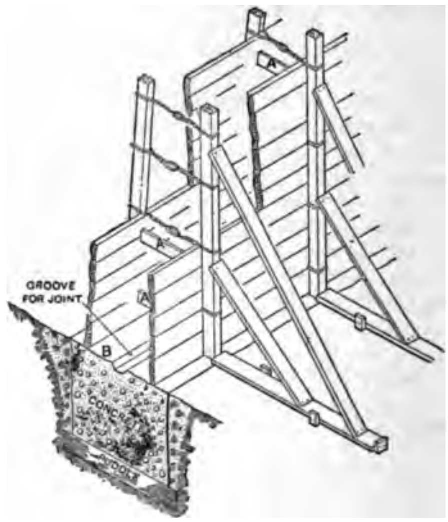
The term "first set" may be determined by a pat of neat cement supporting without indentation a ¼-pound weight on a wire 1-12 inch in diameter; final set by the pat supporting a 1-pound weight on a wire 1-24 inch in diameter. Portland cement should not take its first set in less than thirty minutes and should take its final set in not more than 10 hours.

To sample a lot of cement in barrels, take an auger and drill into the barrel well to-



Anchor Bolts and Plates—Cement Foundation

ward the center. Enough should be taken out to make a pat some 3 inches in diameter and ½ inch thick at the center, tapering to ⅛ inch at the edges. The cement should be mixed with just enough water to form a dough and should be worked for several minutes, then formed into the pat. A piece of glass or an old plate is the proper thing to make the pat on. This pat should be watched to determine the first set and should then be covered with a damp cloth for about 24 hours. At the end of that time it should be placed in water (plate and all) and kept there for several days or even



Form for Concrete Work

three or four weeks. It should show no sign of disintegration along the thin edges and no signs of distortion, or expansion cracks. Cement showing lumps should be looked upon with suspicion and tested thoroughly. Mix thoroughly; better have too much water than too little.

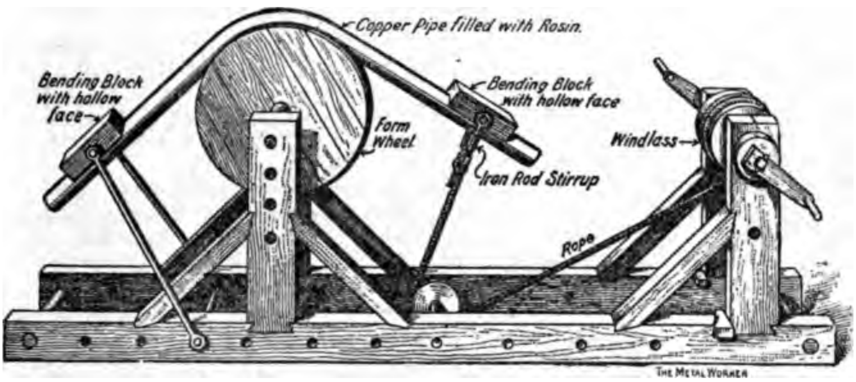
If possible, foundations should rest on hard pan, gravel, or hard clay. Made ground should be shoveled out for a depth of at least 12 inches below the bottom of the foundation and rammed as hard as possible. The 12 inches should then be filled with clay puddle, well rammed in place. Of course the forms must be strong, tight and smooth on the inside. A good form is shown in the cut. It will be noted that the wall is braced in three places, besides being wired. The wire is about No. 12 iron wire. The braces AA are loose, or only tacked in place, and are removed as the wall is built up. Do not nail the sheeting too securely to the studding. Any carpenter can put these forms up and the cheap, unskilled men that wheel the concrete may be employed to assist in the bracing and sheeting. Different methods of bracing the forms will readily suggest themselves to the mechanic in charge, to conform to the local conditions. Th shows the wall with a foo several inches

SHOP NOTES

HOW TO BEND COPPER PIPE.

I have seen copper pipe from 1½ to 6 inch for distillery purposes, bent over improvised apparatus of various kinds, but nowhere have I seen the means of bending illustrated, says a writer in the Metal Worker. The sketch shows the essential features of a machine rigged up by the shop carpenter for a coppersmith, in the heart of one of the distillery districts of Kentucky. While not ideal, it combined some of the good points of several makeshifts which the smith had rigged on different jobs when time was limited and work too pressing to wait for something better.

As I remember it, the frame work was 6 by 10 inch stuff, 20 feet long, with windlass and form wheel posts of same, and braces 6 by 4 inch, set at an angle of 45 degrees. There were holes along the frame on both sides, so that the rods from the rear hollow block could be attached by slipping the bolt through near the form wheel posts, or further back, according to the degree of bend or its position. The snatch wheel shaft under the forward block was movable in the same way for the same purpose. There were holes in the form wheel posts, so that the wheel could be lowered or raised. There were several form wheels of different diameters for different size bends, some with V-shaped groove to ·s wrinkling; others with circular ... according to the size and and radius of the bend. ... offsets on different sizes of pipe were made with one form wheel. There were many hollow blocks, some long, some short, all of the same width, so that the same stirrup and bolts would work on them. All the blocks for small pipe, 2 to 4 inch, were made of wood pump tubing, sawed through the base and



Bending Copper Pipe

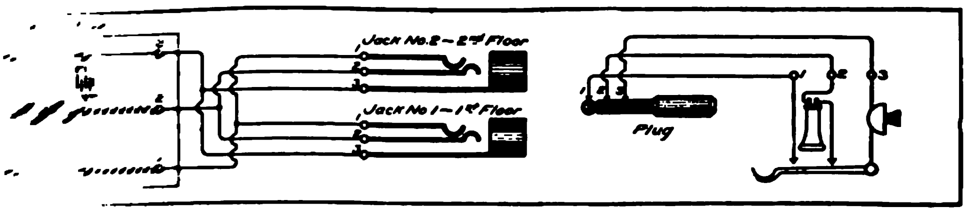
built out for the stirrups. The windlass was wood, with two handles. Small pipe was bent by using the windlass direct, as shown in the sketch. Large pipe was bent by putting sheave blocks between the snatch wheel and the windlass, one block being attached to the pull rope and the other to a rod between the windlass posts, the block rope being wound on the windlass. Some skill in shifting the hollow blocks, rods and the pipe on the form wheel is essential to good and rapid work. Any means to the end is admissible, to make the bend as required being the object, and common sense to the point of "melting out," malletting up and refilling being in order.

Seamless drawn hard pipe requires annealing by heating red along where the bend is to be made. The balance can be left hard to help resist the strain of bending. Hand made pipe from brazier's copper is soft, and no effort was made to further anneal it. When bending brazed pipe the seam is placed about midway between the neck and the side of the bend. Brazed pipe often requires hollow blocking all along the part subject to strain to make it bend only at the particular place if the ends must be straight. If a worm is being made, some permanent strain between the

... of no consequence, ... be reached and ... direction. ... to be of real ser- ... Lead or rosin ... and rosin princi- ... serves the purpose. ... at one end, stood ... in the rosin, ... bending the rosin ... forge, beginning to ... end.

... TELEPHONE IN TWO PLACES.

... is found in many ... subscriber likes to ... stairs during the day, ... convenient to have it in ... To avoid the expense ... following description ... American Telephone ... the arrangement of ... bell box in a conven-



To Make One Telephone Serve Two Departments

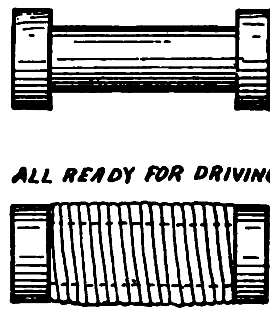
... can be heard all over ... three (3) wires from ... the bell box to points ... No. 1 down stairs, and ... No. 2 on the second ... the bedroom, and ... 2 and 3 points of the ... instrument to plug ... telephone can be used ... the plug in the ... will ring for the sub- ... is in the Jack or ... for a common but

STOPPING A LEAK IN A BOILER.

... what trouble it is to ... of a boiler. It is no trouble to put in a new tube if you can get the old one out.

Now I want to tell how I stopped a leak in a tube about six feet from one end, says a writer in the American Miller. The tube is 3 inches in diameter. I took a 2-inch gas pipe, about 8 inches long, put a narrow coupling on each end, wrapped asbestos wick around the middle and drove it into place with a 1-inch gas pipe.

This beats plugging all to pieces, as you



Arrangement to Stop Leak in Boiler Tube

still have a draught through the 2-inch hole. The pressure forces the wick up against the coupling at each end and there is no inclination to blow the plug out. A short piece, 2 or 3 inches long, would do for a leak at the end of the flue. The drawing shows the plug with and without wick.

TO BECOME A SUCCESSFUL MACHINIST.

A young man who was about to start in to learn the trade of a machinist, received the following good advice from an old man who had built up a large fortune, starting with nothing but his own efforts. The counsel applies equally well to any undertaking. He said: "Young man, if you see a piece of work on the floor that has to be lifted and it takes more than one man to lift it, always be the first to take hold of it, don't let *anybody* get ahead of you; if you follow the spirit of this advice for four years you will come out a good mechanic."

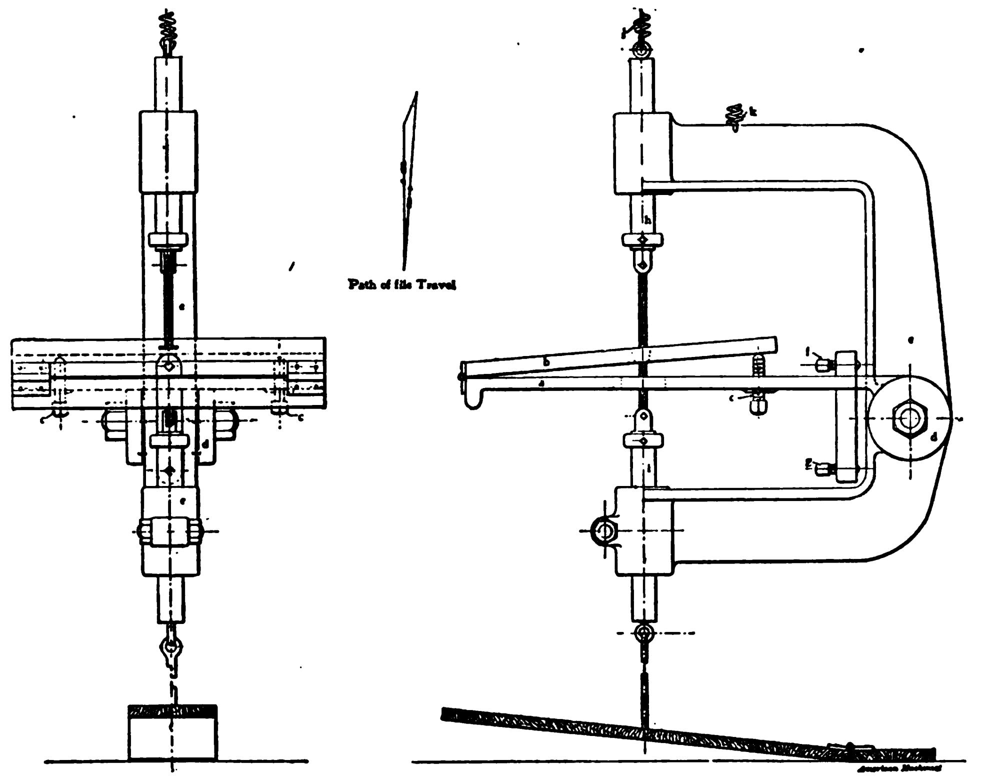
The catalog of the Hoffman Motor Works, 1253 North Halsted street, Chicago, will interest those desiring to build a motor bicycle, ... launch.

FOOT POWER FILING MACHINE.

This is a home made machine, which has never been put on the market, nor is there any patent on the device. The American Machinist, from which the following is condensed, says the operator has full control of the machine and has his hands both free to guide the work:

The machine is arranged to be placed on a bench, or stand, preferably with a side light, in order the better to see the lines to be worked to. It consists of a platform or top-plate a, supported by legs or other convenient means, and provided with a hinged leaf b covering the top portion immediately surrounding the file and serving as a work supporting table; this leaf is capable of being tilted at an angle for the purpose of obtaining clearance in the dies, and has a pair of screws c for adjusting and holding it in position. From the back of the plat- descends a pair of lugs d having wide area, between which is fitted a holding frame e; a turned the parts and forms a the file frame is free to swing. The amount of swinging action is limited, however, by the screws f and g, only enough being allowed to permit the file to clear the work on its upward stroke; it is evident that if both screws were set up, no swinging action could take place and the motion of the file would be perpendicular in both directions of its travel and during its entire stroke.

The front ends of the U-shaped file frame have bosses bored in alignment to each other and provided with neatly fitting plungers h and i; the lower boss is split and has a clamping screw to take up the wear and also to maintain sufficient tension on the plunger to cause the frame to move with it as far as the limiting screws will permit. Both plungers are provided with suitable clamps at their inner ends to hold files, and at the outer ends with hooks or loops for attaching, respectively, a spring at the top and a strap or rod at the bottom; they also have adjustable collars on them to limit their movement and the stroke of the file. The spring j, at the upper end, has sufficient tension to draw both plungers and their attached parts up until

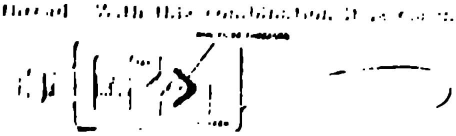


Foot Power Filing Machine

[illegible]

Cutting Left-Hand Thread with Right-Hand Tools

[illegible] ... With this combination it [illegible]



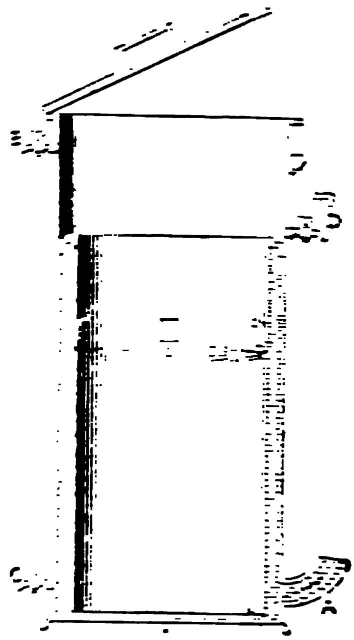
Cutting Left-Hand Thread with Right-Hand Tap

that a fair left-hand thread may be cut with the ordinary right hand equipment. It now remains for some ingenious reader to show us how a left hand nut can be cut with extemporized tools.

It costs $10 a week to feed a horse in Pretoria. There is plenty of fertile land but little water.

[illegible] Case-Hardening

[illegible]



Hardening Tank

[illegible] into steel [illegible] case-harden[illegible] in an iron case [illegible] bone-ash, leather. [illegible] The high quality and [illegible] amply repay for the [illegible] taking care that no two [illegible] and carefully luting [illegible] the lid and sides [illegible] to exclude the air, and heating to redness in a furnace for a time varying with the number and size of the pieces. Many of the leading locomotive makers in England and America use an oil or gas furnace, and they claim several advantages for them over the ordinary type; the temperature can be regulated to a greater nicety, it is cleanly in use, and more economical than the coke or coal furnace.

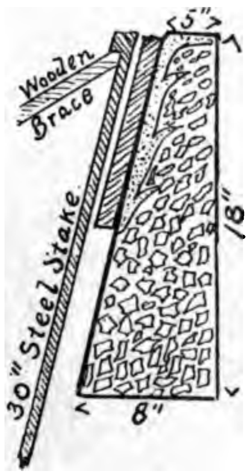
Bone-ash is the cheapest, as it can be used over and over again by adding new bone to the mass and mixing thoroughly each time a box is charged.

The railway mileage of the United St[ates] now exceeds 202,500 miles.

HOW TO MAKE CONCRETE CURBING.

Curbing made of concrete is rapidly taking the place of stone. It is not only much cheaper in first cost, but lasts longer and can be made into any shape required. It is less subject to damage from frost. A writer in Municipal Engineering tells how to lay a concrete curb which has been found very satisfactory. He says: We first made curbing with vertical walls on both sides, but soon found out that a much better curb could be made with less cement by making the side next to the gutter battering and proceeded to do the work in the following manner:

First excavate to the required depth of curb, say eighteen or twenty inches, using the earth on one side as a mold, where conditions will admit of it. If the soil is sandy no provision need be made for drainage. Next we set up a mold two inches thick,



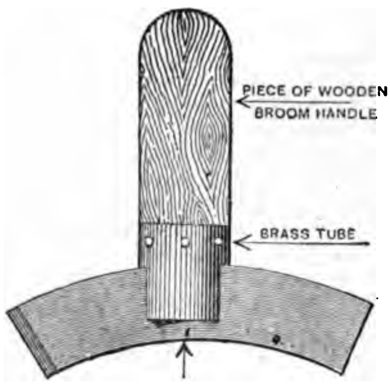
Concrete Curb

twelve inches wide and sixteen feet long, held in place with seven-eighths inch steel stakes, set so as to make a curb eight inches thick at bottom and five inches at the top. Then proceed to fill space with concrete, sliding the mold up as required, until the finish line is reached, then float and trowel on the top and twelve inches down on the face. Cut deep into sections with pointing trowel say three in sixteen feet. Finish front edge to straight edge with quarter-round. Trim edge next to lawn to straight edge, leaving that edge sharp. This makes an ideal curb, looks ...nds well and is well. Note the ...hich the facing is anchored to ...wn in the accompanying sketch. After troweling, brush the work to give it the appearance of sawed stone. We do not consider it necessary to use any metal in constructing curb.

COMMUTATOR CLEANER.

A reader of Power, writing from Australia, describes how he made a very satisfactory commutator cleaner. The device will be new to many of our readers.

The device for cleaning the commutator consists of a piece of wooden broom han-

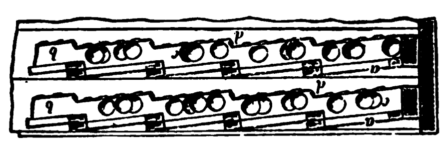


COMMUTATOR CLEANER.

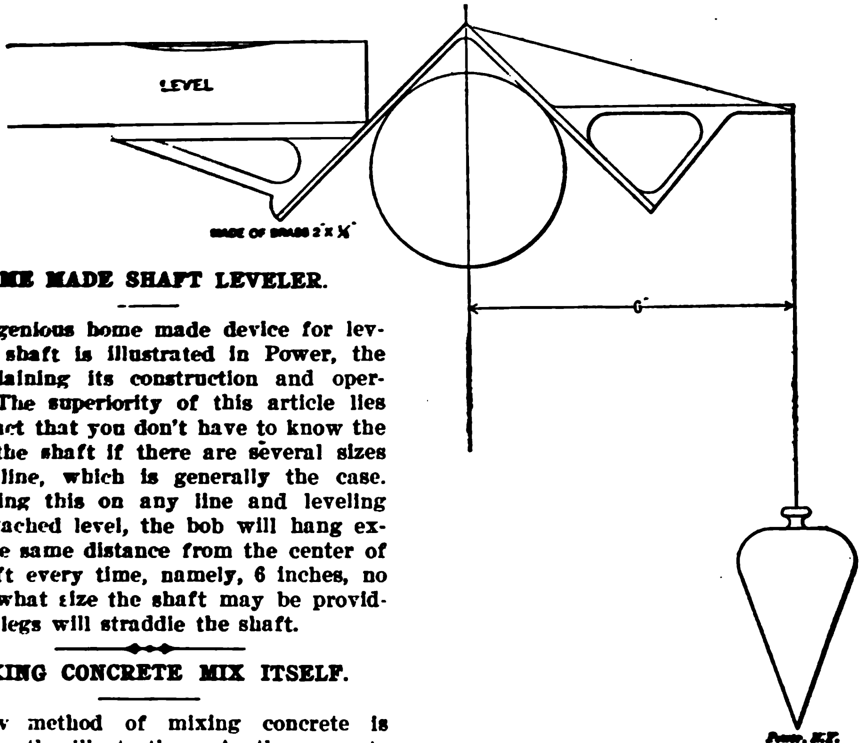
dle with a brass tube to fit it slotted so as to hold a piece of Paragon packing into which is rubbed graphite. With this held against the commutator it cleans it and stops the brushes from chattering and sparking in a great measure.

DEVICE FOR CLEANING SIEVES.

Dr. H. Sellnick, of Leipzig, Germany, well known in the European milling world, has been granted a patent on a device for keeping the meshes of sieves open and free to work, says the American Miller. The



cut shows the plan. Under the sieves, shown at a, are ledges running lengthwise, d, provided with balls or bodies of suitable material, e. When the sieves are in motion the balls are thrown up against the under surface of the sieves and the particles adhering to the bolting cloth or wire are dislodged.



Power, N.Y.

TOOL FOR LEVELING SHAFTING.

HOME MADE SHAFT LEVELER.

An ingenious home made device for leveling a shaft is illustrated in Power, the cut explaining its construction and operation. The superiority of this article lies in the fact that you don't have to know the size of the shaft if there are several sizes on the line, which is generally the case. By placing this on any line and leveling with attached level, the bob will hang exactly the same distance from the center of the shaft every time, namely, 6 inches, no matter what size the shaft may be providing the legs will straddle the shaft.

MAKING CONCRETE MIX ITSELF.

A new method of mixing concrete is shown in the illustration. As the concrete drops from the mixer it falls into buckets fastened to an endless belt. The weight of the concrete as it descends causes the belt to turn the mixer on a platform. Where concrete is to be used in basements, or other places below the street level, where the cement and crushed stone are dumped, this method works nicely and saves power.

New Concrete Mixing Method

More than 50,000,000 pounds of India rubber, valued at more than $30,000,000, were ir the United States last year.

TO CEMENT RUBBER TO LEATHER.

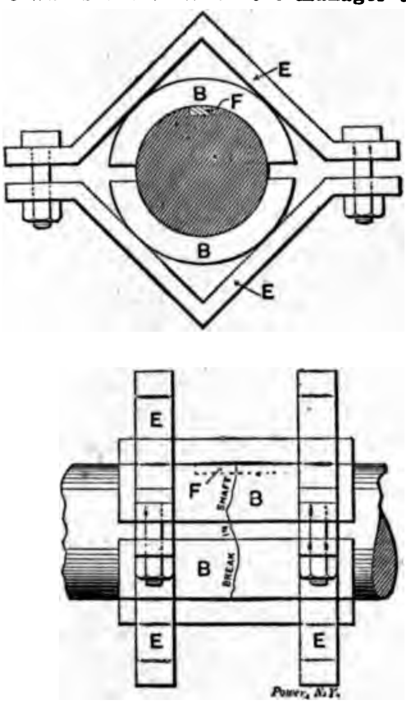
It is sometimes required to cement rubber to leather. The following is a good way, says the American Blacksmith:

Roughen both surfaces with a sharp glass edge, apply on both a diluted solution of gutta percha in carbon disulphide and let the solution soak into the material. Then press upon each surface a skin of gutta percha 1-100 of an inch in thickness, between rolls. Unite the two surfaces in a press that should be warm but not hot. In case a press cannot be used, cut thirty parts of rubber into small pieces and dissolve it in 140 parts of carbon disulphide, the vessel being placed on a water bath of 86 degrees Fahrenheit. Melt ten parts of rubber with fifteen parts of rosin and add 35 parts of oil of turpentine. When the rubber has been completely dissolved, the two liquids may be mixed. The resulting cement must be kept well corked.

The Chicago Cit- ... being to do aw... street

TEMPORARY REPAIR TO BROKEN SHAFT.

The enclosed sketch shows how I made a quick repair to a broken shaft, says a correspondent of Power, from England. The shaft was used for driving two printing machines and an ink mill. It was owing to the ink mill becoming locked that the shaft was broken. When the manager told



Showing Method of Repairing Broken Shaft

me to look to it I was told to make as quick a repair as possible, as he did not want the printing machines to stand long. I uncoupled the broken shaft so that the rest of the works could run. I then propped the broken ends from the floor, so that I could chip a keyway, as shown by the dotted lines F, about 1½ inches long, ¼ inch deep and ½ inch wide, in both halves, thus making a keyway 3x½x¼. I then filed an old key to fit. When in place I filed it to the same level as the shaft, as shown. I then got a cast-iron bush B, in halves from a very broad pulley. I then borrowed two pair of strong driving clamps E E, such as are used by turners for driving large shafts, etc., when turning. With ... -lamped the bushes over the broken ... nding the whole together. For ... this will be hard to beat, ... nding only 1½ hours. I might say that the apprentice was getting the things together and was ready when I had got the keyway chipped and key fitted, or the repair would have taken longer.

A NOVEL METHOD OF PIPE THREADING.

The method of pipe threading referred to is no doubt better "honored in the breach than in the observance;" however, it points a valuable moral, as will be seen.

The reminiscence is related by a one-time superintendent of water service, the incident occurring some twenty-five years ago on a road entering Chicago, says Resourcefulness. Receiving advice that the water pipe was leaking at an important water station, the superintendent of water service went at once to the scene, with such men and tools as he had with him. Arriving at the water station he found the 4-inch wrough-iron water pipe broken squarely off, only 2 feet of water in the tank, and no means of getting a piece of pipe from any shop cut to length and threaded inside of twenty-four hours. Unwilling to interrupt the water supply and determined not to acknowledge defeat until the last resource was tried, he cut a piece of pipe to length with cold chisels, chalked the unthreaded end, placed it in line end to end with a threaded old piece of the same size pipe, and with two-pointed tram, one point engaging in the thread of the old pipe, the other scribing on the chalked end of the blank pipe, he followed the thread with one point, always keeping the train parallel with the axis of the pipe. The path of the right pitch thread was thus scribed by the tram point on the chalked surface of the blank end of pipe requiring thread. The spiral scribe mark thus made was nicked with chisels, deepened and made continuous, until at the end of an hour and a half a good thread was cut, the job put up without a drop of leakage and without the interruption of the water service.

The above incident was modestly related on its own merits as an ingenious little mechanical makeshift, but it is of greater interest as symbolizing that high attribute of generalship which shrinks not in the face of difficulties, but which with skillful use of the means at hand snatches victory from defeat.

The unexplored arctic region, which equals Europe in size, is the largest unexplored area in the world.

SHOP NOTES

PORTABLE ELECTRIC "SCOTCH" DRILL.

A handy machine recently patented is a Scotch drill operated by electricity. It can be used in any shop having incandescent electric lights by connecting to the nearest socket. It will drill up to 7/8-inch diameter

Electrically-driven "Scotch" Drill.

and has a feed of 7 inches, controlled by the hand wheel. It is mounted on a pedestal which admits of movement in any direction. The machine is 30 inches high and weighs less than 100 pounds.

LEATHER BELTS.

A leather belt is more economical in the end than a rubber one. When buying a leather belt it should be tested by doubling it up with the hair side out; if it should crack, reject it as it cannot realize the whole amount of power it should transmit. If it shows a spongy appearance it should be condemned at once, says Dixie, for it must be pliable as well as firm. The grain or hair side should be free from wrinkles and the belt should be of uniform thickness throughout its length. It should be tested for quality by immersing a small strip in strong vinegar. If the leather has been properly tanned and is of good quality, it will remain in vinegar for weeks without alteration, excepting it will grow darker in color. If the leather has not been properly tanned the fiber will swell and the leather will become softened, turning it into a jellified mass.

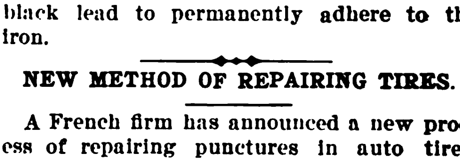
Some people have an idea that a new belt that does not stretch any is the best for transmitting power, but this is a mistake. A belt in this condition is very apt to break when used to transmit variable loads.

HOW TO MAKE STOVE POLISH.

Mix 2 parts of copperas, 1 part of bone black and 1 part of black lead with sufficient water to form a creamy paste. This will produce a very enduring polish on a stove or other iron article. After two applications it will not require polishing again for a long time, as the copperas will produce a jet black enamel and cause the black lead to permanently adhere to the iron.

NEW METHOD OF REPAIRING TIRES.

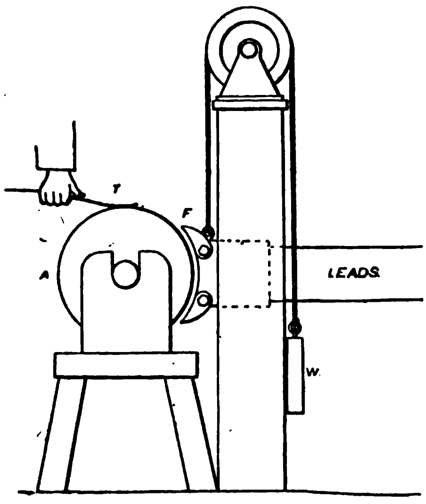
A French firm has announced a new process of repairing punctures in auto tires. Patching with cement has usually been short-lived, and almost sure to leak and deflate the tire at high speed. By the new method, says Machinery, a rubber rivet, A, is used, having a hollow stem. This rivet is pushed through the puncture, using a blunt punch for the operation as shown at B. After the rivet is in position, a shot such as used in shot-guns of about the size known as B or BB, is pushed through the stem until it reaches the bottom where, of course, it enlarges the stem to a considerably larger diameter than it is in the neck where compressed by the walls of the punctured tube. For large punctures it may be necessary to use a steel ball such as used in bicycle bear-



ings. The result is that the rivet cannot come dislocated when in use without ing off the stem or greatly hole. Of course the head is treated being placed

INDUCTION TESTS FOR SHORT CIRCUITS.

The drawing illustrates a method of testing armatures for short circuits, reported in the proceedings of the American Railway Mechanical and Electrical Association. The apparatus used in this case consists of an old Baxter motor field, F, suspended between two uprights and balanced with a counterweight, W, so that it may be adjusted to conform to the various heights of different armatures, A. This field is wound with No. 9 wire and supplied with alternating current from a small, belt-driven dynamo. The armature is placed in the magnetic circuit of this field and revolved slowly, and a small telltale piece, T, consisting of a light piece of sheet metal, is held at the top of the armature, as shown. If there are any short circuits they will easily be determined, as the telltale piece will set up a vibration, which can readily be felt by the hand. A device of this kind is one of the greatest money-savers possible to put in an armature repair shop, and it will save many an armature from being need-



INDUCTION TEST FOR SHORT CIRCUITS.

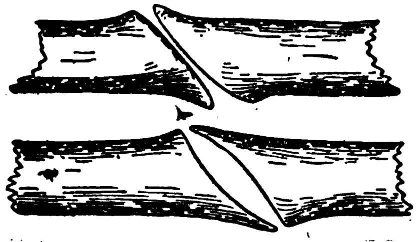
lessly burned out, as the short circuits can be detected in the shop instead of developing after the armature has been placed in service.

AUTOMOBILE VS. THE "BUS."

"ns" which for generations
between the towns of
Bodersweiler in
a modern

RIGHT AND WRONG METHODS OF MAKING A WELD.

Good coal and good materials generally, are among the essentials in the art of welding, writes J. M. Fix in the American Blacksmith. For a good weld have your tuyere



THE RIGHT AND WRONG METHODS OF MAKING A WELD.

iron from four to eight inches under. In other words, have four to eight inches of coal on your tuyere iron depending upon the character of the work you are doing. Coke your coal and beat it down solidly around your fire. Now heat your iron to the welding point—upset and scarf. In order to make the most perfect welds, you must scarf your iron properly. Upset well to allow for wasting away. Have your scarf full in the center, so that the two pieces to be joined will touch in the center first. If there is a hollow in the center, foreign substances are liable to collect in there and cause a very imperfect weld. When they have reached a good, clean, white heat with the scarf down in your fire, take them out and give each one a good jar on the anvil while the scarf is still down, so as to jar off any dirt which may be on them. Reverse or turn over the one you have in your left hand, get them together as quickly as possible and hammer rapidly so as to get them united before the heat gets below the welding point. The cold anvil will reduce the heat below the welding point in a very short space of time. Don't be continually poking at your fire. Let the clinkers gather at the bottom.

MACHINE THAT PICKS COTTON.

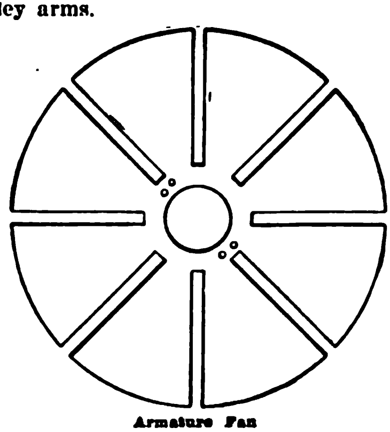
A new cotton-picking machine has been invented. The essential principle of the machine is suction by air, which is produced by fans, the device being pulled across the field by one or more horses. The machine is moved a short distance and then two or three operatives direct the pipe nozzles to the cotton on the eight or ten rows surrounding the machine. The cotton is sucked from the plants as cotton is now sucked from a wagon at a gin.

AIDS INCANDESCENT FILAMENTS.

The Elektrotechnische Rundschau, of Berlin, says: The filament in glow lamps gradually diminishes in diameter in consequence of the slow volatilization of the carbon. A German firm introduces into the glass globe certain chemical compounds with a high boiling point; these, under the influence of the temperature in the lamp bulb, slowly give off vapors containing carbon which is deposited on the filament, thus making up, to a large extent, for the loss caused by the volatilization referred to. Besides it keeps the resistance and the brightness of the lamp more uniform throughout its useful life.

SIMPLE FAN TO COOL DRUM ARMATURES.

A simple home-made fan, easily constructed in any shop, is described by a Canadian writer in the Engineer. It was constructed for use on an armature of the solid-core unventilated type still found in many places. The fan was made of sheet iron. He says: The fan is shown as first made, before the wings are turned. This part I found easy to accomplish by catching the inner ring of the fan in a vise and turning the wings to the proper angle by means of a monkey wrench. When this is done take the dynamo pulley off and slip the fan onto the pulley hub and tie it in position by means of two tie wires run through small holes shown in the inner ring, and around the pulley arm and then twisted, the holes for the tie wires having previously been spaced properly to suit the pulley arms.



Armature Fan

This will be found to blow considerable air onto the back end of the armature, as well as onto the box on the pulley end of the dynamo.

HANDY STOVE PIPE WEDGE.

A pattern for a wedge for fastening a stove pipe into a chimney is given herewith. Sometimes small things wedge

themselves into one's good graces when larger and more complicated ones cost too much or are not to be had just when wanted, says the American Artisan.

Cut a scrap of sheet iron about 4x4 inches and fold or bend, as shown in cut.

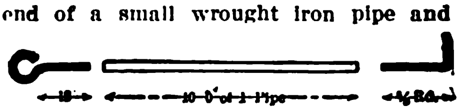
Then pound one end flat and you have a wedge that will hold the pipe securely, for it will spring enough to be very tight in the chimney flue. This wedge can be made on the spot from a scrap cut from the pipe or any bit of old sheet iron.

NEW WELCH TOOL STEEL.

Experiments in making tools of Siemens steel instead of from the crucible, and thereby effecting a great saving in cost, are being conducted in Wales. The new process consists in the use of an alloy, which is a secret. The experiments so far are meeting with success.

HOW TO MAKE A LIGHT POKER.

A long poker, easy to handle because it is light, and which will not quickly heat on account of its being hollow, can easily be made by welding a solid hook at one end of a small wrought iron pipe and a



solid handle at the other end. For a poker 12 feet long, 10 feet of 1-inch pipe is about right, and the solid ends should be made from ⅝-inch rod iron. The handle and hook should each be 12 inches in length.

NEW POWERFUL EXPLOSIVE.

The latest in explosives is powdered aluminum mixed with nitrate of "ammonal." It is said to be the safest and surest explosive known. It is not affected by friction blow. It can onl
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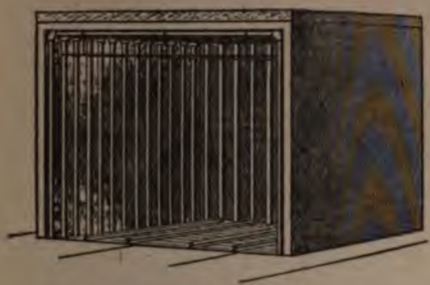
HOW TO MAKE A STEAM-HEATED ENAMELING OVEN.

A steam-heated oven for enameling which can be constructed by any mechanic is illustrated in the Metal Wroker. From 80 to 100 pounds steam pressure is required for baking, and the articles to be japanned should remain in such temperature for three hours.



Steam-heated Enameling Oven

The oven shown is much larger than would be required in any repair shop, but its design is such as to permit of easy modification to suit any existing conditions. The oven is heated with live steam, conveyed direct from the main boilers. The walls of the oven are made of two shells of thick sheet iron, so arranged as to form an air space between them. The top is covered with a layer of asbestos about 1 inch thick. The floor is of sheet iron, and in this instance is provided with two tracks, upon which run iron cars carrying the articles to be enameled. This would not be necessary in a bicycle repairing shop, and the bars and hooks could be substituted as in the other ovens. Inside of the sheet iron walls are vertical rows of steam pipes, placed closely together, as indicated. Across the top are other steam pipes. Below the pipes on the ceiling is a sheet iron apron, which serves to çatch any dust or dirt that might fall from the overhead pipes. Steam at boiler pressure passes through all of these pipes. It is of the utmost importance in arranging these pipes to provide for their proper drainage—that is, provision should be made for the water condensed from the steam to flow to some point where it could be drawn off.

An extremely uniform temperature can be maintained for any period in this oven. The way in which the heat is applied insures the even heating of every part of the oven. This is essential in an oven of large size, but is of minor value in one of small dimensions designed for the work of a small shop. The degree of heat to be obtained is controlled by the steam pressure available, and higher than this it is, evidently, impossible to go. But any lower temperature desired can be easily and quickly obtained and can be maintained indefinitely.

WAY TO MANAGE A FOUNDRY.

"If a foundry foreman desires to keep his shop up to a high state of efficiency," said an American foundryman recently, "he will, as soon as he receive an order for castings, see that the necessary cores are at once ordered from the core department. Then he will proceed to learn if he has a suitable flask for the casting. and if he has, he will ascertain if any repair work be needed on this, and, if so, he will have this done before the flask is taken to the molder's floor. All repairing of flasks should be done by a flask man instead of by the molder and his helper.

"In order that the molder may use his time to the best advantage, his helper should see that he not only has his facing sand, gaggers, clamps, etc., but he should also look after the many little things which the molder sometimes spends his high-priced time in looking up. Even in specialty shops I have seen molders take a hand in barring up flasks. This they should not have to do as this kind of labor belongs to the flask-maker and the latter will do a better job than the molder every time.

"In a great many foundries the men depend too much upon the foreman for everything. They should remember that he is only human, and has not the time to attend to every little detail. It has always seemed strange, too, that the place where castings are made should receive so little attention from the owners of plants, a majority of whom seem to think that anything can be made to do for this department. Perhaps nearly every practical foreman is familiar with shops where ordinary equipment is so scarce that the molders are spending a great part of their time looking for things of which each should have a plentiful supply. The successful foundry manager of to-day must not only be a practical molder, but also experienced in cupola practice, or he is not fully equipped for the position."

HALF TWISTING A QUARTER TWIST BELT.

I was at one time the proprietor of a planing mill where it was necessary to transmit motion from one line shaft to another where the two were at right angles to each other, says a writer in the American Machinist. The belt was first used in the ordinary way and ran well enough for a while, then it commenced breaking the laces and giving trouble generally. One day the belt was taken down and stretched upon the floor and it was found to be bowed—like an iron barrel hoop when it is cut and straightened out—a result which one can readily see the reason for upon careful observation, as the belt has more tension upon one edge than the other. The belt was then sewn together with a half twist, as shown in the accompanying drawing, with the result that the trouble ceased.

Since that time I have been about the country a good deal and have found several belts running under the same conditions and giving the same trouble and have had the pleasure of suggesting the half-twist remedy, the application of which has always brought the same satisfactory results.

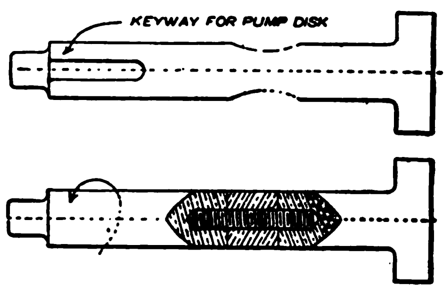
This contribution is offered in the hope that it may meet the eye of someone who is having the same difficulty, whereupon, if he applies the suggested remedy, his troubles will cease.

OPERATING TRANSFER CAR BY CABLE.

The boys were spending too much time pushing the transfer car in a mill, so the superintendent installed a cable system. The following is a condensed description from the Woodworker. A small endless cable was driven from a drum at one end of the mill. One lead of the rope was carried on one side of the track, the return lead on the other, in each case just outside the rails. A grip was placed on each side of the car. To operate the car in either direction the operator has only to close the grip on the side in which the cable is moving i' the direction he desires to go.

HOW A PUMP ROD WAS REPAIRED.

Figs. 1 and 2 illustrate the Muntz metal rod belonging to a centrifugal pump, which broke where the packing had worn it to some extent, says Fieldings Magazine, as shown by the dotted lines, Fig. 1. It being necessary to have the pump working as soon as possible, we resorted to the following method of repair. We first drove out the keys, took off the pump disk, faced up the broken ends of each piece of rod in a lathe, drilled up the center of the rod for about 2 inches in each piece, and cut a 1⅛-inch left-handed thread, Whitworth pitch. Next we turned up and drilled a "distance-piece," the length of which was equal to the amount turned off the broken ends, and also cut a thread in the same. Then we turned up a piece of mild steel about 5 inches in length and cut a 1⅛ inch left-handed thread on it, fixed all together as in the sketch, and skimmed up the part that ran in the stuffing-box. If the shaft was driven from the other end in the same direction, of course it would be necessary to cut a right-handed thread. This was much quicker than making a new shaft, cutting keyways, fitting keys, drilling holes, etc. It was only intended for a temporary job, but is still running.



FIGS. 1 AND 2. REPAIR TO PUMP ROD.

PREVENTS BLOW-HOLES IN STEEL.

To prevent blow-holes in cast steel M. Meslans, of Paris, adds to fluid steel an alloy of aluminum with a metal of the alkali earth group, or with lithium. Aluminum alone does not act upon the nitrogen and hydrogen in the fluid metal. The metals of the alkaline earths and the lithium possess t' property, but they are too dear for use
An alloy of aluminum and cal'
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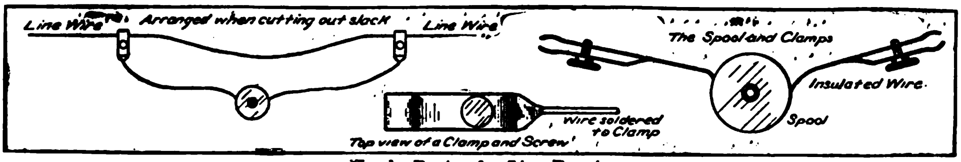
HANDY DEVICE FOR LINE REPAIRER.

The homemade device shown in the cut will be readily understood by every electrician.

Shown in the drawings is a little arrangement which is handy where it is often necessary to go out on the line and take out the slack, says the American Telephone Journal. Frequently when the repairer pulls up the slack and prepares to make a new splice he cuts the line wide open, and in many cases cuts off a conversation which is taking place. By the use of this little device such annoyances can be avoided. The drawings are almost self-explanatory, but a little description may aid in their understanding. Two clamps are soldered (one at each end) to a piece of insulated wire of a small enough diameter to be easily handled. The wire is then coiled on a spool in such a way that both of the ends are available. When it is desired to cut out slack the wire on the spool is arranged around the point where the line wire is to be cut and connected to the line wire by means of the two clamps. The slack is then pulled and the connection made without interrupting the service. The length of wire to be used will depend on circumstances. Forty feet has been found a handy length.



Handy Device for Line Repairer

NOTES ON STEEL.

The following items are taken from the November issue of Sparks from the Anvil:

In annealing cold rolled steel, gas is turned into the annealing boxes after they are removed from the furnace. The burning of the gas uses up any air that might come in contact with the steel while cooling. By this method the steel comes out of the boxes in bright condition.

* * *

Where a defect occurs in a finished article made of steel, and always in the same place. the steel is not at fault; there is ... with the method of mak-

...high as the ... is not so high as the hardening heat; and the hardening heat is lower than the forging heat. Always, in practice, bear this in mind. The only exception is in the case of high-speed steel, which is a law unto itself.

* * *

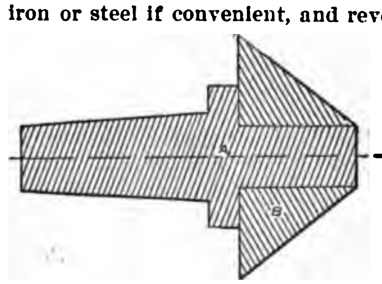
Twist drills hardened in a water bath should be plunged deep enough to harden a short distance on the shank. Water cracks are apt to occur if the drills are held almost stationary in the water. If the drills are soft directly back of the water cracks, it is proof that this portion was held at the water line or so close to it that they did not go into the bath deep enough to harden.

* * *

High speed or self-hardening steel, when required to be cut or broken off into tool lengths, should first be nicked deeply in the bar while hot; or better, should be cut entirely through. Cracks and slivers are liable to be produced if nicked but slightly.

LARGE CENTERS FOR PIPE TURNING.

A is turned from a piece of mild steel to fit the mandrel and roller, with a collar left on to take thrust, while B is turned from cast iron or steel if convenient, and revolves



CENTER FOR TURNING LARGE PIPE.

freely on A with the work, which runs much truer than with the usual solid center in a rough pipe.—Engineer.

BLACK INK FOR RUBBER STAMPS.

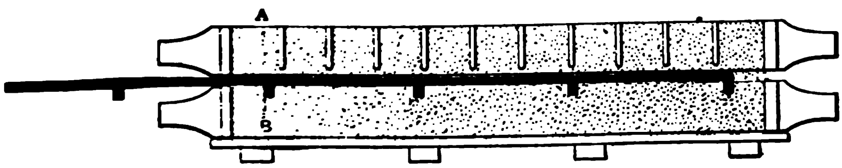
Nigrosin 3 parts, water 15 parts, alcohol 15 parts, glycerine 70 parts. Dissolve the nigrosin in the alcohol, add the glycerine previously mixed with water, and rub well together.

TO BALANCE A LOOSE PULLEY.

A somewhat novel plan for balancing a loose pulley is described as follows in the Woodworker: After it has been bored out ready for use, place it upon a smooth arbor that is solidly supported in place. Wind a cord around the hub, or the rim, according [illegible], and give the cord a long, even pull that unwinds it, giving the pulley the motion due to unwinding process. The inner end of the cord is not tied to the pulley, but left free, except that the cord [illegible] it to hold the same in place. When the pulley is perfectly balanced it will run a long time without "chattering."

MOLDING SHORTER THAN A PATTERN.

I send you a sketch showing how we made a [illegible] casting off a 9-foot pattern in a 4-foot flask without cutting the pattern, says a correspondent of the American Machinist. We first took the pin off one end of the core, as, the top being a flat surface, a slight shift would not matter; or, to avoid this, we could have bored a hole through the pattern to clear the pin. The pattern was rammed up in the usual way, only the drag was raised from the board the thickness of the pattern, and the pattern projected from the end of the flask. After the cope was taken off and the pattern drawn, we stopped off, as marked by line A B. We did not want to cut the pattern, and we did not have a spare flask long enough to take all the pattern, so this was a case of necessity.



MOLDING SHORTER THAN THE PATTERN.

WHEN THE WHISTLE BLOWS.

The whirring wheel and the rasping saw
And the hissing plane are still;
There's silence down in the darksome mine,
And silence up in the mill.
The hammer and axe are cast aside,
The shovel and pick repose;
And the sawdust settles in drifts of gold
When the whistle blows.

Beneath the shade of a spreading tree
They sit with their dinner pails,
A group of earnest and brawny men
With muscles as hard as nails.
Their lot is labor from early dawn
To the daylight's weary close,
With an hour of ease when the clock strikes twelve,
And the whistle blows.

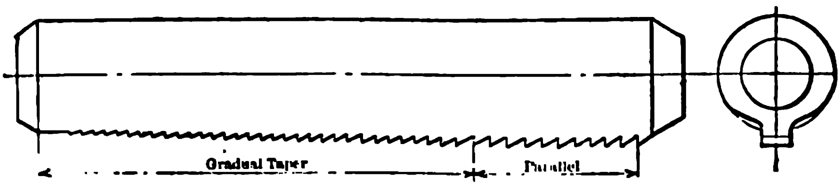
The breeze is fanning their heated brows,
And to some a dream it brings
Of a cottage small, and a garden gay
Where the robin builds and sings;
A window curtained in spotless white
And framed in a crimson rose,
And a smiling face at the open door
When the whistle blows.

They feel no envy of him who dines
From damask and silver rare,
On delicate fruits and costly wines,
With lackeys behind his chair;
For the bread they eat is twice as sweet,
And the rich man seldom knows
The keen delight of the sons of toil
When the whistle blows.

—Leslie's Weekly.

TO CUT SMALL KEYWAYS.

Where small keyways have frequently to be cut in a shop not otherwise equipped the following English kink from the American Machinist may be found useful. A broach, such as shown in the sketch is used, the work being held in a vise, in a bush, and the broach driven through. A broach of this description is very strong and the holes are not injured by it.



COMBINED BROACH AND ARBOR.

Cottonwood is worth 40 per cent more than one year ago. It is rapidly becoming scarce and valuable.

A meth[illegible] ...e positive protection [illegible] as he
[illegible]

Speed vs. Size

Equivalent High and Low Speed Generators

That an increase in speed requires additional power is illustrated negatively in the cut showing the comparative size of two electric generators. Both are of equal capacity, but owing to the much greater speed of the smaller it produces just as much current as the other. These machines are each 200-kw. capacity; the armature of the larger revolves at 100 revolutions per minute, while the speed of the small one is 900 per minute.

The advantages of the smaller machines are a saving in weight and size. The slow speed machine weighs 35,000 pounds; the high-speed only 9,500 pounds. The larger contains 3,700 pounds of copper more than the other.

Income tax returns show that citizens of Great Britain have invested $5,630,540,500 abroad.

HOME MADE OIL FILTER.

Here is another home-made oil filter to add to several already described in these columns. This one is from The Engineer, and the writer says: "I have a filter which works on the principle of capillary attraction that any tinner will make for $5.00.

First have a can with a top made out of heavy tin or galvanized iron 30 inches high by 20 inches in diameter with a faucet 1½ inches from the bottom, and a strainer attached on the inside of the can.

A SIMPLE OIL FILTER.

Next have a smaller can 20 inches long by 14 inches in diameter, made with three legs. Place the latter inside of the large can. From a dry goods store obtain three rolls of cotton batting and fold it lengthwise making three folds, six thicknesses, then roll it sidewise and tie it with a string to prevent it from unrolling.

Take the rolls and put one end into the small can and let the other end extend over the side into the large can. Fill the small can with new oil pouring some over the rolls and let it stand for eight hours. Capillary attraction will take about eight inches out of the inner can. Then you can fill it full of dirty oil.

The more rolls of cotton the faster it will filter. Be sure not to have any water mixed with the oil as it will filter water as well as oil.

HOW TO SOFTEN CAST IRON.

A German authority says, to soften cast iron, heat the whole piece to a bright glow and gradually cool under a covering of fine coal dust, etc. Small objects are packed in quantities, in a crucible in a furnace or open fire, under materials which when heated to a glow give out carbon to the iron. They should be heated gradually, kept at a bright heat for an hour and allowed to cool slowly. The substances recommended to be added are cast-iron turnings, sodium carbonate or raw sugar. If only raw sugar is used, the quantity should not be too small. By this process it is said that iron may be made so soft that it can almost be cut with a pocket-knife.

PROFESSOR RATEAU ON STEAM TURBINES.

The New Engine that Will Probably Revolutionize Engine Building

At the recent Engineering Conference in London, Prof. Rateau, of Paris, read a paper on the steam turbine. He stated that while C. A. Parsons and the Swedish engineer de Laval are the two foremost names in connection with the development of this type of engine the idea is not new. Its possibilities were indicated by the French engineer Tournaire in 1853 and both Parsons and de Laval have since adopted his suggested plan.

The Engineering Times, London, condenses the following from the paper: As in the case of their hydraulic analogues, steam-turbines may be divided into two principal classes, action and reaction turbines; and each of these classes is subdivided according as the turbine is composed of a single wheel, or of several wheels, traversed successively by the steam in course of expansion. Among re-action turbines (analogous in hydraulics to the well-known "Jonval" turbine), of which, as multiple machines, the prototype is the "Parsons" turbine, the steam is only partially expanded in the distribution, and acquires its full expansion in the movable wheel. The steam, therefore, acts on the blades at once by its pressure and its velocity. The movable wheel is thus subjected on its two faces to pressure of different amount, causing longitudinal thrust, which has to be balanced. These differences of pressure render it necessary to reduce to a minimum the clearance between the movable wheel and the walls by which the steam tends to escape without traversing the blades and so doing useful work. It is indispensable that the distribution of the steam should be effected over the whole circumference of the movable wheel in order to avoid movements of pulsation very prejudicial to efficiency.

In the "action" turbine, on the other hand, the steam only acts on the movable wheels by its velocity. Each wheel revolves in a casing in which the pressure is uniform. Therefore the steam does not produce any sensible longitudinal thrust on the moving parts, which dispenses with the necessity for any special provision to neutralize such thrust. The steam does not tend to rush across the blades in order to pass from one face to the other at the expense of efficiency. It is therefore possible to provide sensible clearance between the moving and fixed parts, and consequently to disregard the wear of the shaft bearing. Further, is is possible, if need be, to project the steam on to one point only of the circumference. Finally, under the same conditions "action" turbines revolve at a less velocity than "re-action" turbines. This renders more easy the direct coupling to the machines worked.

It is not necessary to insist on the well-known advantage possessed by turbines in general of smooth and continuous movement of rotation, but the excessive speed for which they are obliged to be designed in order to meet the speed of flow of the steam constitutes in many cases a serious inconvenience, e. g., in its application to ship propulsion. For a long time this hampered their use for electric installation, but latterly dynamos of very high speed have been constructed, worked by steam-turbines, constituting an outfit of light weight, requiring small space, and although of ample power, of low cost, and, as a consequence of working and upkeep, as simple as can be desired. It follows that for this purpose the steam-turbine may be expected rapidly to supplant the piston-engine.

OIL PRODUCTION IN CALIFORNIA.

The amount of oil consumed on the Pacific coast during the past four years is astonishing, having increased from 4,000,000 barrels in 1900 to over 20,000,000 in 1903. All this oil was taken from California wells.

The oil is found in strata of sand where it is held in suspension like water in a sponge, and lies about 1,000 feet below the surface. Such a well costs $4,000 to put down and in operation. The oil brings 30 cents a barrel at the well. Enterprise gives the following table for estimating the amount of oil suposed to be contained in the oil sand:

One acre of land with sand 100 feet thick contains 155,400 barrels.

One acre of land with sand 200 feet thick contains 310,800 barrels.

One acre of land with sand 300 feet thick contains 466,200 barrels.

One acre of land, with sand 400 feet thick contains 621,600 barrels.

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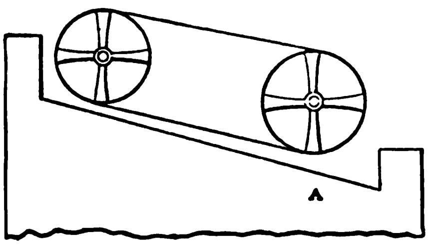
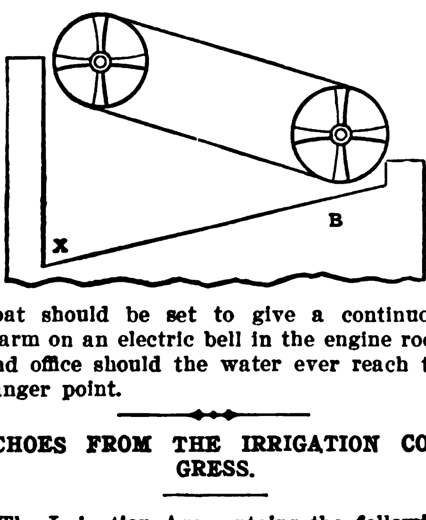
KEEP YOUR BELT PITS DRY.

A certain manufacturing concern which uses a very wide and expensive belt recently had a costly experience. The belt pit, made in the usual manner as shown in the Cut A, filled with water one Saturday night and by Monday morning the belt was nearly ruined. The American Machinist tells how a future accident of the kind may be



prevented. It suggests that belt pits be built as shown in the cut B. Not only would the pit hold a large amount of water before reaching the belt, but at X is placed a trap which allows water to drain to the sewer, but which closes automatically if any back water attempts to enter. In addition a



float should be set to give a continuous alarm on an electric bell in the engine room and office should the water ever reach the danger point.

ECHOES FROM THE IRRIGATION CONGRESS.

The Irrigation Age contains the following in its report of the recent irrigation congress:

Washington correspondent, attempting to be funny at expense of Idaho man, poking at [illegible]rize pumpkin: "I say, they raise [illegible] than that where I came from." [illegible]ontempt: "Apples, is it? [illegible]em's huckleberries." [illegible] the man from Virginia. The Oregon man snickered. "What you laughing about?" demanded the Virginian. "Oh, nothing, but that cigar is made of fresh cured Oregon beet leaf." Virginian puffs away for a while, then: "Well, it goes to show what irrigation will do."

INCANDESCENT LAMP WITHOUT PLATINUM.

L'Electricien, of Paris, says: The Compagnie Generale has been able to entirely abandon the use of platinum in incandescent lamp manufacture. Heretofore attempts have been made to substitute for the platinum one of the ferro-nickel alloys investigated by Dr. Guillaume, but these have not resulted satisfactorily. The method employed by the French firm is based on the use of a special cement, the composition of which is not disclosed. With the cement it is possible to make a perfectly air-tight joint between the leading-in wires and the glass.

HOW TO MAKE PIVOT FILES.

Pivot files, constantly in use by jewelers, may be made from the following directions, according to the Pacific Goldsmith:

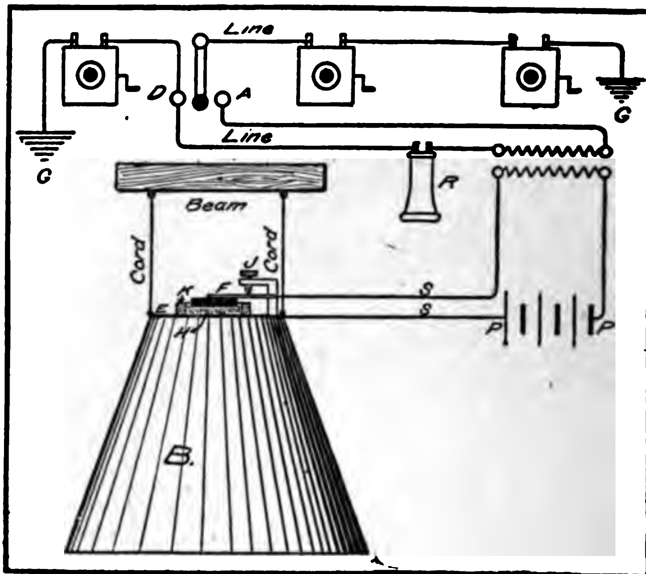
Dress up a piece of wood, file fashion, about an inch broad, and glue a piece of fine emery paper upon it. Shape your file then, as you wish it, of the best cast steel, and before tempering pass your emery paper heavily across it several times, diagonally. Temper by heating to a cherry red, and plunging into linseed oil. Old worn pivot files may be dressed over and made new by this process. At first thought one would be led to regard them too slightly cut to work well; but not so. They dress a pivot more rapidly than any other file.

The Noble prize, the blue ribbon of the scientific world, has been awarded by the Swedish Academy of Sciences to Sig. Marconi, the inventor of wireless telegraphy, for making the most important invention of 1902. The prize consists of $40,000 and was provided for in the will of the late Alfred Noble, who died six years ago.

British soldiers with defective eyesight are now required by the war department to wear glasses. This is considered a radical order for conservative England.

HOW TO SEND MUSIC BY TELEPHONE.

The drawing indicates a method that has been used to send music out on a toll line so that all the parties on the line could hear it. The apparatus is crude but has been found to work well and considering the materials from which it was made, has paid for itself many times, says the American. Telephone Journal. The transmitter is shown in section, the rest of the circuit being indicated diagrammatically. It will be noted that the transmitting apparatus is suspended from the ceiling by cords. This is done so that the ordinary vibrations of the room will not affect it and also so that it can be easily moved from place to place. B is a tin funnel, 3 inches in diameter at the top and 14 inches in diameter at the bottom. H is granular carbon and F is a block of carbon attached to a strip of metal which is arranged so that the pressure of the carbon block on the granular carbon can be regulated by the tension screw J. The little standard which holds J (which can be an ordinary wood screw) is of seasoned wood. E is a disk of tin which is the diaphragm on which the granular carbon rests and K is a felt ring to confine the carbon to its proper place. The apparatus has been used to send music 50 miles over a party line. The switch D is used to cut the transmitter into the line or to cut the line straight through as is desired. The tension screw J should be adjusted until the listening party says he can hear best.



Device for Sending Music Over Party Lines

USING EXPLOSIVES IN MINING.

Discussing the use of explosives in mining operations, J. H. Karku says: "In soft material the action of a high explosive is too local to make it economical, and a weaker and slower one will give much better results. The charge should be concentrated as much as possible at the bottom of the bore-hole, and chambering the hole gives good results. This may be done by placing a small quantity of high explosive at the bottom of the hole. The primer is placed in this, and dry sand poured into the hole. If now the charge is exploded, the hole will be enlarged at the bottom, and a large charge of explosive can be put in, with which the blasting proper is effected. Never attempt to thaw frozen dynamite by roasting, toasting, or baking it, and never put it in heated vessels, boilers, or before fires. Never put a cap on to charge a primer until ready to use it; and after it is capped, never let it out of hand until it is in the hole. Keep caps away from dynamite; they should never come near each other till they are to be used. Never allow smoking near the powder or explosive. Never use a metallic rammer. Do not get nitro-glycerine on the fingers, as it is absorbed and causes headache. Invariably prepare the primer at a distance from the explosive."

California redwood is being used to splendid advantage in the construction of the big pipes used for conveying water to the electric power houses. They cost less than metal pipes and are more durable.

The principal cause of rails creep double-track railroads is that the a given track is all in one the heavier and faste the rails will cre

Cost of Starting a Small Brickyard

Anton Vogt, an expert brickmaker, contributes an interesting article to Brick, the representative organ of the clay-working trade, from which we extract the following:

The extraordinary demand for clay products all over the country has turned the eyes of the big investors towards their manufacture. Statements of fabulous profits to be made in the brick business are quoted from mouth to mouth—brick can be made and loaded on cars for $3 per M. and they sell from $6 to $7 per M.; profit $3 to $4 per M. Given a yard with a 20,000 capacity per day the profit will be from $60 to $80 daily. This, of course, is on paper, and for the sake of enlightening intending clayworkers as to the actual figures of brick manufacture on a small scale we present a resumé of the equipment of the smallest kind of a brickmaking plant.

To begin with, if only a tempering wheel is used, this wheel will cost with freight about $125. Next a dozen molds must be ordered, three bricks in a mold, costing with freight about $20. While the wheel and molds are on their way from the factory, six pits must be dug, two for soaking clay, two for grinding and tempering and two for filling; these for a yard of 12,000 brick daily capacity. The digging of these pits will cost $30 inclusive of the laying of the floors, the lumber for which will cost another $54. Six hundred feet of 1-in. lumber are required for each pit at the rate of $15 per M. ft. Two carts for hauling the clay will cost $80 and a pair of horses or mules to haul and temper the clay can be obtained for about $200. Then come the smaller items; picks, shovels, axes, hammer, saw, etc., about $20 worth. Two mud barrows $10; two sand barrows $7; two molding tables and sand boxes $12; running boards, hacking planks and lumber for covering about $40, and other small apparatus about $40 more. The harness and feed for the mules can be figured at $75. This makes a total of $693 for the outfit and then about $300 must be in hand for operating expenses. Briefly stated, then, no one should figure on embarking in

on no matter how small

will cost

0,000

15

cents per M., digging the clay, filling and tempering will cost 70 cents per M. inclusive of horse feed. Molding will cost 30 cents per M.; mud wheeling, 25 cents per M.; off-bearing with three boys, 30 cents per M.; hacking in the yard, 10 cents per M.; loading to the kiln, 20 cents, and setting, 15 cents per M.; casing the kiln, 5 cents per M. Coal or wood will cost $1 per M.; labor for firing, 25 cents per M.; loading in cars, 25 cents per M.; a total of $3.80 per M.

So far the figures would seem to show a fair profit in the brickmaking business, but the brickmaker has both an ally and an enemy in the weather department.

Suppose 12,000 bricks were molded today and ruined during the night, then the next 12,000 would cost twice as much or $7.60 per M. There would be simply no profit at that price and that is the figure which many bricks cost, less the setting and burning. One case in particular can be quoted where 200,000 bricks were made and the labor paid for and only 101,000 were set in the kiln on account of unfavorable weather conditions. Of course this 101,000 cost more by the time they were burned than their market value. These things happen in open yards without any shelter. It is, therefore, not advisable to make any bricks by any process without providing a suitable shelter for them after they are made. Six thousand bricks per day under shelter will bring more than 20,000 bricks laid out in an open yard at the mercy of the weather, but this sheltering costs money to erect, and this additional cost must be added to the sum estimated for the equipment of the yard as first mentioned. There is money in the brick business if the enterprise is managed right, but not so much as the amateur imagines or as the skillful manipulator of the black pencil on white paper is able to show.

This country is filled with brickyard graveyards.

A new material for joining pipes is called "leadite," because it replaces lead in many ordinary uses.

In Wisconsin a roof cevered with sheet zinc in 1854 is still in fine condition and has never cost one cent for repairs.

SHOP NOTES

THE EVOLUTION OF THE TIRE.

The greatest improvement in vehicle construction was when some bright blacksmith thought of heating the tires and shrinking them on the wheel. While many claim the honor it is not known to whom it rightly belongs. Previous to this event tires were made in short sections and held on the felloes with nails. When starting on a long haul the driver always laid in a good supply of nails to use on the trip. The West Tire Setter Co. has put into a few lines of verse this interesting historical event:

A smart smith thought of a hoop for a tire,
 Welded it up when the boss was gone,
Heated it well in a circular fire,
 Doused it with water and shrunk it on.
Many a smith would not believe it,
 Many a head was shaken "no,"
Many a one would not receive it,
 Nevertheless it was a "go."
It was a great thing, 'twas a wonderful day,
When tires were shrunk on in this new-fangled
 way.

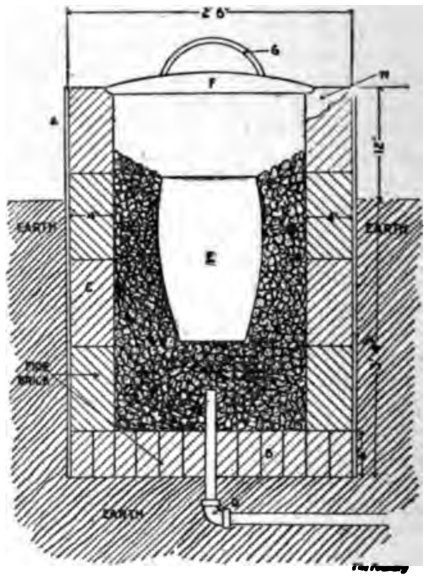
CUTTING LEFT-HAND THREAD.

To the Editor: I notice in the December number the article on cutting left-hand threads with right-hand tools. About two years ago some one advertised to tell how to do this for $5. This aroused my interest and I worked out about the same as you state except in place of the V block I placed another tap the same as on the other side. To make the nut first cut the left thread on a piece of steel, then file the gutters in it and temper it and cut the nuts.—T. N. Phillips.

HOW TO BUILD AN EMERGENCY BRASS FURNACE.

A small foundry and repair shop had occasion to use a small brass furnace for very immediate work. It is so simple in construction and has given such excellent results we illustrate it here with a condensed description from the Foundry. The cut shows a section of the furnace:

It consists of an outer shell A lined with fire brick as shown at C. The bottom of the furnace is all composed of fire brick. The cast iron cover F is provided with an iron handle G. The products of combustion escape through nicks cut on the edge of the brick work as shown at H. Dimensions are shown on illustration. The blast is taken from a small centrifugal blower which supplies the blast for the forges in the smithshop and is introduced through a one and one-quarter inch pipe shown at G.



This pipe extends about four inches above the bottom of the furnace. The fuel consists of anthracite coal of about grate-size. A bed of about 8 to 12 inches thick, depending upon the charge to be melted, is placed in the bottom of the furnace and the crucible E, set on top of it; coal is then filled in around the sides of the crucible up to the top as shown.

GIVING IRON AWAY.

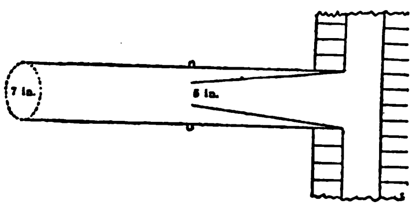
Many a manufacturing concern—and they are not all large ones—are giving away tons of iron or other metals, every year, and don't know it. The Foundry explains how this is done. It occurs in castings of considerable weight, of 250 pounds up. For instance, a large number of castings are required, to weigh, say, 250 pounds. To avoid constant repairs to a wooden pattern an iron one is used
heavy s
wood

the mold on all sides and at the bottom. When the castings are weighed it will be found that the one cast in a mold which was excessively rapped will weigh 275 pounds, or even more, instead of 250, as intended. As the manufacturer in making his price estimated on only 250 pounds, he loses the value of 25 pounds on each one.

The same result can also occur from a too rapid pouring of the metal, causing the mold to enlarge from sudden pressure, and by overfilling the riser and gates.

TO CHECK EXCESSIVE FURNACE DRAFT.

The illustration will be sufficient direction from which to construct an effective check draft for a house furnace. The furnace had an excessive draft and fairly pulled coal up the chimney, says the American Artisan.



The smoke pipe of seven inches diameter was tapered down to five where it entered the chimney. This did no good. Then a pipe section, as shown in the cut, was installed, creating an eddy, and curing the trouble.

OILING CYLINDER OF AIR COMPRESSOR.

In an address before an engineering society M. E. Stover said:

In lubricating the interior of an air compressor cylinder conditions will be found different from those existing in a steam engine cylinder. In the former the heat is dry, while in the latter moisture is always present. Moisture has a tendency to wash oil from the surfaces, whereas with a dry heat the oil adheres to the surfaces better, with the result that a given amount of oil will give better and longer service in the air cylinder than in a steam engine cylinder, both being of equal size.

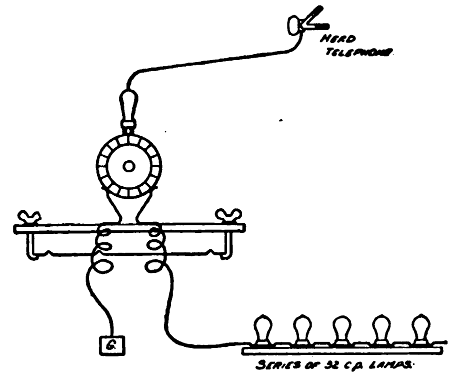
Owing to the intense heat, the oil used i- an air-compressing cylinder must be of re that it will not deposit a coat- burnt oil in and around the the compressor. If of on reaching the noriso and pass off with the air without affording any lubrication to the wearing surfaces. If the oil is too dense, or is compounded with animal or vegetable oils, it will have a tendency to adhere to the discharge valves and passages, and will gradually change to a hard, brittle crust or layer of carbon, which in time will completely choke up the passages and render the valves inoperative.

RAPID METHOD OF TESTING ARMATURES.

A handy device which can be rigged in any shop, for testing armatures, is in use by the street railway at Postmouth, O., and is described in the Street Railway Review. The test is made quickly, but surely.

The armature to be tested is mounted between lathe centers and tested just after the last turning down of the commutator. A board clamped to the lathe carriage carries two brushes so placed as to make contact on the commutator 90 degrees apart; one brush is connected to the ground and the other to the trolley through a series of 32 c. p. lamps. Any telephone may be used with a head receiver to allow the operator two hands to work with. The operator should stand on an insulated platform to prevent accidental shock, in case the trolley contact should happen to be made and the ground contact broken.

The testing operation is as follows: Place the two contacts which connect with the telephone on adjacent bars; if everything is normal, and there are no open or short circuits, the operator will hear the generator current very plainly, as the telephone is in



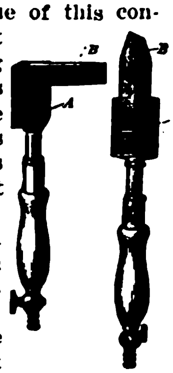
DEVICE FOR TESTING ARMATURES.

multiple with an armature coil. The armature is revolved and each pair of bars tested. Should two bars be short circuited no sound, or very little, will be heard, depending upon the resistance of the short.

If there is an open circuit no sound will be heard between any bars until the bars are found between which the open circuit occurs, when a very large sound results, as the telephone is in parallel with half the coils in series. The time required for testing by this method is only a few minutes and the cost is trifling.

NEW SOLDERING IRON.

An extremely practical gas soldering iron was recently placed upon the Berlin market. As is apparent from the illustration, the copper bit is movable and can be placed at any desired angle. By virtue of this construction the iron is of great convenience in soldering metallic edges so located as to be difficult of access. The heat generated by the gas flame (Bunsen burner) is utilized to its fullest extent in that the hollow part (A) prevents rapid radiation and concentrates the heat upon the copper bit (B). This system of heating develops a sufficiently higt temperature to permit of the employment of a comparatively small piece of copper in the bit and also economizes in the amount of gas consumed. The size of the flame can be regulated at will and the apparatus attached to any gas jet by means of a hose and operated without the employment of a bellows. The short length and comparatively light weight of the iron makes it a most convenient and handy tool to manipulate.



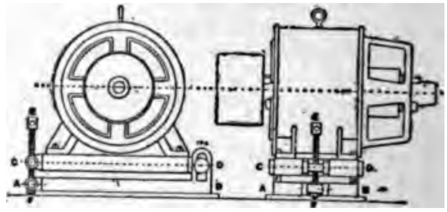
TO TIGHTEN VERTICAL MOTOR BELT.

In an English shop, where the machinery is driven by electric motors, it was necessary to use a vertical belt. The method of taking up the stretch in the belt is described in the Electrical Review, London:

A B is a fixed casting, fixed to the floor with foundation bolts, having cast on to it two slotted lugs 1 and 2.

C D is a similar casting, to which is bolted the motor. At D it is hinged to 1 and 2 by bolts which can be moved up and down the slots in 1 and 2. At C are two lugs having a nut through which the screw E F passes, being fixed at F.

When the belt is first put on C D is fixed at the top of the lugs, then the motor is levelled by screw E F, and as belt stretches C D is lowered (at one end), and when it



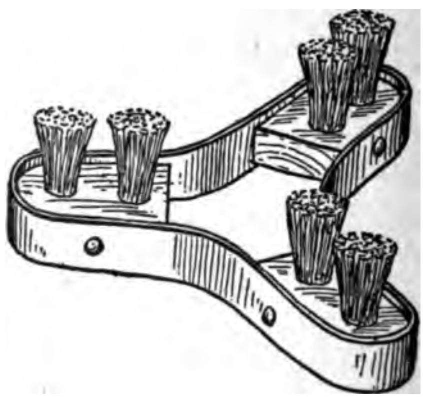
is in contact with A B and more adjustment is required, C D is lowered at the slotted lugs 1 and 2.

MILLER'S BRUSH TO CLEAN CORNERS.

A home-made device, easily prepared, for cleaning the corners of sieves in flour mills, is described in the American Miller.

This brush is made of spring steel bent into three U-shaped arms. In each arm is riveted a block of wood with bristles.

The advantage claimed is that it will never get out of shape or break. It will



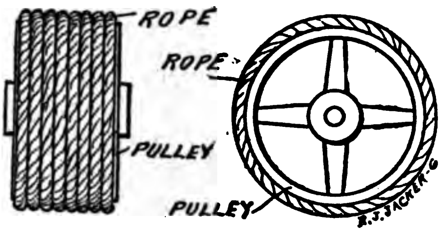
clean the corners of the sieve. It will not get clogged in the corners. It will rebound in an irregular course, thus covering all parts of the sieve. It can be made large or small, light or heavy, to suit conditions.

GASOLINE BOATS FASTER THAN STEAM.

A small boat, with say, 25-horse-power will make better speed with a gasoline tor than a steam engine. The [illegible] is in the saving in piping. Th very m

INCREASING PULLEY DIAMETER.

To increase the diameter of a pulley, take a four-strand manila rope and make one end fast with a hook-shaped, quarter-inch bolt. Wrap the rope tightly around the pulley, making the other end fast in the same



manner as the first one. An 8-inch pulley covered with inch rope may be used to drive a large wheat elevator. This is an inexpensive way to make a pulley larger and still leave the face true. It only takes a little time to do the work.

TREATMENT OF SOLDERING IRON.

Editor Popular Mechanics: Will you kindly give a few suggestions on the care and treatment of a soldering iron used by carriage lamp makers. What is the best method of keeping the iron bright? What is the best acid in use for soldering that class of work?

Mr. P. Rubenstein, of the Chicago Silver Plating Works, who has wide experience in this line, states: Of course it is the gas or charcoal or whatever is used in heating the iron that blackens it. To keep the iron bright first prepare a solution as follows: Put a quarter pound of sal ammoniac into a pint of water and permit it to thoroughly dissolve. Dip the iron into the solution and it will brighten immediately.

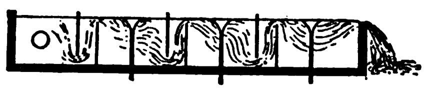
The iron needs filing every three or four hours to keep it in good condition. If it is not filed frequently it will acquire such a heavy coating of tin that it will not melt the solder.

The best acid to use for soldering this class of work is muriatic acid, cut down with zinc until it will not eat (dissolve) any more zinc. Then take three parts of the [illegible] cut down with the zinc, to one [illegible] Be sure and clean well the [illegible]ering. Be sure and do [illegible] zinc in the house, for [illegible] it boils up is [illegible]nous.

TO RECOVER CYLINDER OIL FROM CONDENSING ENGINES.

In the power house of the Camden & Suburban railway is a unique device for recovering cylinder oil. Part of the time the exhaust is discharged into the condensers. The Street Railway Journal describes a very novel and economical feature of the oiling system in an arrangement both for recovering the cylinder oil and utilizing the latent heat in the water in the hot well. The overflow from the condensers discharges into a large concrete and masonry tank, 60 ft. long by 14 ft. wide by 6 ft. deep, set the level of the boiler room floor.

This receptacle, a rough section of which is here shown, is divided by barriers into four compartments, the barriers being so arranged that the water has to flow over the first, then under the second, over the



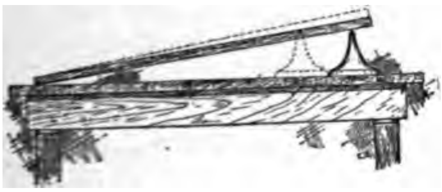
SECTION OF HOT-WELL TANK, SHOWING SKIMMERS FOR RECOVERING CYLINDER OIL

third, and so on. The overflow from condensers is led into the first of these compartments, and as it flows under and over the barriers of the tank the cylinder oil collects on the surface of the water in each compartment. In this position it is automatically skimmed off by funnel-shaped drain pipes, about 6 ins. in diameter at the top, as illustrated. It has been found possible in this way to recover about one-fifth of the oil used in cylinder lubrication. It has also been found not only practicable but desirable to use the overflow of this tank for boiler feed purposes. The temperature of the water averages about 115 degrees F., and the little oil that is mixed with the water seems to act as a boiler compound and be just enough to precipitate the mineral matter in the water; in fact, since the introduction of this water the boilers have been entirely free from scale or corrosion.

John J. Camp, of Seattle, Wash., will start in a gasoline launch 18 feet long, and attempt to follow the western coast down to Cape Horn, and then up the Atlantic shore to the St. Lawrence river. Thence through the Great Lakes to the Mississippi, up the Missouri and Snake rivers, where a short portage will bring him to the Columbia river, and thence home.

CASTING TO ELEVATE DRAFTING BOARD.

Where it is desired to use a drafting board on a flat table, the castings shown in the cut will be found of service. The Draftsman says the base of the casting should be 4½ inches in diameter, the height



Elevating Drafting Board

4 inches, terminating in a sharp point which holds the board and prevents slipping. By moving the casting various elevations of the board are secured.

BURNISHING NICKEL PLATE ON HAND LATHE.

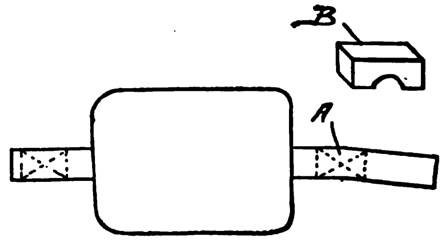
Nickel plated articles capable of being handled rapidly can be profitably burnished on a hand lathe. Some manufacturers prefer this method to buffing and the finish is more durable. In buffing a certain amount of plate is worn off, while in burnishing the surface is hardened under the burnishing tool. J. W. Force, in Metal Industry, says: I have been using the burnishing process for buttons, and some 1200 gross are treated every day. To accomplish the result, however, the solution must be properly made and maintained. The coating also must be very light; only just enough to cover the article should be put on. I use a solution which does not stand over 5 degrees hydrometer test, and even a little less is better than over.

The method which I use is as follows—viz,; The articles to be plated are first sent to the dipping department and dipped in the usual brass dip until a good, bright, clean finish is produced. They are then rinsed in cold water, then in hot water and afterward dried in sawdust. They are now sent to the plating department. The articles are now placed in baskets, rinsed in potash solution and then in cyanide solution. The next operation is to rinse thoroughly in three waters and place in plating baskets in the plating bath. The plating is allowed to continue until a light coating is produced. They are then thoroughly rinsed in cold water, then in hot water and dried in sawdust and afterward sent to the burnishing department.. The burnishing is accomplished with the ordinary suds and burnisher.

HOW TO STAIGHTEN A SHAFT.

The following description of a quick repair of a bent shaft of an electric motor in a mill may prove useful some day. The American Miller says the shaft was bent at A, being on a bearing. The bearing could not be turned down, nor could it be mutilated from pounding. The shaft was straightened without doing either.

Mr. London had an iron, B, forged to fit about one-third of the way around the shaft. This was heated in a furnace and while hot was placed on the concave side of the bent shaft. When the shaft was slightly beyond straight the iron, B, was removed



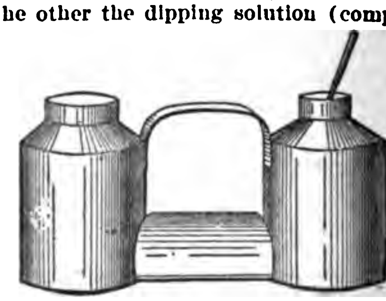
Straightening a Bent Shaft

and the shaft became straight. The heat had expanded the one side of the shaft enough to leave it perfectly straight.

DIP AND ACID CUP.

A handy device for tinners, which can easily be made is described in the American Artisan. It is especially convenient for work outside the shop.

Make two bottle-shaped cups of copper and join together with a boss and handle. In one of the cups put your flux and in the other the dipping solution (composed

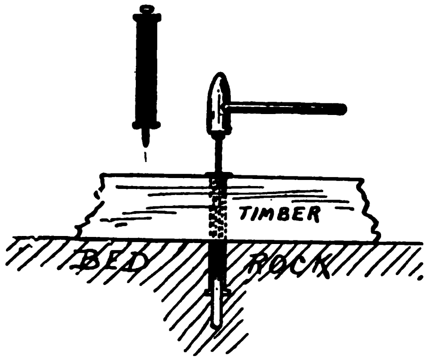


Dip and Acid Cup

of weakened flux or acid). Let the opening of the dip cup be larger than the acid cup, so you can always tell in which to your coppers. Tin and horse hair mat

TO FASTEN DAM TIMBERS TO ROCK BOTTOM.

The difficult task of securely anchoring timbers to a rock bottom for dam or other similar construction is made easy by a

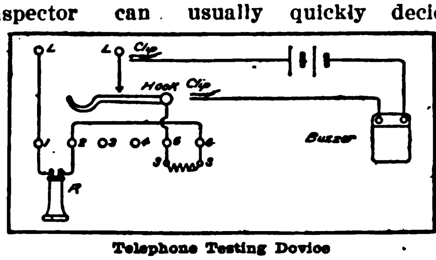


Method of Anchoring

writer in the American Miller. The illustration tells the whole story. Any blacksmith can make the fastenings, to be used as shown in the cut.

HOW TO MAKE A TELEPHONE TESTING INSTRUMENT.

It is often quite handy to a telephone inspector to have a simple testing apparatus with him while he is making his rounds, says the American Telephone Journal. The one here described is easily made, and will be found practical. It requires but a couple of small dry batteries, vest-pocket size, and a small buzzer. The dry batteries and buzzer can be carried in the pocket or a better arrangement is to mount them in a small box with a pair of flexible cords, to the ends of which snaps are soldered. Old suspender snaps will be found to answer the purpose admirably. When a station is in trouble the inspector can usually quickly decide



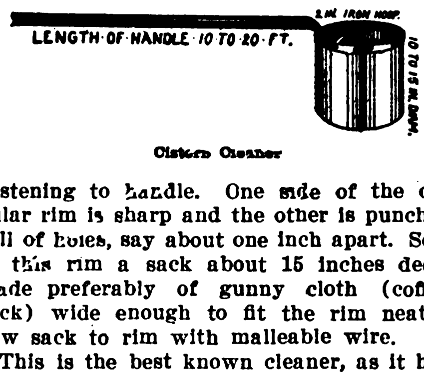
Telephone Testing Device

whether it is the primary or secondary circuit that is at fault. The figure represents the secondary circuit of a telephone sub-
nstrument. Supposing an open is
hat cannot be easily located, the
e snap from his buzzer
to the line post L' and the other he touches to the hook switch. If the buzzer sounds here, he is sure that that part of the circuit is closed, and then touches bind post number 5, still leaving the first snap at L'. If the buzzer fails to sound at 5 it is evident that the trouble is in the wire between the switch hook and the bind post 5. If, however, the buzzer sounds at 5, and does not at 6 it is evident that the open is in the secondary of the induction coil. The buzzer is better than a telephone receiver for this sort of work, as enough current to make a distinctly audible click in the receiver might flow across a partial open, while the buzzer, under the same circumstances, would not sound.

TO MAKE A CISTERN CLEANER.

Here is a description of a really good cistern cleaner, condensed from the American Artisan, with which a cistern can be cleaned without pumping out the water.

It is made of 2-in. hoop iron bent into a 10 or 15 inch circle with 6-inch straps for



Cistern Cleaner

fastening to handle. One side of the circular rim is sharp and the other is punched full of holes, say about one inch apart. Sew to this rim a sack about 15 inches deep, made preferably of gunny cloth (coffee sack) wide enough to fit the rim neatly. Sew sack to rim with malleable wire.

This is the best known cleaner, as it has a good edge for scraping up the dirt while the sack allows escape of surplus water. The sack must be sewn inside, or in such a manner so as to protect from wear near the hoop circle.

The new cruiser Maryland, which was successfully launched at Newport News recently, is 502 feet on load water line; extreme breadth 69 feet 6½ inches; trial displacement, 13,860 tons; mean draft at trial displacement, 24 feet 1 inch.

When the piano manufacturers hold their convention at Atlantic City, N. J., next summer, one of the attractions will be a great piano bonfire. A huge pile of old square pianos will be stacked on the beach, sprayed with petroleum and burned.

WHAT TO DO WITH OLD RANGE BOILERS.

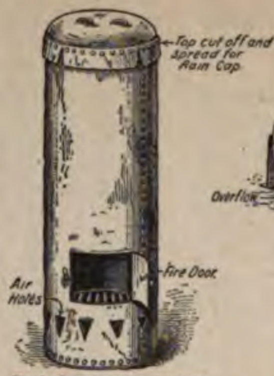


Fig. 1 Garbage Incinerator

Fig. 2. A Kentucky Tavern Drinking Trough.

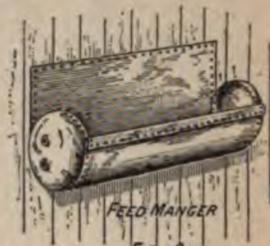


Fig 4.


Fig 3. An Ohio River Fishermans Scheme for Tarring Nets.

Fig. 5

Expansion Tank. Fig. 6.

A kitchen range boiler when put out of service seems to be one of the most useless things in the world. Patching and mending are a waste of money. The junk man refuses to buy them, and the plumber feels imposed upon when requested to take them away. And yet, but for some apparently insignificant weakness, the boiler which cost from $25 to $50 seems good for many years to come. A writer in the Metal Worker has discovered uses for these discarded boilers; some of them are shown in the illustration. In Pennsylvania many house holders burn their refuse and garbage; the old boiler makes an excellent incinerator by cutting off the top and inserting a grate 15 inches from the bottom. Fig. 2 is a water trough. Fig. 3 a device used by Ohio river fishermen to tar their nets, the nets being dipped in the hot tar. Figs. 4 and 5 speak for themselves. Fig. 6 shows a section of old boiler used as an expansion tank for a greenhouse heated with hot water. The height of the water in the tank is a reliable indication of its heat. The pipe holes in old boilers can be stopped with wood or iron screw plugs.

With both ends cut off they make good culverts. A rod through the center with a handle transforms an old boiler into a good lawn roller. With one end cut off and buried in the ground it makes a fairly good refrigerator as a temperature of 52 degrees can be thus secured. Other uses will suggest themselves to our readers.

The Prince of Wales has a most extraordinary design tattooed on his arm. It takes the form of a fearful looking dragon, with open jaws bristling with rows of gigantic teeth, and a row of spiked horns down the middle of its back.

FREIGHT CARS ORDERED IN 1903.

There is always great interest in railroad circles to know the number of freight cars ordered during the year, as affording an indication of traffic present and prospective. The Railway Age has compiled the figures, which are: Freight cars, 108,936; passenger equipment, 2,310; locomotives, 3,283.

In 1902 the orders were: Freight cars, 195,248; passenger equipment, 3,459; and locomotives, 4,665.

A Toledo, O., man has invented a self-starting gasoline engine for automobiles. The engine is a vertical two-cylinder, and after being once started in the morning will start any time during the day by pushing a button. One cylinder always is charged with compressed gas, which of course would lose its efficiency in about 20 hours.

LENGTHENING A SMOKESTACK WHILE IN USE.

The 110-foot round iron smokestack of the Century Building in Indianapolis was recently lengthened 60 feet while the boilers and plant were in full operation. The

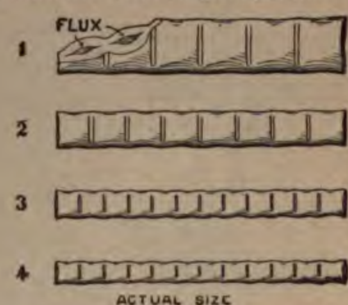
Lengthing a Stack While in Use

stack had long been a source of annoyance to occupants of nearby tall buildings, and to extend it without banking the fires and shutting off the power of the manufacturing companies occupying the Century Building was considered impossible by local engineers. W. H. Schott, consulting engineer of Chicago, was called upon and in an ingenious and effective way accomplished the job. A damper was placed in the old ...ew feet below the top and two ...t into the sides a short distance below the damper. This permitted the escape of the smoke and gases, and the workmen were able to rivet the previously prepared sheets into place with but little difficulty. The stack is five feet in diameter and was extended to a height of 170 feet in eight days. The accompanying illustration is reproduced from the Iron Age.

SOLDERING.

The best solder for ordinary purposes is called "half and half," i. e. 50 per cent tin and 50 per cent lead. More lead and less tin makes softer and poorer solder and raises the melting point. An addition of proper proportion of bismuth reduces the melting point but greatly increases the cost.

To join surfaces by solder, they must be thoroughly clean and heated sufficiently to melt the solder. Heating causes both the solder and the surfaces to rapidly oxidize and oxides are fatal to good joints. To pre-



vent oxidization as much as possible and to carry the oxides away, acid or fluxes are used. An excellent flux is one that has both an active reagent to cut away any foreign matter from surfaces and a protective ingredient which will shield the hot surfaces from the air until the solder can run in and take its place, which it does by capillary attraction.

Different metals require different fluxes.

Muriatic (HC1) acid and zinc, decanted, makes a fairly good (but corrosive) fluid for tin plate, brass, copper or steel. Tallow or stearine for lead. Rosin for lead or tin plate. These are the most common.

To "tin" a copper, do not have it too hot. File bright, quickly rub with sal ammoniac or dip in paste or salts solution and apply solder before the copper has time to oxidize.

Few manufacturers realize how much can be saved by having things convenient. At least, there are few methods employed that can not be improved upon. Most operatives have but two hands. In any case where operations must be repeated rapidly and many times, it is important to have only two things to manipulate, one for each hand. In many, possibly most cases where the work is light, all the time spent in moving the soldering copper is lost.

However, there still remain three motions, viz., bringing the work, the flux and the solder up to the copper. These three motions can be reduced to two, when a self-fluxing solder is used.

Where the surfaces to be united are very extensive a method called "sweating" is employed. This is done in several ways. The writer has employed two methods in his experience covering many thousands of square feet of work. The first method was to coat both surfaces with solder (over a hot stove) by means of wire brush and crystal of sal ammoniac and, as soon as solder was set, to coat with rosin to prevent oxidization. The two plates thus covered were clamped face to face and "baked" in an oven.

A more economical method was to lay a sheet of solder foil, 5-1000 inch thick, coated with flux, between the plates. These were clamped together and baked as above. The latter method proved more economical and reliable. The plates above mentioned [illegible] brass or bronze twelve by forty-

and the other but 1-16 inch. Every square centimeter of the entire surface had to be soldered. By the use of self-fluxing solder it is possible to do much soldering without a copper. Merely heat the article and apply the solder.

F. G. Dickerson.

HOW TO TIE A HITCHING KNOT.

A knowledge of how to tie the hitching knots, which are a part of the education of every sailor, will be valuable to all our readers. The illustration is from the Scientific American. A piece of white cotton clothes line is most suitable for practice.

No. 1 is the so-called half hitch, which is so common as to be familiar to nearly everyone. No. 2 is known as the timber hitch, and is particularly useful when medium-sized sticks of timber are to be hauled about. No. 3 is a combination of the timber hitch and half hitch, that is particularly advantageous when longer sticks are to be handled. No. 4 is the famous clove hitch that is more frequently used than any other form of rope fastening.

Nos. 5, 6, 7 and 8 are self-explanatory methods of [illegible] slings whereby articles of almost [illegible] description may be

Commonly Used Hoisting Hitches.

SHOP NOTES

HOME-MADE BIT.

You need never want for a small bit with which to bore a hole. All you have to do is to take a wire nail and hammer the

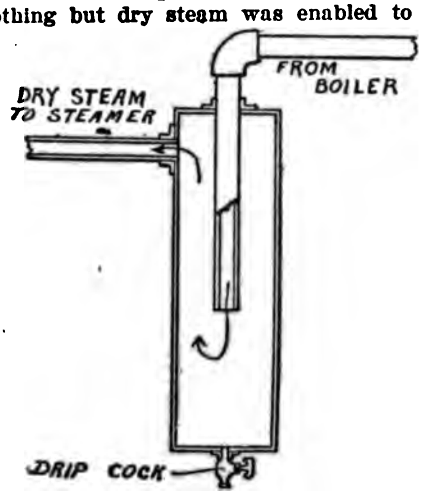
point flat, after which point and sharpen it as shown in the cut. The head is squared by a few blows with a hammer to fit the stock.

DRY STEAM FOR WHEAT STEAMER.

A writer in the American Miller tells how he made a trap for supply dry steam to his wheat steamer. He says:

Before using this wrinkle I had hard work to keep my steamer doing even work, as there was too much condensation before the steam reached the steamer. We had a standard make of steamer, but the great distance from the boiler prevented it from doing successful work.

After installing the trap I found it to be a wonderful help. The steamer receiving nothing but dry steam was enabled to do



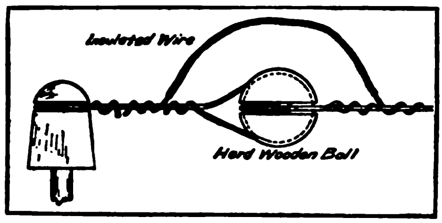
Trap for Dry Steam

[illegible] work. Any one adopting this plan [illegible]ased with results. The trap can [illegible]ing a piece of pipe 3 or 4 [illegible]d about 14 inches long. [illegible]d and screw caps [illegible] proceed to pipe

ENGLISH ANTI-HUM DEVICE.

The method here described of preventing the vibration in telephone wires from being communicated to a building to which they are attached is said to be in quite extensive use in England. We quote the description from the London Electrical Engineer:

"In the fixing of wires to buildings trouble is sometimes experienced through the humming noise, and several more or less effective methods of overcoming the difficulty exist. One plan is to bind in the line wires



with strips of lead about ½-inch wide, and twist the lead round the wires for a distance of about 12 inches from the insulator. A better and more excellent method is to break the wires about 18 inches from the insulators, as shown in the figure, and insert hard wooden balls doubly grooved for making off and terminating the wires, the continuity of the wires being made by bridging over the wooden balls with a piece of insulated wire."

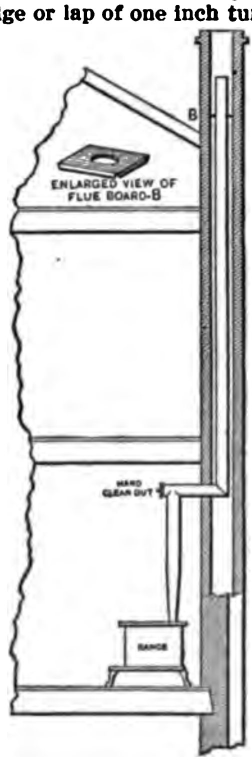
RADICAL CHANGE IN BLUE PRINTS.

A radical change is being made by the larger machine builders in their blue printing. Instead of white lines on blue paper they are now printing blue lines on white paper. The advantages are too obvious to require comment. This is accomplished at small expense by means of what is known as negative paper, which is printed from the tracing, the result being a white lined drawing on a deep, brownish-gray background. This background is opaque, while the white lines are very transparent. All subsequent printing is from the negative paper, the tracing being discarded for the purpose. This new blue print is of especial value as a substitute for original drawings, which may be preserved in their freshness.

Excellent prints may be obtained as a substitute for the ordinary blue prints to send to prospective customers. For shop use, however, the old blue print is considered the better, because the blue background soils less easily, and it is more easily read after being shop handled.

A CHIMNEY REMEDY.

Here is a method which its author, writing in the Metal Worker, guarantees to cure an obstinate chimney which refuses to draw. He accomplishes this by means of an extended smoke pipe and a flue board. Where the smoke pipe enters the flue, it is the intention that it be continued on up the flue to near the top of the chimney, where it should connect with a flue board made of heavy, galvanized iron, with a hole in it for the smoke pipe to pass through. This flue board should fit horizontally across the flue and should be made of heavy sheet iron, with an edge or lap of one inch turned up on



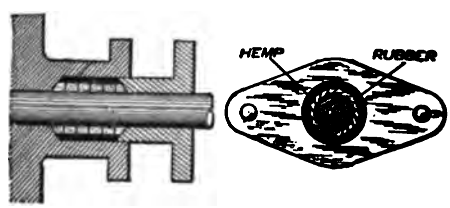
Improved Draft

all four sides, so that it can be nailed into the mortar to hold it in position. It should be the exact size of the flue, and after the pipe is connected with it, mortar should be put on the top of it to make the connection with the smoke pipe and to render the walls of the flue air tight, as well as to increase its durability by preventing rust. If it is necessary, at any other time, that another stove pipe shall connect into the same chimney flue, either a larger pipe can be used and the additional pipe connected with it by means of a tee joint; or, if the original flue is large enough, a second sheet iron pipe can be run up alongside of the other. The advantages of having a horizontal sheet iron flue board in a chimney, near the top, are that the chimney is then air tight, soon gets hot and stays hot, and therefore the draft is much more powerful. Again, it is cheap and simple, and any apprentice boy can put it up. By providing a hand clean-out to the elbow at the top of the pipe from the stove, where it turns into the chimney, as shown, the pipe can be kept clear and a full draft realized.

A SIMPLE HOME-MADE PACKING.

A description of a home-made packing which is especially adapted to piston rods that are worn and scored may be of interest to engineers. Almost every engineer has the material at hand with which to make it because all that is required is a piece of rubber hose and some hemp. The hose should be as heavy as can be obtained, says the Engineer.

To apply the packing cut off a length of hose equal to the depth of the stuffingbox, leaving about ¾ inch for the gland to enter



Home-Made Rod Packing

the box and also leave room for the rubber to expand when it gets warm. When the hemp is well soaked with cylinder oil, either braid or twist the hemp to fit the space between the rod and the rubber cushion and drive it in with a piece of soft wood until solid. Then screw up the gland tight enough to render the packing firm. When the packing gets warm begin to slacken gland bolts so that the rod wi

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four months. When renewing the packing just loosen the gland and add some more hemp.

THE VALUE OF MANUAL TRAINING.

Comparison of the Educated Youth with the Uneducated Reduced to Dollars and Cents

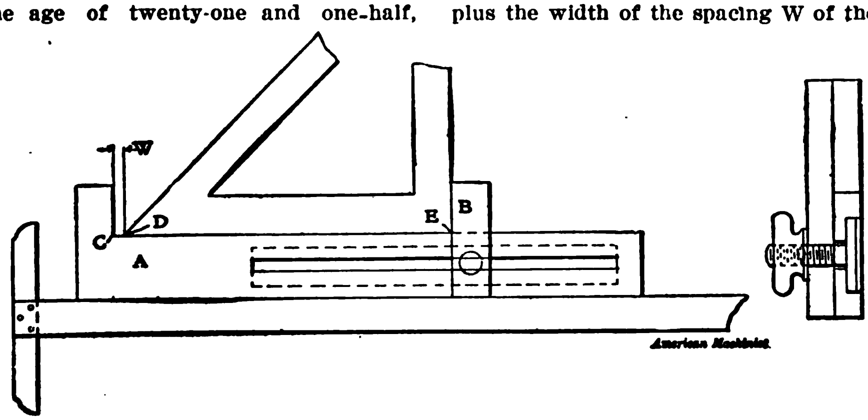
The boy who spends three years at a trade school overtakes and passes the one who goes directly into the shop. The following is abstracted from the Manufacturer, by the Electrical Review:

This is a more detailed study of the comparative value of manual training, as obtained in trade schools, and shop training, than was given by the author, Mr. James Mapes Dodge, in his recent address before the American Society of Mechanical Engineers. He starts with boys sixteen years of age, each of whom can obtain work at $3 per week. One set goes into the shop; the other takes a three-year course at a trade school. The potential or invested value of each—that is, the value on which his weekly wages amount to five per cent—is $3,000. The shop-trained apprentice receives an increase in wages of sixty cents per week for each six months of service, until he reaches the age of nineteen and one-half years, when his wages are $7.40 per week. They are raised to $9 a week at the age of twenty, and to $13.20 per week at the age of twenty-one and one-half, finally reaching $15 per week at the age of ... a graduate of the trade ...ool at nineteen, can ... per week. He is ... the shop-trained ... is $12,000, ... that of the shop-trained boy of the same age. His increase from this point is less rapid, but he reaches a wage of $15 per week—the maximum reached by the shop-trained—at twenty and one-half years, and is then three and one-half years ahead of the latter. His wages at the age of twenty-five are $22 per week, and his invested value is $22,000, an increase of $19,000 in nine years; and from this point he continues to rise. His average yearly increase in value at the age of twenty-five has been $2,100 per year, as compared with $1,300 for the shop-trained. The author says that of all the trade school boys he has employed, only one per cent have failed completely. The rest are still with his company and have advanced, or have left for better situations. Of the shop-trained boys, only five per cent rise above $15 per week. Thirty-five per cent remain in the employ of the company indefinitely, without rising above this point; twenty per cent leave of their own accord, and forty per cent are dropped gradually.

A GOOD SECTION LINER.

A home made section liner which is practical, reliable and quick acting is described in the American Machinist. It is made of transparent celluloid, $\frac{1}{8}$ inch thick, though hard rubber will answer. A 45-degree triangle is used and worked as follows:

First set on piece A the movable slide B to the length of the base of the triangle plus the width of the spacing W of the section lines needed, and clamp it. Draw the first line when the point C is in contact with point D, then move the triangle to point E and piece A to point D. Two lines can be drawn now by shifting triangle. Repeat until the sectioning is completed.



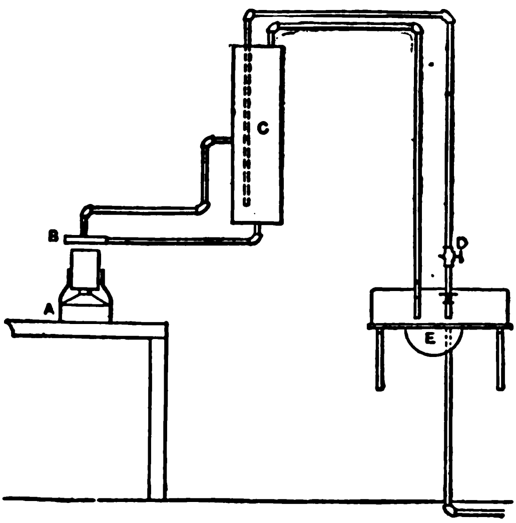
A Section Liner

Dimensions are not given, as this tool

should be made to fill the requirements of each individual. The construction is self-evident from the sketch. The piece A slides along the T-square as shown, and all movements of the liner can be easily made with one hand. A little practice will produce very rapid work.

HOME-MADE SHOP WATER HEATER.

Any shop furnished with a gasoline furnace, or furnace for heating soldering cop-

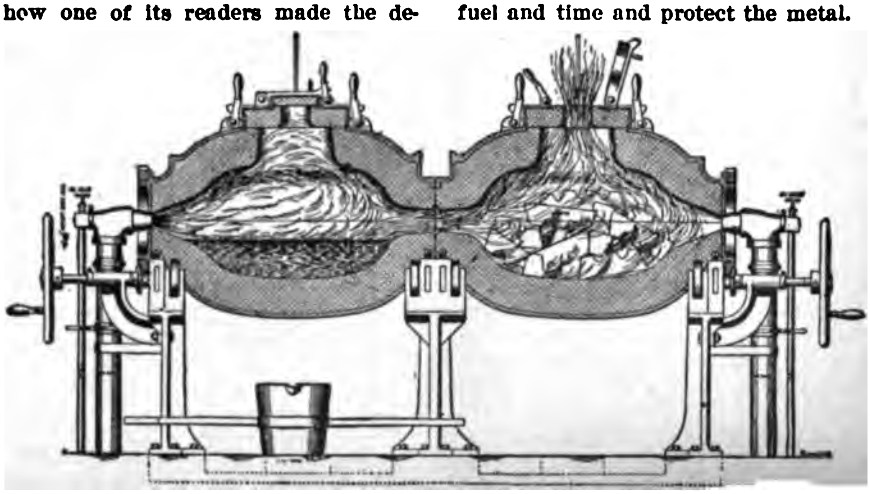


Shop Heater

pers, can easily have plenty of hot water for washing purposes. The Metal Worker tells how one of its readers made the device: "I have made of heavy sheet metal a water heater 1 inch in height and 7 inches in diameter. From the top and sides of this heater one half-inch pipes lead to a hot water storage tank made of No. 24 galvanized iron, which is 8 inches in diameter and 30 inches high. This is securely supported to one of the walls of my shop, convenient to a wash bowl, and is connected, as shown, with the water heater by half-inch pipes. I have taken a cold water supply pipe to this wash bowl, and led it to the storage tank and connected it to a tube that runs down inside nearly to the bottom. From the top of the tank I have brought over to the wash-stand another pipe which is open at the end, and I control the water supply by using a stop cock on the cold water pipe."

NEW ROTARY MELTING FURNACE.

A new style of rotary melting furnace has been put on the market, which uses the waste gases of combustion. The furnace is in two sections, and will melt two different metals at the same time, or the same metal in both chambers. Usually one chamber is filled with fresh metal while the other is in a molten state. Four sizes are made, ranging from 350 to 3,500 pounds for each chamber. The Foundry says: One of the chambers is always in the act of melting, the other receiving the spent gases which give up their heat into the fresh charge of metal in this latter chamber. As soon as one melt is poured and the chamber recharged the fire is practically continuous. It is quite reasonable that it should result in saving fuel and time and protect the metal. While the one-
ness



SECTION SHOWING FURNACE IN ACTION

SIMPLE OILING SYSTEM.

An oiling system which was home made at a cost of only $20 has been in successful use for several years at the power house of the electric road in Portland, Me. It was devised to avoid the use of auxiliary pumps for lifting the oil as required by gravity or compressed air apparatus. In the Street Railway Review, the manager says:

"We took a piece of heavy iron pipe about 1½ ft. in diameter and about 7 ft. long. We capped it at both ends and stood it on end for our oil pressure tank. Then to get the pressure, we merely connected the bottom of this oil pressure tank to the city water main."

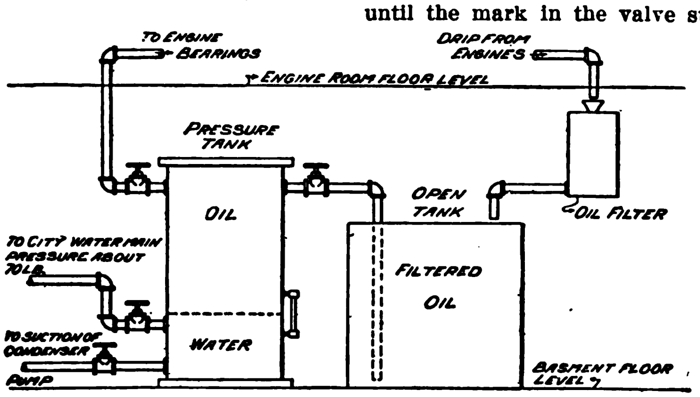


DIAGRAM OF OILING SYSTEM.

The general layout of the system is indicated in the diagram. The oil in the pressure tank floats on a stratum of water, the water coming from the main at about 70 lb. pressure. The water forces the oil up through the feed pipe leading from the top of the tank to the engine room above and to the bearings of the several engine units. The oil drips from the engines are collected in drip pans and flow by gravity to the oil filter, from which the filtered oil flows by gravity into the open tank for storing the filtered oil. From the bottom of this filtered oil tank, a connection leads to the top of the pressure tank previously mentioned. When the water in the pressure tank has risen sufficiently to force nearly all the oil therefrom, the connection to the water main is closed, and a valve is opened giving connection to the suction of one of the condenser pumps, that pump being used which ... be working at the time. This ... water from the bottom of ... and at the same time ... the top of the pres... storage tank. ... the appa... he

pressure tank be watched to prevent the supply of oil from becoming exhausted and the water from rising into the oil piping system. This is not a serious task. A glass gage shows the level of water at all times. A compressed air system to do the same work would have cost $1,500. If the city water pressure should ever fail connection can be made to the boiler feed supply.

REVERSING SINGLE VALVE ENGINE.

To reverse a single valve engine put the crank on either center and scribe a line on the valve-stem next to the stuffing box; loosen the eccentric and turn it on the shaft until the mark in the valve stem is again even with the face of the stuffing box; tighten the eccentric and the engine will run in the opposite direction to what it formerly had. Care should be taken not to move the stuffing box during the operation and to see that the crank is still on the same dead center when tightening the eccentric that it was at the outset.

A HEAT PROOF PUTTY.

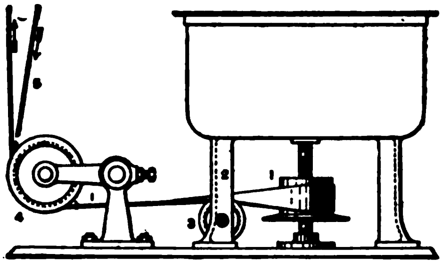
Mixing a handful of burnt lime with 120 grams of linseed oil, boiling down to the usual consistency of putty and allowing the plastic mass to spread out in a thin layer to dry in a place where it is not reached by the sun's rays, yields eventually a very hard putty. When required for use it is made plastic by holding over the funnel of a lamp; on cooling it regains its previous hardness.

FIVE-YEAR SUBSCRIPTIONS.

In response to numerous requests the publishers of Popular Mechanics announce a special subscription offer of five years for three dollars. Address may be changed as often as desired.

AN INGENIOUS GUIDE PULLEY.

After a number of machinists had endeavored to prevent a belt from running on the flange of a small pulley on an extractor used in a laundry for wringing clothes, and which on two occasions had broken the flange as well as destroying the belts, an idea struck me that by placing a guide pulley underneath the belt and a little higher than the flange it would have a tendency to alleviate trouble. Thus writes a correspondent to the Engineer.



Arrangement of the Guide Pulley

So I made a pulley from an ordinary 3-inch pipe socket. I first plugged it with wood, then drilled in the center for a ½-inch pipe and in the end of the plug I drilled a hole, and also through the pipe, for an oil hole. Then, after finding a suitable bolt I drilled and tapped one of the legs of the machine and mounted the pulley on the bolt. It has answered the purpose very well and is running satisfactorily.

A BLUEPRINT PAPER FOR BLUE LINES ON A WHITE PAPER.

The following process, credited to Captain Abney, yields a photographic paper giving blue lines on a white ground:

Common salt	3 ounces.
Ferric chloride	8 ounces.
Tartaric acid	3¼ ounces.
Acacia.	25 ounces.
Water	100 ounces.

Dissolve the acacia in half the water, and dissolve the other ingredients in the other half; then mix.

The liquid is applied with a brush to strongly-sized and well-rolled paper in a subdued light. The coating should be as even as possible. The paper should be dried rapidly to prevent the solution sinking into its pores. When dry, the paper is ready for exposure.

In sunlight, one or two minutes is generally sufficient to give an image while in a dull light much as an hour is necessary.

To develop the print, it is floated immediately after leaving the printing frame upon a saturated solution of potassium ferrocyanide. None of the developing solution should be allowed to reach the back. The development is usually complete in less than a minute. The paper may be lifted off the solution when the face is wetted, the development proceeding with that which adheres to the print. A blue coloration of the background shows insufficient exposure, and pale-blue over-exposure.

When the development is complete, the print is floated on clean water, and after two or three minutes is placed in a bath, made as follows:

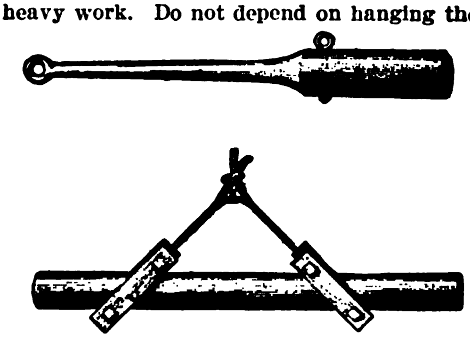
Sulphuric acid	3 ounces.
Hydrochloric acid	8 ounces.
Water.	100 ounces.

In about ten minutes the acid will have removed all iron salts not turned into the blue compound. It is next thoroughly washed and dried. Blue spots may be removed by a 4 per cent solution of caustic potash.

The back of the tracing must be placed in contact with the sensitive surface.

BLACKSMITH'S RAM.

Every blacksmith shop should have three rams, according to the Blacksmith and Wheelwright. The rams are used for butt welding. One should be of soft steel, three inches in diameter; another forged from a piece of 4-inch cold rolled shafting; and a third from five or six-inch shafting for heavy work. Do not depend on hanging the



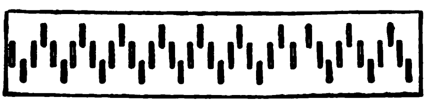
Blacksmith's Ram

ram by a rope passed around it. Drill a hole clear through and use an eye-bolt, as shown in the first cut, or use two clamps, as in the second cut. Never use screw-eyes, as they are sure to break off at the critical moment.

If the end of the ram is to be har for use on cold iron, the layer should be a little thicker—say ¼-inch—and it may be hardened by means of a hose attached to a hydrant or tank of water so as to give a good head to the steam. The trick of hardening large pieces of metal is to keep the cold water in contact with the metal to be hardened. When a large piece of steel is heated and plunged into water, steam is generated which very effectually keeps the cold water away from the hot metal, therefore the cooling of the steel is so slow that a sufficient degree of hardness cannot be obtained. With the hose, a powerful stream of water is at all times forced against the steel, and the steam is forced away as fast as generated, the cold water constantly reaching the steel and carrying away the maximum quantity of heat possible. When a hose is not available, procure a half-a-dozen pails, fill them with water and stand them handy. Place the ram hot end uppermost, and let two men man the pails of water and keep a large solid stream constantly flowing upon the end of the ram, which can be made quite hard in this manner.

LOCOMOTIVE SPARK PREVENTER.

The Germans are fostering their forests, and in pursuance of this policy are taking great precautions against forest fires. Their locomotives all carry spark arresters which, while retaining the sparks have caused some trouble in choking up the escape. A recent



Spark Arrester

invention consists of three grates, set one above another in a square iron or steel frame of proper size to fit into the smoke chamber of the locomotive. Each bar is two inches wide by one-tenth of an inch thick. The middle tier contains twice as many bars as the top and bottom tier. No spark or ember larger than 16-100 of an inch can escape and these are so small they are self-extinguishable in going a few feet. The bars readily expand and contract.

ALUMINUM CONDUCTORS FOR ELECTRIC LINES.

Alton D. Adams says that the inferiority ...num as an electrical conductor in ...l area is more than offset ...ver copper in terms of weight. For equal resistances the weight of aluminum is only one-half as great as that of copper wire of the same length. When the price per pound of aluminum is less than twice the price of copper the former, he says, is the cheaper for a transmission line of any required length and electrical resistance. The principal demerits of aluminum are its liability to oxidation when exposed to the fumes of chemical works and its liability to corrosion in moist air when it is impure, especially when it is alloyed with sodium. It is also hard to secure soldered joints.

THE VERANT—NEW INSTRUMENT FOR PHOTOGRAPHERS.

The Verant is a new instrument for photographers by which the apparently ludicrous perspective caused by short focus is overcome. It was recently exhibited and

The Verant

exploited before the Royal Photographic Society by Dr. Moritz von Rohr, who said:

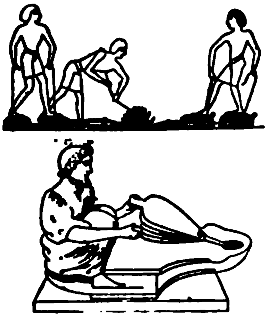
"Summing up, we come to the following conclusions: Supposing we have a Verant lens of the focal length of the camera objective, a normal eye will obtain, through the Verant, as far as perspective and accommodation is concerned, the same impression it would obtain from the natural landscape when brought to the place of the entrance pupil of the camera lens. And if color is neglected the impression caused by the photograph will exactly correspond with that exercised by the natural objects.

"This necessarily affects our apprehension of relief, and our estimation of distance must correspond with the conclusions we should derive from monocular inspection of the objects themselves."

SHOP NOTES

THE EVOLUTION OF THE BELLOWS.

The great blowing engines of our modern blast furnaces, requiring hundreds of horse power and running constantly night and day, are but the outcome of the ancient method of blowing employed by the Egyptians 1500 years before Christ. The Blacksmith and Wheelwright has gathered data on the subject, from which we condense the following:



Figs. 1 and 2

In Fig. 1 is seen the Egyptian bellows, worked by men who rested their weight first on one leather bag and then on the other. Cords were used to lift the bag for another compression. The middle man is holding the rod of metal in the fire.

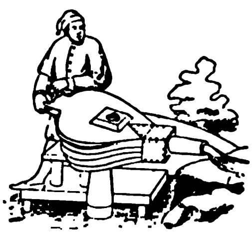


Fig. 3.

The Roman lamp bellows is like those still in use in this country and elsewhere. The same type of bellows, only larger, was used in pumping water, as shown in Fig. 3. The natives of British India still use the crude bellows seen in Fig. 4, for blowing charcoal fires for smelting ore. In striking contrast to all these is the scene of a modern blacksmith shop where power blowers are employed for forging, melting and ventilating.

Fig. 4.

A Modern Shop

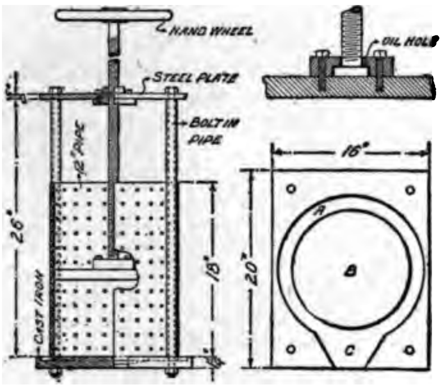
HOW TO MAKE A POLISHING WHEEL.

"For this purpose I use old felt boots," which can be obtained for little or nothing," says a correspondent in the American Blacksmith. "Each boot will make two plys. Three pairs of boots will make one wheel about 3 by 7. Put iron plates on each side about ⅛ of an inch thick, and about one inch smaller than the wheel. Bolt them together. The wheels can be made any thickness desired. To obtain a smooth surface put the wheel on emery stand shaft, use a chisel like those used for wood lathes, and hold up to the wheel on a rest. The wheel must have good speed. This makes fine polishing wheels, as they are soft and will not bump or break."

SIMPLE DESIGN FOR A WASTE PRESS.

A simple form of waste press which can be readily made from material generally at hand in a machine shop is shown in the accompanying sketches in the Street Railway Review. Only a few dimensions are given as the sizes will necessarily be varied to suit different conditions. A piece of wrought iron pipe 10x12 inches in diameter and about 18 or 20 inches in length is faced squarely at each end and drilled full of small holes of about ¼ inch in diameter spaced about 1 inch apart. A cast iron plate 1¼ inch thick is faced on top and a ring about 3 inches wide is cut as shown at A so that the pipe will fit down over the projecting part D which holds the pipe central on the plate. The front of the plate is chipped out as indicated at C, the botto surface sloping downward towar edge so that the

A piece of ½-inch or ⅝-inch steel plate is used for the top of the press and this is cut about the same size as the cast iron plate at the bottom. Two plates are held apart by four 1½-inch pipes used as distances pieces, through which run bolts holding the plates firmly in place. The



Waste Press

steel plate is drilled to receive a cast iron bushing, which is threaded to receive the screw and is held in place by bolts or cap screws. The piston is made of 1-inch or 1¼-inch cast iron, and secured to this is another cast iron piece which is turned out to receive the head of the screw. The latter is upset and turned down to fit. The screw should be of 1¾-inch steel, or larger, and on its upper end it carries a hand wheel by which the press is operated.

TO MAKE COTTON FROM PINE.

Process Discovered in Bavaria That May Make Europe Independent of America

Experiments are being made in Bavaria in the manufacture of cotton out of pine wood. The method is to reduce the wood to the finest layers possible, then to subject it to a vapor pressure for ten hours. The pulp is then plunged into a soda bath where it stays 36 hours. It is thus transformed into a kind of cellulose, to which a resistant quality is given by adding oil and gelatin. Then it is drawn out and untangled by machinery.

The process is said not to be expensive and it is thought if this cottom can be made ·tical use, Europe will be independent ·a and India. The immense for- ·ia and Germany would fur- of material.

THE FIRE PAILS WERE HANDY.

Fire buckets are made with round bottoms to hang up and thus prevent their use for other purposes. The boys got around this by making a dent in the bottom so the pail would stand alone. To circumvent this a pail was made which tapered to a point. Then the boys cut a hole in a board and laid it across a box with the pail sticking into the hole. It is a bright one who can fool the boys.

The use of flour barrels has fallen off 40 per cent during the past 12 years. People purchase by the sack.

SPECIAL SUBSCRIPTION OFFER.

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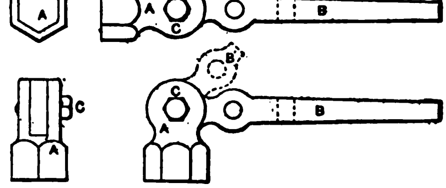
POPULAR MECHANICS' PREMIUMS.

Don't forget to send for Popular Mechanics' premium list. It is sure to interest you. It will tell how you can get many desirable and serviceable articles with little effort.

A SOCKET WRENCH.

A socket wrench with adjustable stem for use in awkward places is shown in the accompanying cut. By the use of a jointed stem, as shown, the wrench is made available for nuts in almost any position and,



SOCKET WRENCH.

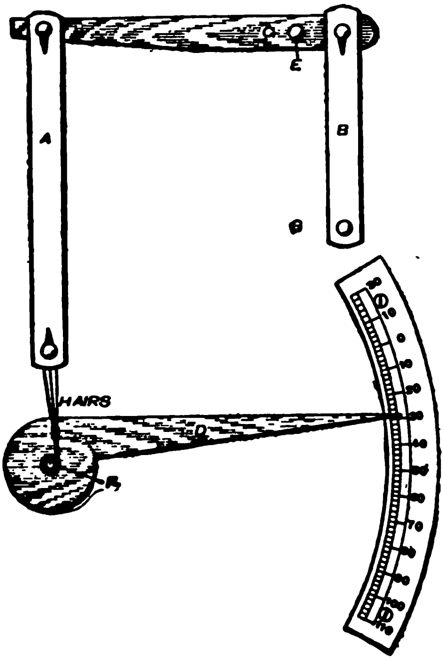
of course, will avoid marring any nut for which it is fitted by any slipping of the wrench. Sets of these wrenches may be made up with handles and sockets interchangeable, so that at slight expense they may be available for any size of nut. We are indebted to Machinery for the suggestion.

If you like Popular Mechanics please tell your friends about it.

HOW TO MAKE A CURIOUS THERMOMETER.

A thermometer which depends upon pieces of brown paper and a few horsehairs, instead of mercury or spirits, for its action, is certainly a curiosity, and cannot fail to attract attention and interest your mechanical friends. The Engineer tells how to make one.

The strips, A and B, are cut from thick brown wrapping paper, the coarser the better. Cut the strip, A, 1 inch wide and 30



.A CURIOUS THERMOMETER.

inches long, and B, 1 inch wide and 20 inches long. Cut button-holes in the end of each strip as shown. The piece, C, is about 1 foot long, and is made of thin wood. The hole, E, is 4 inches from the wide end. The hand, D, is made of very thin light wood and tapers to a point at one end, a circle being formed at the other end to act as a counter weight. The principal thing to be remembered in connection with the pointer is to have the pointed end just heavy enough to overbalance the round end so that it will descend by its own weight.

A small circle of wood, F, is fastened with glue on the large end of the pointer to which the horsehairs are attached.

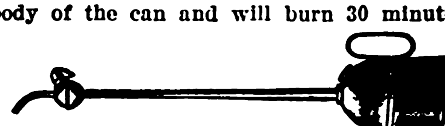
Select a place on the wall where you wish to locate the thermometer. Then first put [illegible]ver, C, by driving a smooth wire nail, or a screw, through the hole, E. Button on strip, B, and with the lever, C, in a horizontal position put a tack or screw through the button hole, G, in the lower end of B. Now button on strip, A, to the other end of the lever, C. To the lower end of strip, A, attach three or four strands of the horsehair, bringing the strands down about 6 inches and fastening them to the under side of the small circle of wood, F, on the pointer, D. Then fasten the pointer, D, to the wall with smooth nail or screw, which is to be put through the center of the small circle, F. The lever, C, and the pointer, D, must work perfectly free and easy on the screws.

When it is cold the paper and horsehairs will contract and the pointer will rise, and when it is warm the hair and paper will expand and the pointer will descend. A scale should be made, and degree marks laid off by marking the position of the pointer corresponding to the indications of a mercury thermometer.

You will notice that this thermometer works diametrically opposite to the mercury thermometer, the pointer descending with rising temperature, and rising with falling temperature. A very slight expansion or contraction of the paper and hair will move pointer a considerable distance.

COMBINED OILER AND TORCH.

A combined oiler and torch is something which will be appreciated by many engineers. The torch receives its fuel from the body of the can and will burn 30 minutes



without tilting the can. A cap fits over the torch when the oiler is to be used in the daytime. The combination leaves one hand free, as well as lighting the part to be oiled.

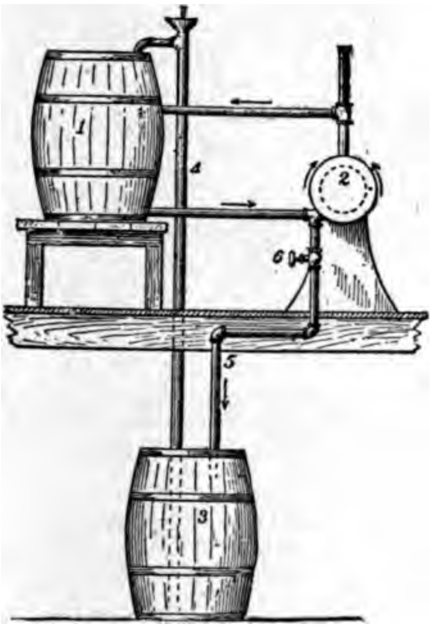
BOILING KETTLES WITHOUT COALS.

Every day in London scores of workmen's kettles are boiled in lime that will afterwards be used for its proper purpose. Just before the breakfast hour, say, one of the workmen empties a quantity of the dry lime from a sack. In the center of this lime he makes a hole, and into it water is poured. Then he puts his kettles int[illegible] water, and in a few minutes th[illegible] boil. In th[illegible] spared.

A GASOLINE ENGINE KINK.

The problem of keeping a gasoline engine cool in cold weather and still avoiding frozen pipes or a bursted water jacket has been solved very satisfactorily by a writer in the Blacksmith and Wheelwright. The accompanying cut illustrates the arrangement used.

Two barrels and some piping are all that is required, one barrel being placed on a



bench on a level with the cylinder of the engine, and the other one below the freezing line, as shown. The figures indicate, 1—barrel for water; 2—cylinder of engine; 3—barrel for water below; 4—pump to raise water to upper barrel; 5—pipe that lets water in barrel below when done work, by turning valve 6. The pump is operated from the engine and when barrel 1 is full can be thrown out of gear.

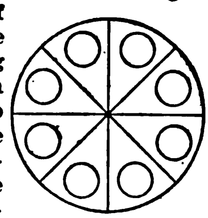
COPPER WIRE FOR HOT BEARINGS.

An ingenious remedy for a bearing which ran hot and burned out every three weeks is described in the Woodworker. The bearing was one of three on a band saw machine. The writer says: I cut out all the old babbit metal, then got some copper 'h diameter and bent it in zigzag enough bent to go the g; laid it in the box, and poured the hot babbit metal the same as though the wire was not there. The idea I had was to have the shaft bear on the copper as well as the babbit, and I succeeded.

HOW TO MAKE EVERY FURNACE PIPE HEAT.

Where there is sufficient height in the furnace room, every pipe leading to a register may be made to carry heat. The method is described by a writer in the Metal Worker, who says:

I put up a hot air furnace 42 inches in diameter and having eight pipes on it. The customer complained of two rooms not heating that were fed by pipes on opposite sides of the furnace. To overcome this trouble I resorted to an expedient that would have been impossible in a low cellar, but the furnace was in a cellar having a 12-foot ceiling. I took off the top and raised the casing 18 inches, finishing it with a flat top with a 3-inch rim around it to hold sand, and put the eight pipes in the top, running off with three-piece elbows. I put a partition in between each of the pipes, extending down to 18 inches. A plan of the under side of the top is shown herewith. This practically makes eight separate heaters over one fire, for all of the air that rises in the furnace between any pair of these partitions can only escape through the pipe from that space. The finished job gave entire satisfaction.



HOW TO MAKE A HECTOGRAPH.

A formula for making a hectograph, or composition for taking duplicate copies from one original copy written with aniline ink, is as follows: 100 parts white glue; 500 parts glycerine; 25 parts sulphate of baryta (kaolin); 375 parts of water. Soak the glue in the water until dissolved; then add the glycerine and kaolin, and cook slowly until thoroughly dissolved and smooth. Add a few drops of carbolic acid; pour the mixture into a pan and clean all scum and bubbles off the top; then set to cool. Trouble is sometimes experienced with this formula, probably because of difference in the quality of the glue or the glycerine; but, under favorable conditions, it makes a thoroughly good hectograph.

BORING AN ENGINE CYLINDER.

A 10 or 12-horsepower stationary engine cylinder may be bored on a 24-inch lathe even if you are not supplied with cast iron brackets and adjusting screws, says the Blacksmith and Wheelwright.

Get four good seasoned oak pieces, A, long enough to reach across the lathe carriage. Bore holes for the bolts, which

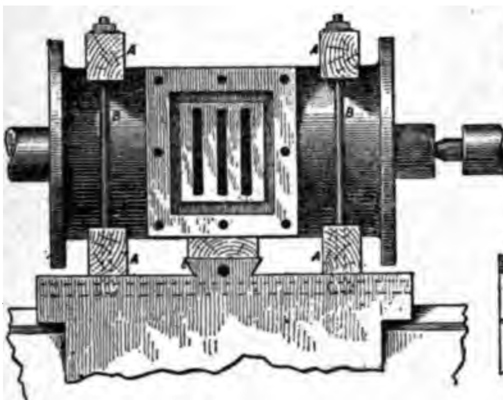


Fig. 1.

should fit T slots in carriage. Find radius outside diameter of the cylinder. Lay blocks in carriage. Take pair of dividers, set to radius of cylinders and scribe from lathe center on blocks and cut out as per dotted line in Fig. 2. Get four ⅝ or ¾-inch bolts, B, long enough to allow nuts to have a full thread after top clamp is on, as in sketch. Next place bar through cylinder and between lathe centers; put tool in bar; tighten it just enough to hold it in place; true cylinder by counter lines, on each end turning bar by hand. If too low when tightened down, loosen up and raise with pasteboard under blocks on carriage. After getting cylinder perfectly true set tool to take just enough out to true inside by taking a ruffing cut and finishing cut. Run lathe on slow speed, and feed just fine enough to make a smooth job. Never stop lathe while taking the finishing cut.

Make tool as at C, Fig. 2, of ⅝-inch round steel to suit diameter of cylinder. Give it just enough clearance to clear cylinder wall on point. Use good judgment in tightening clamps on cylinder. If too tight they will spring out of round.

What becomes of the 100,000,000 tooth picks manufactured daily in this country? Let the lodging house fellow, the loafer and the kindergartner answer.

RECIPES FOR POLISHING PASTE.

Good receipes for polishing pastes are the following:

1. 5 pounds lard or yellow vaseline melted and mixed with 1 pound fine rouge.

2. 2 pounds palm oil and 2 pounds vaseline melted together, and then 1 pound rouge, ½ pound tripoli and 1 ounce oxalic acid are stirred in.

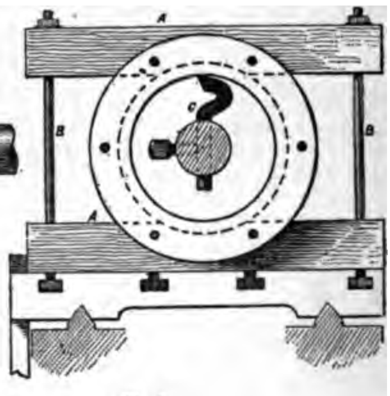


Fig. 2.

3. 4 pounds vaseline, 2 pounds oleic acid and 1 pound tripoli and sufficient kieselguhr mixed together to form a paste of suitable consistence.

4. 4 pounds vaseline and 1 pound lard, melted and mixed with 1 pound rouge.

The polishing pomades are generally perfumed with essence of mirbane and filled into tin boxes.

Polishing powders are advantageously prepared according to the following recipes:

1. 4 pounds magnesium carbonate, 4 pounds chalk and 4 pounds rouge intimately mixed.

2. 4 pounds magnesium carbonate, mixed with ¼ pound fine rouge.

3. 5 pounds fine levigated whiting and 2 pounds Venetian red ground together.

POPULATION OF CHINA.

The last census taken of China places her total population at 426,447,325 inhabitants, distributed as follows: Eighteen Chinese provinces, 407,737,305; Manchuria, 8,500,000; Mongolia, 3,354,000; Tibet, 6,430,000; Chinese Turkestan, 426,000.

Will you not send us the name of at least one acquaintance whom you think might be interested in Popular Mechanics?

SHOP NOTES

HOW TO COLOR ELECTRIC LAMPS.

Very often much effectiveness can be worked out in a window trim with the aid of colored lights. Colored lights are expensive. The following formula will explain how to color electric lamps, thereby saving a big part of the expense. Take a little white shellac, thin it down with alcohol, and by dipping the bulb in this it produces a splendid imitation of frosted glass when a clear white light is required. Care must be taken to have the shellac very thin, otherwise it will not run smooth. If you use green, purple, red, blue or any other color, buy a package of egg dye of the color required, dissolve it in wood alcohol and pour it into the shellac. By using this or any transparent coloring a vast number of beautiful tints can be made that will blend with your color scheme.

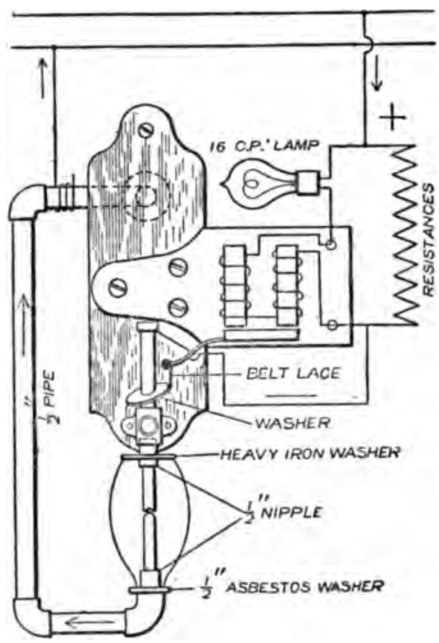
To go about it properly and to get the best results, after preparing your shellac pour it into a vessel deep enough to immerse the lamp. Take a piece of wire and fasten it around the socket of the lamp, then bring one end of wire back over the end of the lamp to opposite side of lamp to form a loop, then dip it in the solution and hang it up to drip and dry. While mixing your color bear in mind that the more dye and the less shellac the deeper the tint will be, and vice versa. Any of these colors can be removed with wood alcohol.

HOW TO MAKE AN ARC LIGHT.

Any engineer can make a cheap, serviceable arc light out of the odds and ends generally found around a plant. We get the following instructions from The Engineer:

"It will be noted in the sketch that the feed machinery is nothing more than the magnets, armature and hammer of an old electric 5-inch bell. The magnets, with a 16-candlepower incandescent lamp in series with them, are connected across a resistance of about 25 ohms, which may consist of three or four coils, taken from an old rheostat or a bank of lamps in multiple. The magnets and the 25 ohms resistance are in multiple and are connected to the posi- L, which is clamped to the top carbon. The negative lead is simply connected to the ½-inch pipe, where convenient.

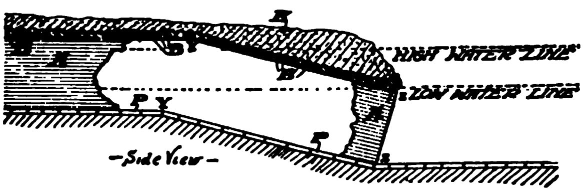
"Sliding loosely on the top carbon is an iron washer with a small hole drilled near the edge with a thin lace passed through it and tied to the end of the hammer. The spring on the armature must be bent so there will be no make-and-break action. As current passes through the magnets, the



hammer pulls on the washer, causing it to grip the carbon and lift it up, thus forming the arc. As the carbon burns away, less current passes through the magnets, causing the carbon to lower and keeping it the right distance from the lower carbon. When the hammer has lowered as far as it will go, the washer on the carbon should be low enough to strike on top of the drop tee, causing it to release its grip on the carbon and allowing the carbon to fall. More current now passes through the magnets and the carbons are pulled apart again, the iron washer having taken another grip. This action is continuous and the lamp can be adjusted, so there will be no flickering in the light whatever."

HOW TO BUILD A FROST-PROOF TAIL RACE.

Users of waterpower who have experienced trouble from freezing the past severe winter, will be interested in a method described in the American Miller which is to prevent trouble. The writer says: Our raceway has a cross-plank bottom from the wheel pit to a short distance below the mill. The sides are planed timbers, A in sketch, covered with round cedar, B, laid crosswise and covered over with earth. We excavated the last 20-foot section from Y to Z and then carried the bottom on a level a short distance. The remainder of the waterway is open race with earth bottom.



The top of the sloping section, of course, follows the same angle downward from Y to Z as does the bottom and dips into the edge of low water, shutting off all currents of air from outside, but allowing a free flow of the water, which just flows downward under the upper covering and then rises to its original level on the outside, flowing away without having the current stopped or raising the tail water. We made this submerged section of slightly larger capacity by setting the side timbers, A, a little farther apart. But a little more space is sufficient.

Since using this arrangement our wheels have been clear of ice and frost and our drive belts are dry. Previous to this we had our main belt connections covered with frost, the gate rods were often frozen and occasionally the water wheels were solid.

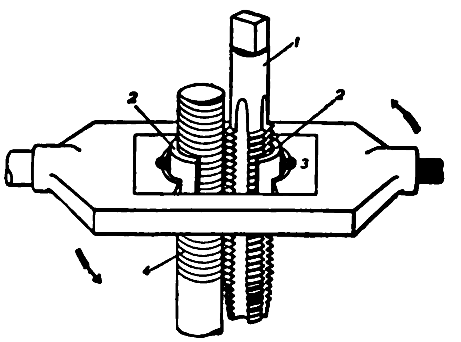
To keep the submerged portion of the tail race from floating we bolted a large log at the outer end and covered the section over with stones and gravel.

FIVE YEAR SUBSCRIPTIONS.

In response to numerous requests the publishers of Popular Mechanics announce a special subscription offer of five years for three dollars. Address may be changed as often as desired.

A THREAD-CUTTING KINK.

Cutting a left-hand thread with a right-hand tap and die is something everyone cannot do, says a correspondent in the Engineer. Referring to the drawing, 1, is a tap which may be of any size, 2 and 2, are pieces of sheet brass or copper placed between the tap and the die and between the bar and die to prevent the crossing of the threads, and to keep the die from tearing out the threads cut by the tap. The tap is right-hand and cuts the left-hand thread. Part, 3, is the die that holds the combination of brass, tap and the iron rod in place while part, 4, is the rod on which the left-hand thread is to be cut.



It may be readily seen that, by placing the combination on the rod as shown and turning the die to the left, viz., in the direction of the arrow, after the first thread is started the rest will follow and will be found to be a perfect left-hand thread.

HOW TO CLEAN AN OIL STONE.

If the stone is glazed or gummed up, try cleaning with turpentine. If this does not restore its cutting qualities, scour it with sandstone and water, or with a piece of sandpaper fastened to a smooth board. Oil or dirt may be removed by boiling the stone in lye, or an entirely new surface may be obtained by holding the oil stone against a grindstone, revolving the grind[illegible] applying w[illegible]

TO CEMENT LEATHER TO IRON.

A good way to glue leather to iron is to paint the iron with a mixture of white lead and lamp black, dissolved in oil. Then cover with a cement made of the best glue soaked in water until soft, and dissolved in vinegar. This is mixed thoroughly with one-third of its bulk of white pine turpentine, and thinned with vinegar until it can be spread with a brush. It should be applied to the iron while it is hot and the leather put on and quickly pressed into place. It must be held tight by a clamp while it is drying.

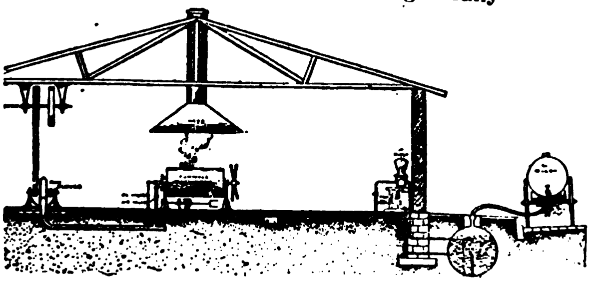
BLOWPIPE METAL WELDING.

At Birmingham, England, a special blowpipe for the seamless welding of steel, iron and other metals has been exhibited. The heat is produced by the burning of acetylene with oxygen, and is so intense that the welded joints show no trace of their welding. The separate gases pass from cylinders through valves which reduce the initial pressure in the cylinder to about 7 pounds on the blowpipe. The united gases are then ignited and though the heat zone is only about one-eighth of an inch in length it melts the metal quickly. Even quartz can be quickly melted, it is said, and blown like glass.

MELTING BRASS WITH OIL FLAME.

One to two gallons of fuel oil will melt 100 pounds of brass. This is done by means of a furnace which, to a degree, has done away with the use of crucibles.

In this furnace the oil fuel is generally



Furnace for Melting Brass

supplied to the burner by a gravity system which consists of an overhead gravity tank with a capacity of 10 to 20 gallons, to which pumped by hand or power from a tank located conveniently for piping or outside a building, and when the gravity tank is placed at a height of 12 feet or more above the furnace a head pressure of five pounds to the square inch is obtained, which is ample for the oil feed. Any ordinary grade of fuel oil may be used for fuel, or, where procurable, crude oil. Natural gas may be used with the same success.

HOW TO PROTECT THE GROUND CONNECTION OF A TELEPHONE.

An excellent way to protect the ground connection of telephones is given in the American Telephone Journal.

Carry the leading-in wire down the out-

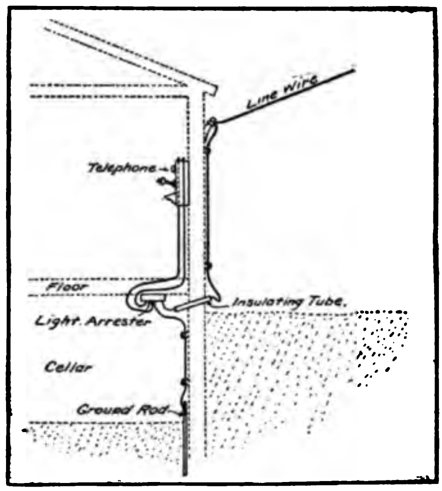
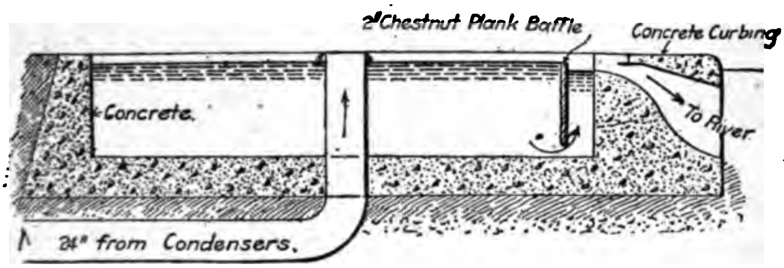


Diagram of Wires for Grounding a Circuit

side of the building and into the cellar as near as possible to the spot where the instrument is to be located; attach it to the combined fuse block and lightning arrester; run the wire up through the floor and attach it to one binding post of the instrument. From the opposite binding post run the wire down through the floor and give a scant half-inch of it a full turn about the binding screw of the arrester; carry the wire the shortest way to the ground rod, to which solder it securely. The ground rod should be not less than one-half inch in diameter and three feet in length. By this method the lightning arrester is placed away from inflammable substances and the security of the grounding connection may be easily tested at any time, besides being protected from the extremes of heat in the summer and cold and frost in winter.

RESERVOIR FOR RECOVERING CYLINDER OIL.

An ingeniously arranged concrete reservoir located outside the walls of a plant and receiving the waste water from the system within, may be used for recovering cylinder oil. The main feature is the exit of the water from the reservoir. The oil rises to the top and the water below it flows under a baffle (in order not to disturb the surface) and over a weir into the river. The oil may be skimmed off as often as the amount requires it.



Section of Reservoir for Recovering Oil.

THE WELDING OF ALUMINUM.

At a meeting of the Faraday Society, London, a paper written by Mr. S. O. Cowper-Coles stated as follows:

"Soldered aluminum joints have proven unsatisfactory, as they will not stand the test of time, because galvanic action takes place between the aluminum and solder. One of the chief difficulties encountered in soldering aluminum other than the formation of oxide, is that a few degrees below its welding point it passes into a pasty or brittle state, and, being a very good conductor of heat, the solder very rapidly cools and freezes before it has time to flow sufficiently. He then proceeded to describe Dick's machine for welding aluminum by the removal of the oxide mechanically, combined with pressure. Reference was also made to Heraeus's process of welding aluminum, which consists in heating the aluminum in a reducing atmosphere until it reaches the pasty stage, when the joint is made by kneading and hammering. Emde's process, which is somewhat similar, consists in heating the aluminum up to 600 deg. C., and welding by hammering. The electric welding of aluminum has not proved commercially successful."

CARE IN ATTACHING BRASS VALVES.

In screwing iron pipe into a brass body valve it is necessary to use little or no lead or pipe joint grease, as the brass is softer than iron and gives enough to form a tight joint. If lead or pipe joint grease is used it should be placed on the pipe end rather than in the valve, so that it will not be carried by steam to the bearing parts of the valve and catch and hold scale and grit on the seats and discs of the valve.

Extra long wrenches or tongs placed on the hexagon farthest from the pipe end should not be used for screwing pipe into brass valves, as this method is apt to spring the seats and place them out of line. When screwing pipe into gate and other styles of valves always close it tightly so as to make the body rigid.

PATTERN LEAD.

An alloy suitable for small metal patterns is composed of tin one part and lead one part by weight. The result is a somewhat soft alloy which requires care in the handling of the patterns. Some harder mixtures are as follows:

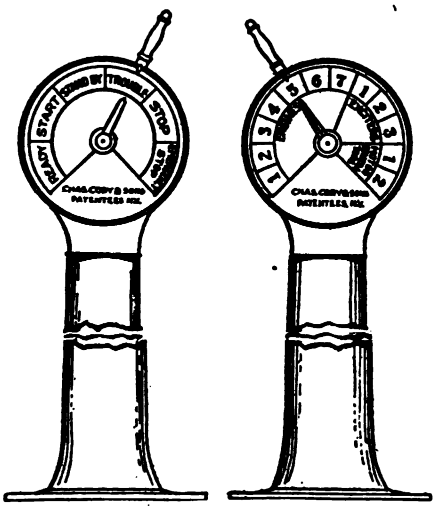
Lead.	Antimony.	Tin.
55	30	15
55	22.7	22.3
61.3	18.5	20.7

A white metal that has small shrinkage and is good for pattern plates is lead 90, antimony 10. A harder metal with small shrinkage and very good for pattern-plates is zinc 66 per cent, tin 34 per cent. The Ironmonger says an amalgam, very convenient for stopping up holes that cannot be soldered easily, is made of the filings of the above alloy, and mercury kneaded in the hand into a dough, squeezing out all the merc[illegible] amalgam should be pres[illegible] the

SHIP TELEGRAPH SIGNAL SYSTEM FOR POWER PLANTS.

The electric signal system generally used on board ship by which the orders are given to the engineers, has been adapted to the use of electric power plants on land. It frequently is of the utmost importance for the man in charge of the switchboard to communicate instantly to the engineer by means of signals which cannot possibly be mistaken.

The dial in the engine room bears the wording of the usual orders, and when the



Side Telegraph System

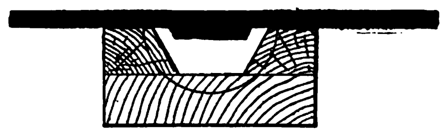
operator moves the pointer of his dial to a certain order, the pointer in the engine room instantly responds while at the same moment the bell signal also sounds. The illustration shows a pair of the sending instruments.

A POINTER ON DRILLING IN IRON.

Sometimes it is necessary to drill a hole in iron when making repairs to wood-working machines, and it is found that the drill is just a little too small for the size required. If a flat drill is used, it may be made to cut a hole larger than the width of the drill by grinding the center a little to one side, leaving the radius of one side longer than the radius of the other. If a
a is tapped for a bolt and the bolt is too
n ... can be opened by putting
... on one side of the
again. Neither
has an outfit
it in a pinch.

CENTER FOR SCRIBING CIRCLES.

A center to support one end of the dividers while scribing circles is made as follows: Take a piece of hardwood and set into one



of its edges a piece of tin or other metal to receive the prick punch mark for the divider point. This is handy in working at large core boxes when scribing circles on the ends.

SCARFS FOR WELDING STEEL.

A correspondent from New Zealand who has success in welding steel tells how it is done there:

For the last six years my work has been principally working steel of various grades. I get my steel I am going to weld and upset the ends of each piece scarf them with a short scarf, seeing that my scarf is full in the center so that when they come together they will touch in the center first, so that all dirt, etc., will squeeze out sideways, as the welds come together. I then make up a good coke fire, place my two pieces of steel in it and get my helper to blow very steadily until my steel gets thoroughly heated through, and then the last few seconds I get him blowing very hard. My helper takes one piece and I take the other and give them a few light taps over the anvil to remove as much dirt as possible. I stick it first with my hand hammer, then

get my helper to give one or two light pressing blows, and then heavy and as quick as possible. I have welded from ½-inch to 2-inch steel and very rarely had to take a second heat. The flux I use is sandstone or sea beach sand, and it has always given me perfect satisfaction. I have welded steel drills for rock boring machines and hammer and drill steel, and very rarely have had one break in the weld.

I have seen men rivet steel for the rock boring machine and have noticed that they break where the rivet goes through. I think it is impossible to get a solid weld when rivets are used. I am inclosing a sketch to show how the scarfs are made.

ELECTRICAL EXPRESSIONS AND THEIR EQUIVALENTS.

The Practical Engineer publishes a table of electrical expressions and their equivalents, arranged for convenient reference, as follows:

One WATT	A RATE of doing work	
	1.	ampere per sec. at one volt
	.7373	foot-pounds per second
	44.238	foot-pounds per minute
	2654 28	foot-pounds per hour
	.5027	mile-pounds per hour
	.00134	Horse-Power
	$\frac{1}{746}$	Horse-Power
One KILOWATT	A RATE of doing work	
	737 3	foot-pounds per second
	44238.	foot-pounds per minute
	502.7	mile-pounds per hour
	1.34	Horse-Power
One HORSE-POWER	A RATE of doing work	
	550.	foot-pounds per second
	33000.	foot-pounds per minute
	375.	mile-pounds per hour
	746.	watts
	746	kilowatt
One WATT-HOUR	A QUANTITY of work	
	2654.28	foot-pounds
	.508	mile-pounds
	1.	ampere hour per one volt
	.00134	Horse-Power-Hour
	$\frac{1}{746}$	Horse-Power-Hour
One HORSE-POWER HOUR	A QUANTITY of work	
	1,980,000.	foot-pounds
	375.	mile-pounds
	746.	watt-hour
	.746	kilowatt hour
One AMPERE HOUR	A QUANTITY of current	
	One ampere flowing for one hour, irrespective of the voltage	
	Watt-hour volts	
TORQUB	FORCE moving in a circle	
	A force of one pound at a radius of one foot	

HOW TO WORK STEEL INTO TOOLS.

A blacksmith, successful in working steel into tools, thus describes his method in the Mining and Scientific Press: The steel is worked at an orange heat during the forging. When shaped, the next step is refining. This is done by hammering in water. A little water is put on the anvil and the face of the hammer is wetted. The steel must be at nearly red heat when this is done. The refining is repeated by reheating several times. After finishing this, the steel is heated to a dark red, so that it just shows the color, and dipped in raw linseed oil. The tool is reheated and dipped three times. The fourth time the reheat is carried to an orange color and dipped in the oil until nearly cold. The oil is then wiped off and the metal polished, care being taken not to break while polishing, as the metal is extremely hard. A large piece of iron is then heated to a red heat. The tool is laid on *this with* the heavy side down to draw what*ever color is desired, different* tools requiring *different colors.*

WATER PUMPED FROM GASOLINE STORAGE TANK.

Water instead of gasoline was pumped from a large gasoline storage tank at Cleveland, Ohio, recently. The tank had had gasoline emptied into it several weeks before. Investigation showed that the tank was affected by frosts and thaws, that moisture collected on the sides and bottom and the gasoline being lighter than water rose to the top, making it necessary to pump the water out first. Tanks made of galvanized iron well coated with tar will not sweat.

THE WATT.

The watt, the unit of electrical power, is 1-746 of a horsepower. It equals the mechanical energy represented by 44.24 foot pounds. One ampere of current moving under the influence of one volt pressure, or any combination of volts and amperes, and that will make unity when multiplied together, is the equivalent, in the expenditure of energy to the work a man would do in lifting one pound 44.24 feet high, or any work—any weight—raised any distance, in which the weight and the distance multiplied together make 44.24.

CORRECTING BLUE PRINTS.

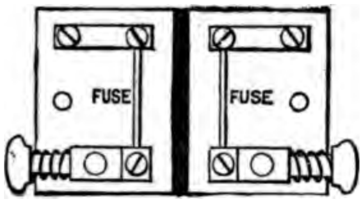
Lines omitted on a tracing can often be produced on the blue print by scratching through the blue surface with a sharp-pointed knife. If carefully done, says the American Machinist, the resulting line is much better than one made with erasing fluid.

CARE IN BURNING OIL.

In firing with petroleum, if the fire should go out, as it sometimes does when water is mixed with it, the oil continues to spray onto the hot furnace, generating a gas. If you attempt to light the fire the gas will explode with violence, says the Mining and Scientific Press. First shut off the flow of oil, then blow the gas up the smokestack, then you can light the fire with safety. Never venture near a barrel or other vessel which has the petroleum in it, with a naked light, as it is liable to have gas in it, and is more dangerous than when full of petroleum.

CONVENIENT CONNECTOR FOR TESTING.

A very simple and convenient connection for testing wires is illustrated in the London Electrical Review. It is intended for use on currents up to 10 amperes, and is easily constructed.



The square plunger is kept out a certain distance by a spring, and on pressing the ebonite knob, the two holes come into line. By inserting the wire and releasing the knob, the spring causes a fair grip of the wire. The edges of the holes being well rounded, quite small wires can be clamped without being cut. A pair of fuses protect the terminals.

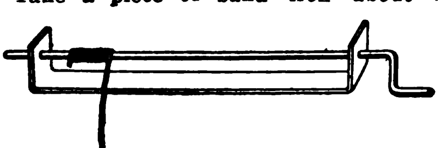
TO CUT ENDS OF STEEL TIRES.

I have a simple way of cutting off ends of steel tires, or any iron, with the aid of a helper, writes J. L. Painter in the American Blacksmith. I take a heavy three-cornered file and break it up into 2 or 3-inch lengths, and draw the temper, when they are ready to use. I lay the file on the anvil and place the tire on top and have the helper strike, after which I turn the tire, give it another blow and off it comes.

SIMPLE DEVICE FOR MAKING COIL SPRINGS.

A contributor to the American Artisan tells of a simple device for making coil springs:

"Take a piece of band iron about 12



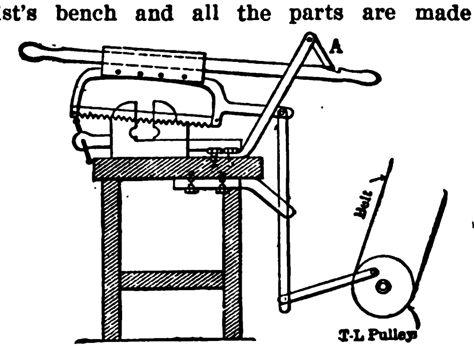
inches, 1 inch wide and 1/8 inch thick, turn up the ends as shown in the sketch, bore holes for the crank and bore holes in the end of the crank to receive the end of the tire. It can be fastened to the bench rs or held firm in the vise."

HOW TO MEASURE COAL IN A BIN OR BOX.

A solid cubic foot of anthracite coal weighs about 93 pounds. When broken for use it weighs about 54 pounds. Bituminous coal, when broken up for use, weighs about 50 pounds. The consequent rule for the approximate measurement of coal in a bin or box is to multiply the length in feet by the height in feet, and again by the breadth in feet, and this result by 54 for anthracite coal, or by 50 for bituminous coal. The result will equal the number of pounds; and to find the number of tons, divide by 2,000.

A HOME-MADE POWER HACKSAW.

I send a sketch of a home-made power hacksaw; it is not very pretty, but it gets there just the same, writes a correspondent to the American Machinist. There is not much machine work about it, as can be seen. It is secured to an ordinary machinist's bench and all the parts are made



HOME-MADE POWER HACKSAW.

from stock wrought iron, with the exception of the slide which is brass, riveted to the blade frame. For holding the work an ordinary vise is used. The saw is not automatic, but a simple stop at A prevents the saw dropping after cutting through the work. When the apprentice has nothing to do, this is a good thing for practice.

REMEDY FOR VITRIOL BURNS.

A Frenchman has discovered a remedy instantaneous in its effects for the horrible burns caused by the use of oil of vitriol. It is soft paste of calcined magnesia and water, with which the parts burned are covered to the thickness of an inch. It alleviates the pain almost immediately, and when the paste is removed no scar remains.

TO MEASURE TAPERING LOG.

As to the number of board feet in a stick of timber four by four inches at one end and eight by eight inches at the other, the stick being 24 feet long, there are two ways of arriving at a correct answer, says Mining and Scientific Press. Add the areas of the two ends to four times the area of the center section and multiply by one-sixth of the length; or, multiply the areas of the ends and extract the square root; to this add the areas of the two ends, and multiply by one-third of the length. The answer by either process is 74⅔ feet.

A SAW HORSE FOR TINNERS.

"The 'tinner's saw horse' is a model of convenience." It is made by fastening the rolls, folders, etc., to a wooden horse, like those of the carpenter's saw horse. The top and back of the horse should be as

Convenient Saw Horse for Tinners

wide as the base of the machine, and the legs made of 2 by 6 timbers, tapering toward the bottom. The inventor claims that they are convenient to approach with large and odd-shaped work; when wanted they can be brought out into a convenient place, and when not in use may be set aside in a corner or other small space.

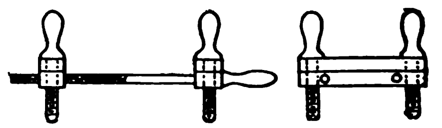
TREATMENT OF BURNS FROM HOT WATER OR STEAM.

When a man is burned with hot water or steam of course the first thing to do is to send for medical assistance, but in the interim the injured man's clothing should be removed, and bandages soaked with sweet oil and lime water should be lightly applied to the burned parts. If steam has been inhaled, sweet oil should also be swallowed by the patient in considerable quantity, as it will soothe such of the burned parts as it can reach.

Sweet oil and lime water should be kept about every steam plant, to provide for contingencies of this sort. Cooking soda (saleratus) is also very soothing when applied to burns, and castor oil in moderate quantity may be given internally in the place of sweet oil.

HANDY BELT CLAMP.

A wooden belt clamp can be made by anyone having a wood screw box and tap. It is very handy in splicing new belts, and old ones can be mended without removal from the pulleys. The writer says: "An



8-inch belt is about the limit of its use, although if you have 1⅛-inch good hickory screws, and leave the handles flat, you can turn them up with a wrench for a pretty stiff pull. I have two clamps, one for wide belts and the other for narrow, with screws long enough so that I can make a glue splice between the jaws when desirable."

TO CLEAN SPONGES.

To clean old sponges, boil them for three or four hours in water (enough to cover them) containing a couple of tablespoonfuls of carbonate of soda, or in water mixed with a couple of handfuls of wood ash, this to remove all the greasy matter that the sponges may contain; then rinse them thoroughly, squeezing them well in several lots of clean cold water. After this preliminary operation soak the sponges in chloride acid, mixed with four times the quantity of water, suiting the whole amount to the size of the sponge, but keeping the same proportions. After 24 hours let water run on to the sponge for some time, then rinse with the hands until the smell of the acid has disappeared. Hang the sponges up to [illegible] over a hot stove, and when this [illegible] satisfactorily ac[illegible] be almost

PAINT FOR STEEL PLATES.

One of the large railroad companies uses the following recipe in making an excellent protection for exposed steel plates:

Four pounds pure lamp-black ground in raw linseed oil, seven-eighths gallon genuine asphaltic varnish, one-quarter gallon pure refined linseed oil, one-quarter gallon drying japan. One gallon of the paint will cover 350 square feet of surface.

HOW TO UNITE CAST IRON.

To unite ordinary cast iron is not an easy task, but it may be done, if one has luck, by boring a dozen holes in the parts to be united, then secure well and place about the break an abundance of filings of good pig iron, some wrought iron filings and also some of steel. Lute with fine clay and place in fire (before luting use any good flux, borax, etc.); heat until the filings melt and fill all the cavities. Let remain in the fire until fire goes out and the metal is cold; then remove and clean up.

TINNING CAST IRON.

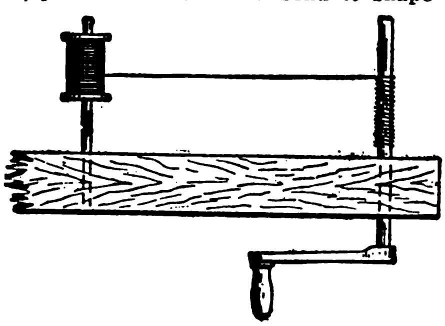
To be successful in coating with tin the castings must be absolutely clean and free from sand and oxide. They are usually freed from imbedded sand in a rattler or tumbling box, which also tends to close the surface grain and give the article a smooth metallic face. The articles are then placed in a hot pickle of one part of hydrocloric acid to four parts of water, in which they are allowed to remain from one to two hours, or until the recesses are free from scale and sand. Spots may be removed by a scraper or wire brush. The castings are then washed in hot water and kept in clean hot water until ready to dip. For a flux, dip in a mixture composed of four parts of a saturated solution of sal ammoniac in water and one part of hydrochloric acid, hot. Then dry the castings and dip them in the tin pot. The tin should be hot enough to quickly bring the castings to its own temperature when perfectly fluid, but not hot enough to quickly oxidize the [illegible] f the tin. A sprinkling of pulver- [illegible] e may be made on the sur- [illegible] tle tallow or palm oil [illegible] surface and make the tinned work come out clear. Some operators again dip in a pot of hot palm oil or tallow at a temperature above that of the melted tin, for the purpose of draining the excess of tin and imparting a smooth, bright surface to the castings. As soon as the tin on the castings has chilled or set, they should be washed in hot sal soda water and dried in sawdust.

TO DRILL CHILLED CAST IRON.

To drill chilled cast iron first draw the chill. This is done by laying the piece on the forge, covering the spot to be chilled with sulphur, and working the bellows slowly until the sulphur is burned off. Then proceed with the drilling.

HOW TO HARDEN BRASS AND MAKE SPRINGS.

Brass can be hardened by hammering or running through rollers while cold, says the American Blacksmith. To make a coiled spring, say a 5/16 spring, take a ¼-inch iron rod, put a crank on it or bend to shape of



crank and let it run out at one end. Bore a hub in a block of wood so the iron will fit tight, and run it through, fasten your wire on it and wind it on by turning the crank, having your spool post so you can hold it tight enough to stretch the wire.

TO CLEAN CHASED BRASS.

Benares ware, or chased brass of any kind, may be cleaned thus: Wash well with hot water and soap and dry thoroughly; then rub all over with a lemon cut in half. When it looks quite clean, rinse well in warm water, dry and polish with a chamois leather. Chased work of any kind should not be cleaned with powder.

HINTS ON MELTING BRASS.

The following points were made by Chas. Vickers, of Chicago, in an address before the Boston meeting of the American Foundrymen's Association:

Compared with steel or iron it is an easy matter to melt brass. It is often melted on a small scale in an ordinary stove. Great waste of fuel occurs in using a 20-inch pot in a furnace intended for an 100-inch. Three inches of solid fuel should surround the pot, and will do the work of six or more. Tossing metal into the pot causes great waste by splashing. Be sure the molds are ready by the time the metal is ready to pour – costs money to "hold" a pot in furnace. Never allow your furnace to become barrel-shaped; straight sides are best. Gas in the shop is often caused by the furnace flues being too small; rather than the main flue. A fan in the main flue is good. When sheet iron is used for main flue it must be suspended and not allowed to touch the wall. Do not cover flues with asbestos to protect workmen from the heat; hang a curtain of asbestos, but do not let it touch the flue.

TO PICKLE BRASS CASTINGS.

The following method of pickling brass castings is recommended: If greasy, the castings should be cleaned by boiling in lye or potash. The first pickle is composed of nitric acid, one quart; water, six to eight quarts. After pickling in this mixture the castings should be washed in clear warm or hot water, and the following pickle be then used: Sulphuric acid, one quart; nitric acid, two quarts; muriatic acid, a few drops. The first pickle will remove the discolorations due to iron, if present. The muriatic acid of the second pickle will darken the color of the castings to an extent depending on the amount used.

HOW TO AVOID "SWEATY" PIPES.

The cause of so-called sweaty pipes is [illegible] and the remedy equally simple. [illegible] is hardly necessary to explain [illegible] are not sweaty in the sense [illegible] comes through the pores [illegible], though this is a not uncommon [illegible] among those who do not understand [illegible]. The moisture on the [illegible] caused by the condensation [illegible] in the air, the difference [illegible] between the air and the pipe causing the condensation of the natural moisture in the air and depositing it on the pipes. The difference in temperature between the air and the pipe is caused by the water flowing through the pipes. Water at rest in the pipes soon takes nearly the same temperature as the room. Even an occasional flow of water through the pipes will not cool them sufficiently to make them sweat, but even a slight constant dropping will cause the trouble. That being the case, it is only necessary to make tight all faucets and cocks on supply and flush pipes in order to put a stop to the trouble. Packing the pipes will of course help matters, but this is expensive and unnecessary.

CONNECTING PIPES WITH RIGHT AND LEFT COUPLING.

"While speaking of piping I thought of something today that I might have thought of years ago with profit," says a correspondent of The Engineer. "In connecting two pipes with a right and left coupling try the coupling on each pipe, and count the number of turns necessary to screw it on each one by hand. You generally find that the left-hand one will require two turns more than the right-hand. This is because the left-hand dies are not used as much as the right-hand, and consequently they cut a smaller thread.

"In order to have both ends of the coupling make up the same, the end of the coupling that screws on the pipe farthest should be started first and given as many turns as is necessary to equal the difference between the number of threads employed at each end. This should be done before starting it on the end of the other pipe. For instance, if the coupling covers 12 of the left-hand threads and only nine of the right-hand threads at the opposite end, then the end having the left-hand threads should be started first and be given three turns before starting the end having the right-hand threads. This will enable the coupling to be screwed up tight on both pipes at the same time."

CEMENT FOR PIPE JOINTS.

At a meeting of the Ohio Gas Light Association in Columbus, Mr. George Light recommended a cement for pipe joints, consisting of a mixture of ordinary pine tar and dry oxide of iron. This cement, Mr. Light stated, is as good in a faced or rough flange joint as red-lead putty, costs about one-tenth as much, does not harden as quickly as red lead, and is very adhesive under pressure.

HOW TO USE CEMENT IN COLD WEATHER.

In cold climates the employment of concrete has its objections, in that the material will freeze before it sets, and upon thawing is found to be practically worthless. In such cases the operation of setting may be hastened by dissolving two pounds of carbonate (not bicarbonate or cooking) soda in one gallon of water, boil the solution and use it in mixing the concrete with whatever additional water is required; the water and sand should also be heated. This heat will remain long enough to allow the concrete to set, which should be about 45 minutes. Subsequent freezing, if the mass is not thereby cracked, will not injure the concrete.

SWITCHBOARD POLISH.

For polishing white marble switchboards the following dressing may be applied with white flannel: Ten parts white wax, two parts Japan gold size, and 88 parts turpentine.

HOW TO MAKE METAL POLISHES.

It is not difficult for any person to make his own metal polish. It can be done cheaply and will probably give him better satisfaction than the polish he buys. Here are a few recipes for good polishing soaps:

1. Twenty to 25 pounds liquid curd soap, intimately mixed with about 30 pounds of fine chalk and one-half pound Venetian red.
2. Twenty-six pounds liquid cocoanut oil soap, mixed with 12 pounds tripoli and one pound each of alum, tartaric acid and white lead.
3. Twenty-five pounds melted cocoanut oil saponified with 12 pounds soda lye of 38 to 40 degrees B., after which three pounds rouge, three pounds water and two ounces ammonia are crutched in.

Polishing soaps are generally cut into cakes and stamped or pressed and brought [illegible]erce with directions for use. The [illegible]nerally state that a small [illegible]ap is put on the metallic article to be polished with a damp flannel and rubbed until the desired polish is obtained.

PASTE FOR MOUNTING PURPOSES.

To prepare a paste for mounting purposes.—Mix three-quarter ounces of starch with a little water to form a smooth cream, and pour on it sufficient boiling water to make 10 fluid ounces. Take one-half ounce of glue, allow it to soak in cold water till quite soft, pour off the excess of water, melt the glue down by gentle heat, and stir into the paste previously made. Now add one drachm of alum and a few drops of oil of cloves and stir well until dissolved. If the material should dry too hard, add one or two drachms of glycerine.

COLORLESS VARNISH.

Colorless varnish for use on fine labels or other prints, as well as for white wood and other spotless articles, is made as follows: Dissolve two and one-half ounces of bleached shellac in one pint of rectified alcohol; to this add five ounces of animal boneblack, which should first be heated, and then boil the mixture for about five minutes, filter a small quantity of this through filtering paper, and if not fully colorless, add more boneblack and boil again. When this has been done, run the mixture through silk and through filtering paper. When cool, it is ready for use. It should be applied with care and uniformity.

COST AND HANDLING OF GLUE.

More than $7,000,000 annually is spent in the United States for glue and yet few people know how to buy or use it. Made up properly the better grade requires 39 pounds of glue plus 61 pounds of water to give 100 pounds of liquid glue ready in the pot for joining hard wood, says the Wood-Worker. From the cheap glue we must take 42 pounds of glue plus 58 pounds of water to get our 100 pounds of glue liquid. The better glue requires 10 per cent less glue, but 10 per cent more water in order to get the same quantity of liquid from both, namely, 100 pounds of exactly the same fluidity of body.

The difference between the two glues in regard to strength is fully as large as the difference in spread. The better grade carries a strain of at least 47 pounds, while the other only resists [illegible] pounds.

To get the cost, multiply the required number of pounds of dry glue with the price, and we have the cost of 100 pounds of liquid. For the best grade we need 39 pounds of glue (and 61 pounds of water) costing 12 cents per pound dry glue, or $4.68 for 100 pounds liquid glue. For the lower grade we must take 44 pounds glue (and 56 pounds of water) at 9 cents per pound dry glue, at a cost of $3.96 for the 100 pounds in the pot.

Both glues give the same quantity, namely, 100 pounds of liquid of exactly the same body, and the 100 pounds glue liquid from either will, of course, cover exactly the same surface. To use the better grade costs $4.68; to use the lower grade, $3.96, or 72 cents less. The cost is in favor of the lower glue if the strength of the work done is to be ignored, but for the general use of the wood-worker the better grade will, in the long run, be found the cheaper.

UNCLE SAM'S WHITEWASH RECIPE.

A whitewash used on government buildings is made as follows: Take a half bushel of unslacked lime, slack it with boiling water, cover during the process to keep in steam, strain the liquor through a fine sieve or strainer. Add to it a peck of salt previously dissolved in warm water, three pints of ground rice boiled to a thin paste stirred in while hot, half a pound of Spanish whiting and one pound of glue previously dissolved by first soaking in cold water and then by cooking in a small pot hung in a larger one filled with water. Add five gallons of hot water to the mixture, stir well and let stand a few days covered as nearly airtight as possible. It should be applied hot, for which purpose it can be kept in a portable furnace.

TALLOW FOR CUTTING TOOLS.

Tallow is better than the best lard oil in cutting threads in iron. A reader of the American Machinist tells how he accidentally found this out. He was cutting 1-inch taps and found it impossible to use the oil furnished him. Seeing an old piece of candle on the shelf he tried it with success. It is cleaner, does not run, and on small work the heat from the friction of the cutting tool and the center is sufficient to melt it as the tool goes along. In cutting inside threads it stays where needed and is considered a great improvement over oil.

For cutting threads on copper use beeswax.

TO MAKE CELLULOID NON-INFLAMMABLE.

A process of rendering celluloid non-inflammable has been patented. To 25 parts of celluloidine, dissolved in a sufficient quantity of solvent, are added six parts of chloride of magnesium dissolved in either alcohol or methylated spirit and three parts of pulverized pure asbestos. These constituents are worked into a paste and may be applied either during or after the process of manufacture.

ANTIDOTE FOR AMMONIA FUMES.

Employes in ice and refrigerating plants are sometimes overcome by the fumes of the ammonia used in the process. In such cases a good stiff drink of vinegar will help to counteract the action of the ammonia, revive the unconscious, and in many cases save life. If the victim is unconscious, it may be necessary to pry his jaws open to get the vinegar down.

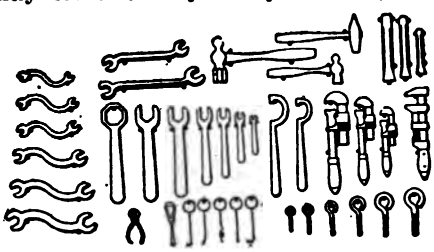
VALUABLE METHOD OF PRESERVING BLUE PRINTS.

The superintendent of a large car shop thus describes his method of preserving blue prints. His first method was to fasten the prints on ordinary flat sheets of pasteboard. These answered fairly well for a time and kept the prints flat, but the pasteboard became broken and oil-spotted. He then hit upon the idea of using thin sheet iron as a backing, and this proved eminently satisfactory. All the prints in common use in the shop were first pasted on these pieces of sheet iron, then both sides were varnished over, so as to make the paper oil and waterproof. After being subjected to this treatment, these prints can be hung up near the machines. They are always flat, clean and clear, and they can be filed away in small shape when not in use. Moreover, they are practically indestructible, because when soiled they can be put under the hose and washed off. The plan has been in use for about six years, and has prov satisfactory.

SHOP NOTES

TOOL RACK FOR ENGINE ROOMS.

Engine room tools, such as wrenches, hooks, etc., may be very conveniently arranged on a rack specially fitted for the purpose. Measure the space you can use for the purpose, being sure it is conveniently located. Lay out your tools, on a



Arrangement of Tools on Rack.

board of the proper dimensions, ranging them according to size and reversing the sizes where one row comes under another. Bore holes to fit the wrenches, and put screws for holding the tools in the places you have indicated on the board.

HOW TO WELD A STEAM DRILL.

To weld a steam drill say a 1¼-inch drill, split the steel both ways for about an inch, making four prongs. Turn them nearly straight and scarf the end of each prong to a sharp point. (See Fig. 1). Heat to a

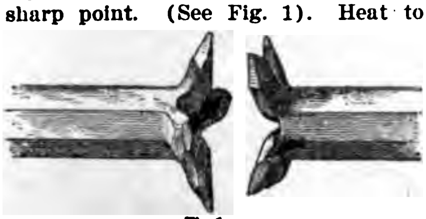


Fig. 1.

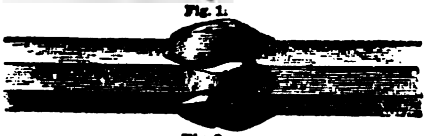


Fig. 2.

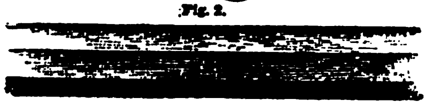


Fig. 3.

...together and hammer as ...ld closely. Place in ...at. By the help of an expert striker it can be welded with one heat as solid as in Fig. 3.

The correspondent, who describes this method in The Blacksmith and Wheelwright, says he has welded over a hundred drills the past year in this manner and never yet had a break.

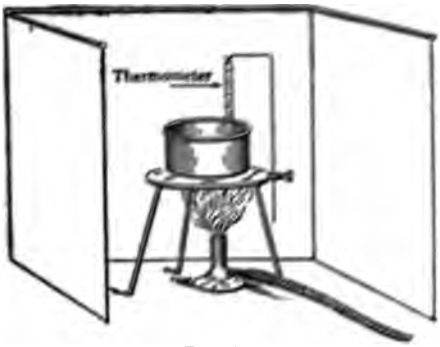
HOW TO MAKE AN IRON BOOT FOR A CRIPPLE.

An iron boot for a cripple may be made by fitting a piece of old hand saw blade, the size of the heel and sole of the shoe, for the top, says a correspondent of the American Blacksmith. Take two pieces of tool steel (¼-inch) and bend them to the proper shape and rivet them to the sole piece. Fasten the iron boot to the shoe by means of small screws.

Boot for Cripple.

TO TEST LUBRICATING OILS.

A good test for lubricating oils is the flash test. Make a tripod of heavy wire and place it over an alcohol lamp or a Bunsen burner. Place a shallow enameled-ware drinking cup on the tripod, and from a wire support suspend a thermometer so that the bottom of the bulb will be about ½ or ⅝ inch from the bottom of the cup. The thermometer should register to about 600 or 700 degrees, and should be accurate. "A well-seasoned, gas-filled thermometer is best," says Power, "and will cost about $2.50 or $3.00." Around the instrument place a screen of sheet iron to protect it from drafts. Fill the cup to within one-eighth inch of the top, with the oil to be tested. Light the lamp and adjust the flame so the temperature will rise about 15 degrees per minute, not more. When at about 250 or 300 degrees Fahr., adjust it to about 10 degrees per minute. Have ready some pieces of hard-spun wrapping twine or some toothpicks. If testing engine oil, light one of these pieces when the temperature approaches 300 degrees Fahr., and pass it across the surface of the oil. Repeat the operation from time to time as the temperature rises, until a faint puff of blue flame ensues. Note the temperature, which is the



Flash Test Apparatus

flash point. The burning point is the temperature at which the oil ignites of itself and continues to burn.

HOW TO MAKE A STEAM BLOWER.

In an emergency steam blowers may be used to provide draft for the combustion of coal in steam boilers. Fig. 2 shows a blower which was constructed for use with a battery of boilers of 125 horsepower to maintain a uniform steam pressure of 80

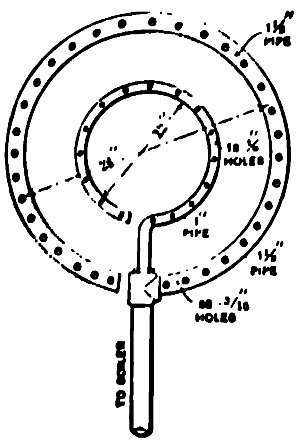


Fig. 2

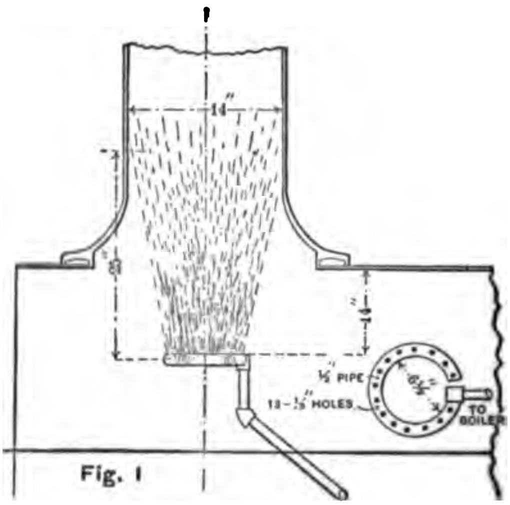


Fig. 1

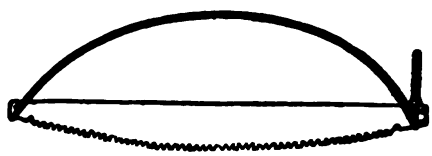
Use of Steam Blower.

boiler during the cold winter months. The blower was placed in the 48-inch circular uptake, the holes drilled so that the bottom jet would fill the uptake at about four feet from the jet," says a correspondent in Power. This increased the capacity 30 per cent, at a cost of 90 cents per hour, with coal at $3.00 per ton.

The jets give better service in round stacks than they do in square ones. Inserting a tube into a square stack, filling up the corners and placing the jet underneath is the most efficient method of using them with square stacks.

HOW TO STIFFEN A CROSS-CUT SAW.

One man can work a cross-cut saw by means of a simple contrivance for stiffening it. Make a strong, stiff bow, saw a slit in each end five or six inches long; take off one saw handle and insert a plug in one of



Stiffening a Cross-Cut Saw.

the holes in the saw. Slip one end of the bow over the saw in front of the plug and tie underneath with wire; bend the bow and slip the other end over the saw in front of the handle and tie as before. Have the teeth filed very beveling so as to bring as thin a cutting edge against the saw as possible, and do not file the rake teeth as short as you would if two men w...

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SHOP NOTES

A FOOT-POWER HAMMER.

A correspondent of the Blacksmith and Wheelright describes a foot-power hammer made by him 14 years ago. He says

"A is a wooden bench right height for anvil to set on under hammer; B B are

Foot Power Hammer.

pillow blocks for hammer to swing on; C is hanger for treadle to swing on; D is axle; E is connecting rod from treadle to handle; F is a spiral spring to raise hammer.

EXPLOSION OF A HOT WATER BOILER.

That kitchen hot water boilers are as liable to explode as any others under the right conditions, has been fully demonstrated by an explosion that occurred at a club house near Hartford, Conn., recently. No person was seriously injured, but damage to property to the extent of $2,500 was done, the building having an immense hole torn in one side and other rooms being wrecked.

The boiler was an upright cylindrical copper tank of 300 gallons capacity; had no fire under it, and the water was heated by a water front in a range. The only pressure it was supposed to be subjected to was 65 pounds per square inch from the city water mains and which amount was quite safe.

Investigation, however, showed that a check valve had been put in the supply pipe to prevent the water, when there was enough heat to generate steam in the boiler, backing up and injuring a water-meter on the supply pipe. Of course the water had no exit and the explosion followed.

There should never, for the reason shown, be a check valve in the pipe between a kitchen boiler and a water main, says The Locomotive. The boiler can in no way relieve itself of excess pressure when the water is overheated where there is a check valve. Such an accident could be prevented by providing the boiler with a safety valve. In England "dead weight" safety valves are commonly used on kitchen boilers, this kind of valves being very simple and reliable. A check valve and safety valve might both be used with safety providing the condition of the safety valve was looked after, but it were best to dispense with the check valve entirely.

A stop valve on the supply pipe is a positive necessity to a kitchen boiler, but should be placed where it could never be closed by mistake. If it were secured by a wire when open, the danger of closing accidentally would be eliminated and the wire could be easily broken if necessary to close the valve.

HOW TO CONSTRUCT A CEMENT WATER TROUGH.

Cement water troughs are good for long service as they will stand any amount of freezing without cracking. A correspondent of the Ohio Farmer tells hows to construct one:

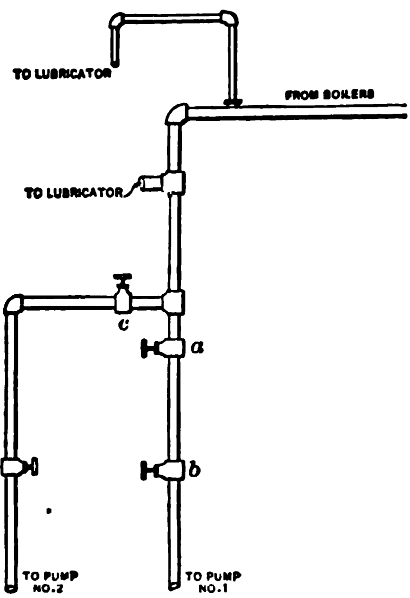
Side View of Cement Trough.

Excavate to the depth of 18 inches a place somewhat larger than the trough is to be; fill the cavity with broken stone, pounding it down until each piece is firmly embedded, pour thin cement over it until the crevices are full and smooth over the top. On top of this construct a box exactly the shape the trough is to be, having the inside of the box perfectly smooth, with all cleats, braces, etc., on the outside. Make a similar box five or six inches smaller, having the smooth surface on the outside in this case. Place the small box inside of the larger one, brace and make solid and fill the space between the walls of the two with a cement made of one part cement to two of sand. Mix in dry state and but a bushel or two at a time. Wet just enough so that when it is shoveled into the mould and tamped down but a little water will rise to the top. After the cement has set for a time knock off the moulds.

It should harden very slowly. Keep full of water and sprinkle the outside of it. Such a trough costs about the same as a galvanized iron trough.

ONE LUBRICATOR FOR TWO PUMPS.

A correspondent of Power tells how he made one lubricator serve two boiler pumps, using one pump at a time and changing to the other in case the first gave out.



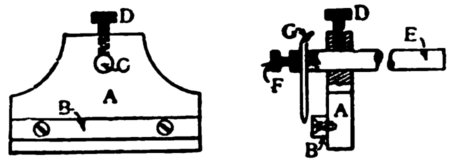
Connecting one Lubricator for Use with Two Pumps

Referring to the diagram the arrangement is as follows: If using pump No. 1, close valve C, then D, open A wide and regulate the pump by valve B. If No. 2 is used, close valve A, then B, open C, and regulate by D.

A MARKING GAUGE

The marking gauge described here is useful for marking off sheet brass, copper, etc., where the material is of fair length, or the distance from the edge is out of range for use of jenneys, says a correspondent of the Model Engineer and Electrician.

It consists of a block of mild steel (or



A Marking Guage

iron) (A), about ⅜ inch thickness. At about ¼ inch from the bottom edge is fastened a piece of ¼ square steel (B) by means of two screws countersunk flush, and at about ⅓ inch from the top is drilled a ¼-inch hole (C) to take a length of ¼-inch round steel (E), which should be a sliding fit. Another hole is drilled and tapped in the top of block to take the knurled screw (D) which is to hold tight the steel rod (E). At one end of E a hole is drilled to take a scriber (G), which may be made from a good-sized knitting-needle. Another hole is drilled and tapped to take the knurled screw (F), which is to hold tight the scriber. To use the block, the bar B must rest on the edge of the material to be marked, and the scriber and rod E adjusted.

HOW TO CUT GLASS JARS.

Fill the jar with lard-oil to the point where it is to be cut; heat an iron rod red-hot and plunge it into the oil. Because of the unequal expansion the jar will crack all the way around at the surface of the oil and the top may be lifted off.

TO TOUGHEN PLASTER CASTS.

To toughen plaster casts immerse them till well saturated in a hot solution of glue. When treated in this manner a nail can be driven into them and not crack them.

The southern pine forests, from which is obtained the wood so much in demand building and inte
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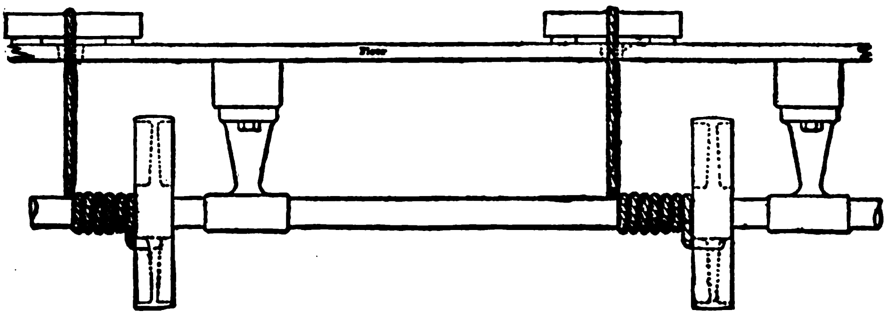
AN INGENIOUS HOIST.

The lowering, adjusting and raising of a pulley shaft 150 feet long having many pulleys from 2 to 5 feet in diameter, in a short time without blocks or tackle was the proposition to be met and a correspondent of the American Machinist tells how he dealt with it.

The shaft was, in places, 3 inches in diameter and at others, 4 inches. The 3-inch places were wrapped until as large as the 4-inch. Six lengths of rope 1¼ inches in diameter were used, fastening one end of each piece to an arm of a pulley, the ropes being as nearly equidistant as the pulleys on the shaft would permit. Enough of each rope to reach from the shaft to the floor was then wrapped around the shaft and the other end passed straight up through a hole in the floor above and there secured to a piece of timber. The caps to the hanger boxes were then removed and the shaft was rotated by the rims of six pulleys, a man at each pulley, and in a direction calculated to lift the shaft out of the boxes, when two other men, by means of levers, swung it clear of them. Then the pulley reins were rotated so as to unwind the rope on the shaft and thus it was lowered. The method of raising was simply a reversal of that of lowering.



Lowering a Heavy Shaft at Short Notice.

HOW TO FIREPROOF WOOD.

Wooden buildings or wooden parts of any structure can be made fireproof by a very simple method and at small cost.

Add enough water to a quantity of fresh ... make it of the consistency of ... and add two pounds of ... mercial potash and ... thoroughly ... r of ... be obtained by adding a couple of handfuls of plaster of Paris, or shades ranging from light gray to black may be had by adding lampblack, the amount varying with the shade desired.

Two coats of this mixture will keep wood fireproof for a long while and if the building should be subjected to flames for a time it will not blaze, but merely char. The mixture, with the addition of a few handfuls of white sand to every gallon of liquid, makes an excellent preservative for brick or stone.

TO PREVENT TARNISH ON SILVER.

Brush alcohol in which a little collodion has been dissolved over silver ware to keep it from tarnishing. The thin invisible coating the solution leaves can readily be removed by dipping the article in hot water.

REMOVING RUST.

To remove rust from metal, cover the metal with sweet oil, rubbing it in well, let stand 48 hours. With a piece of cotton wool apply oil freely, then rub well with powdered unslaked lime.

REMEDY FOR BURNS.

A saturated solution of Epsom salts is an excellent remedy for burns. Apply as soon as possible and keep wet constantly until pain ceases.

Among the disputed questions that never will be settled are: Whether a long screw driver is better than a short one of the same family; whether water wheels run faster at night than at day; the best way to harden steel; which side of the belt should run next the pulley; the proper speed of line shafts; the right way to lace belts.

HOW TO BUILD A CIDER MILL AND PRESS.

A correspondent of The Blacksmith and Wheelwright tells how to build a cider mill. We give the instructions here:

Fig. 1.

Fig. 1 shows the grinder—a black gum log—20 inches in diameter, 18 inches long. Into this drive spikes as shown, allowing them to stick up about ¼ inch. A rod is

Fig. 2.

run through the log, and a pulley fitted on one end. Then build a frame as shown in Fig. 2, and your mill is ready for business.

Fig. 3 shows a cider press built of 10 by 12-inch timber, 8 feet long. Distance from post to post is 4 feet; mortises, 6 by 10 inches; pin-holes, 1 inch. Use a 3-inch iron screw, 5 feet long, operated by a 6-foot pinch bar.

Fig. 3

COMBINATION ANVIL AND STRAIGHT-EDGE.

An anvil which will serve as a straight-edge as well as an anvil was contrived by a correspondent of American Machinist. It is placed so that its angle is in line with the operator's eye, for this purpose, and

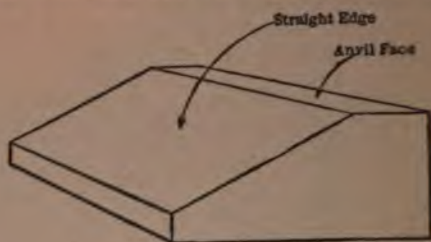


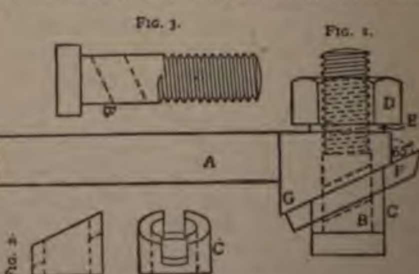
Diagram of Anvil.

should be set on a white paper to get a light background, so as to see more clearly between the face of the anvil and the forging while straightening the latter. For straightening badly bent and twisted small forgings it will be found most convenient.

A HANDY TOOL-HOLDER.

A handy tool-holder which is easy to make and inexpensive is here shown in detail.

The body of the toolholder (A) is cut from an old bicycle crank (axle end, of course), and is cut off at an angle of 65 degrees through boss at section, steel being



Details of a Tool-Holder.

used for cutters (self-hardening). The body of holder at G (Fig. 1) beds against slide-rest, preventing spring of cutter. Perfect adjustment is provided by pushing cutter up or down, as may be required.

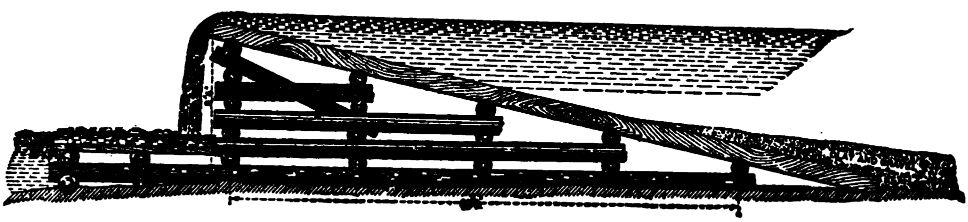
At the present rate of output England's coal supply will last but 371 years. The increasing use of gas and electricity for driving many mechanical mechanisms, however, it is believed will greatly economize the consumption of coal in the future.

HOW TO BUILD A SMALL DAM.

If you live near a small creek, or stream and enjoy boating, swimming, and fishing, but have no place suitable for these sports, why don't you build a wooden dam and make a place for yourself? A club of boys, two or three grown persons, or even a party of girls could pool funds and construct such a dam and create a source of pleasure for many summers and winters after. Boys or men could do their own work.

For such a purpose a crib dam is the construction best adapted to every phase of the case, as it can be built on any kind of a bed, can be of either plank or logs and in a locality where there is much timber land the expense will not be great.

the stream so deep that the logs when laid in them just show. Use logs or plank from 6 by 6 inches to 10 by 10 inches. Logs in the foundation course should be placed from 6 to 8 feet apart and extend deeply into the banks at either hand. If the stream is wide, splice two or more logs together. The second course of logs is placed at right angles to the first, or lengthwise the stream, and an apron is formed between the two foundation logs farthest down stream by placing planks between the logs of the second course and letting them project under the third course, which begins back about 8 feet. From here on the dam proper is built up of the crib-work as high as need be. Use tapering logs for the lengthwise course, letting their tapering ends point up-



Cross Section of Crib-Work Dam

Every locality has its individual conditions which must be considered, and among these are, the depth and width of the stream, its bed, the volume of water, and its velocity. In general the points to be remembered are: The dam must be securely fastened to the bed of the river so that the water cannot undermine it; must have abutments at the banks, or be built into the bank to such a distance that the water cannot work a channel for itself there; must be so solid that it cannot be overturned or shoved aside by the pressure of the water; where the river bed is soft, must have an apron so that the falling water cannot create a cavity into which the dam could be engulfed; must have a surface impervious to water.

If the stream has a rock bottom, it has a natural apron, but the foundation logs must be anchored to the rock. Drill holes in the rocks at places where the logs belong, split the anchor bolts up for five or s[illegible]ches from the bottom and insert a [illegible] bolts through the logs into the rock. When the [illegible] ges expand them in place. If the [illegible] enches across

stream. This gives the upstream side of the dam a slant. The pockets of the crib-work should have vertical sides and may be filled in with stones, brushwood, gravel and some clay. Gravel, however, is best, as the wooden dam is less liable to rot where it is used. Wherever logs cross, flatten them and bolt together by means of drift bolts ¾ by ¾ inches. Square bolts hold best.

For the cover of the dam use 4 by 12 planks, joined so as to be watertight, projecting a little above the crib-work at the top and extending into the bed of the stream at the bottom. Over this put a layer of gravel. In time a layer of silt will be deposited by the stream.

An outlet for the water should be left until the last thing and then closed as rapidly and closely as possible, being careful not to leave this spot weak.

In calculating the speed of pulleys, when the diameter and driven are given, in order to find the number of revolutions, multiply the diameter of the driver by the number of its revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven.

SOME TYPES OF OIL BURNERS.

We here show three methods of arranging oil burners and a method of attaching them. A correspondent of Power says that

Fig. 1
ONE TYPE OF OIL BURNER.

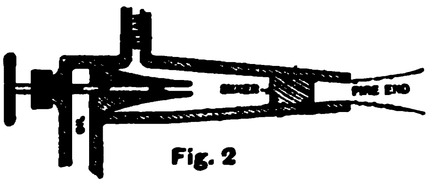


Fig. 2
ANOTHER BURNER.

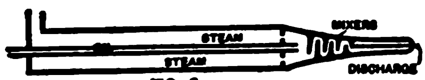


FIG. 3
ANOTHER ARRANGEMENT OF OIL BURNER.

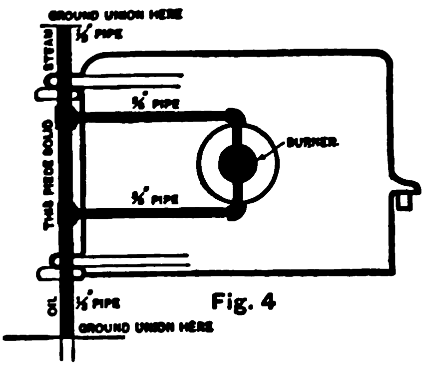


Fig. 4
METHOD OF ATTACHING BURNERS.

Fig. 2 attached as shown in Fig. 4 works beautifully, overcoming many difficulties met with in using other burners.

HOW TO MAKE A TRIP HAMMER.

Take two pieces of wood 8 by 8 inches by 4 feet; lay them eight inches apart and bolt another piece, 8 by 8 inches by 3 feet between them at the back end for an upright. Bolt a piece of 8 by 8 inches by 1 foot long between them at the front as a base for the anvil stand. Take a piece of iron 1¼ by 1½ by 2½ feet long, weld a heavy plate on one end of this and bolt it fast to the base. Bore a hole in the upper end and square it into a 1-inch hole. Make an anvil die of tool steel with shank to fit this hole in the stand; drill a small hole through the stand and shank and drive in an iron pin as a key to hold the die.

Make two straps of new wagon tire; bolt to back upright on each side with a ¾-inch hole through the ends for a bolt to fasten hammer arm to. This latter bolt to a tee of the same material, turning the end of the cross tee to fit between the short pieces on the upright and fastening with a ¾-inch bolt. The arm may be made from the large part of a buggy tongue, and the hammer out of a sledge, swelling the eye about as large again. Cut off about one-half the large end and dress up, using the pene for the face of hammer after dressing this up also to suit the work. Brace it both ways solidly. A crank shaft of an old mowing machine may be used for a crank shaft and also the pitman rod for driving the hammer. Make a loop or strap out of wagon tire also to fit over the arm extending above and below about 10 inches, and put in coil springs there to take off the solid blow from the arms and hammer and also to throw the hammer up as a support to the pitman. Screw this pitman into the lower end of the loop under the arm and place a clamp on each side of the loop on the arm, to hold springs and loop in place. By moving the clamp and loop backward and forward the stroke can be regulated.

Next put a crank shaft in its old boxings about one-third way from back end of the base of hammer, and put a pulley wheel on outside end for belt to run in. The belt tightener, of course, can be fastened to the base or back upright to work with trip, which can be made of anything handy that will stand the pull on the belt tightener. It may be fastened to a separate post which is right by the hammer, to which fasten a countershaft, if the engine runs opposite to the way the hammer is to be turned; put in a short countershaft and then run a loose belt from it to the hammer. It gives a steadier belt by making it shorter, as six or eight feet of belting running loose from the line shaft to the hammer will flop, unless it is wide and heavy.

A correspondent of the American Blacksmith says the hammer will cost about $20 and that he has sharpened plows in 2-
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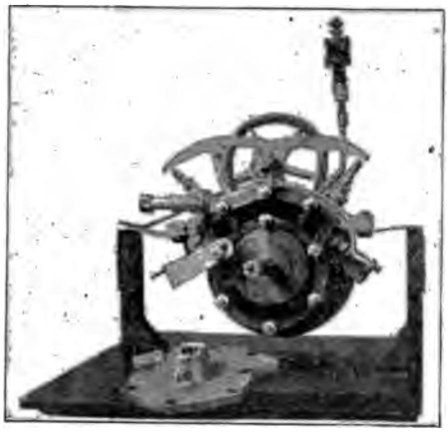
ROTARY GASOLINE ENGINE.

A 10-horsepower rotary gas engine, built on the model exhibited by Otto Konigslow at the March automobile exhibit in Cleveland, Ohio, is soon to be tried in an automobile. The Automobile describes the invention as follows:

"The stationary part of the engine is a cylindrical casting 8 inches in diameter and 4½ inches wide, outside dimensions. Immediately above and integral with this, as seen from left to right in the engraving, are the admission, compression and exhaust chambers. Valveless ports lead from the admission and exhaust chambers to the cylinder. A valve connects the admission and compression chambers, and another the compression and exhaust chambers. The main admission and exhaust valves may be seen at the top of the casting, on the left and right respectively. The operating devices for the valves, also shown at the top, are controlled by cams on a time shaft geared to the main shaft by a chain and sprockets, its time of revolution being one-third that of the main shaft.

"The rotary part consists of a cylindrical casting, mounted on a shaft and set eccentrically with respect to the stationary cylinder so as to be tangent to it at the top and to leave a considerable clearance space between the two at the bottom. The rotating cylinder carries a single blade, forced outward by means of a spring so that its outer edge is always in contact with the inner surface of the enclosing cylinder.

"The operation of the engine is as follows: As the blade passes the port of the admission chamber (the direction of rotation being left-handed), the intake valve opens and the charge is drawn in by suction for an entire revolution. At the beginning of the second revolution, just before the blade again passes the part, the admission valve closes and the charge (now being in front of the blade) is forced through the exhaust chamber, where compression takes place during the entire revolution. At the beginning of the third revolution, just after the blade has passed the port between the admission chamber and the main cylinder, the valve leading from the compression chamber to the admission chamber is opened, so that the compressed gas is allowed to pass into the cylinder. At this instant the gas is exploded by means of an sparking device located in the chamber and, impinging upon de, rotates the shaft. During the next revolution, which corresponds with the one first described, the exploded charge is forced in front of the blade out through the exhaust valve to the air, a fresh charge being drawn in behind the blade at the same time for a new cycle of operations.



Rotary Gasoline Explosive Engine.

"The speed is controlled by varying the amount of charge and changing the time of ignition. At a speed of 1,600 revolutions per minute, there is so little vibration that holding-down bolts are unnecessary. This feature, together with its compactness, are the two qualities which recommend it most strongly for automobile service."

The engine is to be cooled by water circulation.

ELECTRIC TRAP TO KILL RATS.

A clerk in Rochester, N. Y., used electricity to rid a warehouse of rats. In one corner he placed a flat piece of copper connected by a wire to the incandescent light circuit. On this copper plate he placed a tempting bit of cheese. Another copper plate, connected with the return wire of the circuit, was placed near, but not touching, the first plate. Rats, trying to secure the cheese, came in contact with both plates at the same time, thus completing the circuit, and were instantly killed.

PREVENTING RUST ON STEEL.

To preserve steel articles from rust, place a lump of freshly-burnt lime in the drawer or case in which they are kept. The lime will absorb a great deal of moisture.

TOOL FOR MOVING MACHINERY.

A wooden lever made of maple, having the square part [illegible] by [illegible] inches and from 9 to

A Wooden Lever

[illegible] feet long will be found convenient for moving machinery, says a correspondent of [illegible]. Such a tool can be used by one man to do work which ordinarily would require two or three. It will take the place of a jack.

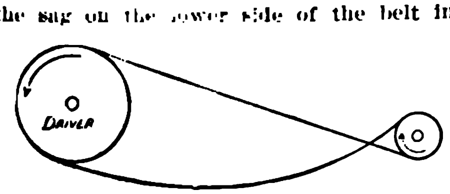
SOFT TOOLS FOR HANDLING MACHINERY.

For driving keys and other work about machinery a babbitt or lead hammer is better than a copper hammer which hardens the more it is used. To keep the lead hammer from getting out of shape, take a piece of copper pipe, iron pipe size, drill a hole in one side of it and fit with a handle and then fill in the hollow of the copper pipe with lead.

Even better than the lead hammer are hardwood blocks on end. Put against part to be driven and strike with a hammer. For driving the [illegible] end of connecting rods on large engines back and forth when keyed up use [illegible] about 5 inches square and 3 feet long.

CROSSED PULLEY BELT.

Here is a case of a crossed pulley belt. The more load there is on the saw, the more the sag on the lower side of the belt in-



How the Crossed Belt Runs

creases, until the belt contact on the small pulley is greatly increased, and the contact on the driver considerably lessened.

To produce a polished surface on turned work, soapsuds is one of the best lubricants. It should be fed continuously and lavishly upon the tool while cutting. The work must be carefuly dried and oiled when completed to prevent rusting.

TO PREVENT BRONZE CASTINGS FROM ADHERING.

A new method of casting bronze so that it will not adhere to the metal mold and tear away from the casting when forcibly removed, consists in adding metallic sodium, in the proportion of 1½ parts sodium to 100 parts bronze, to the tin of the alloy.

Heat the tin to from 400 to 435 degrees F., and the sodium separately to from 175 to 200 degrees F., excluding the air as much as possible. When the tin is at the heat specified, add the heated sodium. If the tin is more than 435 degrees, the sodium will ignite. When the alloy is cool break it into pieces. It may be laid away for future use if the casting is not to be made immediately.

To make the bronze, heat the copper to about 1,350 degrees F. (below melting point, to prevent the sodium volatilizing), and add the alloy in the right proportion. The alloy will melt and the copper begin to absorb oxygen, thus developing heat. Finally the copper will melt, the fusion of the alloy and copper will follow, and it may then be poured into the molds. During the pouring the remaining sodium goes off in fumes and forms a layer between the mold and the casting, which prevents the casting from adhering and causes it to come out in perfect condition. The coating on the casting, due to oxidized material, may be removed by immersing in dilute hydrochloric acid.

CLEANING GRAY IRON CASTINGS.

To clean scale from gray iron castings, pickle by immersing in water containing one per cent (not more) of sulphuric acid and let stand from two to three hours. Rinse in cold water and scour with sharp sand and a fibre brush, or with a coarse rag and the sand.

TO TEMPER MILL PICKS AND CHISELS.

Heat the bill to a dull red, and hammer until nearly cold; heat it again to the same color and quench in 3 gallons of water, in which has been dissolved 2 ounces of vitriol, 2 ounces [illegible] and ¼ ounce saltpetre, or [illegible] spirits [illegible] in

SHOP NOTES

WHAT TO DO IN CASE OF ELECTRICITY ACCIDENTS.

The first thing to do is to have the current shut off, or release the injured person from contact with the conductor of the current, if this is still acting upon him.

The person who attempts this must not touch with his bare hands or skin, or with any part of his body, either the patient or a live wire or a lamp or generator, while any part of his body is in contact with the ground, either directly or by means of a moist or metal surface. He should, if possible, put on rubber boots and shoes and rubber gloves. If these are not at hand he may use a dry board for the feet, and for the hands a number of coats or folds of woolen cloth or paper. A thick bundle of silk is also a good insulator. In cutting a wire, the feet should be protected as just indicated, and if an axe or hatchet be used it should be one with a dry wooden handle. After a live wire is cut, the end should be wrapped or insulated with a piece of cloth or rubber.

The person who has received the shock should be laid down, his clothing loosened and he should be given fresh air and the body should be kept warm.

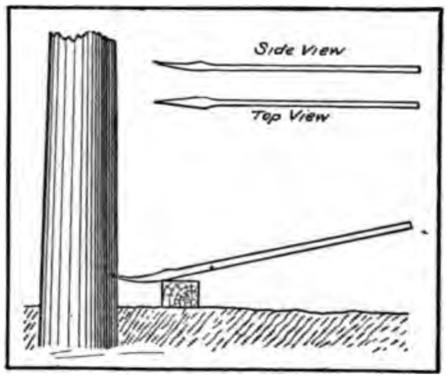
Rescuing from Contact with Live Wires.

If breathing is suspended, artificial respiration or rhythmical traction of the tongue, similar to the methods followed in cases of drowning, should be used. If the heart has stopped beating, several hard taps or blows with the hand may be given which may cause it to start up again. Burns of the surface caused by electricity may be treated in a similar man- ...rns from fire.

...sations if acted on promptly ...tal results, but the ...ys a surgeon ...n all cases.

HANDY TOOL FOR PULLING POLES

An ordinary crowbar with the end drawn out and tempered as shown makes a good tool for pulling poles, says the American Telephone Journal. The point of the tool is thrust into the pole near the base and a



Tool for Pulling Poles.

block or other elevation serves as the fulcrum. With three of these tools poles 70 feet long may be pulled and moved ahead 15 feet.

HOW TO TRANSFER PICTURES

Transfers instantly any printed picture on to paper, cloth or dishes. Also transfers designs from magazines on to cloth ready to work or paint. Sometimes used for transferring advertisements onto glass for magic lanterns for advertising displays.

FORMULA.—One bar of common soap dissolved in one gallon of hot water, then add one-half pint turpentine. Let stand over night, stir well and bottle and it is ready for use.

Apply the solution to the picture with a small brush or your fingers, then lay a clean cloth or paper over the picture and rub with the bowl of a teaspoon quite hard, when the picture is instantly transferred. To transfer on glasses or dishes, first varnish the glass or dish with a white varnish and let it dry, then wet the picture same as before and lay the picture face down on the glass or dish and rub on the back of the picture. This will transfer the picture instantly on to the glass or dish.

HOW TO MAKE A HANDY ROPE LADDER.

[illegible]

A [illegible] Ladder

sides of the ladder and to it is attached an iron hook for hanging the ladder over a bough of a tree. The sides are made of rope with pieces at regular intervals for fastening in the rungs as shown at b. A rod (a) for hooking the ladder over a limb is made of pieces of pipe held together with thumbscrews.

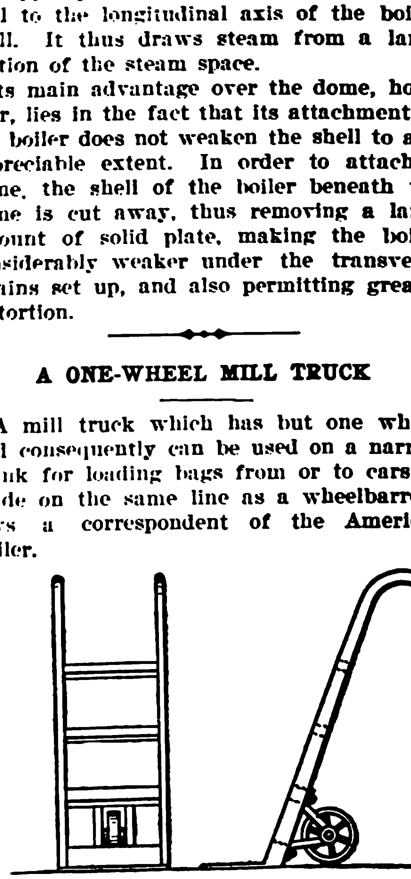
STEAM DOME ON BOILERS UNNECESSARY.

A stationary boiler is better without the steam dome, says the Practical Engineer. The steam dome is supposed to effect a drying of the steam and also add to the steam space of the boiler. Both of these purposes it certainly performs, so that it cannot be objected to upon the grounds of inefficient service. In the first place, it removes the outlet of the steam to a greater distance from the water surface, and consequently there is less chance of carrying water over to the engine when the boiler primes slightly. Being of comparatively large cross section, the velocity of the steam passing through it on the way to the outlet is comparatively slow. This gives the moisture particles entrained with the steam an opportunity to fall out of the steam by mere action of gravity. However, there are other and better ways of securing the same result. The dry pipe is just as useful in obtaining dry steam as is the dome. It is merely a perforated pipe attached to the outlet, but lying wholly within the boiler. The areas of the perforations when taken together are considerably greater than that of the steam main leading from the boiler. The dry pipe is usually placed so as to extend along the upper part of the steam space and parallel to the longitudinal axis of the boiler shell. It thus draws steam from a large portion of the steam space.

Its main advantage over the dome, however, lies in the fact that its attachment to the boiler does not weaken the shell to any appreciable extent. In order to attach a dome, the shell of the boiler beneath the dome is cut away, thus removing a large amount of solid plate, making the boiler considerably weaker under the transverse strains set up, and also permitting greater distortion.

A ONE-WHEEL MILL TRUCK

A mill truck which has but one wheel, and consequently can be used on a narrow plank for loading bags from or to cars, is made on the same line as a wheelbarrow, says a correspondent of the American Miller.



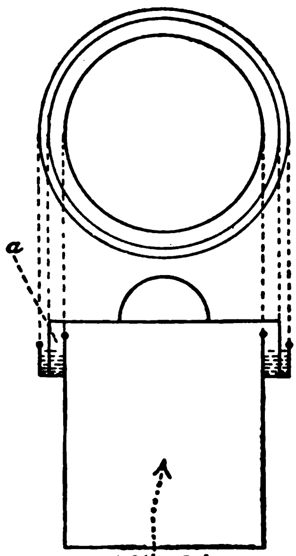
Mill Truck with One Wheel

In many cases it will be found more convenient than a double-wheel truck, as an equilibrium can be maintained even on a rough path, where the double-wheel truck must of necessity tilt.

To prevent serious results from a wound caused by running a rusty nail into the foot or hand, smoke the wound with a woolen cloth. Twenty
will cause
flamed pa

ECONOMICAL GLUE POT.

To prevent an insoluble film forming on the surface of hot glue when not in use it should be covered to exclude the air, thereby preventing the waste due to "skimming,"



GLUE POT.

An ordinary tight cover becomes stuck to the pot, owing to a small amount of glue which is sure to be around the edge of the pot, and which at the same time being uneven, prevents an air-tight joint. To overcome these difficulties I have had a pot made like the accompanying sketch, which explains itself. By filling the space around the pot at *a* with water the cover is perfectly air tight, and nothing prevents its easy removal at any time. The above is sent us by Frank W. Hobbs, Bangor, Me.

LIQUID METAL POLISH.

Take eight ounces of Spanish whiting, which must be perfectly free from grit, and put in one quart of gasoline. Shake up the whiting and gasoline thoroughly. You will notice the whiting settles immediately, leaving the liquid as clear as water. To remedy this, and further to make it a better polishing agent, add to each quart of the mixture 22 drops of oleic acid—no more, no
... and the whiting will not
silver, nickel, brass,
... surface with
... well.

HOW TO TURN CORK IN THE LATHE

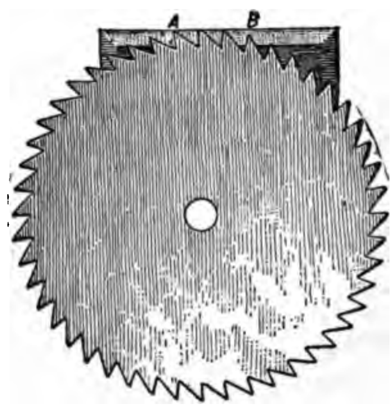
The natural structure of cork causes it to crumble readily, therefore it cannot be turned in the lathe in the ordinary way. However, it can be done by the following method:

First, set the cork revolving, then pass a rather coarse, sharp file over the cork, but at the same time let the file bear upon the tool-rest, or upon a piece of wood fastened to the latter. In this way, the cork will be abraded without serious tearing, and can be shaped as desired, and finished with a finer file.

The essential point is to touch the cork only while the file is in motion *forward*, and while the file is also supported by rubbing against the tool-rest. This support keeps the work running true, and also moderates the pressure upon the cork.

BEVELED BLOCK FOR SETTING CIRCULAR SAWS.

A block of cast iron having a different bevel on each of its four edges to suit the different saws is a good device for setting circular saws, says a correspondent of The Blacksmith and Wheelwright. The block should be about 6 inches square and 2 inches thick. Place the saw on the block of iron with the bevel to be used up and hit the tooth B. Use a small-faced hammer to set the teeth.



For Setting Circular Saws.

To soften paint brushes that have become hard, soak them in raw linseed oil for 24 hours, rinse in hot turpentine and repeat the process till clean.

BENDING SMALL PIPES.

A method of bending small pipe, the bore of which is not large enough to permit filling it with sand, is given in The Model Engineer. The tube was cut off to the length

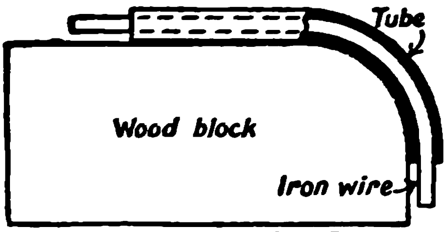


FIG. 1.—MAKING THE FIRST BEND.

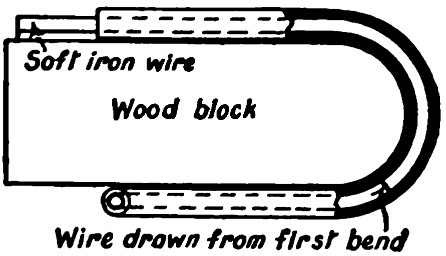


FIG. 2.—THE BEND FOR SYPHON PIPE.

to make a syphon pipe for a small pressure gauge, and a length of small soft iron wire was cut to a little longer than the tube and, the size of wire being just an easy fit in the tube, was then inserted into the latter. The first bend was made at the end where the pipe fits into the boiler, upon a wooden block, and then the wire was drawn out of the curve and the next one bent to shape, and then the wire drawn out. If both bends are attempted without drawing out the wire from the first curve, it will be difficult to withdraw the wire afterwards. In this way small tubes may be bent without damaging them in the least, whereas if the tube be bent without anything in the bore at all, it will surely become flattened somewhere.

COLORS USED IN TEMPERING.

One of our subscribers sends the following list of colors used in tempering. The Fahrenheit scale is used.

Lancets and razors, yellow, 430 degrees; straw, 460 degrees. Wood-cutting tools and taps, dark straw yellow, 470 degrees; yellow, 490 degrees. Chisels, hatchets, saws, etc., and percussive tools, brown yellow, 500 degrees; brown (slightly tinged), 510 degrees; purple, 520 degrees; light purple, 530 degrees. Springs, clear black, 570 degrees; dark blue, 600 degrees.

POWER REQUIRED TO RAISE WATER

Multiply the number of gallons per minute by 10 and by the number of feet the water is to be lifted, and divide by 33,000. Then add one-third for friction, or, if a considerable lift, or through more than two elbows, add two-thirds for friction.

For example, to raise 100 gallons per minute 25 feet through a pipe with two elbows: 100 $\times$ 10 gives us 1,000; $\times$ 25 is 25,000; divided by 33,000 gives us .757 horsepower, or three-quarters of one horsepower; to which add one-third (.25 or one-quarter horsepower) gives as the result, 1 horsepower.

MAKING LARGE WRENCHES IN EMERGENCIES.

For turning nuts on large unions where there is no wrench of a size suitable for the work in hand, it is not always necessary

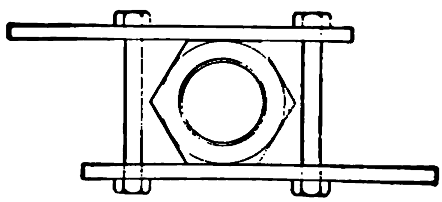


Fig. 1

to forge a wrench, says a correspondent of Power. For a brass union on a 2½-inch pipe take two pieces of iron about ½ by 2½ inches and 18 inches long and two ½-inch bolts. Bore holes for the bolts and screw up as shown at Fig. 1. The two projecting ends coming on opposite sides will serve as handles for turning. Friction is reduced by applying force on two sides of the pipe.

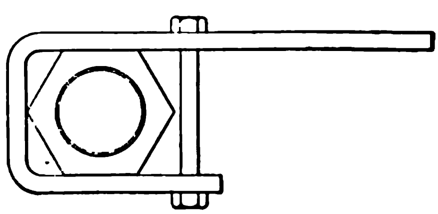


Fig. 2

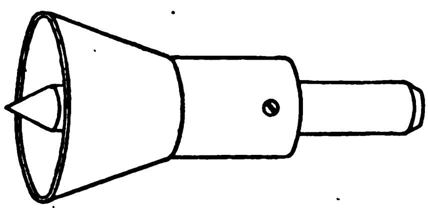
Where there is not room enough to use this wrench, heat a single piece of iron. it into the shape of Fig. 2 and one bolt. Turn handle.

TO LOCATE FIRE ESCAPE IN FACTORIES.

A simple signal to show location of fire escape in factories is to paint one pane of glass red, on each floor, in the window opening on the fire escape. This not only serves as a guide to employes during the day, but if fire occurs during the night indicates to the fireman the location of the standpipes which are placed on the iron ladder.

A BELL-CENTERING PUNCH.

A bell-centering punch is one of the most convenient centering tools in use. It consists of a bell, or cone, which carries a center punch free to move up or down. A small screw put through the top of the cone so that its point comes in contact with a



A Bell Centering Punch.

flat filed on the punch keeps the punch from falling out. Hold the tool upright on the work and give the punch a sharp blow to obtain a center. The illustration is reduced one-third.

TO PREVENT RUST ON MACHINERY.

A good mixture for use as a slush to prevent the rusting of machinery is made by dissolving 1 ounce of camphor in 1 pound of melted lard; skim off the impurities and add enough black lead to give the mixture an iron color. After cleaning the machinery carefully, smear on the mixture. It can be left indefinitely, or if wiped off after 24 hours will prevent rust for some time. When removed, the metal should be polished with a soft cloth.

CARBOLIC ACID FOR TEMPERING STEEL TOOLS.

t (a Frenchman) recommends
steel tools, claiming more
han is derived from

TO TRANSFER PICTURES TO GLASS.

Clean your glass thoroughly and varnish it with a clear white or nearly colorless varnish. Put it where it will be clear from dust and let it stand over night. Then take your picture, lay it in clear water for ten to twenty minutes, or until thoroughly wet through. Then lay it carefully upon a piece of blotting paper, so that the moisture may dry from the front and leave the back still wet. Now at once varnish your glass the second time; then place tue engraving face down upon the varnish and press down firmly, excluding all the air bubbles. If you have one, it would be well to use a rubber roller, such as photographers use, to press the picture to the glass and exclude all air bubbles. Then rub lightly the paper from the back until transparent and even, then varnish again and dry.

TO CUT SKY LIGHTS.

An ordinary soldering iron is the best to use for the work. Make a notch in the edge of the glass with an ordinary file for a starting place. Heat your iron good and hot and pull it slowly back and forth over the line to be cut and when the line commences to open, keep the iron one-fourth inch ahead of the cut. Keep iron very hot and use point and corners of it.

A GOOD TEMPERING RECIPE.

For small drills, chisels, etc., for very light work, says W. F. Smith of Baltimore, heat to a dull red and cool in a bar of common soap. The temper will be about right and no drawing will be required.

REMOVING INK SPOTS ON MARBLE.

Ink spots on marble may be removed with a paste made by dissolving an ounce of oxalic acid and half an ounce of butter of antimony in a pint of rain water, and adding sufficient flour to form a thin paste. Apply this to the stains with a brush; allow it to remain on three or four days and then wash it off. Make a second application, if necessary.

To find the width of a belt for any required horsepower, multiply 33,000 by the diameter, and then divide the product, first by the length in inches covered by the belt on the driven pulley, and then by half the belt speed in feet per minute.

HOW TO BORE HOLES IN GLASS.

Take an old three-cornered file, one that is worn out will do; break it off and sharpen to a point like a drill and place in a carpenter's brace. Have your glass fastened on a good solid table so there will be no danger of its breaking. Wet the glass at the point where you wish to make the hole with the following solution:

Ammonia	6½ drachms
Ether	3½ drachms
Turpentine	1 ounce

Keep your drill wet with the above solution and bore the hole part way from each side.

Still another way, is to dissolve a piece of gum camphor the size of a walnut in one ounce of turpentine. Use as above described.

ANOTHER METHOD.

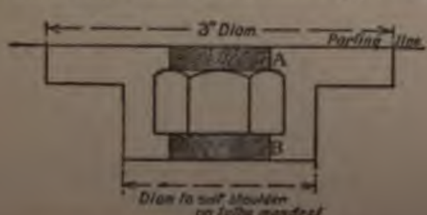
is sent us by a reader who has used the plan for years with perfect satisfaction. He says:

For drilling glass use a steel drill hardened, but not drawn. Saturate spirits of turpentine with camphor and wet the drill. The drill should be ground with a long point and plenty of clearance. Run it fast and feed light. In this manner lubricated glass can be drilled with small holes, up to 3-16 inch size, nearly as rapidly as cast steel.

A FACEPLATE FOR SELF-CENTERING CHUCK.

A self-centering chuck of use to those who have not the necessary screwing tackle, may be made as follows, says a correspondent of The Model Engineer:

Get a good hexagon nut to fit the lathe mandrel, and file the flats up a little, then make a pattern like sketch, allowing 3-16 inch all over for machining. Out of a piece of Bath brick, cut two washers (A and B)



Faceplate for Self-Centering Chuck

exactly ⅜ inch thick, and ¼ inch larger than the tapped hole in the nut. Then glue the washers centrally one on each end of nut, wiping any excess of glue away.

Place the nut in center of the mould, so that the metal envelopes the nut, excepting the ends covered by the washers. The writer says he has made three such himself, one for a 3-inch self-centering chuck, and two for emery-covered wooden disks. These were made out of some white metal, purchased cheaply. The Bath brick washers were then scraped out of the casting, which was then screwed on lathe mandrel, faced up, then reversed and treated in like manner.

TO MAKE A GASOLINE STRAINER.

To make such a strainer as is shown in the cut, simply take a piece of common iron pipe five or six inches long and one inch in diameter, threaded at each end.

Obtain a cap which will screw on each end of the pipe. Now drill a hole in the center of each cap and tap to fit pipe used in connecting up the pump with the engine.

Gasoline Strainer

Cut a piece of fine screen the same size as the inside of the cap. Place the screen inside the cap and screw in the pipe. Next fill the pipe with fine clean gravel (gravel not to be larger than 1-16 of an inch), place the other screen in position, screw on the cap, and the strainer is complete. Place the strainer between the pump and tank.

Have you seen "Shop Notes"?

SHOP NOTES

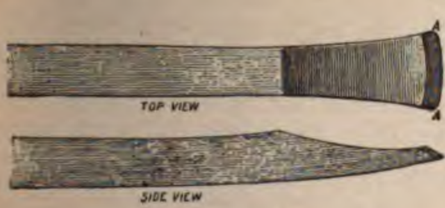
CAULKING BOILERS.

Caulking a steam boiler is something which requires more skill and experience than many engineers and mechanics realize. A correspondent in the Blacksmith and Wheelwright contributes the following comments:

First method, improper; second method, good.

I worked for an iron ship-building concern employing three thousand men, and saw most kinds of work done, though not perhaps working at it.

In first-class boiler work the edges of the sheets are all planed slightly beveling, as it makes a better joint to caulk; too much lap outside the line of rivet holes being as bad as too little. I fancy the allowance is 1½ diameter of rivet, but forget whether taken from center hole or outside edge—nothing is used between edges. If the edge of the plate is not planed or is rough, it has to be chipped and great care has to be



Caulking Tool.

taken that in doing so a line is not cut along the joint on the other plate, weakening it and inducing grooving. Many cases of explosions have been traced to this cause, the rip having followed the caulking line instead of the rivet line. What has to be aimed at to make good work is expanding or upsetting the plate enough to make a tight joint, such upsetting to go some distance down, not merely a little burr. To do this you want a round-nosed tool, held well upright, held hard to its work and struck with not too light a hammer, and the chisel not so long it takes up the blow; leave no gaps—marry your work as you go. Avoid using too thin a pointed chisel, which is

Caulking Chisel.

likely to open up a strained seam or at best only to force off the top edge and make a burr and rust joint.

This is not to be taken as favoring heavy caulking, which is as bad as drifting holes, but let us use what brains we have. Well done is twice done, and men's lives are back of our work and we are responsible for them.

VISE JAWS CAST FROM SOFT BRASS.

Many big machine shops use vise jaws cast, as here shown, from soft brass. A is

formed over the top to keep from falling off.

Those of our readers who are specially interested in this department are invited to send in new ideas and "kinks", which are likely to be of interest and help to others.

HOW TO MAKE A PORTABLE CUPOLA.

All foundries have to produce castings in a hurry at times, and sometimes it is inconvenient to wait for iron from the regular cupola or to fire up one of the large cupolas for a small quantity of metal, says Foundry.

A Portable Cupola.

A small portable cupola, such as that shown in the accompanying illustration, will be found very serviceable indeed for such occasions as this. The cupola shown is in use in Paducah, Ky. It has no stack and is set against one wall of the foundry. Air for the blast comes from the blacksmith shop, which is about 20 feet away, the air being conducted through a pipe underground and brought up behind the cupola, as shown. Connection is made with the cupola by means of a gland, as shown in the illustration. The diameter of the shell is 18 inches and the height of the shell 5 feet. All of the castings for the cupola were made in open sand, and the construction was such that very little patternmaking was required.

The bustle pipe is a ring of square cross section about 5 inches on a side. The tuyeres are made from 1½-inch pipe. The cupola is mounted upon a frame upon wheels as shown, so that it can be moved away from the wall for cleaning and repairs. The A-shaped frame which supports the trunnion is 3 feet high, the center of the trunnion about 3 feet 6 inches from the floor.

When in use the cupola is lined with molding sand ¾ of an inch thick. A casting weighing 300 pounds can be made with this cupola, and a heat of 700 pounds of metal can be taken from it. The charges for such a heat are as follows: Three riddles of coke for the bed and 300 pounds of iron. This is followed by two charges composed of one riddle full of coke and 150 pounds of iron each, and one charge of one riddle of coke and 100 pounds of iron.

The cupola can be gotten ready and hot iron available in from an hour to an hour and a half at any time. When large brass castings are required, the cupola is simply relined and from 300 to 400 pounds of brass melted in it without any difficulty.

DETERIORATION IN GRATES.

The principal cause which contributes to the rapid burning out of the grate bars in a boiler is the action of the furnace heat, which will in time destroy any set of grates, but the want of a proper flow of air through the grates will cause overheating, whether it occurs through too little air-space in the grates themselves, or by these spaces becoming obstructed through any cause, thus preventing the cooling effect of the air on its passage to the fire. Another reason is found in the impurities of the coal, and especially in the chemical combinations of sulphur and iron, which impurities are found in more or less quantity in all coals. The Practical Engineer says any coal which forms an easily fused clinker will injuriously affect the grates.

TEMPERING TOOLS

Heat the tool to blood red and quench in a mixture of 1 ounce of white arsenic, 1 ounce spirits of salts, 1 ounce sal. ammoniac, dissolved in 4 gallons of spring water. Draw gently over clean fire until spittle flashes off, then let it cool. Keep the mixture in an iron receptacle for use.

HOW TO PAINT A CANVAS TOP.

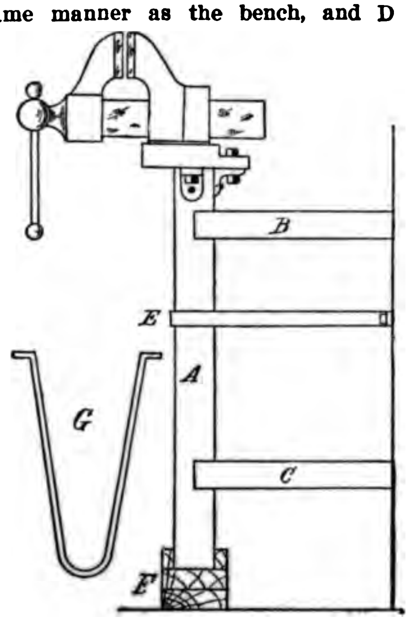
Wet the top thoroughly, using a sponge filled with water and letting the canvas have all it will hold; then apply the paint. Two coats applied in this way
strike throu
dition for ;

COPPERING STEEL.

In preparing copperas for steel a few drops of acid (muriatic) will make the solution adhere to oily metal and can be used immediately without waiting for it to dry. Just coat the piece to be coppered and wipe off the remaining moisture with a piece of waste or cloth. To coat brass or bronze with this solution take a bit of waste dampened, and dip it in cast iron dust, then apply to pieces you wish to coat. This gives a fine coppered surface and any lines will show very plain.—W. F. S.

A CONVENIENT VISE ARRANGEMENT FOR FILING.

Having a great deal of filing to do, I built a vise as follows, the letters referring to the figure herewith, says a writer in the American Blacksmith. At A is shown a piece of 3-inch pipe, having three angle lugs riveted to the top with holes to correspond with the holes in the vise. B is the bench, having a half circle cut out of its face to receive the pipe. C is a shelf cut out in the same manner as the bench, and D is a



DEVICE FOR CONVENIENT FILING.

piece of 1¼ by ⅜-inch tire bent as shown bolted to the wall so that the pipe d down or turn at any it. A blow down- any position light tap upwards loosens it. F is a block having three different thicknesses, the middle thickness being the one I ordinarily use for convenience. Ever since finished, my satisfaction with it could not be expressed in words.

HANDY INSIDE CALIPERS.

A pair of inside calipers can be made from a scrap of sheet steel, spring or tempered steel is the best, or from an old hacksaw blade. Enlarge or make a hole in each end which will allow two rods ⅛ inch in diameter to pass through. The pressure

Handy Inside Calipers

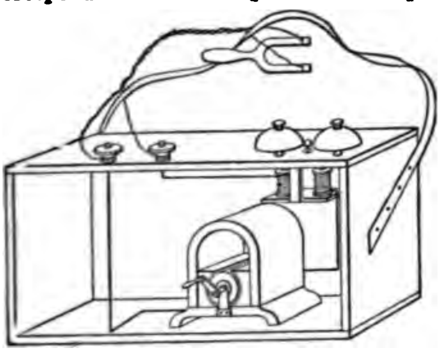
on the rods caused by the spring will be sufficient to hold them firm and they can be adjusted to any inside diameter and the distance measured while they are still in place by a rule, or better still, the rods can have inch marks filed on them.

TO TIGHTEN BABBITT IN A JOURNAL BOX.

Not long ago there was an inquiry as to the best method for tightening babbitt in a journal box. There have been ways and means exploited of doing such work, says the Wood-Worker, but the best way of all is to run a new box, and have the box hot when the metal is poured. To do a job of babbitting and have it theoretically and practically correct, would call for having the box as hot as the metal, so that both might cool and shrink together. That, we know, is out of the question in ordinary practice, but by keeping this fact in mind we are encouraged to have the box as hot as possible when the metal is poured; while, if we do not keep it in mind, we shirk the task of warming the box, till it gets warm weather, and then we only make a bluff at it. This does very well, too, on ordinary shafting, but when we come to machines that run at high speed and tension, the best is none too good, even when its application is to as small a thing as putting metal in a box. Especially should operators of planers take this hint, for while it may worry them temporarily to heat the box hot for running, it will save the chance of enough future worry to pay for it.

QUICK AND EASY METHOD OF TESTING INCANDESCENT LIGHTS.

A convenient testing outfit is made of a generator, a bell from an old telephone box and a wooden fork with metal tips, says a correspondent of The Engineer. The tips of



For Testing Incandescent Lamps

the fork are far enough apart to rest on the binding screws of the rosette and are the terminals of the circuit containing the generator and the bells. Upon turning the generator crank while the fork tips are in contact with the rosette binding screws, the ringing of the bells shows that the lamp and cord being tested are in good order. Always open the switch or remove one of the other lamps before beginning testing.

PLASTER AS A FLUX FOR BRASS.

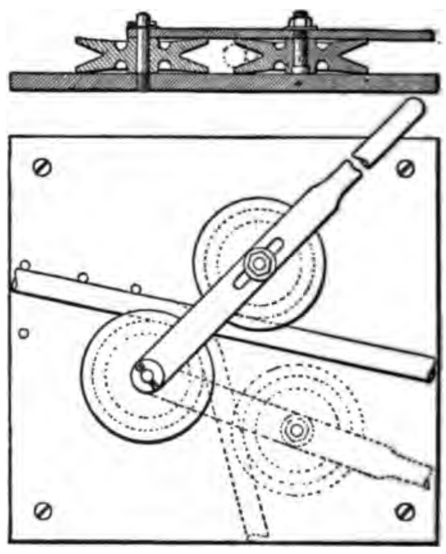
Plaster of paris as a brass foundry flux is strongly recommended by writers on foundry topics, especially where washings, screenings or grindings are to be melted. The method recommended for using plaster of paris for flux in this work is as follows:

Add four or five pounds to 100 pounds of metal, either before the crucible is put into the fire or after it has been in for some time. It is better, however, to have all the flux in the crucible before the metal begins to melt. If possible, it is conducive to better results if the plaster of paris is mixed with the metal and the whole added to the crucible at the same time. Such a procedure insures a more intimate contact with each particle of metal. One need not have any fears about getting a little more than is necessary, as no harm follows, and the flux may be used over again. When the metal is melted and the mass has arrived at a state of complete fluidity, the crucible may be removed from the fire, and the whole mass, flux and all, poured into the ingot moulds. The flux rises to the top, and when cool everything leaves the mould in an excellent manner. Of course the slag may be skimmed off if desired, but as it is usually difficult to completely remove the liquid mass, the former procedure is advocated. The flux does not adhere firmly to the metal, but a few light blows from a hammer always remove it. The flux may be used over several times. So far as the writer's experience has gone, there appears to be no action on the crucible, a feature of the utmost economic importance.

DEVICE FOR BENDING PIPE.

For bending pipe without flattening it the device here shown is one of the best, says a correspondent of The Engineer.

The wheels are made of cast steel and bear on the pipe, top and bottom, thus keeping it from flattening. By this means 1-inch



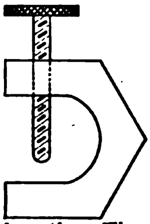
Bending Pipe Without Flattening It

pipe has been bent to a radius of 5 inches and by a little practice it is possible to bend ½ to 1¼-inch pipe to almost any shape.

French morocco which is stamped with stylish designs and sold at a high price in the shape of wall paper, trunk coverings and other articles, is made of old shoes collected in France and sold to factories where they go through a number of processes and come out in the form of paste which is transformed into imitation leather.

A PAIR OF HOME-MADE CLAMPS.

A pair of clamps for small work, for which large clamps would only be in the way, can be made of an old hexagon nut and a bolt.



Cut off two adjoining sides of the nut, as shown in the illustration, leaving that side open. Bore a hole in the middle of one of the edges next the opening, the size of the hole depending on the size of the nut, and screw in a bolt of the proper size and length. The bolt is screwed in contact with the article placed in the clamps. W. K. Smith, of Baltimore, sends us the suggestion.

HOW TO MAKE PAINT ADHERE TO ZINC.

One of our readers, John M. Blake, sends the following:

Some time ago the writer was constructing a piece of apparatus, in which metal zinc was to be the support of a slate surface. This surface was to be made by applying a paint composed of shellac in alcohol, containing pumice stone and lampblack. Just as the affair approached completion, an all-around mechanic, who had become interested, said: "The thing will not work. You cannot make paint stick to zinc."

This remark caused a study of the subject to be in order, and the following experiment was made by the writer:

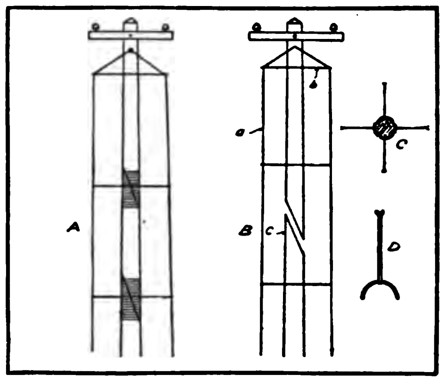
A portion of the "paint" was diluted with alcohol, and the surface of the zinc was well sandpapered while thoroughly wet with the solution—the intention being not to allow any part of the surface to come to the air during, or after the operation of sandpapering. The paint was thick enough to cover securely as it dried. When every part had been gone over carefully, a number of coats were added so as to fill up low places, and the surface was ground with pumice stone.

Time has proved the success of this experiment. Many years have gone by, but the coating holds perfectly, and the matter is now brought forward with the hope that the suggestion may have useful application in ordinary painting. For instance, signs painted upon sheet zinc, clock faces, and perhaps other articles.

The theory upon which this experiment was based is that zinc oxidizes instantly, wherever a fresh surface is exposed to the air. This oxide is so white and thin that it is not visible. Nevertheless, it is present, and forms an unstable attachment for the paint as commonly applied, thus preventing the same from coming in absolute contact with the metal itself. The sandpapering operation under cover of the wet paint, produces a different condition of things.

HOW TO LENGTHEN POLES.

In places on telephone routes where an unusually long pole is needed it is not always necessary to waste time and money in securing one, says the American Telephone Journal. Instead, two or three poles may



Lengthening Poles

be spliced together in the following manner and will be found very strong:

The ends to be spliced together are shaped as at c. They are then tightly bound with wire. At the top of the pole a bolt is driven through and to this four steel wires (a) are attached which are separated by means of spreaders, as shown in Fig. C. Fig. D illustrates the sort of spreader to use. These wires should be brought down to the base of the pole and fastened in a similar manner to that employed at the top. When well done the pole will be as staunch as if it were made of a singe piece of wood. The Fig. A illustrates the use of three poles to secure one long one. The tension wires should be grounded so as to prevent injury from lightning.

HOW TO MAKE A RUST JOINT.

Mix 10 parts iron filings and 3 parts chloride of lime to a paste by means of water. Apply to the joint and clamp up. It will be solid in 12 hours.

PRACTICAL CONDUITS FOR STEAM PIPE.

The best conduit for underground steam pipe is a wooden box large enough to leave two inches of space all around the pipe, [illegible]. When the pipe has been properly tested and made tight fill the space around it with mineral wool, being careful to keep the wool away from the eyes and any cuts or sores on the hands. Do not use wool made from blast furnace slag, as the [illegible] injures the pipe. The best is made from rock. Be sure the box is full

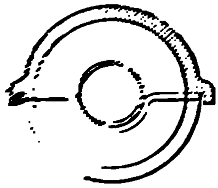


FIG. 2

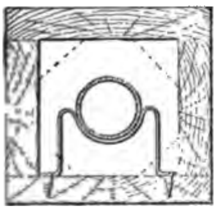


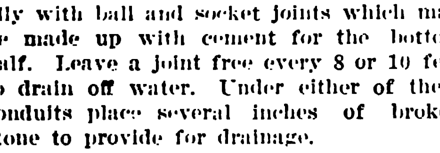
FIG. 1

but do not pack the wool. If the wool is very expensive the corners of the box may be filled as shown in Fig. 1 and the amount needed cut down somewhat. Fasten the cover down with brass screws so that it may be readily removed.

For underground piping in boiler rooms and for long lines of pipe where a permanent conduit is needed Fig. 2 shows an excellent method. It is made of special vitrified tile, like a sewer pipe, split longitudinally with ball and socket joints which may be made up with cement for the bottom half. Leave a joint free every 8 or 10 feet to drain off water. Under either of these conduits place several inches of broken stone to provide for drainage.

AN IMPROVEMENT IN SCALES.

A scale having one or more cross scales marked on vertical lines near its center (A) has recently been patented, says The Patternmaker and will be found useful to the



A Handy Scale

mechanic for many purposes. By laying the scale across the rim of a gear or pulley the height of the hub can be measured on this cross scale.

HOW TO MAKE KNOTS AND HITCHES.

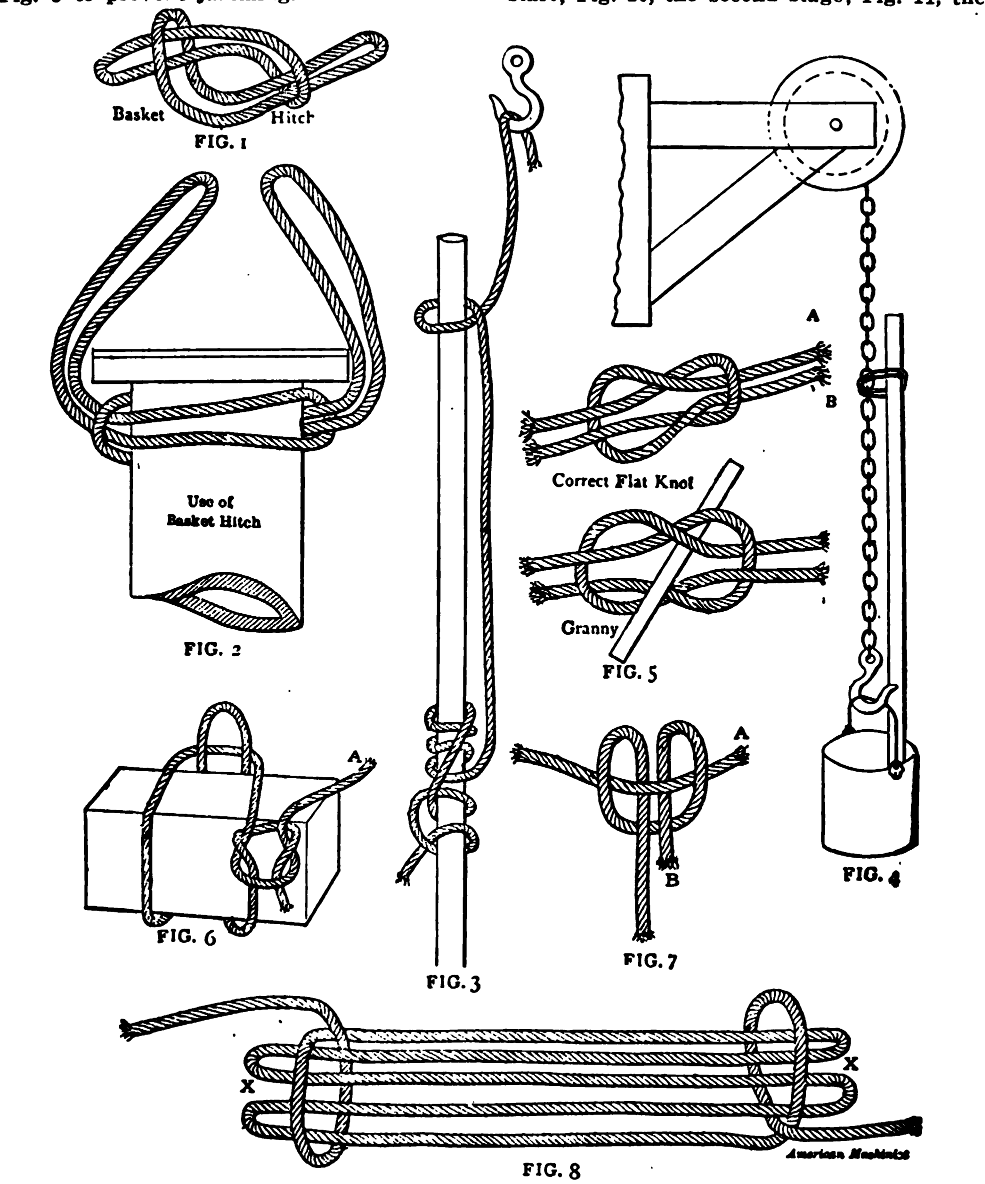
Every machinist and mechanic should be an expert in making knots and hitches. The time lost in fussing with a rope or chain where the workmen do not know what kind of a hitch to use nor how to tie it, amounts to many dollars during the year. Then there is the always present danger of damage to the piece hoisted, and injury to the men engaged in the work, where hoisting is carelessly done. One of the best articles on this subject that has appeared in a long time we extract from the American Machinist. The directions and illustrations are so simple and plain anyone can learn the trick by experimenting with a piece of soft rope. The writer, who is evidently an expert, says:

Fig. 1, made by two endless slings and used as shown in Fig. 2, is a reliable basket hitch when both slings are of equal length, or with one sling long enough to take in one-half of the cylinder's diameter and the other to run through both loops of the smaller and have its own loops catch the chain hook.

Some people hoist a shaft endwise by using a collar or lathe-dog as a safety stay; others use the bitting-rolling hitch shown in Fig. 3, but in one conservative concern whose screw and bolt department, on the fifth floor, is provided with an independent hoist chain, they use the rig shown in Fig. 4. The bucket is hoisted above the floor level and then pulled in as the hoistway is reversed and made to lower away.

It is a very common practice, in the absence of a ready-made endless sling, to tie a flat knot in a short length of rope and use it in lieu of a sling. Be careful to avoid a "granny knot," Fig. 5, which is unsafe and which we all know about; but there is another fool trick that can easily be played with this knot, and I was just chump enough to work it. As it may be new to some of my readers, I will tell you how to get into my class. We were lowering a bed-plate, and as it was going down, to help keep it clear of the building, I took hold of A, Fig. 5 (you might take B, for a change) and gave it a good, strong pull, and down came the bed-plate with a rush. I was too busy saving the pieces just then to figure it all out, but I have since worried it out to this: My pull at A, Fig. 6, caused the loor [illegible] shown [illegible] and tl [illegible] and, presto! the trick was done. In making a flat knot with chains, a piece of pipe or wood should be run into it as shown by Fig. 5 to prevent jamming.

The next is made without passing the end, and provides two loops to which a tackle block can be hooked. Fig. 9 shows the start; Fig. 10, the second stage; Fig. 11, the



KNOTS AND HITCHES.

Fig. 8 shows a good and safe way, known ...shank, of shortening a long rope. ...hat any amount and any ...sed, but it must be ...hat at least a 6- ...at X X is essen-

manner of rolling the two loops into the standing portion of the rope, and Fig. 12, the two loops X X brought vertically down (after rolling) and ready for service. The block or fall must be hooked into *both* loops. The above is a safe and reliable hitch that can be wiggled in at any point in a rope, and besides being perfectly reliable, it is easily and quickly made and unmade.

Fig. 13 is an old and well-known friend of the rigger, but machinists should beware how they use it on Friday, as it has been known to betray a trust.

Fig. 14 is a simple and safe way to take a temporary hold, but as the mere shifting of the weighted loop will suffice to loosen the whole rig, the need of keeping meddlers away must be obvious.

Fig. 15 shows how in using a chain block whose hoisting and lowering range is

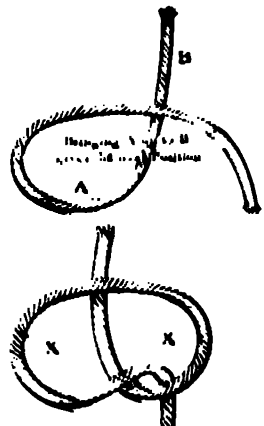


FIG. 9

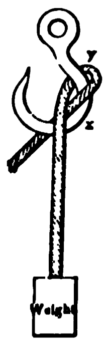


FIG. 13

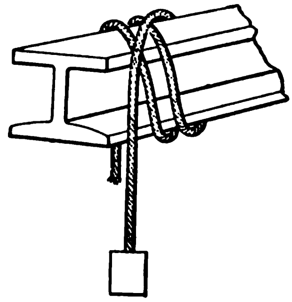


FIG. 14

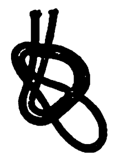


FIG. 16

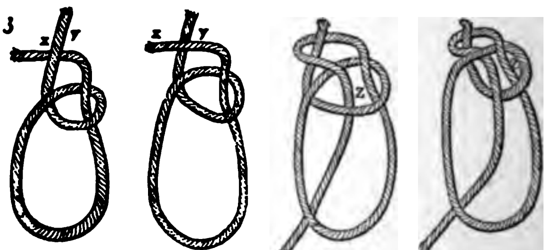
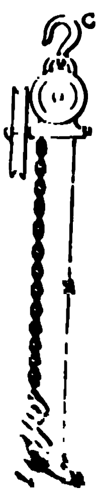


FIG. 17 FIG. 18 FIG. 19 FIG. 20



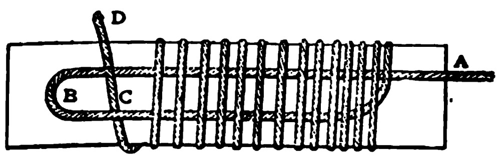


FIG. 21

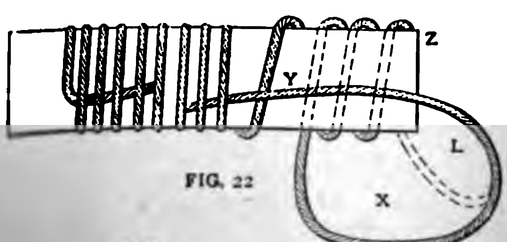


FIG. 22

FIG 23 American Machinist

KNOTS AND HITCHES

A
mark
has recently
termaker

mechanic for
the scale across the
the height of the
this cross scale.

necessarily confined to the limit of its chain length, the weight may be raised or lowered to any distance. Thus in Fig. 15 the chain travel is only 10 feet, but the weight has to be raised 20 feet. We lower the chain and hook into the rope at A, hoist the 10 feet and make the free rope's end B fast to any convenient projection overhead (if necessary, even to the chain block's suspending hook C). We now unhook and lower the chain again for its new *previously prepared hold* lower down, as at D, and up she goes, the 20 feet, or any other old distance. We emphasize *previously prepared hold* advisedly, as, if not so prepared, it will be found impossible to wiggle in a hold for the hook in the tautened rope. Fig. 13 cannot be used for second holds, and positively must not be used as a starter, or first hold, because, after fastening at C, it will be found both hard and dangerous to slip the hook out of it.

Either the doubled-up, non-slipping loop, Fig. 16, or bowlines should be used all along the line.

Speaking of bowlines, the slack line X may go either in front or back of the standing rope Y, as shown in Figs. 17 and 18; but in either case, after going around Y, it must be passed through the loop Z in the manner shown at Fig. 19. Passing it through as shown at Fig. 20 cuts out the non-slipping feature and reduces the bowline to a farce.

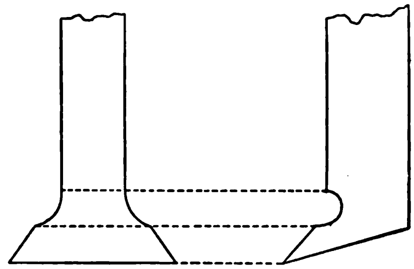
A broken hammer handle, a split monkey-wrench handle, etc., may be nicely repaired by the endless-wound splice, Fig. 21. The make-up is, we think, pretty clear as shown, and it is evident that by pulling at A the loop B will make a similar loop in D at C, and that continued pull will draw the crossed loops out of sight. The loop ends may then be closely cut off.

Fig. 22 is preferable for extra neat work, in that it does away with the bulge caused by the crossed loops. Until the loop X is got to all is plain sailing. The rope Y must then be held steadily in its place on the stick Z while the loop is swung around both it and the stick, as shown by the dotted outline. Only at the finish (shown in Fig. 23) should Y be allowed to move. Then it, as a part of loop L should be swung round the stick as shown at N. Setting the coils close -ing up at M completes the job.

-d above all, in using ropes do -- burlap, even to be had, should always be interposed between a rope and all hard, angled, even if not sharp, edges.

A PLANER TOOL.

A handy planer tool for facing is made as shown herewith. This tool can be used



Handy Planer Tool

for either right or left-hand, or for both if need be. W. K. Smith, of Baltimore, contrived the tool.

RECIPE FOR TEMPERING CHISELS.

The following tempering recipe is sent us by a subscriber.

To 3 gallons water add 3 ounces spirits nitre, 3 ounces white vitriol, 3 ounces sal. ammoniac, 3 ounces alum, 6 ounces salt with a double handful of hoof parings. Heat tool to cherry red. This has put new life in steel that has apparently been burned, and is used to temper chisels for cutting French burr stones.

HOW TO TEMPER KNIVES.

After forging the knife to the shape and size desired make a box large enough for it and 4 inches deep. Fill the box two-thirds full with barrel salt and make a little trench in the salt. Heat the knife from the back cherry red; place it in the trench of salt, edge down; and cover it with salt. Let it remain until cool when it may be ground.

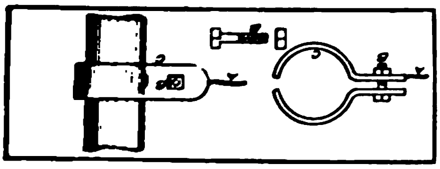
CONTRIBUTIONS INVITED.

Our readers are invited to send in any new kinks which would be of service to others. When you happen on something good in your own experience let us give others the benefit of your skill.

Use smoked shellac for cementing jet, first warming the broken edges.

MAKING GOOD GROUND CONNECTIONS.

For making ground connections to pipes the method here shown is especially good. The pipe should be thoroughly cleaned and brightened and then the simple clips



Good Ground Connection to Pipes

shown in the diagram fastened on. Use the nuts and screws from worn-out dry batteries for fastening the clamps to the pipe. The device can be readily removed for cleaning, says the Telephone Journal.

TO CONVERT A STEAM RADIATOR INTO A BAKE OVEN.

[illegible] to make various [illegible] following description [illegible] there is not suffi[illegible], and again it may [illegible], consequently a [illegible] along without it.

[illegible] repair man requires an [illegible] field coils and arma[illegible] varnishes, for [illegible] take the word of any one [illegible] of such an important article.

The [illegible] should be 3 inches wide and 32 [illegible] or its equivalent, to obtain a [illegible] of 150 deg. Fahr., which is the [illegible] perature allowable for insulating [illegible].

Nail strips of wood on the floor on at least three sides of the radiator. Make the oven from sheet [illegible] set it down over the radiator. Fasten to the strips of wood with screws. There should be at least 10 inches air space above the radiator. Have a hinged door in the upper part of the front of the oven, with a clasp for locking. Fit the cork holder of a varnish can in the top of the oven, to retain a cork through which there is a hole to receive a tube thermometer. This is always a necessity. Heavy iron wire can be fastened from end to end of the oven on which samples can be placed to dry.

By leaving it uncovered, the oven will not cut off too much heat in winter. During this time, when not in use, the door may be left open.

Pieces of paper dipped in insulating varnish can be hung on the wires to make the heat test. Armalac and like varnishes are similarly tested. Endurance tests are make in this way for a period of two or three weeks.

FIRST THINGS TO DO IN CASE OF SPRAINS OR DISLOCATIONS.

The most important thing is to secure rest until the arrival of the surgeon. If the sprain is in the ankle or foot, place a folded towel around the part and cover with a bandage. Apply moist heat. The foot should be immersed in a bucket of hot water and more hot water added from time to time, so that it can be kept as hot as can be borne for fifteen or twenty minutes, after which a firm bandage should be applied (by a surgeon, if possible) and the foot elevated.

In sprains of the wrist, a straight piece of wood should be used as a splint; cover with cotton or wool to make it soft, and lightly bandage, and carry the arm in a sling. In all cases of sprain the results may be serious, and a surgeon should be obtained as soon as possible. After the acute symptoms of pain and swelling have subsided, it is still necessary that the joint should have complete rest by the use of a splint and bandage and such applications as the surgeon may direct.

Simple dislocation of the fingers can be put in place by strong pulling, aided by a little pressure on the part of the bones nearest the joint.

The best that can be done in most cases is to put the part in the position easiest to the sufferer, and to apply cold wet cloths, while awaiting the arrival of a surgeon.

HUNT'S TEMPERING RECIPE.

For heavy planer or lathe tools, when steel has been selected at random and is found a little too low in hardening properties for the purpose, to one pail of water (soft), add 1/4 pound cyanide potassium, 1 pound salt, 1 dessert spoonful oil of vitriol. Draw the temper slightly.

FILLING AUTOMOBILE TIRES.

A fluid is now used for filling automobile tires and it can be injected without [illegible] being removed. [illegible] owner of th[illegible]

SHOP NOTES

HANDY HOME-MADE BAG-HOLDER.

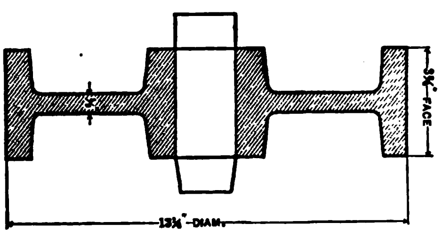
A firm standard supporting a wooden hopper of convenient size and provided with

iron hooks on which to hang the bag constitutes this convenient bag-holder. Any workman, shop-keeper or farmer can build it out of a few pieces of wood with little trouble and no expense and will find it a time and temper-saving device forever afterward.

MAKING A FRICTION WHEEL PATTERN IN SHORT TIME.

A customer wanted a friction wheel and two castings made in a hurry one afternoon, says a correspondent of The Patternmaker, and the pattern was rushed out in one hour and twenty minutes by the following method:

"Planed out a piece the right thickness for web, bored a small hole through at center for divider points and struck a circle on each side to nail segments to. Sawed four segments for each side accurately to line on inner diameter and to the right bevel for draft. Sawed a hub for each side with proper draft. Sawed two sets of prints, one 2 inches in diameter, one 1¼ inches in diameter. Segments were nailed to each side of web, drag hub nailed on carefully in

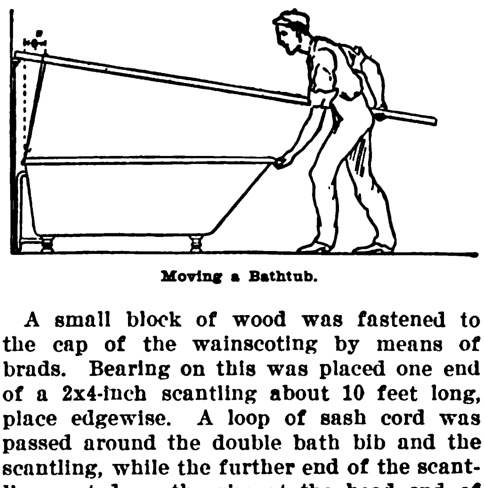


Emergency Pattern.

...ents ...easuring from inside diameter of ... Outside diameter of wheel was ... this hub center and the ... sawed with proper ... in center of loose hub and dowels in center of all prints and holes bored in hubs to match, so that molder could change them at foundry. Saw was in excellent order and no sandpapering was done. Putty fillets were put in, a coat of varnish was put on and the pattern sent to the foundry.

HOW ONE MAN MOVED A BATHTUB IN A TIGHT CORNER.

Disconnecting and resetting a 6-foot porcelain enameled bathtub, the foot end of which stood in a close-fitting recess for a distance of two feet, is hardly a job that any plumber would care to tackle alone, but a correspondent of the Metal Worker, Plumber and Steam Fitter tells how he did it.



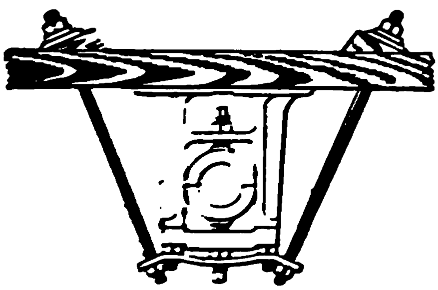
Moving a Bathtub.

A small block of wood was fastened to the cap of the wainscoting by means of brads. Bearing on this was placed one end of a 2x4-inch scantling about 10 feet long, place edgewise. A loop of sash cord was passed around the double bath bib and the scantling, while the further end of the scantling rested on the rim at the head end of the tub. Standing at the head end of the tub, and raising the end of the scantling with the right hand, the foot end of the tub was easily lifted. With the left hand lifting the rim of the tub at the head end, the tub swings clear, and may be moved to either side or endwise at will. The endwise movement is obtained by shifting the loop of rope out of the perpendicular on the scantling in either direction.

The bathtub when lifted with the rope in the position shown in the sketch will move six inches toward the plumber.

REINFORCING A SHAFT HANGER.

Irregular impulses from the engine will often cause shafting to break down, causing much damage and endangering lives. The method here shown of reinforcing the shaft hanger was used by a correspondent of the Engineer, and effectually overcame the

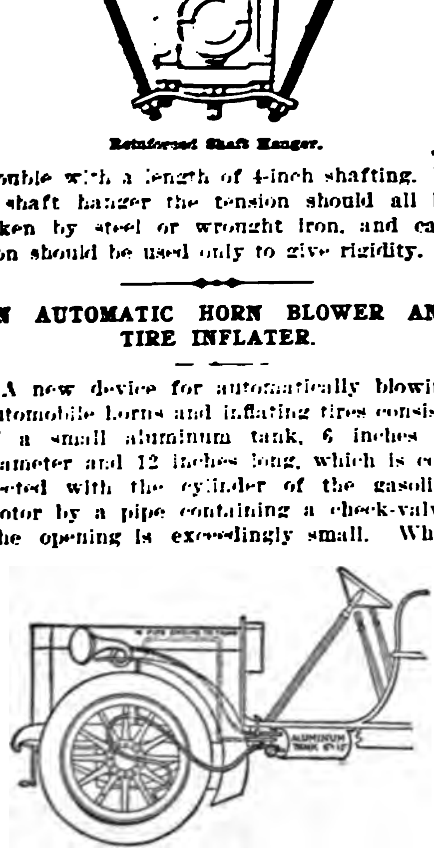


Reinforced Shaft Hanger.

trouble with a length of 4-inch shafting. In a shaft hanger the tension should all be taken by steel or wrought iron, and cast iron should be used only to give rigidity.

AN AUTOMATIC HORN BLOWER AND TIRE INFLATER.

A new device for automatically blowing automobile horns and inflating tires consists of a small aluminum tank, 6 inches in diameter and 12 inches long, which is connected with the cylinder of the gasoline motor by a pipe containing a check-valve. The opening is exceedingly small. When



Automatic Horn Blower.

an explosion takes place a minute quantity of gas finds its way into the tank, where it is kept under pressure until wanted for use. By pressing a foot button a whistle can be blown, and a hose connection is provided for inflating tires. The same outfit is used with some modifications, for sounding whistles in motor boats.

ESTIMATING THE HORSEPOWER OF STEAM ENGINES.

When steam engines were first introduced they were largely used to take the place of horses, previously employed for raising water from mines. Naturally the people would inquire, when buying an engine, what amount of work it would perform as compared with horses. The earliest engine builders found themselves very much at a loss to answer these questions. Their first business, therefore, was to ascertain how much a horse could do.

The most powerful draught horses and the best of any then known were the London brewers' horses. These, it was ascertained, were able to travel at the rate of two and a half miles per hour and work eight hours per day. The duty in this case was hoisting a load of 150 pounds out of a mine shaft by means of a cable. When a horse moves two and a half miles per hour, he travels 220 feet in a minute, and, of course, at the speed named, the 150-pound load would be raised vertically that distance. That is equal to 300 pounds lifted 110 feet per minute, or 3,000 pounds lifted 11 feet, or 33,000 pounds one foot high in one minute. That is the standard of horsepower, as we all know. It is much more, however, than the average horse can do, and therefore the engine builders were confident that the engines would take the place of fully as many horses as the horsepower would indicate that they should.

Of course, 33,000 pounds lifted 1 foot per minute is much more convenient for calculation than 150 pounds lifted 220 feet, and therefore the former has been adopted. The amount of work, or number of foot pounds, is the same in either case. A foot pound represents the amount of power required to lift one pound one foot high. To find the number of horsepower in any engine, we multiply the area of the piston by the average pressure per square inch upon the piston, multiply this result by the distance which the piston travels per minute in feet, and the result is the number of foot pounds per minute which the engine can raise. Divide by 33,000 and the result will be the number of horsepower. The number of feet per minute traveled by the piston is twice the number of strokes per minute multiplied by the length of the

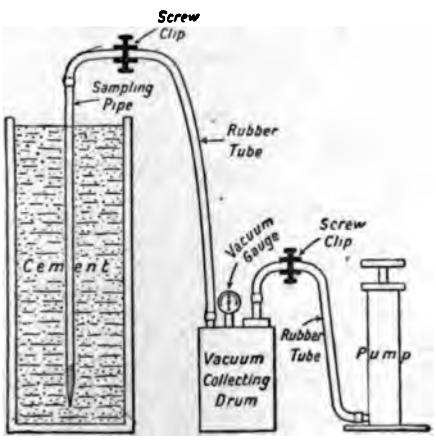
This gives the number of h

ciently acc

MACHINES FOR SAMPLING CEMENT.

An English device, lately patented, takes a sample of cement from any given batch with great simplicity of operation and accuracy.

The apparatus consists first of a small iron pipe some ⅝ inch in bore, with one end closed and drawn to a point. The other end is open, and to it can be attached a length of rubber tubing. The pointed end of the pipe has a number of small holes pierced in it, and to take a sample this tube is thrust into the heap of cement. It may be pushed in at any angle from vertical downwards. The india-rubber tube above referred to is connected to a drum provided with an opening covered with a screw cap, the whole being made air-tight. The apparatus is completed by means of an exhausting pump which may either be worked by hand or by a small motor. In the apparatus first tested an ordinary hand and foot pump was used. It was also connected to the drum by a length of rubber tubing. Each length of rubber tubing was provided with a screw slip, which could be

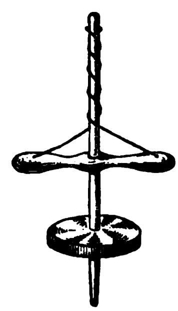


Cement Sampling Apparatus.

made to nip the tubing so tightly that no air could get past. In the tests the heap of cement was represented by a vertical box, some 9 inches square, and filled with cement to a depth of nearly 6 feet. This is about the limit of depth to which the apparatus may be applied with success, but a depth of ... all practical purposes. ...n pipe was plunged ...the box of cement. ...hich is forced ...e lower end ...small that it may be neglected. The clip on the rubber tube joining the sampling pipe with the drum was then screwed up. A man then worked the pump, and exhausted the drum until a vacuum equal to some 18 or 20 inches of mercury had been produced, when the clip on the tube between the drum and the pump was screwed up, so that any tendency to leakage through the pump valves might be counteracted. The drum had fitted to it a gauge, so that the amount of vacuum in it might be readily seen. The clip on the tube between the sampling pipe and the reservoir drum was then unscrewed, with the result that a certain amount of cement was drawn through the small holes in the sampling pipe, up through the latter, and then conveyed thence through the rubber tube to the reservoir. The whole process takes but a minute or two, and the amount drawn into the reservoir varies with the vacuum produced. In the tests several pounds of cement were drawn over each time. Several samples may be taken if desirable, and the whole operation requires but half an hour.

DRILLING HOLES IN GLASS.

One of our readers, Frank F. France, Plattville, Wis., writes: I see in your August number an article on how to bore holes in glass. Another way which I have used is to just make a pump drill, as in illustration, then lay the glass on a level table and lay a board over the glass. The board must have a hole bored just the size you want your hole in the glass; then lay the board on the glass with the hole in the board over the spot and clamp to the table so it is solid, then put a small pinch of sand in the hole in the board and drill part way on each side and you will have the hole in the glass. Remember the oak stick in the drill is almost the same size as the hole in the board. Put fresh sand in the hole frequently.



HOW TO SOFTEN FILES.

To soften small files cover them with oil and hold them over a fire until the oil blazes. As soon as the flame runs all over the file, plunge it into water.

... SHAFTING.

... means of rope ... a rest at any ... there are several

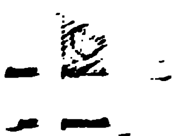


Fig. 1. ...

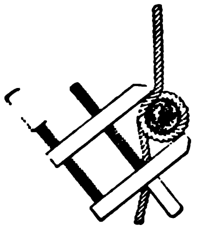


Fig. 2. The Probable Result.

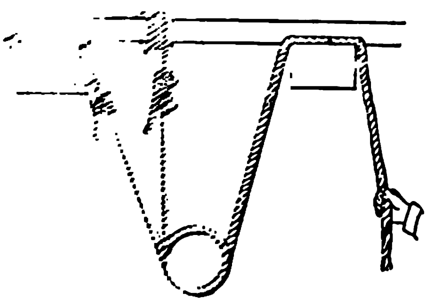


Fig. 3. ... With a Safety Rope Added.

... but some are not as ... at first appear.

... method of clamping the ... which is not to be de- ... probable result is shown

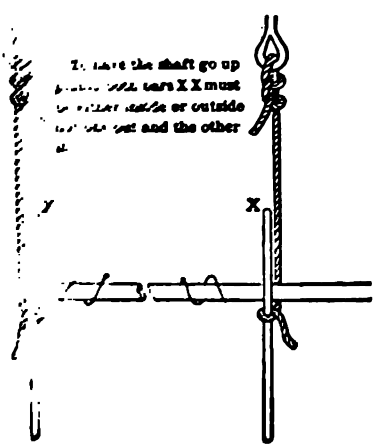


Fig. 4. Hoisting With Two Ropes.

in Fig. 2. Against the peculiar pull made by a heavy shaft while being lowered it is to be doubted whether any wooden clamp yet devised would hold, says a correspondent of the American Machinist.

Fig. 3 shows a safe and easy method of holding the shafting at any point. If there is only one pulley on the shaft, two safety lines may be used, one at each end and the rolling hoist rope in the middle.

If the piece to be hoisted is exceptionally heavy and lacking a pulley large enough to serve as a hoist lever, any bar or piece of timber may be used as shown at Fig. 4.

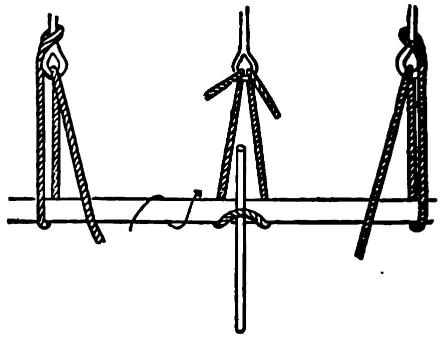
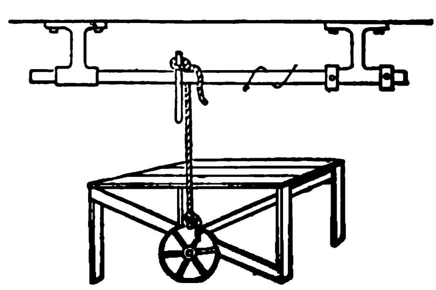


Fig. 5. One Hoist and Two Safeties.

If the center hoist and two-end safety-line way is used, with a bar or even a pulley, try to make it work centrally, as shown by Fig. 5.

Where an extra large and heavy pulley countershaft is to be hung on a very high ceiling and rolling must be resorted to, for lack of head room or suitable tackle, the inadvisable, because most hazardous, rolling from ladders can be done away with as in Fig. 6. The hangers being up, place the stripped shaft in the bearings and adjust the collars. Tie a rope's end to the pulley on the floor, pass the other end over the



shaft, run a bar through a bow-line in the rope and hoist the pulley to the staging from which the counter was put up. When everything is on the scaffold take the shaft out, assemble the counter and hoist it into place the rest of the way in the regular manner.

BORING HOLES IN GLASS.

Holes of any size desired may be bored in glass by the following method: Get a small 3-cornered file and grind the points from one corner and the bias from the other and set the file in a brace, such as is used in boring wood. Lay the glass in which the holes are to be bored on a smooth surface covered with a blanket and begin to bore a hole. When you have made a slight impression on the glass place a disk of putty around it and fill with water to prevent too great heating by friction. Continue boring the hole, which will be as smooth as one bored in wood with an auger. Do not press too hard on the brace while boring.

AN EXCELLENT SOLDERING SOLUTION.

For general soldering and for soldering galvanized wire points in particular, the Telephone Journal gives the following recipe:

"Take a wide necked, 6 ounce bottle, and pour in about 2 or 3 ounces of hydrochloric acid. Drop into the bottle a dozen or two small pieces of zinc, preferably granulated and wait until all ebullition ceases. In using either a solution or a stick flux, apply the heat to the middle of the joint, as the solder must run there first to obtain strength and solidity. Too much heat will anneal the wire and weaken the line. Wipe the joint free of all acid after soldering, or corrosion will follow."

HOW TO MAKE A USEFUL SOFT ALLOY.

A soft alloy which will adhere tenaciously to metal, glass or porcelain, and can also be used as a solder for articles which cannot bear a high degree of heat, is made as follows:

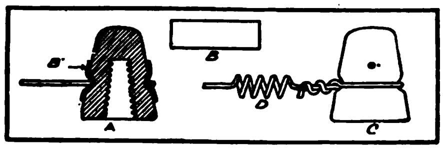
Obtain copper-dust by precipitating copper from the sulphate by means of metallic
... from 20 to 36 parts of the cop-
...ording to the hardness de-
...in-lined mortar, and mix
...c acid of a specific gravity of 1.85. Add to this paste 70 parts of mercury, stirring constantly, and when thoroughly mixed, rinse the amalgam in warm water to remove the acid. Let cool from 10 to 12 hours, after which time it will be hard enough to scratch tin.

When ready to use it, heat to 707 degrees F. and knead in an iron mortar till plastic. It can then be spread on any surface, and when it has cooled and hardened will adhere most tenaciously.

TO STOP THE HUMMING OF WIRES.

The humming sound made by telephone lines is often very annoying and there are two easy methods of stopping it, says the American Telephone Journal.

Take a piece of rubber, B, long enough



To Keep Wires from Humming.

to go around the insulator and place it in the groove, as shown at B′, Fig. A. Put on the wire and fasten in the usual manner.

Another method is shown in Fig C. Make a spiral of line wire about 2 feet long, D, and arrange it about 10 feet from the insulator. This takes the strain off the insulator during a high wind, also.

UMBRELLA JOINTS NEED OIL.

One never thinks of bestowing any especial care on his umbrella, and that is the reason the ribs break in a strong wind when the owner least expects it. The joints of an umbrella should be oiled first with coal oil or kerosene to clean off the rust, and then lubricating oil should be applied to make them work easily.

A GOOD QUICK-DRYING CARRIAGE VARNISH.

Boil together for four hours 8 pounds of fine pale gum anime, 2 gallons of clarified oil and 3½ gallons of turpentine. Strain, put into the two former pots and mix well together. It will cause the paint to dry more quickly and firmly and will enable it to take on polish quickly.

Knots and Miles.

Knots	Miles	Knots	Miles	Knots	Miles	Knots	Miles	Knots	Miles
1.00	1.1515	6.00	6.9091	11.00	12.6667	16.00	18.4242	21.00	24.1818
1.25	1.4394	6.25	7.1970	11.25	12.9545	16.25	18.7121	21.25	24.4697
1.50	1.7273	6.50	7.4848	11.50	13.2424	16.50	19.0000	21.50	24.7576
1.75	2.0152	6.75	7.7727	11.75	13.5303	16.75	19.2879	21.75	25.0455
2.00	2.3030	7.00	8.0606	12.00	13.8182	17.00	19.5758	22.00	25.3333
2.25	2.5909	7.25	8.3485	12.25	14.1061	17.25	19.8636	22.25	25.6212
2.50	2.8788	7.50	8.6364	12.50	14.3939	17.50	20.1515	22.50	25.9091
2.75	3.1667	7.75	8.9242	12.75	14.6818	17.75	20.4394	22.75	26.1970
3.00	3.4545	8.00	9.2121	13.00	14.9697	18.00	20.7273	23.00	26.4848
3.25	3.7424	8 25	9.5000	13.25	15.2576	18.25	21.0152	23.25	26.7727
3.50	4.0303	8.50	9.7879	13.50	15.5455	18.50	21.3030	23.50	27.0606
3.75	4.3182	8.75	10.0758	13.75	15.8333	18.75	21.5909	23.75	27.3485
4.00	4.6061	9.00	10.3636	14.00	16.1212	19.00	21.8788	24.00	27.6364
4.25	4.8939	9.25	10.6515	14.25	16.4091	19.25	22.1667	24.25	27.9242
4.50	5.1818	9.50	10.9394	14.50	16.6970	19.50	22.4545	24.50	28.2121
4.75	5.4697	9.75	11.2273	14.75	16.9848	19.75	22.7424	24.75	28.5000
5.00	5.7576	10.00	11.5152	15.00	17.2727	20.00	23.0303	25.00	28.7879
5.25	6.0455	10.25	11.8030	15.25	17.5606	20.25	23.3182	25.25	29.0758
5.50	6.3333	10.50	12.0909	15.50	17.8485	20.50	23.6061	25.50	29.3636
5.75	6.6212	10.75	12.3788	15.75	18.1364	20.75	23.8939	25.75	29.6515

Table Showing Knots Reduced to Miles.

A nautical mile or knot is 6,080.27 feet. For the benefit of those who are interested in the speed of sailing craft of all kinds, the Motor Boat has compiled a table of ready reference in which the various number of knots are reduced to land miles. The table will save a lot of figuring which would otherwise be necessary.

HOW TO CALCULATE SPEED.

To find the speed of a countershaft, if the revolutions of the main shaft and size pulleys are given: Multiply the revolutions of the main shaft by the diameter in inches of the pulley, and divide by the diameter in inches of the pulley on the countershaft; the quotient will be the number of revolutions, says the Practical Engineer.

Example:—What will be the speed of a countershaft with a 12-inch pulley, driven by a 30-inch pulley 180 revolutions per minute? 180 × 30 ÷ 12 = 450.

To find the size of a pulley required, if the number of revolutions and size of pulley on the main shaft are given: Multiply the diameter in inches of driving pulley by the revolutions of the main shaft, and divide by the speed required; the quotient will be the diameter in inches of the pulley.

Example.—What will be the diameter of a pulley to make a countershaft turn 450 revolutions per minute, driven by a 30-inch pulley 180 revolutions per minute? 180 × 30 ÷ 450 = 12-inch pulley.

To find the size of a pulley for a main sh[illegible] the speed of shafts and diameter of the pulley on the countershafts are given: Multiply the diameter in inches of pulley by speed of the countershaft, and divide by the revolutions of the main shaft; the quotient will be the diameter of pulley.

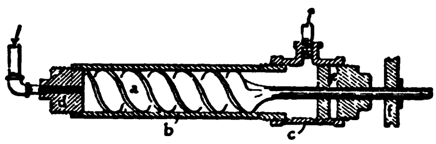
Example.—What will be the diameter of a pulley on a main shaft making 180 revolutions per minute to drive 12-inch pulley 450 revolutions per minute? 450 × 12 ÷ 180 = 30-inch pulley.

A BLACK PAINT FOR IRON.

A good cheap black paint for iron work is prepared as follows: Solid wood tar, 10 pounds; lampblack or mineral black, 1¼ pounds; oil of turpentine, 5½ quarts. The tar is first heated in a large iron pot to boiling, or nearly so, and the heat is continued for about four hours, says Lead and Zinc News. The pot is then removed from fire out of doors, and while still warm, not hot, the turpentine mixed with the black is stirred in. If the varnish is too thick to dry quickly, add more turpentine. Benzine can be used instead of turpentine, but results are not so good. Asphaltum [illegible] erable to the cheap tar.

HOW TO MAKE A ROTARY OIL PUMP.

A rotary oil pump is simply and easily made. Place a ¾-inch auger bit (a), such as carpenters commonly use, inside a piece of ¾-inch brass pipe (b). Make connection at d by a plug turned down, threaded



A Rotary Pump.

and screwed into the threads cut into the end of the pipe and by the wall tee (c). Make a stuffing box (e) by sawing a plug in two parts and drilling a hole for the shank of the auger; f is the pulley belt. The pump should be driven at about 500 to 1,000 revolutions per minute, says Power.

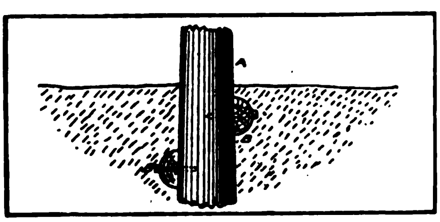
A GOOD RECIPE FOR HEAT-PROOF PAINT.

A good cylinder and exhaust pipe paint is made as follows:

Two pounds of black oxide of manganese, 3 pounds of graphite and 9 pounds of terra alba, thoroughly mixed. Add a compound of 10 parts of sodium silicate, 1 part of glucose and 4 parts of water, until the consistency is such that it can be applied with a brush.

UNDERGROUND BRACES FOR POLES.

In constructing telephone lines there are sometimes places where it is impossible to support a pole with guy wires. To meet this difficulty, says the American Telephone Jour-



Bracing Poles Without Guy Wires.

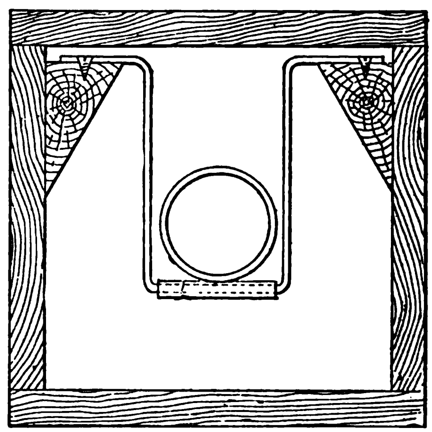
nal, underground pole braces are the proper support.

Two logs, B B, about five feet long, are shaped as illustrated and then bolted to the pole; the earth is then thoroughly tamped [illegible] them. A filling of stone will secure [illegible] firmly and in marshy [illegible]nstruction would [illegible]ful.

When the logs are used in place of guy wires they should be placed as nearly at right angles to the direction of strain as possible, to secure the best results.

SUPPORTS FOR UNDERGROUND STEAM PIPE.

The following method of supporting underground steam pipe is highly recommended by a correspondent of Power: The pipe rests on a roller. A piece of iron rod of the proper length is selected and passed through a piece of iron pipe about the length of the diameter of the steam pipe; the iron rod is then bent and fastened as shown.



Laying Steam Pipe Underground.

Steam pipe for underground use should be carefully selected and the joints well made to prevent leakage; it is a good plan to use a mixture of graphite and cylinder oil in screwing up the connections. The best covering is made by laying cement mortar in the bottom of the trench and pressing into it a V-shaped wooden box, into which the pipe is laid. Over this place another wooden box and cover the whole with cement mortar, laying the bottom, top and sides of the cement all at the same time, so that one part will not set before another. The cement should set thoroughly before the steam is turned on. When there are bends in the pipe it should be provided with expansion joints and stop valves.

When cutting rubber sheets (sheet packing) dip the knife in water frequently and the work will be more easily done.

A HANDY TIRE BOLTER.

Twice the amount of work one can do by hand can be done by the use of the tire bolter here shown, says a correspondent of the Blacksmith and Wheelwright. The machine is run with a 1½-inch loose belt and a tightener and a 5-horsepower gasoline engine for power.

Attaching Power to a Tire Bolter.

Referring to the figure: A is a 16-inch pulley with a 3-inch face and two bands of 1x¼-inch iron shrunk around the edge of the wheel to keep the belt from slipping. B is an 8-inch drive pulley with a 4-inch face. C is the tightening pulley, three inches in diameter and having a 4-inch face ·ı flange on each edge. D is a spring that regulates the tightener and the brake. E is the brake that prevents the machine from turning when not at work. F is the treadle which is used to regulate the speed.

THE USE OF BAYBERRY WAX IN PATTERN MAKING.

The finishing of metal patterns is quite a question, especially in shops where a comparatively small number are made. Bronze patterns retain a very good surface without the use of any lacquer whatever, but in the case of iron patterns it is necessary to provide some coating for the surface of the pattern, says the Pattern Maker. If the iron is thoroughly cleaned and then coated with a solution made by dissolving bayberry wax in benzine or gasoline, it will be found that as the benzine or gasoline dries off it leaves a good firm coating of the wax, which gives a good surface and one that will wear well.

PAINT FOR WOOD OR STONE THAT RESISTS ALL MOISTURE.

The following recipe for a waterproof paint for wood or stone is given in the Architect and Builder:

Melt 12 ounces of resin; mix with it thoroughly 6 gallons of fish oil and 1 pound of melted sulphur; mix some ochre or any other coloring substance with a little linseed oil, enough to give it the right color and thickness; apply several coats of the hot composition with a brush. The first coat should be very thin.

HOW TO MEND RUBBER ARTICLES.

Clean off any particles that may adhere to the rubber and then dry the article or piece thoroughly. Emery paper or a file will remove varnish from rubber, and the part from which the varnish has been removed should then be rubbed over with benzine. Paint the edges of the hole with a solution of Para caoutchouc in benzine and lay over it a strip of natural rubber to fit. Then apply to the edges a solution of 400 parts of benzine, 300 parts of carbon disulphide, and 18 parts of sulphur chlo
Apply by means of some cotton
to a wooden holder. The solv
canize and increase th
rubber. Press the :
gether.

SHOP NOTES

A BOILER GOING INTO DISUSE.

A boiler when about to be laid up for a season should be thoroughly cleaned on the inside, filled with water with steam on so as to be full of hot water that has been boiled, up to the safety valve. The flues and fire surface of the boiler should then be cleaned and ashes and soot removed from every part where such have lodged. Then close fire doors and ash pit, and put a cap on the smokestack. With this treatment laid-up boilers do not rust inside or outside. It is the moist air drawn through a laid-up boiler that does damage by rust.

IMPROVISED AIR COMPRESSOR.

Having been working fifteen miles from a railroad station in Alabama, putting in water pipes in a house, one day my blow-pipe attachment to the firepot broke. After finding that I could not mend it, I constructed the "air compressor" shown in the accompanying illustration.

Securing an old lard can (designated B in the drawing), I cut the hole "A" in the side of it where the lid was formerly placed. Next I punched a hole into the side down near the bottom and inserted the tube "D." Then I got a wash tub "C" and filled it nearly to the rim with water, and taking the lard

Emergency Air Compressor

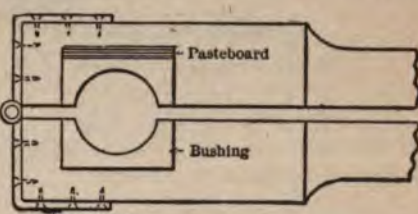
can and putting it upside down into the water and pressing it downward, the air came out of the tube "D," being forced up by the water pressure which entered the can at the inlet "A." I then attached a ⅜-inch rubber tube to the outlet "D" and the other end of the tube to the firepot, and I had an excellent pressure.

THE PLUMBER.

A CONVENIENT POLISHING CLAMP.

A polishing clamp which would be hard to improve upon in point of convenient features was contrived by a correspondent of the American Machinist.

The jaws or levers of the clamp are cut out so that a square block of standard size fits in snugly. Instead of boring a hole in the levers which would fit but one



A Polishing Clamp Improved

size of shaft, the hole is bored in the square block, and other blocks having other sized holes may be fitted in as required. In this way if a hole becomes so worn as to be unfit for further use the block may be discarded and a new one provided, or pieces of cardboard may be packed in between the bushing and the lever until the levers are held as far apart as they were in the first place, whereas without the blocks the whole clamp would have to be discarded.

Another good feature of this clamp is the manner in which the levers are joined. Instead of a strip of leather tacked to the wood, an ordinary iron hinge is used, the ends of which are bent to conform to the shape of the lever ends.

SOLDER FOR SEALING CANNED GOODS.

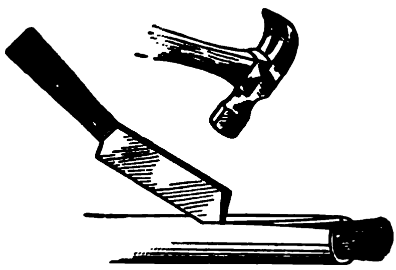
A good solder for sealing the tops of canned goods is made as follows: Melt 1¼ pounds of lead, add 2 pounds of tin, and then stir in thoroughly 2 ounces of bismuth. This makes a soft solder, and a very little heat will open the cans when desired.

TINNING BRASS AND COPPER.

Boil the article to be tinned with tin filings and caustic alkali or cream of tartar. The tinning will be perfect.

CABLE-SHEATH-CUTTING KNIFE.

A new invention on the market, which is filling a long-felt want with telephone men and all those who have to do with the laying of cables, is a knife for cutting cable sheaths. The knife is very simple to operate and does the work quickly and neatly. The illustration explains its use fully.



Knife for Cutting Cable Sheath

ISAAC BABBITT DID NOT INVENT BABBITT METAL.

The soft alloy called Babbitt metal was not invented by Isaac Babbitt, as many infer. Instead Mr. Babbitt only invented the method of using the alloy in journal boxes, with which method the alloy became so closely associated that it naturally came to pass that it was called Babbitt metal. The metal he recommended was britannia metal, pewter, or an alloy of tin 50 parts, antimony 5 parts, and copper 1 part, an alloy somewhat softer than that now known as Babbitt metal, which is composed of tin 96 parts, antimony 8 parts, and copper 4 parts. The idea of using it was much the same, however—that is, to make a bearing which would conform to the surface of the axle.

Isaac Babbitt was born in Taunton, Mass., July 26, 1779. He learned the goldsmith's trade, and in 1784 made the first britannia ware which was produced in this country. This enterprise was not successful, however. He moved to Boston, entered the employ of the South Boston Iron Works, and in 1839 produced his great invention, for which he was given a medal from the Massachusetts Charitable Mechanics' Association, while Congress granted him a reward of $20,000. The invention was patented in England in 1844, and in Russia in 1847. He spent some time in the production and then manufactured soap. His life had an unhappy ending, for he died insane at the McLean Asylum, Somerville, Mass., on May 26, 1862.

HOW TO CLEAN SPARK PLUGS.

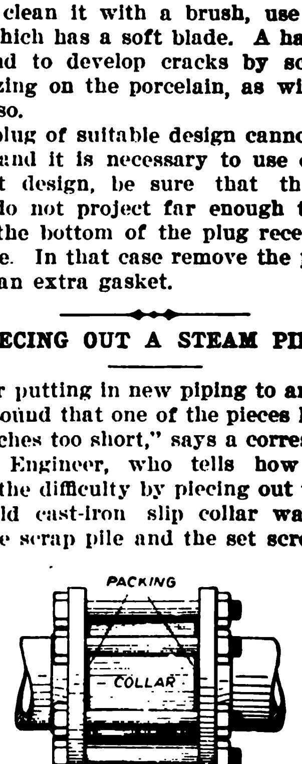
All that is required for the proper cleaning of spark plugs which have become sooted or carbonized are a toothbrush and some gasoline, says the Automobile. The spark points must not be rubbed too vigorously or they are apt to break off. If the plug is carbonized so badly that it is difficult to clean it with a brush, use a blunt knife which has a soft blade. A hard blade will tend to develop cracks by scratching the glazing on the porcelain, as will emery cloth also.

If a plug of suitable design cannot be obtained, and it is necessary to use one of a different design, be sure that the spark points do not project far enough to short-circuit the bottom of the plug recess or inlet valve. In that case remove the plug and put on an extra gasket.

PIECING OUT A STEAM PIPE.

"After putting in new piping to an engine, it was found that one of the pieces had been cut 3 inches too short," says a correspondent of the Engineer, who tells how he got around the difficulty by piecing out the pipe.

An old cast-iron slip collar was taken from the scrap pile and the set screw holes



Showing Ring in Place

were plugged with patch bolts and the extra length sawed off. The slip collar was then put in the lathe and bored out to the size of the pipe, 5 inches, and it was then turned down until it would just fit inside the flange bolts, which gave a ring of metal a little over an inch thick. This was fr[illegible] down to 2¾ inches, making room f[illegible] rubber gasket between [illegible] lar and pipe [illegible] the joint [illegible] son [illegible]

REMOVING STUBS OF BROKEN SET SCREWS.

To remove set screws which have been broken or twisted off do not drill them out for that injures the thread and is apt to make it necessary to cut deeper where sometimes a larger screw cannot be used.

A good way, says a correspondent of the Blacksmith and Wheelwright, is to take a good piece of tool steel and make a strong drill bit to fit the drill. Make the drill bit left-handed so that it will turn backward and draw out the broken screw. First cut a notch in the screw with a chisel; then put in the drill and turn the drill backward, being careful to keep the drill in the notch. Nine out of ten can be taken out in this way if they are not too badly rusted.

LIGHTNING GRIP VISE.

If a mechanic could figure up all the time he has wasted in his life in needless tightening and releasing a vise, and reduce the number of hours to dollars and cents, the result would not fail to astonish him.

A recent invention enables the workman to set the vise by a single movement of the handle. Ten seconds is sufficient to make a perfect clamp on each of three pieces, say, 2 inches, 6 inches and 12 inches in

Upper—Wood-Working Vise
Lower—Vise for Iron Work

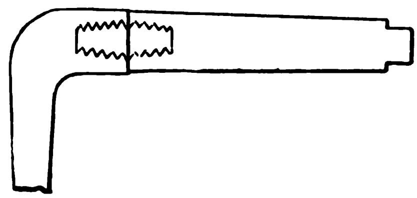
thickness. This shows the range of work. The same principle is applied to vises for holding iron work.

...hed tools from rusting, oil and allow it to ...oil will pre- ...ed.

HOW TO REPAIR A BROKEN AXLE IN AN EMERGENCY.

A broken axle which must be repaired immediately for use over a good stretch of road may be done in the following manner:

Take the two parts to the nearest blacksmith and have a half-inch hole drilled and



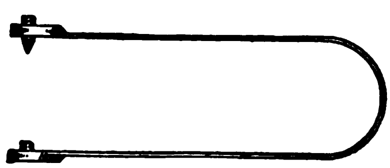
Repairing a Broken Axle

tapped in the center of each piece, then put a half-inch pin, threaded on each end in the two holes, screw together and braze securely.

A correspondent of the American Machinist used this method on an automobile axle which was broken square off next the shoulder for the cone. The auto made a 12-mile run and the repair was entirely satisfactory.

MARKING THE HOLE IN A SLIP LAY.

A very handy tool for marking the hole in the landside point of a slip lay can be made of flat spring steel, light enough to spring with the hand, says a correspondent of the American Blacksmith. The blunt plug should be ⅜ inch and the sharp one should be hardened like a center punch. To



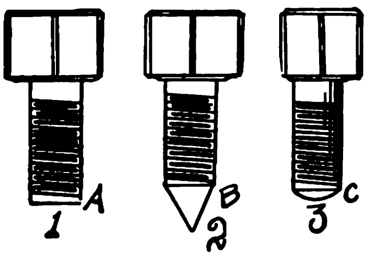
Tool for Marking the Hole in a Slip Lay.

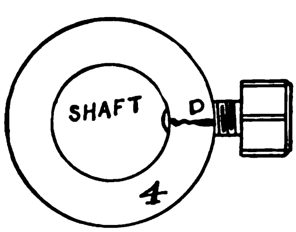
use, hang up the plow by the clevis. Place lay in position and blunt plug in hole in the frog of plow. Spring together with left hand. Hit a tap with hammer on center punch and your lay is marked on the outside and in the right place.

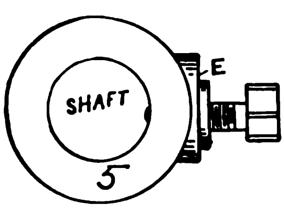
An effective cooling compound for a hot bearing consists of 1 part white lead and 2 parts tallow, mixed with enough cylinder oil to allow it to be fed readily.

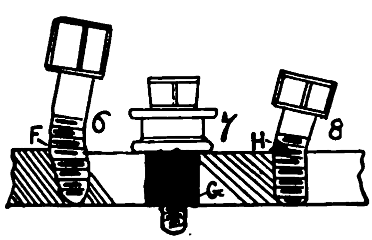
SHOP TALKS ON SET SCREWS.

The little problem of set screws as used in modern machinery and devices forms a project of considerable importance. The accompanying sketches will assist in bringing out the desired points. In Fig. 1 we show the "flat-pointed" set screw. This form of set screw may be found in general service very frequently. The trouble with this type









of set screw is that there is no opportunity for the end of the screw to secure a grip equal to that of the beveled point. The blunt or flat-pointed screw is brought to bear upon the surface of the part forming the shaft, wheel or coupling combination, and it may or it may not sustain the parts. I have met with cases in which the pressure of the flat end, A, on the interior shaft or other part served to hold the part firmly. Again I have found numerous indications of severe grooving, due to the point of the screw having been dragged around the shaft a number of times. To tighten the screw in the groove the screw is given additional turns from time to time. By and by quite a deep groove results, and the shaft will be ruined. Once the groove is established, the parts cannot be moved to right or left unless sufficient distance to prevent any liability of the set screw tip dropping over into the groove.

On the other hand, we have the extremely pointed set screw to deal with, as represented in Fig. 2. The point, B, is hardened, and as a rule quite sharp, so that a hole is soon "pricked." The point serves to afford an excellent gripping power. But when once the hole is formed in the shaft, adjusting is difficult, for the reason that the point of the set screw will work its way into the old hole. Therefore the set screw with the rounded end is usually employed. The oval end, C, can be brought upon the shaft with considerable pressure without actually indenting it.

Some builders of machinery make an excellent design of screw which is about midway between the round end and the pointed end.

The Expansive Set Screw.

One finds set screws in service under varying conditions when he makes a casual examination of machines and shafting in mills, shops and power-using plants. Fig. 4 is a sketch made by the writer of a condition found prevailing in a number of collars used in an electrical power plant. The visit was made through the works during the noon-hour stop. There were a number of collars used on either side of shaft journals for the purpose of retaining the alignment. The collars were not provided with shoulders for the strengthening of the same. Therefore, a number of the collars were fractured, as at D, Fig. 4. In some cases the defect had been overcome by the shrinking of a band of wrought iron about the collars. In other cases the collars were permitted to remain cracked. Fig. 5 is an illustration of one of the collars provided with the strengthening shoulder, as at E. I found that in some cases the fracture in the collars was due to the over pressure of the set screw point upon the shaft. In oth
stances the use of set screw
tapering condi
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the collar, and these conditions prevailed in some of the broken collars.

The Lengthy Set Screw Is an Annoyance.

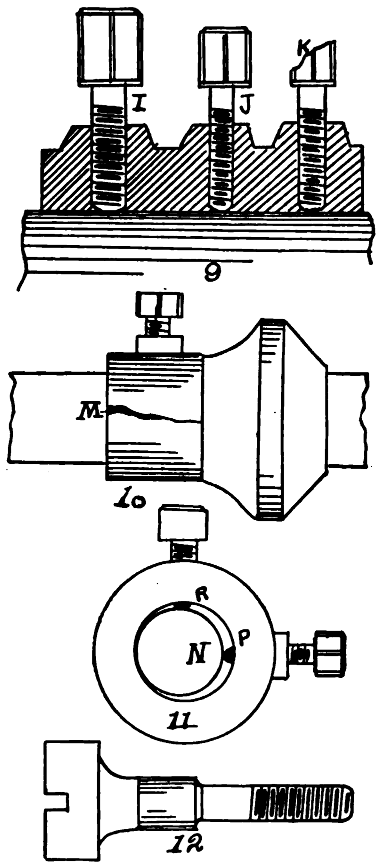
There is always considerable annoyance experienced when set screws are used which are too long. The set screw of unnecessary length in collars is liable to catch upon the clothing of workers and do damage. The long set screw is more likely to become bent than the short or properly adjusted screw. Fig. 6 is an illustration of the set screw of extreme proportions. Because of the projecting upper part, the screw often gets bent, as at F, and a new screw will have to be substituted.

In passing through a flour mill recently I saw that they had made up for the extreme length of some of the set screws in shaft collars and hubs of wheels by using washers as in Fig. 7. The washer system is a poor one. Often instead of washers there are some unusual parts employed to fill the space, as is shown. Sometimes when the thread work of the set screw is exhausted through wear and tear, the hole is bored out and a thimble, G, is substituted. This thimble is cut with the threads to correspond with the threads of the set screw. The thimble is brazed into the part where it belongs and becomes quite as strong as the original solid portion. Fractured portions of set screws, with the defective part at the edge of the bore, as at H, Fig. 8, are not uncommon. I located a number of instances in which the set screws had come into contact with some object and were partly bent over and turned off. When the set screw gets into this condition the only remedy consists in substituting a new one. In many cases the attempt to turn the set screw out will wreck the screw and snap off the head. Then it will be necessary to drill the stub out of the hole, or a cold chisel may be used to cut a slot, and then the stub can be turned out.

Diameters of Set Screws.

We next refer to the diameters of set screws as they were seen by your correspondent. In Fig. 9, at I, is shown the set screw of fair or medium diameter, as employed in usual cases. If one were to look through the shops and mills he would soon locate instances in which there were set scre[illegible] of much greater diameter than [illegible]er-weighted set screw is [illegible] part into which it has [illegible] the metal. On [illegible]ery slender set [illegible] which we are devoid of the substantial bodywork needed to make a firm screw. The happy medium is what the machinist seeks for.

The long, slender set screws are dangerous. They are likewise much bother. It is frequently difficult to keep the thread plan correct. In the same cut we show the broken or worn-headed set screw, and these may be found in some of our best shops. The monkey-wrench in the hands of the new man often causes defects of this nature. Sometimes the edge of the head is worn off.



The defective part is designated I, and the remedy is a new set screw.

Excessive Pressure and Results.

Many times split hubs of gears and wheels are cracked in power plants because of unnecessary pressure of the set screw. Fig. 10 explains the point in mind. The set screw is fitted into the shouldered portion of the hub. Perhaps the set screw point is adjusted into a depression in the shaft.

An unusual strain draws the part over and the point of the set screw rides the common level of the surface shaft. The result is that the set screw is forced outward, often to the degree of opening the hub, as at M. This is fixed in some cases by the use of metal bands about the fracture.

Alignments by Means of Set Screw Points.

It is not out of the ordinary to find samples of crude work with set screws as represented in Fig. 11. I have often met with examples of setting with set screws like this, in which the shaft is of too small diameter for the collar or hub. The workman tries to overcome the trouble by adjusting inward on the set screws. The chances are that the shaft, N, will be thrown quite far out of line, unless there are an equal number of set screws. In the case shown the set screws are two in number and so set that the points, R and P, force the shaft off from the center of the bore. Sometimes the shaft is held in the center by using strips of metal as keys on the side opposite the set screws. This is a slip-shod way of doing work. A better way is to insert a sleeve. The only proper way is to remodel the parts and adjust them only when the collar fits snugly to the shaft. Fig. 12 is a set screw arranged for turning with the screw-driver blade and monkey-wrench as well. It is seldom possible to get a good grip with the screw-driver. Still there are numerous set screws employed which are manipulated entirely by the screw-driver. "TRAVELER."

HOW TO WEIGH IRREGULAR CASTINGS.

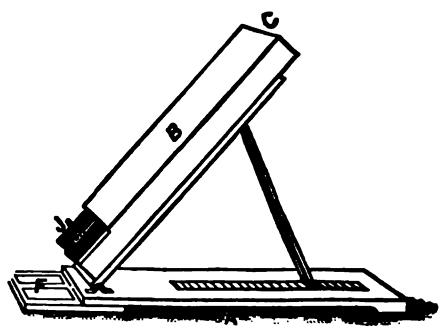
Irregular shaped anchor patterns can be made the right size so that the castings will be of the weight desired after the method shown in the illustration. Of course many know that a cubic inch of iron weighs .26 pounds, says the Pattern Maker, and if the volume of any piece is known the rest of the matter is easy. But irregular shapes are often difficult to figure. Immerse the pattern in water until the pail is just full, then remove it and measure the depth of the water below the top of the pail. Multiplying this distance by the area of the pail gives the volume of water displaced. It is obvious that the volume of the water displaced is equal to the volume of the pattern. This method is applicable to any irregular patterns. Where there are cores which are symmetrical it is easy to figure their volumes and deduct them from the volume of the water displaced.

TELEPHONED FROM A RAFT IN A WATER TOWER.

The inside of a large standpipe belonging to the water company at Paducah, Ky., was painted recently, the painters doing their work from a raft which floated upon the water within the pipe. In all previous times staging had been used within the pipe, but this time the staging was done away with, and telephonic connection was established between the men in the pipe and the engineer in the pump room. When the men had painted as high as they could, they signaled the engineer, who raised the level of the water in the pipe to the required height, and the men proceeded with the work.

THE TINTOMETER.

The tintometer, devised by J. W. Lovibond, of Salisbury, England, is an instrument by means of which the color of any



The Tintometer

object, liquid or solid, opaque, translucent or transparent, can be measured and analyzed in such a way as to permit the keeping of a simple and easily understood record; and for facilitating the establishment of color standards and promoting adherence to them.

A set of standardized colored glasses is used in making the tests. The standard glass is placed at J, and the object tested at F. The observer looks into the box (B) at C.

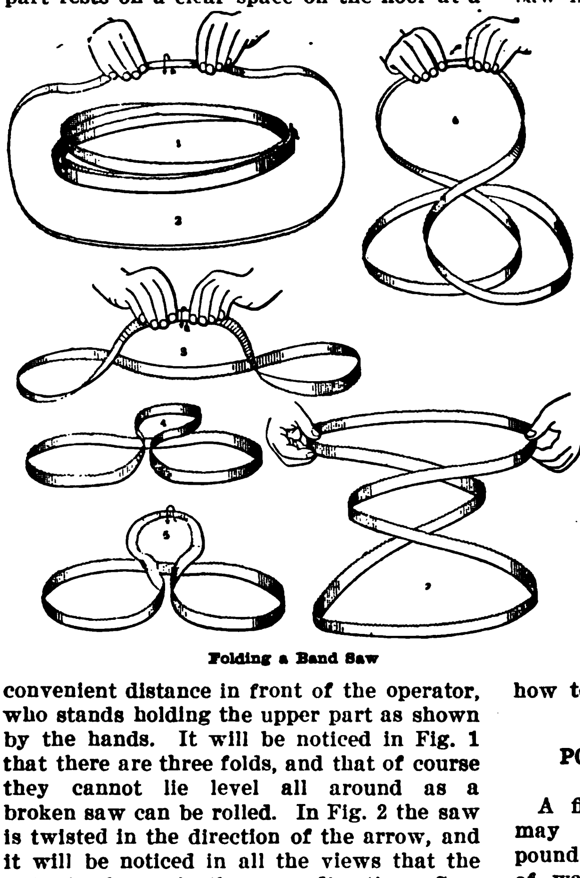
HACK-SAW WRINKLE.

The following is a very expeditious method to obtain a wide slot in a minimum of time: Instead of using one saw blade in the frame, simply add more blades, according to the width of the slot required. This will be found to save much tedious labor of filing.

HOW TO FOLD A BAND SAW.

The proper method of folding a band saw is not easy to discover without help, but by means of a practical demonstration is very quickly learned, says a correspondent of the American Machinist, who proceeds to explain just how it should be done, as follows:

Fig. 1 shows a saw which has been folded as required. Fig. 2 shows the beginning of the operation with the saw open and in position for making the first twist. The lower part rests on a clear space on the floor at a convenient distance in front of the operator, who stands holding the upper part as shown by the hands. It will be noticed in Fig. 1 that there are three folds, and that of course they cannot lie level all around as a broken saw can be rolled. In Fig. 2 the saw is twisted in the direction of the arrow, and it will be noticed in all the views that the twist is always in the same direction. Supposing the saw to be held with the teeth away from the operator, the first twist turns the part in the vicinity of the hands with the teeth toward him. If the entire saw is allowed to spring freely while twisted in this way, this has the effect of throwing the lower part of the saw into two loops, as shown in Fig. 3, although Fig. 3 really goes a step beyond this stage and shows the next twist commencing. Fig. 4 shows that the effect of the first twist can be very simply obtained by merely laying the saw on the floor and drawing one part over the other; but nevertheless in folding a saw it is easier to obtain this effect by a twist, as in Figs. 2 and 3. Fig. 5 shows how the saw is to be twisted after it has assumed the Fig. 4 position. This final twist when completed allows the saw to fall easily into three coils. The first two loops form two coils which turn one over the other when the third is formed. The third coil is formed as soon as the remaining part of the saw is twisted completely over. The rings then will adjust themselves and will not open again unless untwisted. Untwisting can very easily be done by anyone, although it is seldom that a person can discover by carefully opening a saw how to fold it again.



Folding a Band Saw

Fig. 6 shows the operation practically completed. The two lower loops are overlapping each other with their teeth uppermost, and the upper loop still has its teeth toward the operator and merely requires to have them turned upward and the loop allowed to fall and adjust itself with the other two. Fig. 7 shows the saw completely folded, but with its coils raised vertically to show how they lie.

Saws in use can be handled and stored much more conveniently when folded in this way than if they are kept at their full diameter. A broken saw can easily be rolled up and tied by anyone, but an endless saw cannot be rolled, and there are many workmen who only know how to manage a broken one.

POLISH FOR HARDWOOD FLOORS.

A fine wax polish for hardwood floors may be made as follows: One-fourth pound of potash mixed with equal weight of water, boil and add gradually, stirring all the while, one-half pound of yellow bees-wax. Boil up, then pour in one pint of water and heat till it looks milky. Apply at once.

To find the thickness of lead pipe required when the head of water is given, multiply the head in feet by size of pipe wanted, expressed decimally, and divide by 750. The quotient will give thickness required in hundredths of an inch.

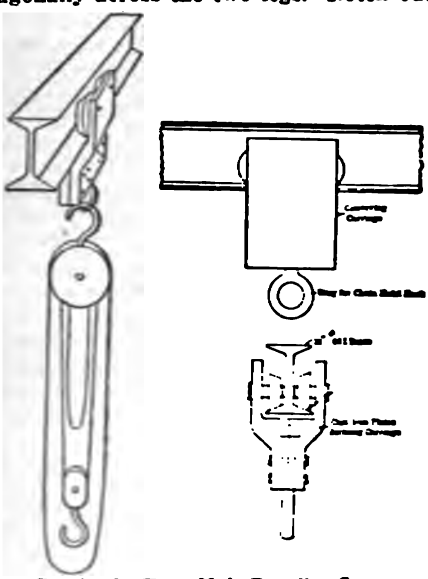
AN EXCELLENT VARNISH FOR IRON WORK.

Dissolve ½ pound of asphaltum and ½ pound of pounded resin in 2 pounds of tar oil. Mix hot in an iron kettle, but do not allow it to come in contact with the fire. It may be used as soon as cold, and is good both for outdoor woodwork and ironwork.

HOW TO MAKE A TRAVELING CRANE.

An inexpensive and very satisfactory traveling crane for the plant where there is a great deal of heavy lifting in connection with repair work, etc., may be made at home, says the Street Railway Review.

Make of 8x10-inch pine timbers two A-frames to fit singly into an extra heavy 12-inch I-beam. (See sketch). Pass bolts through both timbers above and below the I-beam and fasten substantial cross pieces diagonally across the two legs. Notch out a



Details of a Home-Made Traveling Crane.

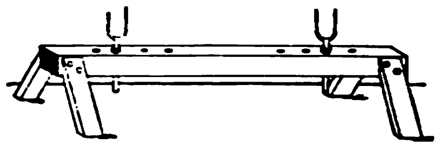
heavy timber near each end to keep the legs from spreading and run bolts through the ends of the bottom beam to prevent shearing of the end pieces. Make a carriage of four wheels with faces beveled off to fit the flange of the I-beam, which will distribute the weight carried over the face of the flanges. The hook is below the I-beam and has two stiff cast-iron plates running up to carry the pins in which the wheels revolve.

Fasten a heavy chain block into the hook arrangement, which will pick up any weight, is complete and by means of it a piece of apparatus can be picked up and moved from 15 to 18 feet along the length of the I-beam in a very short time.

Four men can set up such a crane in a half day and when it is not in use it can be taken apart and stored. Its cost would be approximately $150; a 20-foot, 12-inch I-beam, weighing 40 pounds per foot costing $24; carriage can be built at machine shop for $30 and a 5-ton hoist of 12 feet lift would cost about $85.

A HANDY TRESTLE FOR THE REPAIR SHOP.

A handy device to keep a buggy tongue or shafts from slipping off the trestle while ironing or repairing is described by a correspondent of the American Blacksmith. A number of holes are bored in the trestle to receive a Y-shaped iron piece made with a ⅝-inch stem and ½-inch branches and hav-



Trestle for Repair Shop.

g a collar welded to the stem 2 inches from the crotch. The device is so simple and saves so much annoyance that it is well worth the making.

TEMPERING SPRINGS.

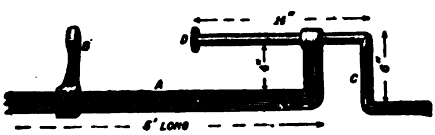
Fish or bank oil bites best in tempering springs. It gives sharper temper than black oil or cotton-seed oil. When using fish oil springs will stand up better if a shade less heat is used for tempering, than when using black oil.

A HANDY CLAMP FOR ANY PURPOSE.

A handy clamp for clamping wagon-box bottoms, doors and, in short, can be used for any purpose where clamping is to be done and can be made any length, says a correspondent of the Blacksmith and Wheelwright, is made as follows:

A is a bar of iron, 1½x1½ inches by 5 feet long, and eye turned and welded at one end. Four inches from the eye the bar is turned at right angles, edgewise. B is made of ⅜x1½-inch iron, and made to slide and stop anywhere on A. C is a crank of ¾-inch rod iron, 6 inches crank and 14 inches straight.

The straight part is threaded and works in the eye of A, which is also threaded. D is a washer that is fitted on C by a shoulder being filed for the washer to work against.



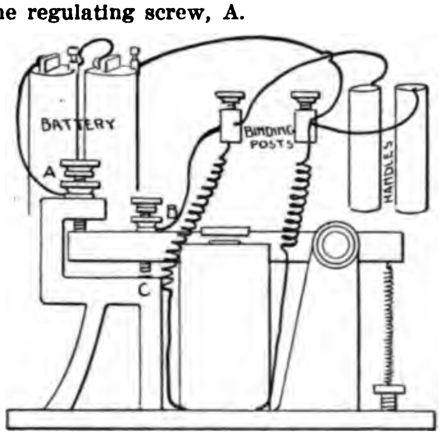
A Handy Clamp

The end of the rod is riveted so as to hold the washer, D. No notches are needed in the bar A to hold B; it will not slip when weight comes upon it, but will hold the firmer.

HOW TO MAKE A SHOCKING MACHINE.

A good shocking machine may be made out of a telegraph instrument as follows:

Fasten one of the battery wires on one of the binding posts of the instrument and fasten the other wire on the regulating screw, A; connect B with the other binding post. To prevent contact when the armature is pulled down put a piece of paper or thin rubber under the regulating screw, B, at C. The armature acts as a contact breaker as on the induction coil. In order to feel the shock, fasten two handles on the binding posts. The shock is regulated by the regulating screw, A.



Shocking Machine

Wm. J. Slattery, of Emsworth, Pa., who sends in this shop note, says an instrument of this kind will give a stronger shock than many high-priced medical coils.

Our readers are invited to contribute to this department. We can use rough pencil sketches; our artist will fix them up proper- the editors will do the rest.

THE BLACKSMITH AND POWER-DRIVEN MACHINERY.

How to Measure the Difference in Expended Energy in Operating Hand Tools and Power-Driven Machinery

Nowadays there are two classes of blacksmiths, each having a distinct and widely different motive in its calling. We do not speak of the blacksmith who uses power-driven machinery and the blacksmith who does not, though truly a distinction could be drawn there by naming the one as out-of-date and the other as modern. But here the

Fig. 1. How Much Can You Lift?

classes referred to are composed of the time-honored smith, fabled in song and story as honest and brawny, who blacksmiths to earn his daily bread, and that growing class of men of many crafts and professions who have taken up blacksmithing from pure love of the work and of mechanics in general. The smith of this class may be honest or not as it happens and his muscles may be as flabby as an infant's, but according to tradition the strenuous recreation should rectify any fault in either direction, and surely for developing the strength no young man could choose a better form of athletics; foot-ball, tennis, rowing, hunting, none of the popular sports are to be compared to it. Until the end of time there will be something sociable and alluring about the blazing forge and the clanging hammers.

Blacksmiths who come within this la class and who are usually amateurs sl by all means learn to handle the hand

well in order to carry out their purpose and should install power-driven machinery only after the hand tools can be managed perfectly. Many power-driven machines, however, are to be found in the little backyard shops where amateurs practice the craft at night after a long day in the office and in the shop where the farmer-smith likes to do his own repairing. But the blacksmith who depends upon this work for bread and goes

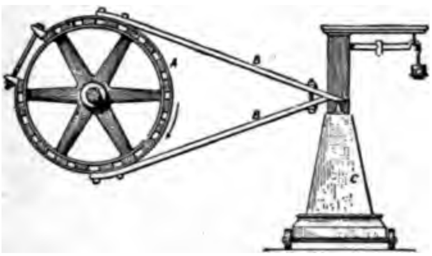


Fig. 2. Brake or Dynamometer for Weighing Friction

on day after day depending only on the results of hand tools when by means of power-driven machinery he might accomplish many times the results is very much like the man who hid his talent and from whom all was taken away.

In either case the following tests given by the Blacksmith and Wheelwright will be interesting. To the amateur because they will give him a fair idea of what he can do and to the behind-the-times smith in that they will demonstrate how much is to be gained by the use of power.

Fig. 1 is an apparatus composed of a small portable scale. The top frame is secured by rods imbedded in the sides of the scale. By means of this scale a smith can easily ascertain how much he can lift. To do this he crouches on the platform with his back against the frame and his arms resting upon a block. Supposing that the hand block and the frame together weigh 15 pounds and that the blacksmith's weight is 175 pounds the scale arm will indicate 190 pounds. By the smith's pressing upward against the frame with his back the number of pounds indicated is increased and this increase is the weight he can lift. The experiment may be carried further by setting a number of pounds to be lifted in a given time and practicing until the object is accomplished. Were the smith to keep up this test for two hours at a time, at the end of that period he would find that his weight had decreased several pounds. This difference in weight is the actual measurement of the energy he expends in that amount of work and measurements made in this way give some startling figures. Surplus energy is foolishly expended by the man who could utilize machinery driven by a gas engine or other power to do much more work in a shorter time with

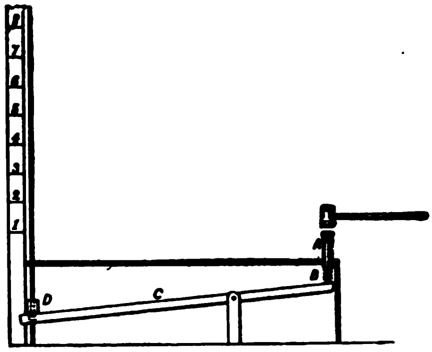


Fig. 3. Striking Box for Testing Force of Blow

a much smaller expenditure of energy, and at the end of the day he would be able to go home in a less irritable frame of mind.

In Fig. 2, is shown a brake or dynamometer for weighing the friction of work done by hand or by machinery. It consists of a metal band, A, clamped around the pulley of a machine by means of a bolt and nut.

Fig. 4. The Force of the Blow Depends on How the Sledge is Grasped

Between the band and the pulley are placed wooden blocks. Arms, B, B, are fastened to the metal band at one end and bolted together near the other end which rests upon a scale block, C, and depresses it, thus weighing the friction. By multiplying the scale weight so found by the circumference in feet of a circle having a radius equal to the length of B and then by the number of revolutions made by the pulleys the foot-pounds of work can be computed. Attach such a brake to a grindstone with the helper turning the crank and weigh the friction. Compare the results.

Fig. 3 is an excellent device for testing the force of a blow. A scale is marked off to show the height to which the dummy, D, is forced by a blow. The stake, A, is struck with a sledge, the blow depresses the spring, B, which operates the lever, C, by which the dummy is forced toward the top of the rack.

The force of a blow from a sledge or hammer (Fig. 4) depends upon the way the handle is grasped and how it is swung and also upon the weight of the hammer, the squareness of the blow, the strength of the helper, etc., and these little points are important to both the amateur and the experienced smith, but for the latter it is false economy to go on using the sledge which requires the hiring of a helper and is slow and in the outcome expensive. A trip-hammer should be installed in every blacksmith shop. It does the work rapidly, pounds regularly, incessantly and hard, and a single helper can handle a large amount of work on it while an increase in earnings will soon become apparent. The power required to operate steam hammers is about one horsepower for every 100 pounds of falling weight. They are rated by the weight of die, ram, rod and piston. Trip-hammers are rated by the weight of the head, as: 25-pound head, 75-pound head.

Tests of the power of a team of horses as pitted against the number of horsepower of an engine are very interesting. The unit of power, or 33,000 foot-pounds per minute is usually greater than good draught horses can do. By means of a dynamometer the exact power of a team of horses may be measured. The dynamometer, (Fig. 5) comprises a spring, A A, with a needle, B, and a graduated scale, C. D is a strip of paper ruled to correspond with the scale and is caused to move under the needle at a uniform rate by means of rollers which are moved by a train of gearing, the whole being enclosed in a box beneath the scale.

In tests made with a draught horse drawing a cart and walking, it was shown to do 25,920 foot-pounds of work per minute, 7,080 foot-pounds less than the accepted unit of horsepower. This is an average result under favorable conditions, for, of course, resistance varies with the character of the road.

Fig. 5. Testing a Team by Means of a Dynamometer.

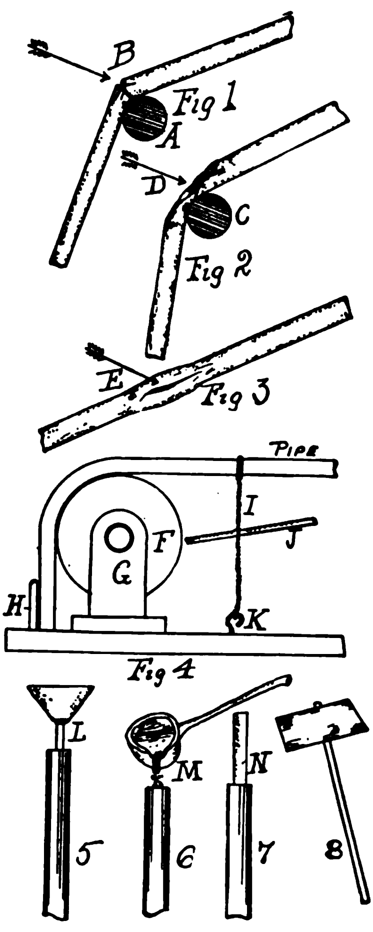
With these figures before us it is not difficult to believe that mechanical power will in time wholly usurp physical power in such cases as those under discussion. The illustrations are by courtesy of The Blacksmith and Wheelwright.

SUBMARINE SINKS CRUISER.

The submarine torpedo boat "Shark," commanded by Lieut. Charles P. Nelson, recently sank the cruiser "Columbia" of the North Atlantic training school—technically. The "Columbia," "Minneapolis" and "Prairie." were engaged in target practice at No Man's Land when their officers were apprised that an attack was to be made upon them by torpedo boats. The "Shark" succeeded in getting within 50 or 60 yards of the "Columbia" and thus technically sank that cruiser.

HOW TO BEND PIPES.

The process of pipe bending is not difficult when the right way is undertaken. If some other than the proper way is adopted, the chances are that the walls of the pipe will collapse, or the sides will be cracked or fractured. Split pipe, due to an attempt to make a bend in its course, is common. One may find samples of defective work of this nature in any shop and oftentimes in



the house. The accompanying illustrations will assist the novice in pipe bending. The usual method of making a bend is to work the pipe to the required oval shape over an object. Sometimes that object is the vise, or anvil, or it may be a round piece of metal or wood set up as shown in Fig. 1 at A. In making the bend over this object the *chances are that the pipe will be broken off as at B, if sufficient* pressure is applied, or the pipe shell may collapse as at D, Fig. 2; the mandrel is indicated at C. Again, we find that in many instances in pipe bending, the pipe shell is split open as at E, Fig. 3.

To avoid troubles of this kind and to preserve the original strength of the pipe, the best way is to make some forms over which to effect the bending. The process of "filling" or "packing" the pipe hollows first is adopted. One of the pipe bending forms of a rotating order is shown at Fig. 4. It is very easily constructed at slight expense. A platform of wood, about 3 feet long and 1 foot wide, is secured, to which is attached the stand, G, for bearing the bending disk, F. This disk is of hard wood, usually about 4 inches thick and 20 inches in diameter. A shaft made of wood is put through to sustain the wheel in the proper position and a bearing of the wooden stand is used for either side. The wheel or bending disk is therefore well sustained and is strong. There is a "check" pin at H, back of which the pipe to be bent is adjusted.

The "packed" pipe end is dropped back of this checking block and muscular power used to draw the pipe form back and down over the disk. In order to assist in the work, a strong metal hook is screwed into the wooden platform at K, and a cord, I, is connected with the hook and the pipe in process of bending. There is a "twisting" bar of wood, J, inserted into the twist of the cord and the bar can be turned and the pipe drawn down to a fuller degree.

Pipe Packing.

To try to bend the pipe cold on these forms or any other would almost invariably result in the breaking of the pipe walls, making it necessary to restore the walls or patch them. To overcome this danger the process of packing the interior of the walls with materials is adopted. Figure 5 illustrates the mode of pouring molten rosin into a pipe. The pipe is placed in an upright position and the lower end is plugged with a wooden plug or with clay. The tunnel, L, is adjusted into the pipe opening and the molten substance is poured therein. The process is simple. By this means the pipe becomes quite solid, due to the rosin hardening inside, and the bending can then be brought about without any likelihood of the walls collapsing. To get rid of the rosin afterwards is easy, as a slight heating will cause it to melt and run out of the pipe. It can be used again if desired.

Another method of pouring the rosin is

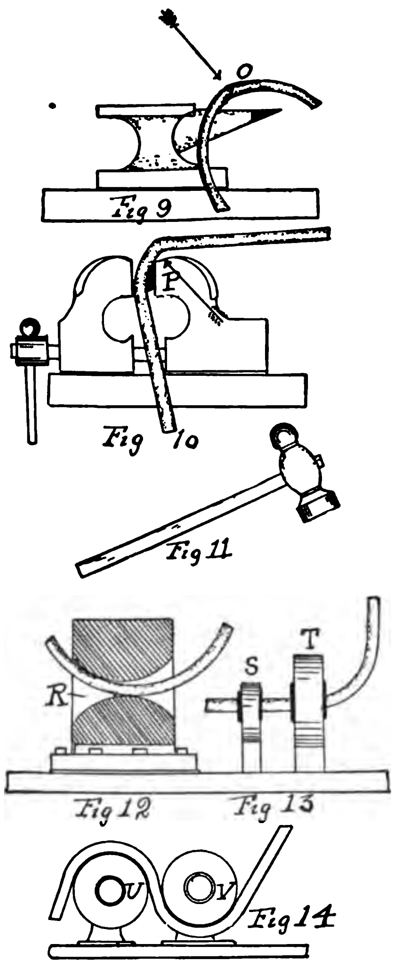
shown at Fig. 6, in which a common pouring ladle, M, is utilized, and the stuff is poured direct, instead of through a tunnel. When the clay-packing is used, the process is as in Fig. 7. Clay of ordinary character is selected, and lumps removed by the usual puddling and rolling. Then when the clay is in a putty-like condition, it is forced into the pipe channel. The packing is done by using a common wooden plunger, N. The plunger can be driven home by force or by using a mallet. The kind of mallet usually employed is shown at Fig. 8, although any sort of mallet would answer.

Different Forms of Bending.

The average man prefers to bend the piping by making use of the devices at hand. There is always considerable bother attached when it is necessary to construct special forms for bending. Often the forms are used only a few times. Therefore a goodly proportion of the bending of pipes in shops, workrooms, homes and other places is done by resorting to the vise or the handy anvil. In Fig. 9 we illustrate the process of working the packed cold pipe over the anvil. Of course if the pipe were heavy, or the metal thick, this could not be done, but ordinary piping can be bent in this form without much difficulty. After the filling of the pipe is accomplished, the pipe is grasped with a hand at either end and the ends pressed down with the anvil as the center point. In order to assist in getting the properly described circle, the common machinist's metal hammer with bell head is used. The strokes are applied at the point O, and the left hand holds the base end of the pipe. In this way the pipe can be brought to a prescribed circle without fracturing the metal. If the vise is used, there is danger of making abrupt turns, as in Fig. 10, unless precautions be taken to avoid this trouble. The grip is usually made on the loaded pipe and then the bend is attempted by forcing with the hands. I would first make forms for the vise, so that the forms can be closed in on the pipe and protect it. Then the proper bends can be made without danger of depressing the shell. The bell hammer is also used in this work. One of the handy styles of hammers is shown in Fig. 11. This is the common machinist's type and can be purchased at any of the hardware stores. It is a mistake to attempt to get the desired bends in the pipe with the claw hammer. A mallet may be used to some advantage and without danger of injuring the metal pipe shell.

A Handy Form for Quick, Light Bending.

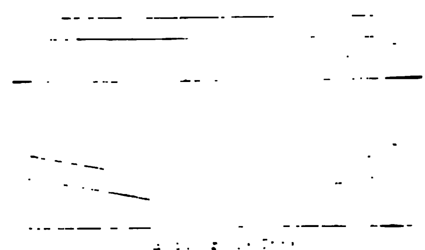
It frequently happens that there are light pipes to be bent on which it is not desired to spend much time. Figure 12 is a drawing of a form which is readily made for this purpose. Get a block of seasoned hard wood, about 6 inches long and same size in height and breadth. Take it to a woodworking establishment and have it bored through, say with a 2-inch bit. Then have the hole tapered from the center on



either side. This gives it the shape shown in the sectional drawing of the block at R, Fig. 12. The block is then screwed or bolted to the base block and it can be used for the purpose of bending pipe in various directions.

Another little scheme that is simple and handy is shown in Fig. 13. There is a base piece used for a platform and to this b

BENDING CAST-IRON PIPE



[illegible] KNIFE

SHOP NOTES

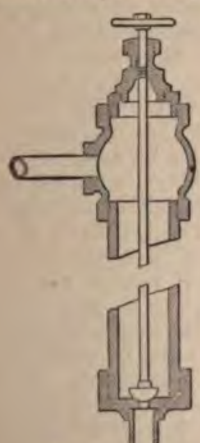
HOW TO MAKE A STEAM TRAP.

A steam trap should always be open when empty, so that when the steam is turned on the water will drain out of the pipes and the pipes can drain themselves after the steam is turned off.

The home-made trap shown herewith includes this advantage and also has the advantage that by the valve arrangement in its top the amount of steam can be regulated according to the requirement.

It consists of 3 feet of 2-inch pipe with a cap on the bottom and a cap on the top, and the stem and gland of a ¼-inch valve inserted in the top. That stem is attached to a brass rod 5-16 inch in diameter.

On the bottom of the rod is a little hemispherical piece of packing, which is sufficiently hard to resist the action of steam. Anything softer than this, the steam will melt away. The ratio of expansion of brass and iron is practically as three is to two; that is, you will have three points of expansion in brass to two in iron. Steam at 50 pounds pressure contains 297 degrees of temperature. Taking 200 degrees as the difference between the inlet steam and the outlet water, a 30-inch trap gives nearly 1-32



Home-Made Steam Trap

inch in expansion, which is sufficient to drain the trap.

Turn the steam on, and the water will come out of the half-inch pipe and fill the pipe at a low pressure. As soon as the steam begins to come, the rod will close the valve entirely. After that it will open itself slightly and allow the water to trickle out in a hot stream.

HOW TO STRAIGHTEN PAPER.

Who has not been annoyed by blue prints, drawings or other papers which, having been rolled for some time, refused to lie flat when in use? And yet it is a very

To Straighten Paper

simple matter to straighten the paper so that it will give no more trouble.

Hold the paper by the corners or by the ends and draw down over the sharp corner of the drawing board or table, or else lay the hand on the sheet at the table edge and draw the sheet through with the other. In this way it can be easily straightened. The illustration is by courtesy of the Draftsman.

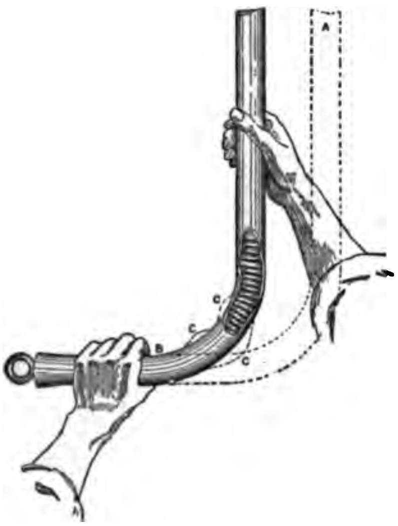
FORMULA FOR WHITE METAL.

A formula for making white metal for motor bearings, which has given excellent results on heavy high-speed service, is given in the Mechanical Engineer, of London, and consists of 48 pounds of tin, 4 pounds of copper, and 1 pound of antimony. The copper and tin are melted first, and then the antimony is added.

PROPER METHOD OF BENDING LEAD PIPE.

Making bends in lead pipe is not difficult, but to make a neat round full-sized bend the workman should be properly equipped with bending tools, says the Metal Worker.

The rubber bender on the market today, consisting of a piece of solid rubber 18 inches long with a rope molded into one end, has certain disadvantages. In use, it is greased and inserted in the pipe to be bent which is then bent over the knee, giving a



Bending Lead Pipe

sweeping curve. There are many instances where a square bend is necessary, but this cannot be had by use of the rubber bender without heating the pipe, which in time injures or destroys the bender, also there is not enough heft in the bender to allow of the pipe being dressed sufficiently to compensate for the thickness in the heel of the pipe. A very important point.

The spring bender, consisting of a spiral spring wound close together with a loop at the end for removing it, and usually, 24 inches long is, generally speaking, much handier.

Before making a bend with the spring drift out the pipe and dress smooth. Grease the coil bender and place full length in the pipe and then, with the handle of the dresser, strike the pipe at the point where the throat of the bend is to be, hard enough to dent the lead slightly. Heat the throat of the bend and the pipe for four inches on each side of the heel of the bend over the furnace until it is so hot that water splashed on it will fly off. Place the pipe on the floor and hold a piece of carpet or a bunch of rags tightly in the throat with the left hand while the right hand bends the pipe up to an angle of about 45 degrees, thus thickening the lead in the throat and thinning it in the heel. Dress out any kinks that may show up by striking the lead in such a manner as to draw any surplus lead from the throat to the heel.

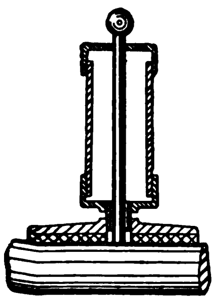
Heat the lead as before; with one hand grasp the short end of the bend close to the throat and with the other hold the long end upright and jump or pound the pipe on the floor, as shown in the sketch. Strike a few sharp blows on one side, reverse the pipe and repeat the operation on the other end, occasionally dressing the lead from throat to heel. In pounding the lead on the floor, strike with a sliding motion, thus forcing the lead from the pipe to the heel (C C C). The bend will soon be square and the pipe should then be dressed perfectly smooth.

To remove the spring insert the bending iron into the loop of the spring, place the foot on the pipe as close to the throat as possible, and then proceed to twist the spring as though winding it up. It will reach a certain tension and then turn suddenly, when it will be as tight as before. Now twist it again, and just before it turns commence to pull, and at the same time keep twisting. If the pull is kept up until it turns, it will spring out about six inches, after which the operation must be repeated until the spring is removed. After the knack of pulling at the right time is acquired, there will be little trouble in removing the spring.

When a bend is to be made in the center of a long pipe or when a spring cannot be had, the old time sand method is a handy thing to know. The sand should be clean and fine. Place it in a pan and suspend over the furnace to heat it hot. Close up one end of the pipe to be bent by soldering or beating over the edges of the pipe as far as possible. Ram a small bunch of oakum down the pipe to fill up the hole. When the sand is hot pour it into the pipe to the depth of a foot at a time and pack thoroughly by dressing the pipe till the sand will stand no more. Close the other end with either a wooden sand plug or as the first one was closed, being careful to dress the lead down tightly on the sand so the sand will have no room to loosen up and cause kinks in the pipe when bending. Make the bend just as it is made when using springs. Do not press hard on the bend, but strike light blows. Hard blows will cause the lead to spread and so loosen the sand; light blows set the lead up against the sand.

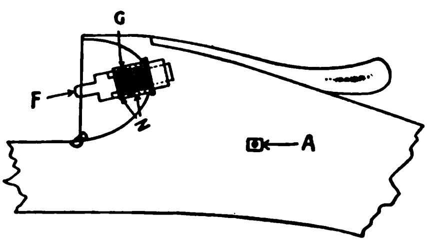
HOW TO MAKE A GREASE CUP.

Take a 1½-inch nipple about 4 inches long and on each end screw a cap. On the cap leading to the bearing there should be a ½-inch nipple and the top cap should have a hole for the brass rod to pass through. The rod is heated by the friction between it and the shaft and this causes the grease to flow down it to lubricate the bearing. The cup is convenient for bearings which are not attended to often, says the Practical Engineer.



WANTS TO REMOVE BROKEN FIRING PIN.

I have noticed several "kinks" in the line of getting out broken studs, screws, and tapper pit rods, but have never read of one just like the one in sketch I enclose, and would be pleased to hear from some of your

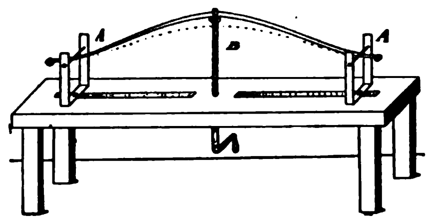


A. Hammer Stud.
B. Breech Block.
G. Position of Cock.
F. Firing Pin.
N. Nipple.

readers as to how they would get at it. The firing pin is slightly damaged and must be gotten out, but only the fore part of the nipple can be turned out in the ordinary manner.—Wm. Nak, Rural Route 14, Grand Rapids, Mich.

HOW TO SHAPE CARRIAGE SPRINGS.

There are only a few carriage smiths, nowadays, who make their own carriage springs, but it is, nevertheless, convenient to know how to do it, and there are out-of-the-way places where the smith is obliged



Device For Shaping Carriage Springs

to make his own springs for every job he builds.

The device herewith shown is handy for shaping the springs after the heads for the main leaves have been made, the smaller ones drawn to taper, the center holes drilled and the ribs and grooves for keeping the holes in place made, says a correspondent of the American Blacksmith.

In shaping the springs in the device hold the ends in place by means of bolts passing through forked irons, as at AA. Force the center up slightly as at B by means of a screw. Heat the second leaf its full length and then with tongs and clamps, bend it to fit the shape of the main leaves. Shape the remaining leaves in the same manner over the one preceding each, moving the forked irons closer together as required, according to the length of the leaf.

All springs should be tempered, but the tempering cannot be done satisfactorily in an ordinary forge, for in order to obtain a uniform heat the full length of the leaf, the fire must be long enough to heat it all at once and not too quickly, but gradually, to be sure the heat penetrates the steel. A coke furnace is best for the purpose, heating the spring as for bending and performing the work quickly, then spraying the leaf with water until it is nearly cold. This is sufficient for cheap grades of work, but for the better class the springs should be oil tempered. To do this fill a trough or tank, large enough to allow of dipping the leaf until cold, with linseed oil. After dipping the leaf, draw the temper by placing it over the fire until the oil is burned off.

A good shellac varnish is made of 3½ pounds orange shellac thoroughly dissolved in 1 gallon of wood alcohol.

RECIPE FOR MARINE GLUE.

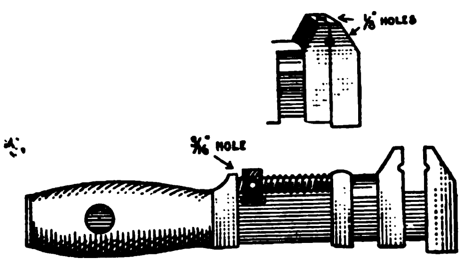
One part of pure india rubber dissolved in naphtha. When melted add two parts of shellac. Melt until mixed. Pour out on tin until cold. Melt and use with a brush at water-bath heat.

Or take a handful of quicklime and four ounces of linseed oil. Boil, and pour out on a plate until hard. Melt and use.

Or take one pound of common glue—not fish glue—in two quarts of skim milk. Soak and boil. All these are good.

TO USE WRENCH AS HAND VISE.

A clever idea comes from W. I. Livingstone, Whitman, Mass., who says: "The inclosed sketch is of a 6-inch Coes wrench which I have improved by drilling a 3-16-inch hole in the knurled thumb-piece. This



Wrench as Hand Vise

enables one to insert a punch or piece of rod in hole and so obtain a greater leverage. This makes a good hand vise with parallel jaws. By closing jaws together and drilling down and across between jaws with ⅛-inch drill, round pieces may be more securely held."

MELTING BRASS IN AN OIL FURNACE.

"For melting a good grade of metal for a fairly heavy class of work such as building locomotives, rotary oil furnaces are less expensive than crucibles," declares a correspondent of the Foundry, "but for a very light class of work, such as melting yellow brass, the crucible is best." Manufacturers of crucibles claim there is a great loss in shrinkage of metal when melting with oil. To sustain his statement as to the advantages of the oil furnace the writer makes the following comparison:

"In the foundry I am going to use for *illustration they cast 3,000* pounds a day on an average, and up to August 1 used the crucible furnace. They used two sizes of pots, Nos. 200 and 150. Of the No. 200 size they used on an average, 12 a month at $10 apiece, making $120. Of the No. 150 pot, four a month at $7.50 apiece, or $30, making $150 for crucibles alone: for 3,000 pounds of brass it will take 2,250 pounds of coke at $5.25 a ton, which is $5.90 a day for coke; costing $153.40 a month for fuel with a loss of shrinkage of metal averaging 2¾ per cent. They melt all good brass of a mixture of 50 per cent new metal and 50 per cent of scrap. The new metal is copper 80, tin 10, lead 10, and small per cent of phosphorus. The scrap is all railroad scrap, running in weight from ¼ pound to 30 pounds apiece. Ten days after the furnace was running the fireman charged 1,100 pounds of metal, 50 per cent new and 50 per cent scrap, and got 1,076 pounds of castings and sprues, making a loss of 2 2-1[illegible] per cent, and in the crucible 2¾ per cent of loss, a saving of loss in melting. To melt 3,000 pounds in the oil furnace at 2 gallons of oil to 100 pounds of metal, with oil at 3½ cents a gallon will cost $2.10, quite a saving over $5.90 for coke to melt the same amount of metal. The total cost of a month's run in which 78,000 pounds of metal was melted was as follows: When using the crucibles, $303.40, and when using the oil furnace, $54.60. The difference making a saving of $248.80 a month not figuring the cost of lining furnaces, either oil or crucible.

"This oil furnace has two chambers, and while melting in one side the heat has to pass through the other side to find an outlet, and by doing so heats the metal almost to a melting point; so that in melting the second heat on the other side the cost of oil is very small, as two gallons for a hundred pounds of metal is a high figure.

"The cost of the furnace is $950, all put in place and ready to melt, and the only extra cost is a small fan, say $1,000 all told. This company was using oil in their plant for other purposes, so all that was needed was to connect the pipes to their oil tank. If the oil tank had to be put in it would cost more. But to compare the two ways of melting, the furnace will pay for itself in less than four months, and besides it is not so hard on the melter, and does not keep the shop so warm. You can put your hand on the oil furnace when it is melting and not burn yourself."

PASTE FOR DRY BATTERY.

The following is from Bubier's Popular Electrician:

Plaster of paris, 1 pound; oxide of zinc, ¼ pound; saturated solution of chloride of zinc, enough to make a thick paste. Make a zinc box, putting your carbon element in the center, at the same time insulating the carbon from the bottom of the box with a piece of fiber. Fill the box with the paste and seal up tightly, insulating the carbon from the top of the box with fiber also. The zinc forms one pole and the carbon the other.

The most effective way of de-magnetizing a watch is to place it inside a coil of wire through which an alternating current is flowing. Hold the watch by the chain and twist it slowly, by turning the chain. After this treatment for four or five minutes, gradually withdraw the watch, still revolving it. A common method pursued in electric light stations is to lay the watch down on the sheet iron core of the transformer. A piece of wood should be placed under the watch to protect from injury by the heat.

CHASER FOR CUTTING THREADS.

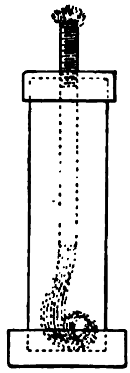
"Last week I made a chaser for cutting or recutting threads in the lathe, by hand. For 1-inch thread put a 1-inch pipe tap in the lathe and set the gears for 11½-inch thread. Then put the chaser in the tool rest and feed against the tap just a few times up and the tool is done. I have been a machinist 17 years but have not seen this method printed."—Contributed by I. H. Gingrich, 328 First St., Grand Rapids, Mich.

HEAVY SCREW DRIVERS.

The young mechanic is very apt to ruin one or two good screw drivers in trying to start set screws or screws that have rusted in. For this and similar work a specially heavy screw driver is made, the shank being square and strong. The operator can then put all the power he wishes on the wrench, without fear of twisting it or bending the blade.

HOW TO MAKE A TORCH OF PIPE.

A simple and inexpensive torch may be made of a short length of pipe. Select 1½-inch pipe for the purpose, and on the bottom screw a cast-iron cap, one which is heavy enough to form a base for the torch and hold it upright. Use a malleable iron cap for the top and before screwing it on tap a hole for ½-inch pipe 3 or 4 inches shorter than the body, and the screw-thread should be about 3 inches long on one end. Screw it through the cap from the bottom until it projects about 2½ inches, says the Engineer, and the torch will be complete.



A GOOD SOLDERING FLUID.

A correspondent in Bubier's Popular Electrician gives the following recipe:

Take a piece of scrap zinc or pure spelter, say about ¼ pound, and immerse it in a half-pint of muriatic acid. If the piece completely dissolves, add more zinc until the acid ceases to bubble and a piece of metal remains. Let this stand for a day and then carefully pour off the clear liquid, or filter it through a cone of blotting paper. Add a teaspoonful of sal-ammoniac, and when thoroughly dissolved, the solution is ready for use. Depending on the materials to be soldered, the quantity of sal-ammoniac can be reduced. Its presence makes soldering very easy, but, unless the parts are well heated so as to evaporate the salt, the joints may rust, and a poor electrical connection result. Some concerns put a few drops of glycerine in their soldering fluids.

TAKING OUT BRUISES IN FURNITURE.

If the bruise is very small all that is necessary is to soak it with warm water and apply a red-hot poker near the surface, keeping the spot continually wet until the bruise disappears, which will occur in a few moments.

For larger bruises or dents wet the part with warm water and double a piece of brown paper five or six times, soak it, lay on the bruise, and then apply on top of the wetted paper a hot flatiron until the moisture has all evaporated. Keep this process up until the surface is level.

ANGLING FOR A FOOT-VALVE.

A good tool for fishing up a broken foot-valve in a pump was contrived by a correspondent of Power. An impression of the valve, the construction of which no one knew, was first taken by means of a tomato can filled with bar soak, secured to the pump rod and lowered into the well until the open end of the can of soap rested on the foot-valve. When withdrawn it showed the imprint of a rubber valve tilted up at an angle.

The fishing tool was made of a strong wood screw fastened into the lower socket of the wooden rod by standing the screw on its head on the bottom of the socket and pouring babbitt metal around it, which was hammered down solid to keep the screw from turning. When lowered into the well a few turns of this tool sank the screw into the rubber and the valve was drawn up into view after which a new foot-valve was put on.

REMOVING LIME IN WATER JACKET.

The removal of lime incrustation is always a more or less difficult job. Muriatic acid, of course, cuts the lime and dissolves it, but it is liable to cut quite deep into the iron as well and leave it rusted, says Gas Power. A small amount of common washing soda used in water after you have washed out the acid will neutralize the acid, but you should be careful to wash the water containing the soda out, as soda remaining for any length of time will rust the pipes and connections, too. One of the most efficient methods that I have ever seen for removing scale from small automobile boilers was to use common crude oil mixed in with the water. The process is this: First disconnect your tank and drain all of the water out of the jacket, then pour in about a pint of crude oil in the jacket, then fill in with water until the oil shows at the top outlet of the jacket; shut off the circulation of water and run the engine, carefully watching it so that it does not become overheated. Then engine should be run until practically all the water in jacket boils away. As the water level goes down the oil follows and has a very considerable loosening action on the lime. The advantage of this method is that there is no risk of rusting, but there is some of overheating and the engine should be run at quite low speed in order to avoid this.

LIFE OF CAST-IRON PIPE.

It is extremely difficult to get any satisfactory estimate as to the average length of life of street mains. Practical men in the trade say that it is a question for the chemist, says Domestic Engineering. The chemical constituents of the soil and the likelihood of exposure to electrolysis have everything to do with the matter. Where garbage has been deposited, or the soil is alkaline from any cause, the pipe may not last more than three or four years. In a good natural clay or sandy soil pipes can easily last for twenty-five years. At the City Hall it is said that eighteen years is a fair estimate in Chicago, where conditions are most favorable.

A SIMPLE TEMPERING RECIPE.

Dissolve a small quantity of sal-ammoniac in water, make the metal red hot, dip it in the mixture and leave enough heat in metal to draw it back a bit. If left to cool in the liquid tools will show too hard.

TO REVIVE FROM SUFFOCATION.

By inhalation of poisonous gases, vapors, such as illuminating gas, charcoal vapor, gas in wells, sewer gas, coal gas, mine gas, etc.

Remove the patient to open air and send for a physician.

In rescuing, avoid risks. If in a room, open and close the door rapidly to fan and force air into it; break out windows. Do not take a light into a cellar, mine, well, apartment, or any place where gas has escaped. Tie a rope around the waist of rescurer; cover his mouth and nose with a handkerchief wet with vinegar and water.

Get the patient to fresh air. Dash cold water on his face and chest. Use artificial respiration the same as in drowning. Apply hot bottles to body; put mustard plasters to heart, soles of feet and wrists; when recovering, mild stimulants may be used.

HOW TO MAKE A GRAVEL ROOF.

There is no reason why a gravel roof should not be a good one, if only proper care and good materials are used in its construction; at least it should be good for the money expended on it when compared with the cost of tin, galvanized or copper roofs. Of course, a gravel roof is only suited for a low pitch or flat roof, as on a steep roof the gravel would eventually wash off and leave the paper or canvas exposed to the weather. Ordinary coal tar answers fairly well for a top coat before the gravel is spread on, if the roof is very flat. If the roof has a good pitch it is a good idea to mix 8 or 10 pounds of common rosin with the pitch while it is boiling, stirring the mass well with a stick before it is taken out of the boiler.

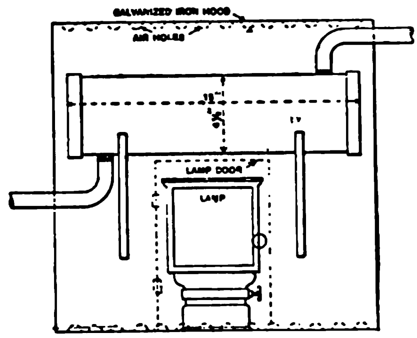
To prepare the roof before covering with tar after it is boarded tightly with matched stuff, the following rules should be observed: In all cases the grain of the roofing boards should run in the direction of the pitch—never across it—and all joints should be driven close and tight. The boards should be planed on the top side, and should be free from shakes or knot holes. Swab the whole roof over with a thick wash of Portland cement mixed with water to the consistency of thick paint. Let the roof dry for a few hours, then lay on a coat of good roofing paper—tarred paper preferred—having a lap of about one-third of the width of the paper. Over this give a thin coat of hot tar, in which ground asbestos, mica or Portland cement has been mixed, in the proportion of one bucketful of cement to four of hot pitch. Let stand until dry and hard. Over this lay another coat of roofing paper, and on this lay a thickness of rough sacking, which must be tacked down here and there with broad-headed tinned nails, such as tinsmiths use in roofing. On this sacking lay a thick coat of the tar while hot, and then sprinkle coarse sand and fine gravel on the hot tar and leave to harden. The tar must contain the proportion of asbestos, mica or cement as described in the foregoing.

Such a roof properly laid will last from seven to nine years, and may then be made good again by a generous coat of tar and fine gravel.

Our readers are urged to contribute to "Shop Notes" any kink they have worked out or may be using to advantage.

HOT WATER FOR BARBER SHOP.

A correspondent in the Metal Worker offers the following as a small heater which any mechanic can fix up. Make a small boiler of a piece of 4-inch wrought iron pipe, 15 inches long, with the ends capped and the inlet and outlets arranged as shown in the sketch. This is designed to lie horizontally and to have ½-inch holes drilled



Plan of Stove and Boiler Arrangement

and threaded in each end, one on the top and the other on the bottom. This can be set up on a stand or brackets sufficiently high to allow a one-wick oil stove to be set under it. The stove and heater could be inclosed in a galvanized iron hood, with a few holes in the top and a few in the bottom to let in fresh air and allow the products of combustion to escape. The hood should have an opening large enough to allow the oil stove to be inserted and removed. This may be set under a sink, or any place where it will be out of sight. The space adjoining it may be protected by asbestos paper, if deemed necessary. If there is gas in the building, a gas flame can take the place of the oil stove.

HOW TO DARKEN OAK.

Oak may be immediately and easily darkened by laying on liquid ammonia evenly with a rag or brush. The effect produced is just the same as is produced naturally by age and the color will not fade. Bichromate of potash, dissolved in cold water and applied with a brush, is another method of deepening the color, or new oak may be brought to any shade, or nearly black, by the application of a decoction of green walnut shells. Be careful to apply each coat evenly.

ANGLING FOR A FOOT-VALVE.

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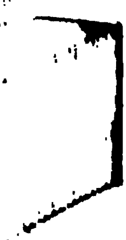
REMOVING LIME IN WATER JACKET.

... incrustation is ... difficult job. Muriat... the lime and dissolv... quite deep into ... rusted, says ... of common w... after you ... neutralize ... to wash the ... soda ... will rust ... of the ... ever ... autom... oil ... is ... drain ... then pou... the jacket ... shut off ... the engi... that it does n... heated. Then engine sh...



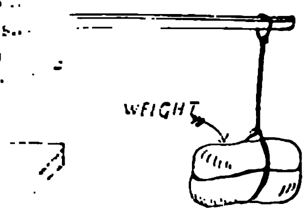
practically all away. As the oil follows loosening ... tage of this of rusting, ... and the en... speed in or...

... is placed over the ... the fulcrum for the

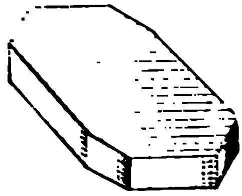
... all milk containing from ... fat may be used. Be... dairy thermometer, rennet, ... cloth will be required. ... pounds of skim milk will make

LI...

It is ... factory of life ... trade ... ist, ... ical ... hood ... thi... has ... fro... the ... cl... tw...



... pounds of cheese. Fill the boiler ... and place on the stove. Put the ... eter in the milk and slowly heat to ... Now add two teaspoonfuls of ... extract with water, about a half cup... before adding to the milk. At the same ... a teaspoonful of coloring. Let the ... come to 90 degrees, take off the stove ... cover with a cloth; in 15 or 20 minutes ... should be sufficiently coagulated. When ... on the stove again, and with a table ... cut the curd in all directions so as to ... into small cubes; heat slowly to 100 ... stirring occasionally to prevent the ... sticking to the bottom and burning or



... When a handful of curd upon ... squeezed until all the whey ... fall apart easily, it is cooked the store again, cover ...curd to lie in the ...ed into a sink ...ey, grind ... it with ... pounds of ... curd ... temperature ... day, when

...two hours, the ...upside down, the ...pressure added ...for two days; have ...when put away to ...of 60 to 70 degrees is ...where it should ...and turned daily.

...E PHOSPHOR TIN.

...for making phosphor tin ...not be applicable in a ...doing a large business, but ...following, says a correspondent ...try. This method must not be ...with the fireworks producing ...using yellow phosphorus, with ...a coating of copper sulphate. I ...phosphorus, which can be obtained ...form of powder. It will not ignite ...temperature of 240 degrees Centigrade. The melting point of tin is about ...rees Centigrade, or ten degrees less ...e ignition point of red phosphorus. ...this difference of ten degrees which ...he method possible.

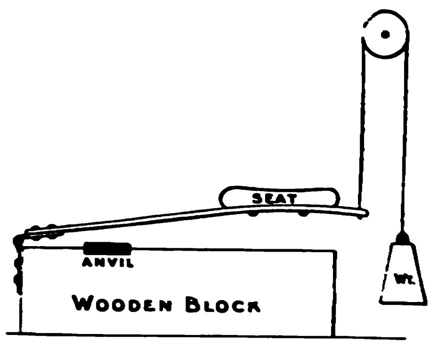
...very 28 pounds of tin, take 4 ounces ...horus and ram fairly hard into the ...of a crucible of sufficient size to ...the required quantity of tin. The ...rus should be covered with powd...rcoal and the crucible warmed be...ing the phosphorus in. Melt the tin ...er crucible, bearing in mind the ...t it must be just melted and not ...ed, on account of the fact that there ...a ten degree leeway between the ...point of the tin and the ignition ...the phosphorus. Pour the tin into ...ible containing the phosphorus, and ...rring and allowing some time for ...place the crucible in the furnace ...off the excess of phosphorus. Ar...can be made in the same way.

...articles in "Shop Notes" depart... printed at end of year in book ...rice 50 cents.

HUMAN CLAMPS.

In the shops of the Pennsylvania lines at Pittsburg, Pa., a very ingenious clamp is used in dismounting broken air and steam hose, says Railway and Locomotive Engineering. The clamp is quite as practical as it is curious, however, and might readily be adapted to other forms of work.

It consists of a stout block of wood about 16 inches high placed on the ground and having an iron plate let into its upper side at a suitable point. The plate forms a sort of anvil. A piece of spring steel is hinged at one end of the block and the other end of the steel carries a seat, the whole being counterbalanced by a weight which hangs from a pulley on a post nearby.



Seat Clamp For Dismantling Hose

When the operator wishes to take off broken hose from a nipple which is to be used again, he lays it on the anvil, leaving the clevis projecting beyond the steel spring, and then he literally sits down on the whole job. His weight effectually clamps the piece of hose pipe in place, and holds it in a most convenient position for working. When he wishes to release the work, he eases up on his seat, and the counter weight on the post carries seat and spring up so that the hose is instantly freed. In fact, the act of standing up to reach another broken piece of hose lets the one which has been dismantled come out of the machine.

The device is very simple and as there is practically nothing about it to wear out, it has no maintenance charge. The heaviest man secures the best clamp on his work.

If Popular Mechanics has no representative in your shop write for particulars, and learn how you can earn money easily every month.

[illegible] A HANDY KEY-SEATING TOOL

[illegible] the American Ma- [illegible] a key seating tool [illegible] in one and one half hours.

[illegible] to keyseat some gun- [illegible] the hole was ⅝ inch

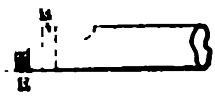


Fig. 1

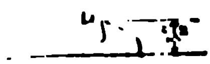


Fig. 2

A Key-seating Tool

[illegible] I thought it im- [illegible] them the more [illegible] on the shaft with- [illegible] This necessitated a [illegible]

[illegible] inch shaft about 12 [illegible] a keyway (A) in it [illegible] and inserted a tool [illegible] is a ⅛ inch pin for a [illegible] C is a 1-16 pin hold- [illegible] in the cutting edge.

[illegible] in the universal [illegible] the tool mounted in the [illegible] I then pushed [illegible] inch screw (E) each [illegible] keyways com- [illegible] half hours."

◆•◆

[illegible] A GOOD QUALITY OF GLUE

[illegible] the glue into several [illegible] it a blow with a [illegible] If the broken [illegible] edges, the glue is [illegible] the edges are very [illegible] good. The more [illegible] edges the more the [illegible] upon and it will [illegible] well.

◆•◆

[illegible] has invented a method [illegible] fluid gas from the [illegible] and heavy mineral [illegible] claims it can be manu- [illegible] where there is an abun- [illegible] and can be transported [illegible] The gas makes a brilliant [illegible] lighting and is very difficult [illegible]

PUTTING PLUGS IN WATER PIPES.

While making some changes in the water piping in a large building I ran across a job that I think worthy of mention, says a writer in Practical Engineer. The business of the company occupying the building necessitated the erection of a new building in the rear of the main building, and when the contractor was well along with the excavating work it was found that the city water pipes were much in the way, so much so that it was necessary to break and plug several joints.

I found that to do this would require four 8-inch plugs and two 10-inch plugs. As the piping was cast iron and the joints bell and spigot, considerable time was lost looking for special plugs. Only two plugs could be found, so I made the following suggestion: I had two blank flanges cut from 3-16-inch boiler plate the same diameter as the spigot end of the pipe, two 8-inch and two 10-inch. After hunting around the plant I found two specials, the running size being 8 inches and the side outlets 4 inches, which were broken at the 8-inch bell ends. Using a handle chisel, the spigot ends were cut off; the ends were 14 inches long. For the two 10-inch openings I had to cut the spigot end off of two lengths of 10-inch cast iron pipe. Making sure that the blank flanges were smooth, I put them into the bell of each opening and with the spigot end against that, and wedged the pipe firmly in the center of the bell, and then drove in about five strands of thoroughly twisted jute. After all the joints had been prepared in this manner I heated the lead and with a jointer on each connection the hot metal was poured in. When the metal had set it was driven up in each joint, and when the pressure was turned on the piping showed no signs of leaking.

◆•◆

REMOVING GLASS STOPPERS.

Glass stoppers sometimes occasion even more difficulty than corks in their removal. An almost infallible cure for a fixed stopper is to grasp the bottle in the left hand, and with the thumb press against the offending stopper, while with the right hand gently tap against this pressure, using the handle of a knife or other hard instrument. In this way gradually work round the stopper, which will quickly become loose enough to be extracted.

EMERGENCY ROPE TIRE FOR AUTOMOBILES.

Rubber tires are not always to be had when wanted, but a piece of rope is generally to be found at any farm house. The Automobile gives the following valuable instructions on making an emergency tire:

If a tire is injured on a run so that it cannot be repaired, and if a substitute is not available, a rope can be wound on the wheel rim and the car run slowly to the nearest repair station. Before applying the rope, the car must be jacked up and the tube and shoe removed from the rim. The clamps or lugs which help to hold the shoe in place are also removed. Procure a piece of rope, of such diameter that when wound on the rim it will project above the edge or clincher and thus protect it. The rope should be long enough to wind around the rim several times, so as to completely fill the space in the rim ordinarily occupied by the tire.

Before the rope is put on, a piece of wire or strong cord should be fastened securely to one end. The free end of this cord or wire is pushed through the valve hole in the rim and fastened to one of the spokes. After one of its ends is thus secured, the rope can be wound on the rim. Care should be taken that the rope is wound on as tightly as possible. To do this an assistant will be, usually, required, who should turn the wheel slowly while the rope is laid on under tension. The other end of the rope is now secured by means of a piece of wire or cord, passing through one of the clamp holes and fastened to a spoke, as already directed.

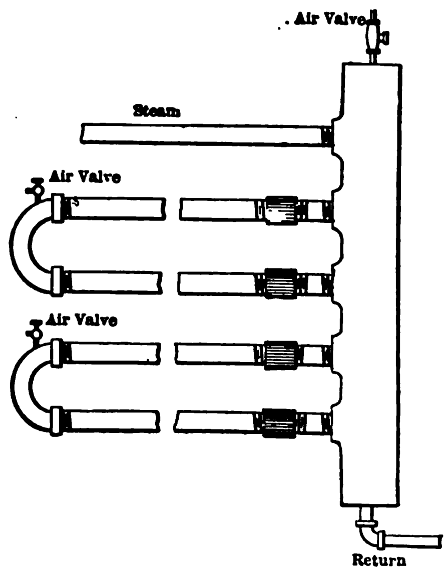
After the car has been lowered down and the jack taken away, the motor may be started and the car driven slowly to the nearest repair station. When driving a car having ropes on a wheel rim as described, great care is necessary. When passing over car or railroad tracks, or when passing over streets paved with stone blocks, the rim may be ruined, if the car is driven at any but the slowest speeds.

It is well to bear in mind that the wheel which has the rope on its rim has a smaller effective diameter than the other wheels, which have tires on. Consequently if either of the rear wheels are roped as described, the differential gear will function as long as the car is moving. For this reason the car should not be driven any great distance under these conditions, as excessive wear of the differential pinions would result.

Ropes on one of the front wheels will interfere with the operation of the car only very slightly, and it may therefore be driven for a greater distance without injury than if one of the rear wheels is roped. If there are any passengers it is well to arrange them so as to have as little weight on the disabled wheel as possible.

RE-ARRANGING HEATING COILS.

A steam heating coil consisting of a continuous coil of pipe around one side and on the end of a room, connected by return bends, which required 15 pounds of pressure to heat was changed by a correspondent of Power, who wished to use exhaust steam for heating so that the room could be heated nicely with less than two pounds back pressure on the exhaust.



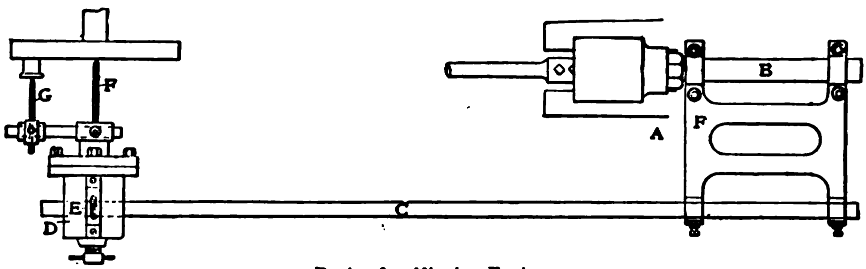
Re-Arrangement of Steam Coils

One day after the coils had frozen up he broke the return bends off at one end with a hammer and substituted a branch tee with right and left nipples and couplings to connect up as shown in the sketch. He put an air valve on the top of the tee and one on the end of each loop. The heat could then be controlled in each loop separately by means of the air valve on that loop, and the whole arrangement worked admirably.

Engineers are scarce in the United States navy and Rear Admiral Charles W. Rae, engineer-in-chief of the bureau of steam engineering, is urging special legislation by Congress with a view to increasing the number of naval officers available for engineering duties.

A SIMPLE INSTRUMENT FOR ALIGNING ENGINES.

An instrument for aligning engines which is simple in construction and particularly helpful in engine-rooms containing a number of engines on which adjustments are frequently made is described by a correspondent of Power who says he patented it years ago.



Device for Aligning Engines.

It consists of a frame, A (see sketch), which is attached to the piston rod of the engine, B, after the connecting rod has been disconnected from the crank-pin. The rod, or preferably a tube, C, is adjusted in the frame, A, and is perfectly parallel to the piston rod, B. This rod, which lies in the same horizontal plane as the piston rod, extends a few inches beyond the center of the crankshaft, forming what is a parallel extension of the piston rod, A. On the end of the rod, C, is carried the sliding adjustable head, D, which is fitted with a small level on the top, E, and two adjustable pointers, F, and G; F is centered at the center of the crank-shaft and G at the center of the crank-pin, and if the crank-shaft is true when it is rotated, the ends of these pointers will remain at the same parallel distance from the rod, C. If the shaft is not at right angles to the piston rod, on rotating it and the pointer, G, the error may be easily measured by observing the amount that the pointer, G, slides in or out of its socket in order to remain in contact with the end of the crank-pin. The slightest variation of the shaft from a right angle or a level position will be shown by the instrument, which may be used without a great amount of labor or loss of time.

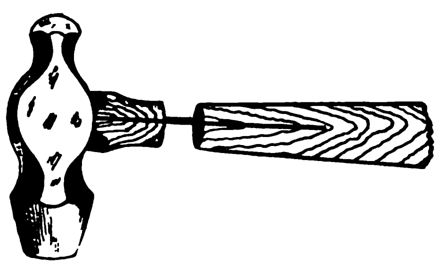
BULGING PUTTY.

In a paper read before the Master Car and Locomotive Painters, at Atlantic City, B. E. Miller reported:

"Bulging of putty is probably caused by the expansion and contraction of the wood during damp weather. As the moisture is evaporated the surface shrinks, decreasing the size of the nail hole. Ninety per cent of the effect is from this cause and 10 per cent is from the expansion and contraction of the nail and the effort of the wood fiber to straighten. It was demonstrated to the committee that where a small nail was used the bulging amounted to but little. The bulging increased with the size of the nail head and the depth of set. It was recommended to use none but seasoned lumber; use small-headed nails as possible; set them not more than 1-16 of an inch below the surface; thoroughly prime and second coat all depressions, including heads of nails and screws."

IMPROVING A HAMMER HANDLE.

When putting a new handle in a hammer for use at the anvil the following little wrinkle, given by a correspondent of the American Blacksmith will be found to greatly improve it.


An Improved Hammer Handle.

Cut a ¾-inch piece out of the handle 2 inches from the hammer head. Slot each end of the cut to receive a piece of spring steel 3/32-inch thick and as wide as the handle. Fasten the steel with rivets. The extra work requires but a few minutes longer, and well pays for the trouble.

THAWING SERVICE PIPES BY ELECTRICITY.

A Transformer Specially For This Work

The approved, rapid and economical method of thawing frozen water and gas pipes is by electricity. A new transformer for this especial purpose and designed to work on alternating circuits of from 2,000 to 2,300 volts, is the latest addition to the electrical apparatus. The transformer operates by means of an adjustable core or flux shunt controlled by a hand wheel and locking device.

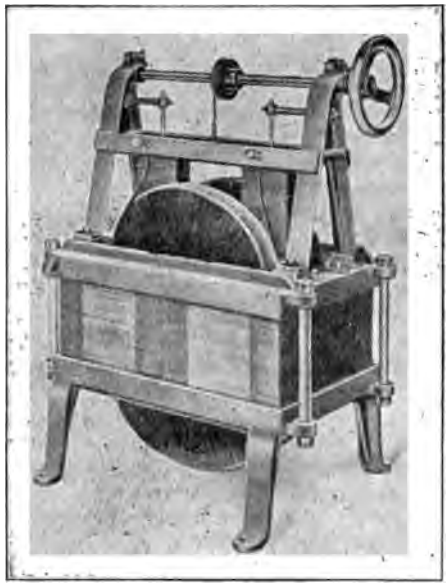
The transformer after being located close to the frozen pipe should have the flux shunt core dropped to its lowest position, the secondary connected to the water pipe and the primary connected to the line. After closing the primary switch the shunt should be raised by means of the operating handle until a sufficient voltage and current are obtained for the particular pipe under treatment. The operating handle should then be securely clamped by means of thumb screws provided for this purpose. After the pipe is completely thawed, the shunt should again be secured at its lowest position ready for the next treatment. In thawing street mains two adjoining hydrants can conveniently be used as terminals. Service pipes can be thawed out by using as terminals a house faucet and the nearest hydrant, the house faucet and the service pipe, or a faucet in a neighboring house.

In every case special precaution must be taken to make good connections, otherwise the water faucets, hydrants, pipes, etc., used for terminals will be burned and disfigured by the heavy current used.

No positive rule is given as to the exact length of time required in any particular case owing to the widely varying conditions, but the following table compiled from records made last winter furnish a fair basis of average conditions:

Size Pipe	Length	Volts	Amps.	Time Required to Thaw
¾"	40 ft.	50	300	8 min.
¾"	100 "	55	135	10 "
¾"	250 "	50	400	20 "
1"	250 "	50	500	20 "
1"	700 "	55	175	5 hrs.
4"	1300 "	55	260	3 "
10"	800 "	70	400	2 "

The manager of the Public Service Corporation of New Jersey, which has a record of 2,963 services thawed out, states: "The first wagon was fitted up with a considerable amount of apparatus for making calculations, but after a very brief experience all the instruments were discarded and the operator simply gauged his work by the manner in which the water boiled in the barrel on the wagon, which was used as a resistance. Additional wagons were fitted up in this manner and the work carried on



Transformer For Thawing Out Pipes

to the extent of our ability to spare men and wagons from other work. Most of the wagons contained a 300-light transformer wired up to a rough wooden rack, with primary fuse boxes on the side, and sufficent length of wire to reach an ordinary overhead circuit, the custom being to stand the wagon alongside the pole nearest the building where the pipes were to be thawed out. On the secondary side a heavy knife switch properly fused was fastened in the bottom of the wagon, and two coils of heavy wire mounted on reels were also provided.

"In the case of a single building, the method of procedure was usually to connect the primary leads to the overhead circuit, insert the primary fuses, run out the two heavy wires from the reels to the desired length; one end being connected usually through the cellar window to the water pipe, as near the cellar wall as possible, the other end being connected to the nearest hydrant or curb box, preferably on the opposite side of the street. The object was to allow treatment of the pipe at any point between the cellar wall and the street main, as there was no way of determining the exact point of interruption.

"When the pipes of two or more adjacent buildings were to be treated, the water services were simply connected in series, and as a matter of fact it was found to be just as easy to thaw several houses and took no more time than it did for one. As a matter of experiment we tried grouping buildings, to see what the result would be, and the largest number we were able to find in one location, which consisted of a row of small tenements, fourteen in number, were thawed out as easily as a smaller number, although the time required was somewhat longer.

"By having sufficiently long secondary leads, we also found it more convenient to extend the secondary than to move the wagon, and in one instance we thawed out about thirty pipes without moving the wagon. The length of wire used in this case, however, was about 500 feet. Charges for the service varied from $4 to $15, and was very much less than the cost of tearing up the pavement would have been. In one case a 6-inch main was thawed out simply as a matter of experiment, the time required being about three hours. The number of services that can be handled by one outfit in a day depends entirely on local conditions of poles, wires and location of service. Our outfits consist of two men each with a horse and wagon, and each outfit averages all the way from 10 to 200 pipes thawed out per working day."

Transformers are also made to work on circuits of 500 volts.

COVERING FOR OVERHEAD STEAM PIPES.

A pipe for overhead steam pipes that is advocated by Mr. Robert Watt in a contribution to the question box of the Ohio Gas Light Association is described in the "American Gas Light Journal." The pipe is enclosed within a molded covering and wrapped in canvas, and the canvas is painted with two coats of tar boiled down to the consistency of soft pitch, having a little slate flour, slaked lime or hydraulic cement added to it. It is applied with a brush, the second coat two or three days after the first.

CLEANING BOILER TUBES.

In a certain city there are two breweries operated by one company each brewery having a separate steam plant says a correspondent in the National Engineer. The engineer of one of the plants insists that the proper way to keep his boiler tubes clean is to use a steam cleaner frequently and not use a scraper until the boiler is laid off, or, in this case, about every two weeks. In defense of this method he states that the boiler and inner setting are exposed to the surrounding atmosphere for a much shorter period of time than would be possible if a scraper alone were employed.

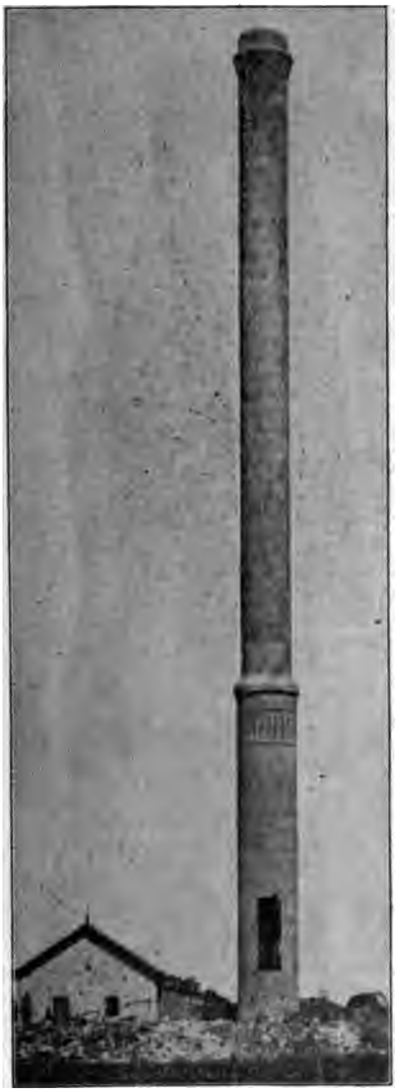
At the other plant the tubes are scraped each day, the engineer there claiming that using a steam cleaner serves to accumulate soot in the tubes, whereas the scraper effectually removes it.

In my opinion both methods are right under certain conditions. One objection to the steam cleaning method, as found in average use, is that the steam used is heavily saturated with water, and in passing through the tube part of it condenses, causing an immediate pasty deposit in the tube, which shortly after hardens and perceptibly affects the transfer of heat to the water in the boiler. In such cases, unless a scraper is used frequently, this deposit accumulates to an extent that calls for a considerable amount of coal in excess of what would otherwise be necessary. Just how often the scraper should be used depends somewhat on the conditions the boiler is operated under. It is safe to say, however, that reliance should not be placed exclusively on steam cleaners. If it comes to a choice between the two methods, the scraper will be found to keep the tubes cleaner than the steam blower.

More natural gas was produced last year than ever before, and was valued at $35,815,000. Ninety-four per cent was produced in Pennsylvania, West Virginia, Ohio and Indiana. The consumers, manufacturers and individuals totaled 634,269. The United States produced 99 1-3 per cent of the entire world's production of natural gas.

ARGEST STEEL-CONCRETE CHIMNEY IN THE WORLD.

The largest steel-concrete chimney in the rorld was recently erected at Bellevue, lich. It is about 182 feet high with a 22-



Concrete Stack

oot square base built in solid rock 4 feet ı the ground, and having 108 steel bars nbedded in it. The chimney consists of n inner and outer shell, 8 and 4 inches ıick, respectively, to a height of 60 feet, 'here they join, tapering from there on rom 8 to 5 inches in thickness. It is a single piece from top to bottom and weighs with its base, 390 tons, 25,000 pounds of which is steel. Work was carried on from the inside at the rate of six feet per day.

TO LOOSEN RUSTY SCREW.

One of the simplest and readiest ways of loosening a rusted screw is simply to apply heat to the head of the screw. A small bar or rod of iron, flat at the end, if reddened in the fire and applied for two or three minutes to the head of a rusty screw, will, as soon as it heats the screw, render its withdrawal as easy with the screwdriver as if it were only a recently inserted screw. This is not particularly novel, but is worth knowing.

HOW TO SOFTEN PUTTY.

Putty which has become hardened by exposure, as around window sash, may be softened and readily removed by the use of the following mixture:

Slake three pounds of quickstone lime in water and add one pound of pearlash, making the whole of about the consistency of paint. Apply to both sides the glass and let it remain for 12 hours. At the end of that time the putty will be sufficiently soft so the glass can be lifted out of the frame.

HOW TO CLEAN POLISHED WOOD.

An encaustic composed of wax, sal soda and a good soap is excellent for cleaning and polishing at the same time. Shave the wax and the soap and dissolve them in boiling water; stir frequently and add the soda. When the wax and soap are thoroughly dissolved place the mixture in a vessel which can be closely covered and stir constantly till cool.

This mixture will remove ink from polished surfaces and may be satisfactorily applied to marbles, bricks, furniture, tiles and floors.

A car door fell from a freight train on the Southern Ry. so that it rested on both rails. The locomotive of a passenger struck it and the locomotive and tender were thrown down an embankment, killing the engineer, fireman and a flagman.

WORN VALVE GEAR AND HOW TO DEAL WITH IT.

Faulty action of the exhaust valves due to wear in the valve actuating mechanism is the cause ascribed by the Automobile of motors missing and not giving off power. In an excellent article on worn valve gear that paper further states:

The rollers, or shoes, which ride on the cams of the half-time shaft or the cams themselves may wear, owing to defective lubrication, or to the material of which they are made being too soft. If the amount of wear is, say, one-eighth of an inch, it is clear that the valve will open just this much too late, and close this much too early.

Back pressure will be caused by late opening, particularly at high speeds, and the burned gases will be retained in the cylinder by early closing, and will be compressed toward the end of the exhaust stroke. When the inlet valve opens, therefore, these burned gases, which are then under pressure, will rush out into the inlet pipe, and displace a portion of the incoming charge. Now the piston goes out on the suction stroke, and as the inlet pipe is full of exhaust gas, the fresh gas will not reach the cylinder until the piston has moved out a considerable percentage of its stroke. Consequently the volume of the aspirated charge will be less, and the percentage of burned gas to fresh, or explosive, gas will be greater. This will cause weak explosions and loss of power.

A little consideration will show that if the exhaust valves act as described, it will be almost impossible to throttle the motor, so as to make it run slowly. When the motor is throttled very much only a small quantity of explosive gas is taken in during each suction stroke. There is, as just shown, a relatively large volume of burned gas in the cylinder and passages. This burned gas may dilute the fresh gas to such an extent as to render the resulting mixture non-explosive.

When there is a greater distance between the "push-rod" and valve stem than 1-16 inch the valve actuating gear should be taken apart and refitted. More clearance must be allowed between the rod and valve stem when the latter is long than when it is short. The reason is, that a long valve stem lengthens more on being heated than a short stem. For this reason before testing the clearance between the stems and rods, one should make sure that the motor is thoroughly heated by running it for ten or fifteen minutes. This run ought to get the valve stems up to working temperature.

When fitting a new exhaust valve—especially if it has a long stem, and everything cold—be careful not to make this clearance too little. If too little clearance is allowed when the parts are cold, the expansion due to the working heat may be sufficient to lengthen the valve stem so much that it will rest on the end of the push rod, and so prevent the valve from seating fully. This will, of course, result in great loss of power also.

Often a motor will have good compression when cold, or slightly heated, and have next to none at all after it has run for some time. When a motor acts in this way, the trouble is usually due to leakage past the valves on account of the small amount of clearance between the valve stems and the push-rods. When the stems and valves are cold, the latter seat properly, but when the stems are heated, and of course expanded, the valves are prevented from seating by the stems resting on the push-rods.

Valve seats which are pitted badly are usually faced off. So much metal may be taken off in doing this that the stem of the valve—when the latter rests on the re-made valve—will touch the push-rod. After valves have been ground in a great deal, or after they have been faced off, the stems may also strike the push-rods. The action of mechanically operated inlet valves will be affected by wear in the mechanism, the same as exhaust valves.

Inasmuch as the springs on the inlet valves are usually weaker than on the exhaust valves, the wear on the parts which move them will not be so great. Another reason why the wear is less is that there is no pressure on the inlet valves at the instant when they are lifted, while the exhaust valves may have forty or more pounds pressure to the square inch on them at this moment.

Inlet valves do not get nearly as hot, and consequently do not expand as much as exhaust valves. For this reason less clearance should be allowed between the stems and push-rods than would be allowed between the stems and push-rods of exhaust valves.

The remarks about facing off the seats of valves and grinding in of exhaust valves apply to inlet valves also.

How To Build a Telephone Line By Using a Wire Fence

50-Mile Telephone System at Marlow, Indian Territory--Story of Its Construction and Successful Operation Is Told By the Builder

T. P. Martin, Jr.

A wire fence telephone line will not give perfect satisfaction during wet weather as ringing is difficult owing to the grounding by the wet posts. However, in a dry climate like that common to the South it will work nicely. Such a line was installed and used by the writer for nearly two years. Thousands talked over the line and few dreamed that their important messages were going over a common barbed wire fence. The line was run on the right-of-way fences of the Rock Island railroad from Marlow, I. T., to Rush Springs, and from Marlow to Duncan, 10 miles each way, making a 20-mile fence line, which was connected at Marlow with a 1-wire 2x4 post line, which had been hastily built from Marlow to Lawton, O. T., 30 miles distant.

The first piece of advice I shall offer is this: what you do, do with care and you will find that you have a convenient telephone line which will work with several 'phones on it, a distance of 20 miles during dry weather and, if very dry, you may ring 50 or more miles. Get only the best of telephones, about a 5-bar generator in what is known as the long distance bridging telephone. This will cost you complete about

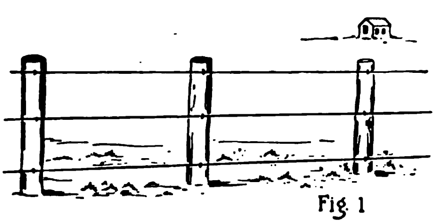


Fig. 1

$12, and is well worth the price. Poor material gives poor results, so get the best of what you do buy.

Get permission from all who own the fences between you and the friend you desire to have telephonic communication with. This is generally an easy matter. If the wire fences are three wires or more, the instructions following will apply for all.

Get some poles or pieces of 2x4 about 16 feet long and saw across and downwards at one end of each piece so that a wire laid in the cleft so made, will not slip over the ends of the pole (a nail driven into the end of the pole and bent down across the wire, or

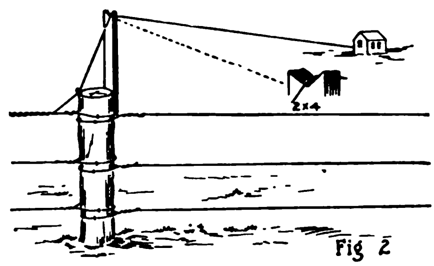


Fig. 2

a fence nail will do better). Now get some No. 12 galvanized iron wire, enough to run across all gates, roads, culverts, or other obstacles, and to run from the fence to each house you desire to connect with.

Begin at the fence in front or near the first house and after splicing the barbed wire from each side of a certain post and tying the splice around the pole, put two good staples on each wire, then cut the original wires in center. Be sure to staple the wires before you cut the original wire, or they will all slip and make the fence sag and look bad. Staple the wires at least an inch from each other so that you have six separate ends on the post of a 3-wire fence. Fig. 1 shows the fence as it is before touching and Fig. 2 after the wires have been cut.

This operation leaves you with the wires in front of you to look after and saves your line from being bothered by grounds or other causes on parts of fence which are not used by you. Join an end of your iron galvanized wire to the top fence wire, pass it over the cleft in the end of one of the 2x4 pieces, or the end of one of the poles you may have. Fasten it there with a bent nail or staple, nail your pole, or 2x4 to the fence post and run the iron wire to the first house, fasten it on the side of the house and cut off the extra wire for further use. Return to the fence and carefully

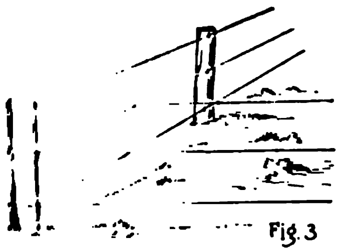


Fig. 3

[illegible] of the next house you [illegible]. See that all staples [illegible] only on the top wire (which [illegible] used for the telephone line), [illegible] wires, for you do not want [illegible] if possible, nor any sagging [illegible] the ground by even the [illegible] although you are not using [illegible] to keep all the wires clear, [illegible] at any time become tangled [illegible] it will not affect your line [illegible] the troublesome other wire [illegible] grounded at some place.

[illegible] along the fence you will soon [illegible] cross fence. Fig. 3 shows how [illegible] look on a fence where an- [illegible] and Fig. 4 shows how you [illegible] three of the cross fence wires [illegible] do not touch any of the three [illegible] wires. Be careful when [illegible] to staple each wire well so [illegible] for that purpose will not [illegible]. Cut off all loose ends so [illegible] small boys will not twist them [illegible] you use. Next you may [illegible] a wire gate, which many times [illegible] on the ground. Fig. 5 shows [illegible] and the way to pass it. Cut [illegible] at least one post from the [illegible] two posts would be bet- [illegible] trouble often happens to 'phone [illegible] gate. Two pieces of 2x4 are [illegible] the drawing shows.

[illegible] how to cross a road, being [illegible] manner of crossing over a [illegible] that in every case all side fence wires or other obstructions are discon- nected from the main line fence.

Fig. 7 is a hollow or creek fixed so that cattle cannot pass. The fence wires are usually tied to each other by smaller wires. These wires should be removed and replaced with a new strong wire and a small porcelain insulator between each fence wire so that while the fence wires are braced and held as before, they are insulated from each other. As such places are usually sources of annoyance, I would suggest the method of Fig. 8, although it is more trouble. This is the method used for crossing small rivers.

Fig. 9 shows a wire coming down a railroad right-of-way fence on one side, crossing under a culvert or bridge and going out on the other side. All three wires are disconnected on each side of the bridge or

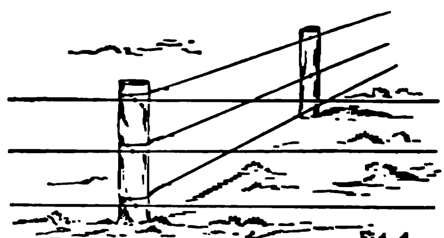


Fig 4

culvert, similar to Fig. 2, and the connecting iron wire between the two sides of the culvert is run under and nailed to one of the cross-ties of the railroad track. If the ties are lying on the ground, a piece of heavy insulated wire nailed near the top, but on the side of a tie, will serve the purpose as well. In this latter case it is well to scoop out the sand next the tie so that in case of rain the water will drain quickly from each side of that particular cross-tie.

Fig. 10 is similar to Fig. 2, and is intended to show the end of the line. If, however, you desire to connect up several houses Fig. 11 shows how to do it. Each house is

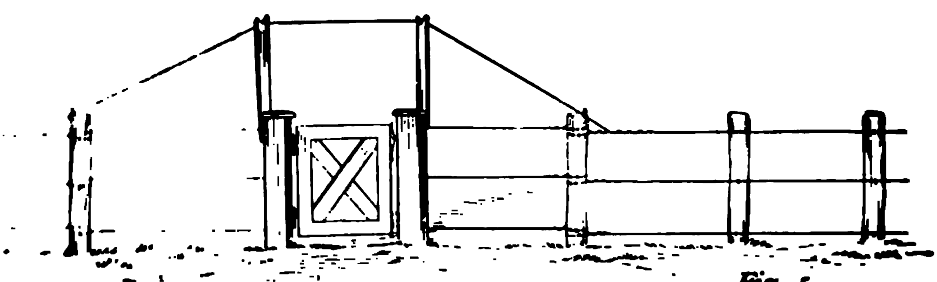


Fig. 5

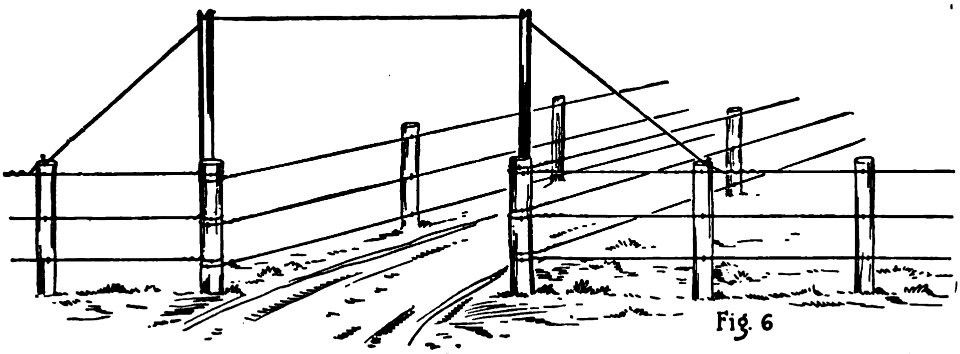


Fig. 6

approached and handled in the same manner as the first one, bridge 'phones being used with a ground wire at each house.

Fig. 12 shows how to place the telephone instrument inside the house, and Fig. 13 the fuse block and ground wire outside. After having attached your iron wire to the side of the house, bore a small hole through the wall (slanting upward from the outside so that wind and rain will not enter) bore another hole just above where you have decided to put the telephone instrument, and still another a few feet to one side of it. Get about 50 feet (to each house or 'phone) of No. 14 well covered insulated wire, copper preferred; take a knife and scrape away all the covering from one end of this wire for about two inches and run the scraped end through the hole at the top and just back of where you intend to put the telephone inside the room. Measure off enough of this wire to reach the ground and there scrape the covering for about six inches. Get a piece of iron rod about three feet long, an old wagon rod or stove rod will do, file each end of it bright for about six or eight inches, and wrap an extra piece of the copper wire around it (first removing the covering from the wire) many times, close and fast, soldering it if possible. Take your axe and, selecting a damp place at the bottom of the house, drive this rod down and under the house (where it is usually damp) until you have covered up the top of it, leaving sticking out the small wire you have wrapped it with. Now take some small double-headed tacks and neatly nail your wire from the 'phone, down the side of the house, along a crack where it will not show, to the grounded rod and there attach the two ends together. Cut another piece of wire about half the length of the wire ty run to the 'phone, scrape each end well and join one end on the outside of the house to the wire already running to the ground. Run the other end through the next nearest hole and leave the slack inside

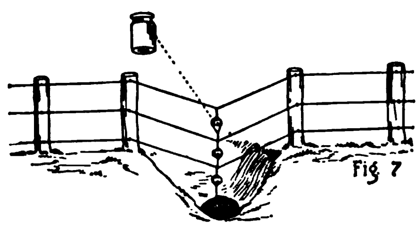


Fig. 7

the room until later. Now take your iron wire coming from the fence, fasten it up high where the cows will not break it down. Get a small fuse block and fuse from your local 'phone man, who will explain to you fully how to use it, and screw the fuse block to the house outside and well up under the eaves out of the rain. To the other end of the fuse block fasten another piece of insulated wire, well scraped, and run the end of this piece through the last hole you bored. Do not run two wires through the same hole and be careful to nail all wires down so the children will not be tempted to pull on them, thus breaking the line and giving you trouble. Now go inside and put up your telephone, with which directions are usually sent. Do not connect up the battery on your 'phone until after your instrument is up on the wall, for batteries run down or lose their

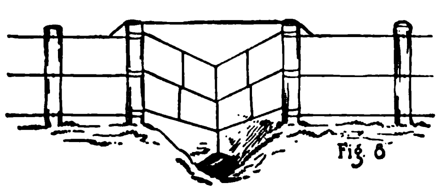


Fig. 8

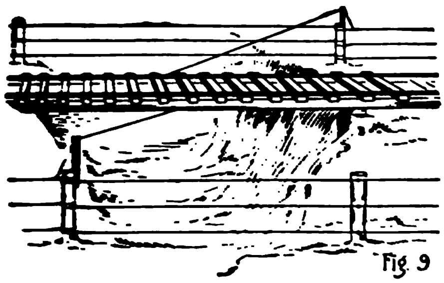


Fig. 9

energy when in use constantly and a telephone on the wall is usually in a position where it throws the battery in circuit.

Get a small wooden 2-point switch with a little lever to it and fasten this switch to the wall immediately above and to one side of your telephone. There are small connecting posts under or on the lever and points, and to these posts attach wires as follows: to the lever itself attach a short wire and fasten the other end of it to one

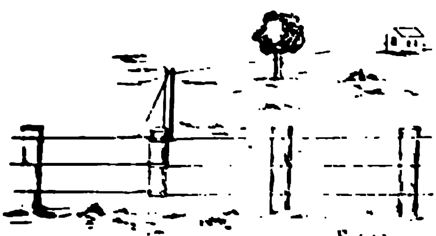


Fig 10

of the binding posts or screws at the top of the telephone; attach to one of the points, the wire which comes from the fuse block, and to the other point attach one of the wires that has been connected with the ground rod, now take the other wire, which also runs to the ground rod, and connect it to the remaining binding post at top of 'phone. Connect the battery in the battery box (put the small wire you will find there loose, under a binding post and screw it down). Now place the lever of your switch on the point the line wire comes to and see if you have left any loose ends of wires, for there should be none. Any

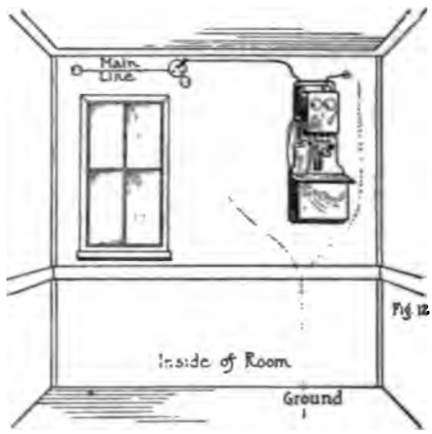


Fig. 12

slack in wires may be remedied by winding the insulated wire around a wire nail or lead pencil. See that your fuse is well down in the block, that all screws and binding posts are well set, and, if such is the case, you are done here. Fix the next 'phone likewise and you are in readiness to ring your friend. The fuse block and fuse is for protection against lightning and the switch serves a similar purpose, and in addition is to be used to "test" your 'phone. If you find that you cannot ring, turn the switch to the other point and if it then rings, your 'phone is all right so far as ringing is concerned and the chances are that the line is cut somewhere. In case of lightning or a thunder storm you can turn the lever to the switch so that it touches no point at all. This leaves your line "open"

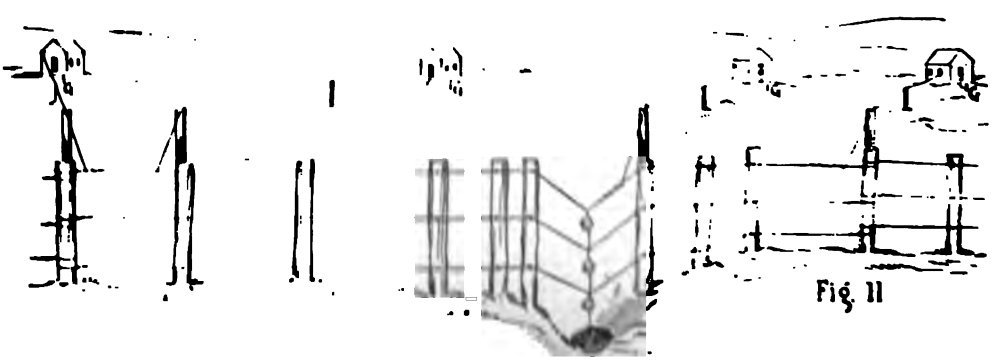
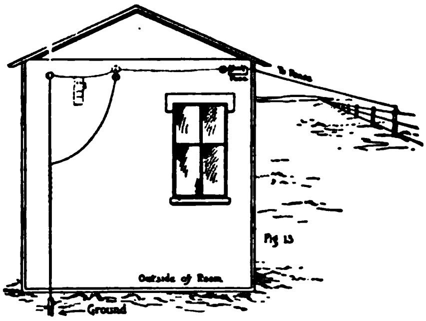


Fig. 11

and you cannot talk or ring anyone until you put the lever back on the point where the main line is connected. If, after putting



up both 'phones, the lines do not work, but test out properly so far as the instruments are concerned, the trouble is (and will be often if you do not follow to the letter directions given here) on the fence somewhere. Go over it again and when you see a place you are in doubt about, fix it. Then go back to your 'phone, leaving the other party at his and try again and you will doubtless have a pleasant surprise in the way of your first conversation over a barbed wire fence telephone line.

AFRICA IDEAL FOR COTTON GROWING.

England, in promoting the growth of cotton in Africa, has taken up a most promising field, as has Germany also. The climate, soil and native laborers of Africa are more favorable to cotton growing than they are in any other continent, and before 1905, in British Central Africa, alone, 200,000 acres of it will be planted.

British possessions in West Africa include 500,000 square miles, containing 20,000,000 negroes, and an output of 10,000,000 bales of cotton of superior quality per year is expected from that district.

That the market for the product is good is apparent from the fact that the average increase of the world's cotton output is 100,000 bales per year, while the average increase in population greatly exceeds it and cotton fabrics were never more in demand.

Egyptian cotton is noted for its silky softness, but in no other country save Africa has its seed produced good results. The establishment of transportation lines will make a great cotton territory of the Sudan as immigration to that part will be greatly sed.

FIRE ENGINE PROVIDES MUSIC FOR SCHOOL EXRCISES.

A fire engine returning from a fire provided the music for grammar school exercises that were being held in the First Presbyterian Church at Austin, Ill., recently. The big pipe organ at the church is pumped by a water motor, but owing to low water pressure the organ only gave a wheezing sound when the organist attempted to play. An alderman was in the audience, who went out and hailed a fire engine that chanced to be passing the church. By the aid of the fire engine and the blower the organ was pumped and the entertainment proceeded.

RAILWAY MOTOR SERVICE IN GERMANY.

Motor railroad cars for service on small local roads are now being built in Germany. The cars are to be of two sizes; the larger ones will pull a trailer of two tons gross and will accommodate the entire passenger, mail and freight service. Passenger service will be German third-class, the seats being unupholstered wooden ones. A separate compartment for passengers with heavy baggage will be provided or the space will be used for standing room in emergencies. These large cars, without the trailer, are capable of a speed of 46.6 miles.

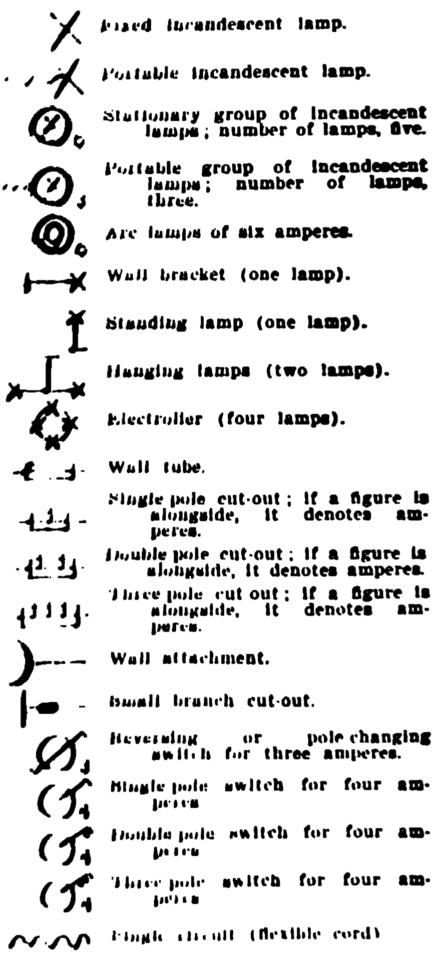
The smaller cars will pull from three-quarters to one ton gross weight and will transport baggage and a limited number of passengers. The freight and regular parcels-post service will be handled by local trains. On main lines the small cars without trailer will have a speed of 37.3 miles, and on branch roads, 31 miles.

Besides these motor cars for railway service, street motor cars of five patterns for mail service are soon to be installed. Three of these are for use in inner cities while the other two types will be used on the highways in rural districts and will accommodate passengers, also smaller cars will be used to collect and deliver mail, and possibly freight, at points having no railroad connection.

Music to soothe the troubled minds of the insane is being used with great success at the Cook county asylum for the insane. One Chicago firm has recently donated six pianos to the institution.

[illegible] SIGNS USED BY FOREIGN [illegible]ICAL DRAFTSMEN.

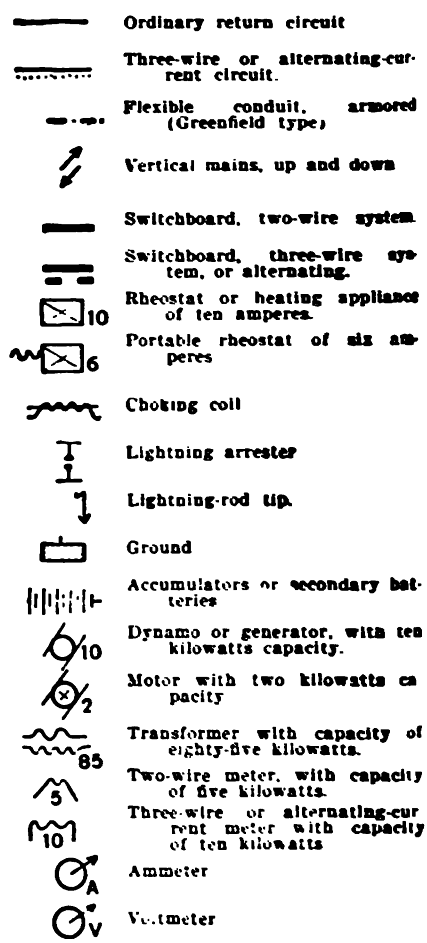
[illegible] drawings laid out by German [illegible] and Italian engineers and [illegible] their designs for wiring of [illegible] are generally most elaborate. [illegible] detail is shown in a most pains-



taking manner and the signs here illustrated are universally used in the countries mentioned to designate the material or apparatus to be used for proposed plants, says Arthur [illegible] in the Western Electrician. One readily gets accustomed to them, and I find that in estimating for foreign work, the use of foreign prints with these symbols greatly accelerates the capabilities of the estimate department. The following conventional symbols are used in [illegible] three above-named countries:

Conductors: B., bare copper; B. E., bare iron galvanized: G., seamless rubber insulation; L., flexible cords; K. B., bare lead-covered cable; K. A. lead-covered cable with asphaltum-taped cover; K. E. lead-covered cable, armored; g., conductors on insulators; o., conductors in iron conduit.

Firms making out plans and drawings to



be used in the before-mentioned countries will do well to consider these symbols, and also carefully to add in figures the proposed amperes to be carried on each wire or cable.

Dr. Niels R. Finsen, whose experiments covering many years successfully demonstrated the use of chemical rays as a curative agent, died in Copenhagen, September 24. His "Finsen's Medical Light Institute" gained world-wide renown in curing tuberculosis of the skin.

Index to Shop Notes for 1905

D

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F

T

MECHANICAL TRADES

:RICAN ARTISAN MANUALS. Cloth, price ach. Each the highest authority in its par- field and recognized as a standard work by vho know.
Tinsmiths' Pattern Manual. Price, $3.50.
House Warming Manual. Price, $3.50.
Hot Water Manual. Price, $3.50.
Cornice Work Manual. Price, $3.50.
Manual of Business, and the

UAL OF RECEIPTS. 240 pages, cloth, price Tells how the various lacquers, bronzes, varnishes, alloys, cements, etc., are made. :s for 119 different kinds of solder and the ious index comprises 1,718 references. Pro- given will be found of special value to sheet workers. In a number of cases the informa- furnished by manufacturers or by skilled ics.

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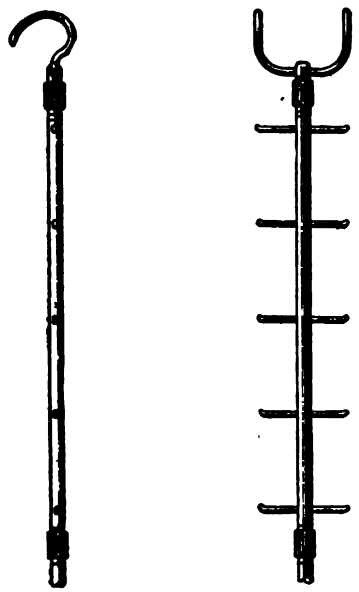
Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

HANDY EXTENSION LADDER

A very handy extension ladder can be made of 1-in. pipe and the teeth of an old horse rake, says a correspondent of Domestic Engineering. Take the teeth out of the rake, heat them in the forge to strengthen them, but do not burn, and cut them up into 20-in. lengths, or to the best advantage. In an 8 or 10-ft. length of 1-in. pipe punch holes about 12 in. apart and just



Pipe Extension Ladder

large enough to allow driving the pieces of steel through tight.

Make a double prong of the steel at the upper end, shaped to hook over a joist or other support. Weld the prong into a stub of 1-in. pipe that will screw into a coupling. Make as many sections of ladder as you are apt to need.

In England public bakeries are not allowed to conduct operations underground or basements, on account of sanitary rea- the offense is not corrected after the owner is arrested and

ROPE SWAB FOR ENGINE ROOM

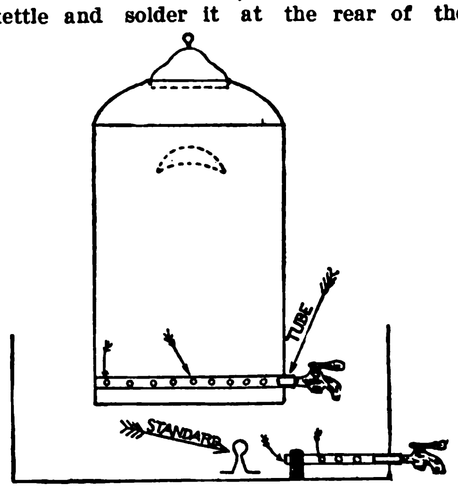
Cotton clothesline is the proper rope to use for a polishing swab, says a correspondent of the Engineers' Review. Have

Soft Rope Swab

about five strands of the rope and twist and wrap them as shown in the illustration. Tie the ends securely to prevent raveling.

TO SOLDER FAUCETS ON COPPER KETTLES

Do not use a boss or any kind of a brace in securing a faucet to a copper kettle, says a correspondent of the American Artisan. Instead, make a tube the size of the faucet; punch a number of holes in it; solder it to the faucet, run it through the kettle and solder it at the rear of the



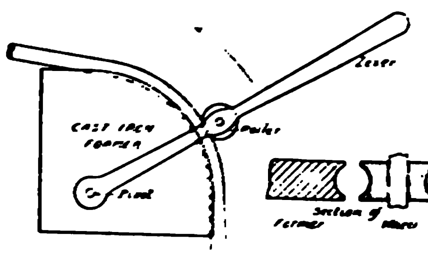
Soldering a Faucet on a Copper Kettle

kettle and, also, at the faucet. This is for round kettles.

Where a kettle is boiler-shaped, with a faucet at one end, make the tube about 8 in. long and for the inner end provide a standard, fastening the standard to the bottom of the kettle.

PIPE-BENDING DEVICE

The illustration shows a handy mandrel or former for bending iron piping while hot. A lever and roller is used to press it into shape. Copper piping may be bent while



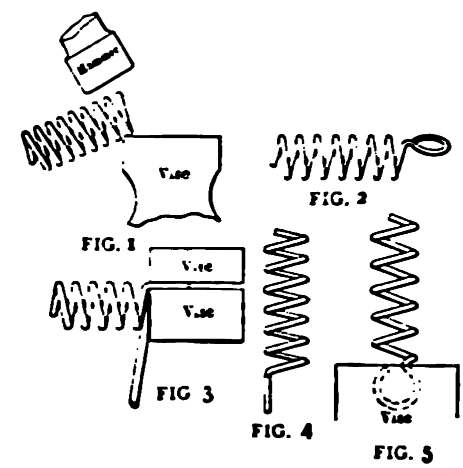
Pipe-Bending Appliance

cold in the same way, but should first be filled with molten lead to prevent buckling, says the Model Engineer. Remove the lead by heating the pipe.

BENDING A SPRING LOOP

It is easy to bend a loop on a coiled spring in the following way, says a correspondent of the American Machinist.

Hold the spring in the left hand so the first coil is over the edge of the vise-jaw, the end of the spring being upward as at Fig. 1. With a hammer strike a quick blow on top of the spring, so causing the first coil to open out nearly at right angles to



the spring (Fig. 2). Catch this first coil in a vise, as at Fig. 3 (top view); force a screw driver in, as shown, and get the coil set in line (Fig. 4). To set the ear central, clamp the ear upright in the vise (Fig. 5) and, using a hammer, punch as close to the top of the vise as possible.

CEMENTS FOR STEAM AND WATER JOINTS

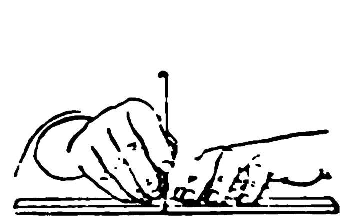
1. Black oxide of manganese mixed with sufficient raw linseed oil to bring it to a thick paste. Remove pressure from the pipe and keep sufficiently warm to absorb the oil while the cement is being applied to the joint or leak. This cement is recommended by a correspondent of Machinery, who says it will be as hard as the iron pipe in 24 hours.

2. With boiled linseed oil mix together to the consistency of putty the following ingredients: Ground litharge, 10 lb.; plaster of paris, 4 lb.; yellow ochre, ½ lb.; red lead, 2 lb.; hemp cut in ½-in. lengths, ½ oz.

3. Another good one consists of white lead, 10 parts; black oxide of manganese, 3 parts; litharge, 1 part. Mix with boiled linseed oil. Recommended by the Monumental News.

HOW TO HOLD THE RULING PEN

In ruling, hold the pen at right angles to the paper, not allowing the point to reach out or in from the straight edge, or it will

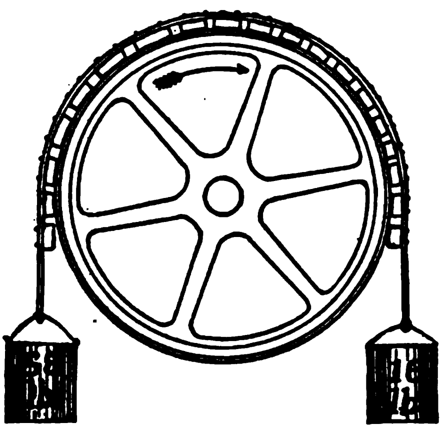


Hold the Ruling Pen Like This

make a ragged line. If it reaches in, the ink is apt to run under the straight edge and make a blur.

TO DETERMINE BRAKE HORSE-POWER

To determine the brake horsepower of an engine attach cleats of pine, basswood, or other soft wood, to a piece of a belt and hang it over the fly-wheel as shown in the illustration. Fill two paint buckets having handles with small pieces of iron or small stones and attach to the ends of the piece of belt. When the engine is running, weight the buckets until they balance and the engine is pulling a full load without decreasing its speed. Count the speed, says the American Miller, while it is running under this load, and when satisfied you have determined the number of revolutions it will



Test of Brake Horsepower

make under the load, stop the engine and weigh each bucket.

Find the difference in the weight of the buckets, which is the number of pounds pulled by the engine Multiply the circumference of the wheel in feet by the number of pounds pulled, by the number of revolutions per minute, and divide the product by 33,000. The result will be the brake horsepower.

With a flywheel $2\frac{1}{2}$ ft. in diameter, capable of making 300 revolutions per minute while pulling 52 lb., one would proceed as follows:

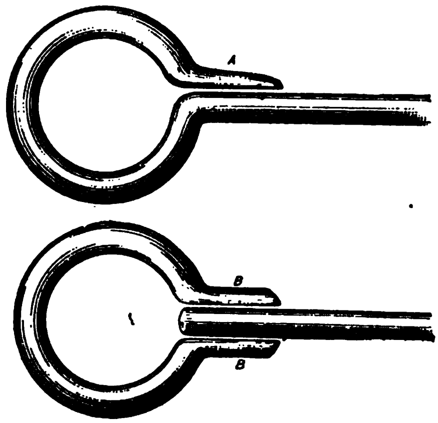
$2\frac{1}{2}$ ft. $\times$ 3.1416=7.85 ft., circumference.

$$\frac{\overset{\text{Cir.}}{7.85\text{ ft.}} \times \overset{\text{Rev.}}{300} \times \overset{\text{Lbs.}}{52}}{33{,}000} = 3.7 \text{ h. p.}$$

For straining paint uses millers' bolting For ordinary purposes 5-cent cheese do.

SEVERAL METHODS OF MAKING A SOLID EYE

In making a solid eye, to upset the ends of the rods and punch the eye is a poor method, says a correspondent of the Blacksmith and Wheelwright, as the upsetting tends to open the fibers of the iron. There are a number of ways of making a solid eye, the merits of each depending a good deal on what the eye is for and its size.



Making a Solid Eye

The rod may be partially upset and drawn down, or the eye may be made and welded on to the bar. In Fig. 1 the eye is made by bending the rod round to form the eye, first drawing the point and welding it at A. As shown in Fig. 2, a tongued joint is used, welded at B B.

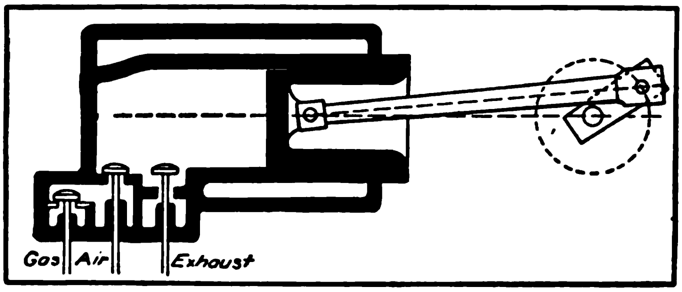
PREPARING TIN ROOFS FOR PAINT

When painting a new tin roof examine it first to see whether the tinner has used rosin or acid in soldering and left some of either on the roof. Rosin may be scraped off with a knife and acid must be cleaned off by rubbing the seams in the tin with kerosene oil and then washing with soapsuds and rinsing with clean water. For new tin that feels greasy, apply a wash made of 1 lb. of sal-soda in 6 qt. of water. Let stand one-half day, then wash tin with clear water. The paint will not scale off when this is done.—Grinnell's Handbook on Painting.

STARTING THE GAS ENGINE

In stopping a gas engine, after the gas is turned off the engine makes several revolutions, during which time it is drawing in air alone. This is what causes the trouble often experienced in starting up again, says the American Telephone Journal. The gas, when turned on, becomes diluted with the air already in the cylinder, as well as drawing air in with it.

To save trouble, under these conditions, before starting up turn the flywheel until the exhaust valve is wide open and leave the valve in this position until the burned mixture has had time to escape. Moving the piston back and forth several times will facilitate matters, also. Then, with the exhaust open as in the diagram, start the engine, and there will be no difficulty in getting it to go.



Exhaust Open to Start

PORK RINDS FOR PACKING

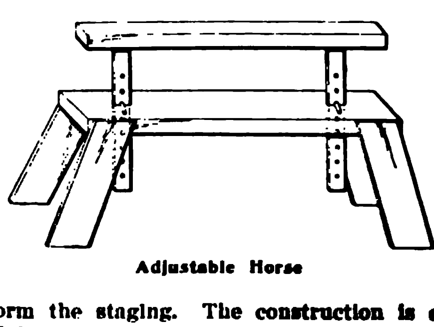
I have been an oil pumper in the Indiana oil fields for a number of years, and have had considerable experience, as well as trouble, with different kinds of stuffing-box packing, old polish rods and worn-out stuffing-boxes. I find that the best and cheapest packing that can be used in water wells, a packing that will never get hard and bind in the box, nor wear the polish rod, is common pork rinds.

Cut them in strips about ½ in. wide, or use them just as they are cut from the meat. Pack by winding them around the polish rod till the box is full.

If the box is worn much in the bottom, it is well to put in a bit of hemp or prepared packing first, to prevent the rinds from working past the rod into the well. Just try it once.—Contributed by Bert P. Fleming, Petroleum, Ind.

AN ADJUSTABLE HORSE FOR PAINT SHOPS

A pair of adjustable horses, like the one shown in the illustration, will be found convenient in many shops, says the American Artisan, but especially in car-painting shops. A plank should be laid across to form the staging. The construction is explained by the sketch.



Adjustable Horse

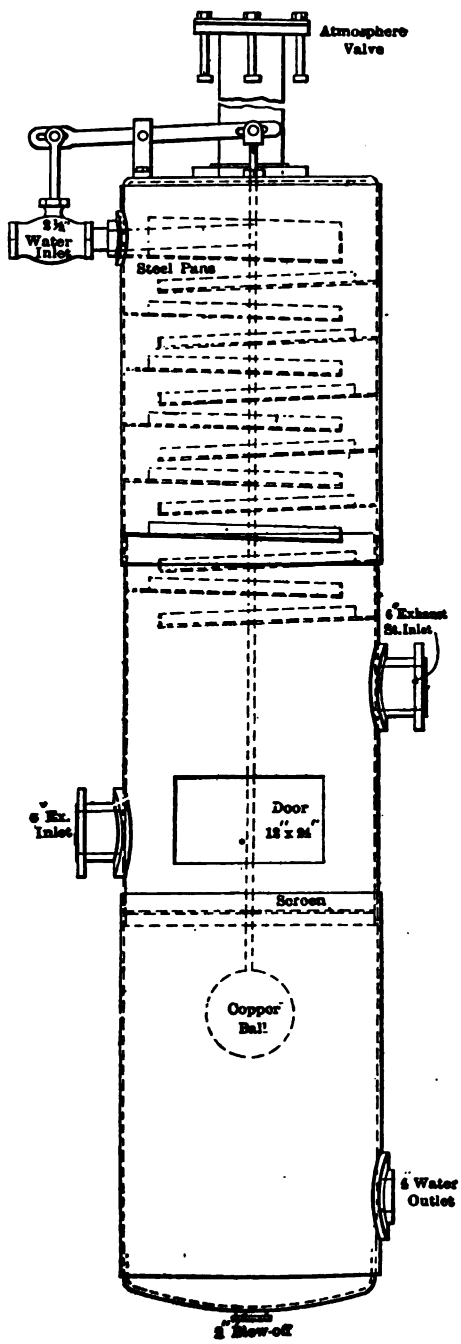
TO EXTERMINATE ANTS

Make a hole about 18 in. deep in the ant hill by pushing down into it a stick. Into the hole pour a wineglassful of carbon disulphide. The liquid is highly inflammable, more so than gasoline, and has a disagreeable odor, but it kills the ants.—Contributed by Henry K. Edgerton, Oconomowoc, Wis.

LABELING PASTE FOR TIN

Use flour and water to make a stiff paste and add 2 oz. of tartaric acid and 1 pt. molasses. Boil till stiff, then add 10 or 12 drops of carbolic acid.

A HOME-MADE FEED-WATER HEATER



ed-Water Heater

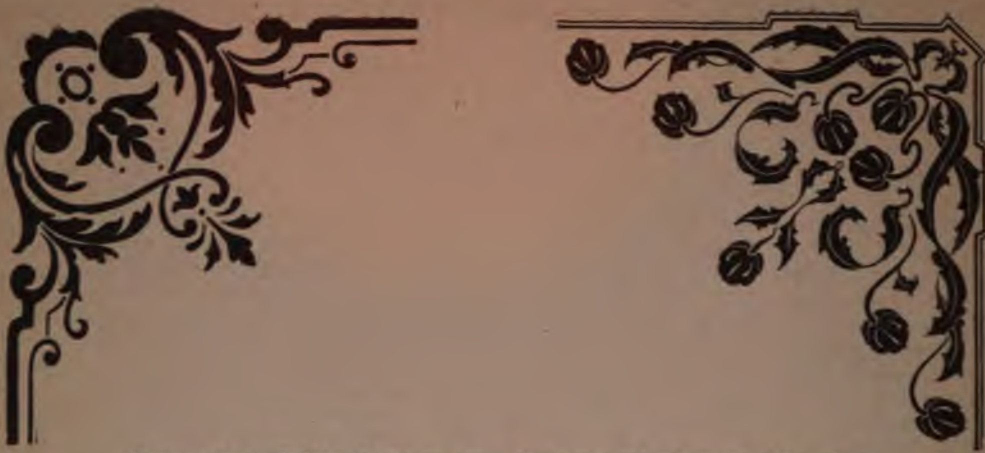
In boiler plants where the system of heating feed water is unsatisfactory, a home-made feed-water heater utilizing the heat from the exhaust steam may be substituted with a great increase of efficiency. A correspondent of Power tells how such a heater was made for a plant where feed water had formerly been heated in coils placed in the stack foundations. The chief steam consumer was a large compressor located just outside the boiler house and the exhaust from this compressor and the feed pump was sufficient to bring the feed water up to the desired temperature.

To make the heater a three-ring section of an old boiler, each sheet or ring being 4 ft. long was utilized. One end of this section had a dished sheet steel head and the other end was fitted in like manner. The heater was to stand upright so an 8-in. hole and an 8-in. tapped flange were put in the center of the top head as an exhaust vent or outlet. Into the flange was screwed a piece of 8-in. gas pipe, long enough to extend through the roof and a "clack" or atmospheric valve was placed on top of the pipe (see sketch).

Into one side of the boiler section at the top was run a 2½-in. nipple plugged at one end. This carried the water into the heater, delivering it through 50 or more ¼-in. holes drilled in the lower half from which the water dropped upon a series of fourteen pans arranged consecutively, as shown.

The lowest of these pans was just above the middle of the heater, and the exhaust was run in at about the middle, and here, also, was placed a door 12 by 24 in. Just below the door was placed an old fine-mesh screen to prevent foreign substances from reaching the pump. The outlet to the pump was placed 10 in. above the bottom, and in the center of the bottom was put a 2-in. blow-off which is opened daily to get rid of any deposit. A copper-ball float, attached by a reach rod through a small brass bushed hole in the top operated a lever which controlled the regulating valve and kept the water level just below the screen. A double-ported regulating valve was used—being substituted for a 2½-in. gate valve formerly tried, but which did not give good service.

This heater is self-regulating, and reliable. It takes the mud out of the water, and the average temperature maintained is 204° Fahr. The total cost of the heater in place was just $155.

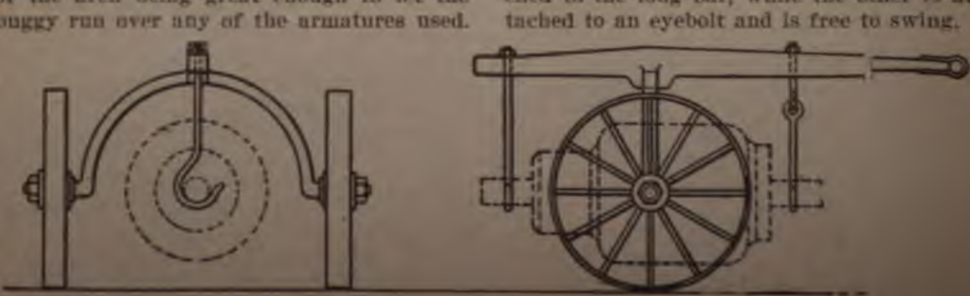


Corner and Frieze Designs from Decorators' Magazine, London

CONVENIENT ARMATURE CARRIAGE

This device which was built by the master mechanic of the Union Electric Co., Dubuque, Ia., is described in the Street Railway Review as follows:

An arched bar terminates in journals on which are mounted the wheels, the radius of the arch being great enough to let the buggy run over any of the armatures used. To the top of the arch is fastened rigidly a long bar which is the longitudinal member of the buggy. For supporting the armature, there are two rods depending from the straight bar, each having a hook at the lower end. One of these rods is rigidly fastened to the long bar, while the other is attached to an eyebolt and is free to swing.



HOW TO MAKE A SHOW WINDOW FOUNTAIN

A fountain that will throw a stream 12 in. high for six hours and which can then be started again, using the same water, is very simple in principle and construction and makes an attractive feature for a show window. The fountain may be constructed entirely of sheet metal, or may have wooden supports, says the Metal Worker. The one illustrated here has the wooden supports.

Fig. 1 shows the details of construction. To make the bodies of the reservoirs B and C, procure a sheet of roofing tin 20x28 in., cut into two pieces 10x28 in. and bend to shape. Form the tin tubes H, H, F, F, G, G on a gutter beader and solder them perfectly tight. Use an ordinary 12-in. wash basin for the part A, and make a 2-in. hole in the bottom of it, under which screw a 1½ in. can screw top, N. Adjust the overflow pipe H so that it extends through a hole in the can screw under the basin through reservoir B, to within ¼ in. of the bottom of reservoir C. Arrange tube F to extend from within ¼ in. of the top of reservoir B through reservoir B, through can screw K, into reservoir C for ¼ in. Have tube G, from within ¼ in. of the bottom of reservoir B, extend upward through can screw N, and

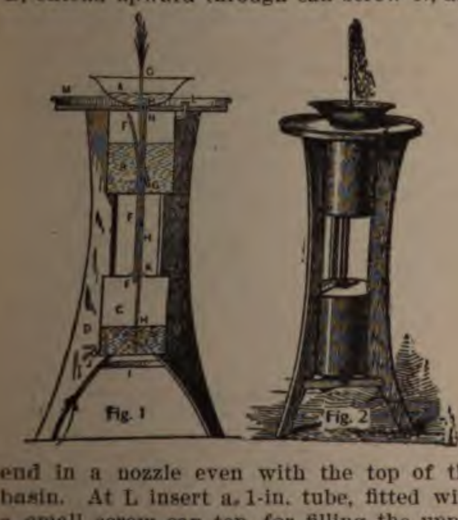


Fig. 1 Fig. 2

end in a nozzle even with the top of the basin. At L insert a 1-in. tube, fitted with a small screw can top, for filling the upper reservoir. Use leather washers with can screws and make all joints and seams airtight.

Make a circular top, M, with a wired tin rim 1 in. high. Shape the three wooden legs as illustrated and mount the reservoir within. The circular top, M, will serve as a flower stand in decorating. The fountain is now ready to operate.

Fill reservoir B through tube L with water, screw top on L, tightly, and fill the basin with water. The water will pass through tube H, force the air through tube F to the top of reservoir B and the pressure so created will force the water from reservoir B up tube G to spout out at the top in a tiny fountain. The falling water is carried from the basin by tube H to reservoir C until this reservoir contains all the water. Then the water may be drawn off at faucet J, and the upper reservoir refilled.

The nozzle for the tube G may be made of a hollow nickel stove knob and a small screw can punctured at the top with a hole not larger than a common sewing needle. The reservoirs can be larger if desired.

MACHINE FOR DIGGING GRASS ROOTS

The Department of Agriculture gives details of two handy machines for digging grass roots. These machines are very ef-


Digs Out Grass Roots

fective and can be rigged out at any blacksmith shop by taking a cultivator frame and making the teeth required as shown in the cut.

Last year this country mined 27,664,330 long tons of iron ore which was a decrease of over 7,000,000 tons over the previous year.

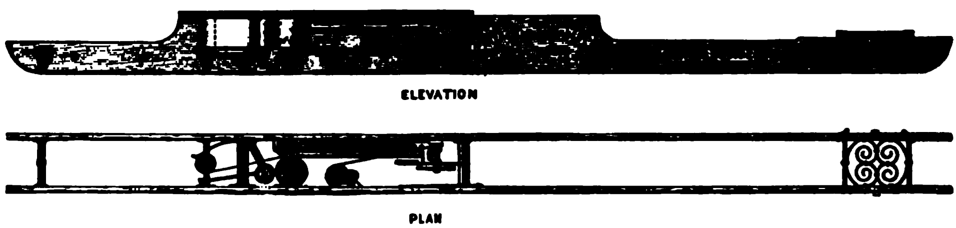
The "Virginian," the new Allan turbine steamship, broke the record for trans-Atlantic trips from land to land by 20 hours recently. The vessel's time was 100 hours.

THE VIAGRAPH AND HOW IT WORKS

The viagraph is an instrument which, when drawn along over the surface of a road, furnishes an exact profile of the road surface, showing its elevations and inclines with accurate measurements as to the locality and amount of any unevenness. It was invented by John Brown, of Ireland, and was first tried on the Belfast and Lisbon road in 1898. America, notorious for having the worst roads in the world, has given little attention to the viagraph or any other invention that would aid in the establishment of good roads. The Motor News, of Dublin, says:

The viagraph is in principle a straight edge applied continuously to the road surface, along which it may be drawn for (first) recording on paper a profile of the road surface, and (second) indicating a numerical index of the unevenness of the surface.

A lever, pivoted to the main frame, carries on its free end a serrated wheel, near the middle of the apparatus. While the main frame in being drawn along the road preserves a sufficiently even line, this road wheel rises and falls over all the unevennesses of the surfaces, carrying with it the lever and thereby transmitting its movements by means of a link to a second lever carrying a pencil, which marks the full amplitude of these motions on the paper passing round the drum. While the motion of the pencil takes place in a vertical direction, the paper on which it marks is carried under it by the drum, which is rotated by a worm and wheel below it, connected by a shaft and bevel gear with the road wheel. The result is a profile of the road gear surface, of which the scale is full size vertically, and ⅛ inch to one foot longitudinally. A second pencil draws a datum line corresponding to that which the indicating pencil would produce from a perfectly even road. From this can be measured the depths of the ruts or "cups" or other unevennesses indicated on the diagram. Each descent of the road wheel into a rut or cup causes this counter to register the amount of the drop, the reading being given in feet per mile of road. The distance is measured off automatically by an ingenious mechanical arrangement which rings a bell when the 88 yards have been traversed.



The Viagraph

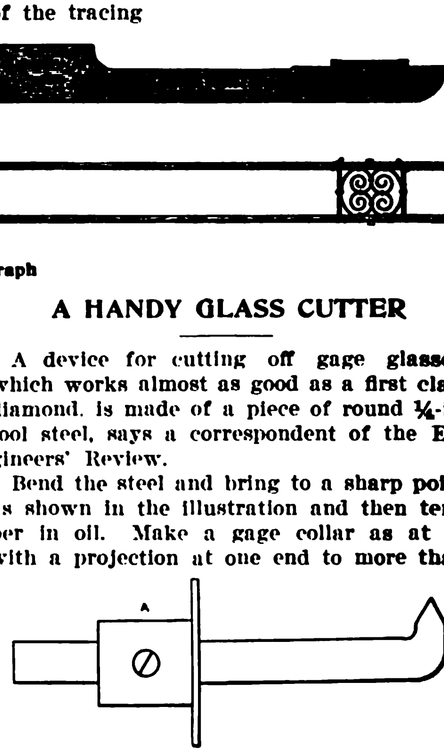
HOW TO CLEAN TRACINGS

Tracings that are badly soiled with grease spots or other dirt may be nicely cleaned with kerosene. Tack the tracing to a board and apply the kerosene gently, but liberally, to the surface, allowing it to soak a short time, and then drying off with a clean rag. Turn the tracing over and treat the other side in the same manner. Dry it on the radiator; it can be safely done. The polish will not be removed from either side of the tracing

A HANDY GLASS CUTTER

A device for cutting off gage glasses, which works almost as good as a first class diamond, is made of a piece of round ¼-in. tool steel, says a correspondent of the Engineers' Review.

Bend the steel and bring to a sharp point as shown in the illustration and then temper in oil. Make a gage collar as at A, with a projection at one end to more than



Water Glass Cutter

cover the end of the glass. Hold the gage in place with a screw.

To use the device with a glass, let us say, ½ in. longer than required, slip the gage A, up on the ... fre... ting point ... in the

HOW TO BUILD AN OVERSHOT WATER WHEEL

In building a water wheel, the "overshot" wheel, or one taking water at the top, is the most powerful, the cheapest, and best adapted to ordinary requirements. The construction of an overshot wheel is very simple, though each individual builder must proportion its size to the fall of water available to him, and the amount of power he desires to obtain.

A 15-ft. fall would require a wheel about 10 ft. in diameter, and the space between the buckets must be equal in order to keep up a steady motion, while each person must adapt the depth of the buckets to the volume of the water. Hardwood should be used for the whole structure. Oak is the best wood for the purpose, but if this cannot be obtained, hard rock ash or hard rock maple may be used for the more important parts.

The first part to make is the shaft, Fig. 1; make this with eight sides and with a square hole in the ends, as at C, for the "gudgeons" or journal pieces. Fasten these pieces in the shaft by means of bolts passed through holes at D D. Near the ends of the shaft, fasten by wooden dowels, blocks, as at E, E, etc., and just within these blocks place other blocks, F, F, etc., fastened by dowels also; the blocks on one end being on opposite edges of the planes of the shaft to those of the other. These smaller blocks are for the purpose of securing the feet of the diagonal braces, which assist in holding the spokes of the wheel upright; they are placed on opposite edges of the planes to permit the stays to cross without interfering. To prevent the shaft's splitting, place an iron band, G, 2 in. or more wide and ½ in. or more thick on each end, and secure each band with four lag screws on alternate planes. A shaft from 18 to 24 in. long is of a good size. The use of wooden dowels is better than spiking for fastening blocks, etc., says a correspondent of the Blacksmith and Wheelwright, as the dowels swell and shrink with the wood of other parts and give off no rust.

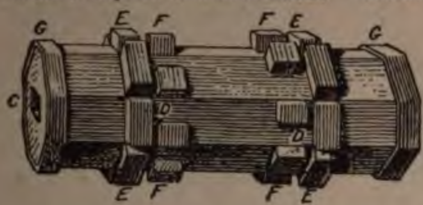


Fig. 1

Fig. 2

To make the hubs, Fig. 2, of which there should be an inner and an outer one for each end of the shaft, frame each of them together in four pieces in the form of a square as shown by the dotted lines in Fig. 2, and cut the hole the proper size for adjusting on the shaft. The hubs may be left square or rounded off, as desired. Make holes as at X, X, X, etc., for securing the spokes to the face. Place the inner hubs on the shaft first and secure them to the blocks, E, by means of dowels at the holes, X.

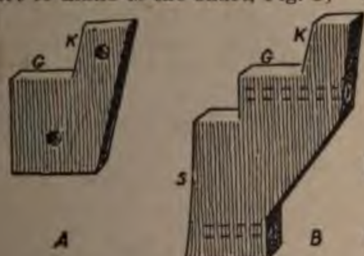
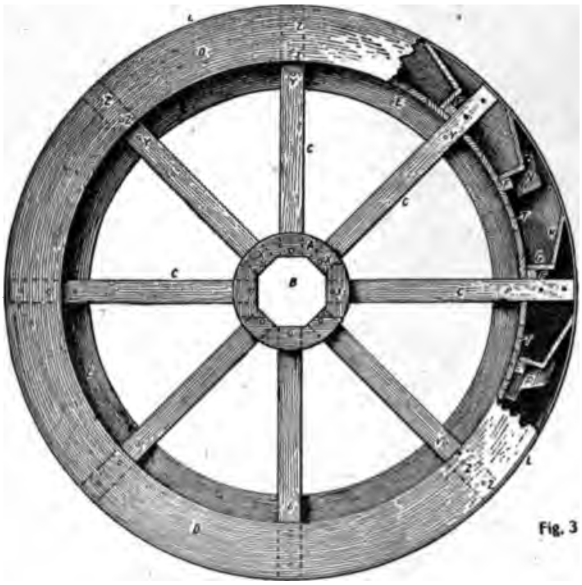


Fig. 4 C

Fasten the spokes, C, C, C, Fig. 3, to the inner hub and then put on the outer hub (A, Fig. 3), and fasten it at X, X, X, etc., to the spokes and inner hub. The outer rim (D, Fig. 3), may now be put on. This rim should be deep enough to form the outer ends of the buckets. In the inner rim, E, the outer periphery equals the inner periphery of the outer rim, D, and this inner rim is used to fasten the sheathing, T, which forms the bottoms of the buckets, to. Fasten the inner rim, E, in place on the wheel



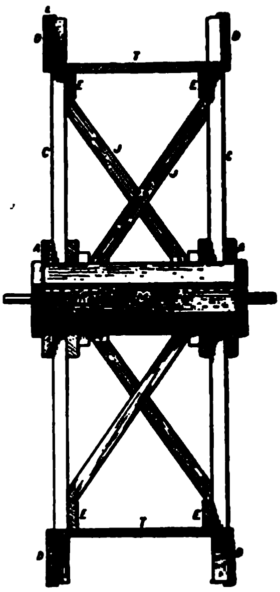


Fig. 3

and sheath it with tongue and grooved hardwood pieces 1½ in. or more thick, and doweled in place. Fasten on cleats (F, F, F, etc., Fig. 3), running all the way across and secure them to sheathing with dowels.

A section of a bucket is shown at G, K. Fasten the bottom of the bucket, G, to the cleats, F, and the outer web, K, of the bucket, to the rim, D, and the inside web or bottom, F. An iron band, L, on the outer rim and covering the outer web of the bucket one inch, may be used as an additional security, if desired. Blocks for supporting buckets are shown in Fig. 4. The form of block at A may be fastened to the inner side of the rim; the one at B may be used at the center. The surfaces, G and K, would support the webs of the bucket marked G and K in Fig. 3. To conform with the sheathing, the side, S, of the block, B, is cut with a sweep. Fig. 3 shows such blocks in position at N and P.

The diagonal stays for supporting the spokes are shown in the sectional view at Fig. 3. M is the shaft, C the spoke, and J the stay from shaft to spoke. In Fig. 4, at C is shown the gudgeon pin or journal. The square part, T, is let into the end of the shaft and is held by the bolt passing through the shaft and gudgeon at R. The iron should be at least 2½ in. in diameter. Secure short posts to the "mill" posts outside and then secure a transverse piece into which to fasten the boxes. Oil may be fed through a metal tube from the top.

For transmitting the power of the wheel, fasten a gear wheel to one end of the shaft outside the spokes. Probably the best means is to secure an eccentric disk or wheel to the end of the shaft and use a wooden pitman or connecting rod to apply to the machinery above. The power developed by such a wheel depends on the volume and fall of the water.

FILLER FOR HARDWOOD

Make a very thick paste of boiled linseed oil and powdered starch; add a little japan and then with oil of turpentine reduce to working consistency. For dark ash and chestnut, add a little raw sienna, says the Master Painter; for walnut, add burnt umber and a little Venetian red. For white oak or white ash no color is required; for other woods, use enough color to cover the white of the starch. Apply with a brush or rag; let stand a few days, then sandpaper.

A grease spot on wood can be removed by using a saltpeter or a thin lime wash, then rinsing with clear water. If necessary, repeat the process.

REPAIRING CHAIRS

For repairing chairs and other light articles of furniture, there are several little devices that may be purchased at the hardware store more cheaply than they can be made and thus insure a neater job.

The Dowel Fastener

Among these, says the Furniture Journal, is the dowel fastener, a small barbed piece of steel which is driven in beside the dowel pin and prevents its coming out. Mending plates of steel with countersunk holes are convenient, also, and for holding legs in chairs a piece of steel with a sharp point for driving into the chair leg and a screw hole to fasten it to the seat of the chair is provided. There are various sizes and shapes of corner irons for strengthening weak places.

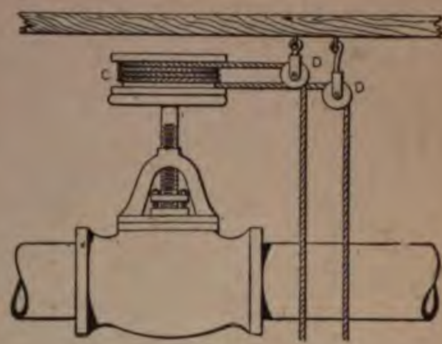
Corner Irons for Bracing Chair Legs

PASTE THAT WILL NOT SOUR

A paste that will not sour, says a correspondent of the Master Painter, is composed of 3 qt. flour, 3 teaspoonfuls powdered alum and ½ teaspoonful powdered blue vitriol. Mix in dry state and make in the usual way. Safe to make up a barrel of this paste at a time.

VALVE OPENING AND CLOSING DEVICE

A valve that had to be opened several times every day was very difficult to get at, being in the position shown in the sketch. A correspondent of the Engineers' Review



Valve Opening and Closing Device

tells how he rigged up a device by which the valve could be opened or closed without climbing up to it on a ladder.

A wooden wheel, flanged, was turned and bolted to the valve wheel, as at C, with ¼-in. bolts, having the heads cut off and bent in the shape of a hook, in order to lap around the arms of the valve wheel. A length of ⅜-in. rope was wound around the wooden wheel, giving it enough turns to open or close the valve without having the rope bring upon the part of the valve to which the pulley was fastened. Small pulleys, D, D, were suspended from the beam by screws and the rope passed over these, as shown, to bring it down within easy reach and prevent its running off the pulley. An endless rope was used and by pulling one way or another on it the valve can be opened or closed as desired.

ANOTHER AUTOMATIC FURNACE TENDER

As nearly all furnaces have a lever, B, Fig. 1, to close the draft and open the check when the steam reaches the point set for, Fig. 1 will be easily understood.

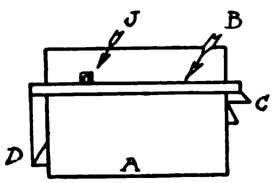


Fig. 1

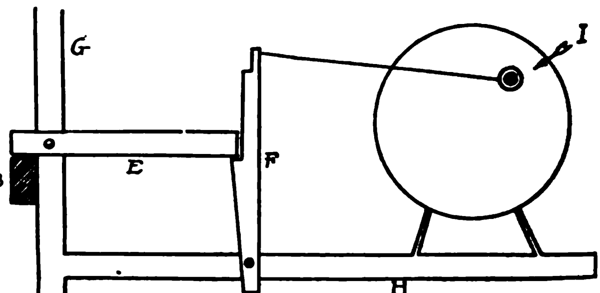


Fig. 2

The arrangement in Fig. 2 is intended to be placed at about the point J in Fig. 1. It consists of an upright 1 in. by 3 in., having a shelf H, on which the clock is to be set, nailed to it. The levers, E and F, are both of band iron, though wood could be used if preferred. A slit is sawed in a small spool, so it can be pushed on the alarm wind and the apparatus is then set as indicated, the lever B being placed under the outer end of F, the alarm set for the time desired, and a small string run from F to the spool on the alarm at I. When the alarm goes off, the string pulls F from E and E falls to a perpendicular position releasing B, thus closing check. This device can be rigged up in two hours, is simple and one can always be sure of a fire.—Contributed by H. E. Gregory, Waverly, N. Y.

WATERPROOF CEMENT RECIPES

1. White lead, red lead and boiled oil mixed together with a good size to the consistency of putty.

2. Dissolve 1 oz. powdered resin in 10 oz. strong ammonia and add 5 parts gelatine and a 1-part solution of acid chromate of lime.

3. For a waterproof paste cement, add to hot starch paste one-half its weight of turpentine and a small piece of alum.

4. For lining cisterns, make into a paste with boiled oil, 2 parts each of powdered brick, quicklime and wood ashes.

TO SOFTEN DRIED PUTTY

Putty that has dried hard as rock can b softened as follows: Pound it with a com mon hammer on a smooth, hard surfac add a little linseed oil and it can then b worked with the hands easily and will b as good as when fresh.—Contributed by E N. Pond, Topeka, Kan.

FORGING A LUMBER DOG

The lumber dog shown in the sketch i made of steel 7/8x2x13 in., punched at on end and drawn out as if for sharpening chisel. It is then bent about two-third of the way round and the back drawn dow

Forging a Lumber Dog

as thin as possible, but still leaving tl point full width of the steel, or 7/8 in. Th kind of dog is commonly used in Orego says a correspondent of the Blacksmith a Wheelwright.

TO DEODORIZE BENZINE

To 1 gal. benzine add 3 oz. quicklim Shake well; let lime settle; pour filter the benzine.

AN AIR-BOUND PIPE LINE

Some time ago I laid a line of 4-in. pipe about 3,000 ft. long, says a correspondent of Power. The first 1,000 ft. gave me a fall of 530 ft.; the rest of it was comparatively level. As the pressure was not required and some of the pipe not very good, I did not put in any valve, but piped direct to a tank having a large enough overflow to take care of any excess in case of the mill shutting down. When everything was completed, the water was turned in, and after waiting some time we were somewhat surprised that no water came to the mill. I had had a similar experience before, but never when there had been so much pressure, and was inclined to think something had gotten into the pipe. However, I took a sharp pick and hunted the high places. When I found one very prominent, I stuck the pick into it. After finding about a dozen of them, the water came all right. I have since lowered the high places when possible, and put in petcocks where I could not level the pipe, and have had no more trouble.

STEAMING OUT SPLINTERS

When a splinter has been driven into the hand it can be extracted by steam. Fill a wide-mouthed bottle nearly full of hot water, place the injured part over the mouth and press it slightly. The action thus produced will draw the flesh down, and in a minute or two the steam will extract the splinter, also the inflammation. Try it and be convinced.—National Magazine for June.

HOW TO RESPOKE A METAL WHEEL

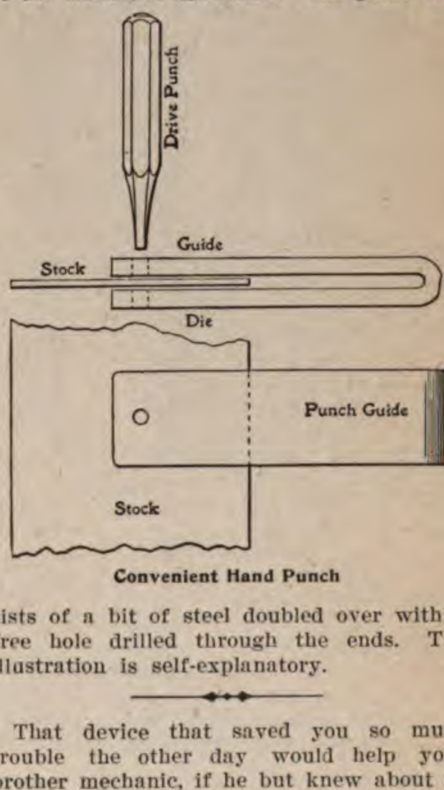
For a threshing machine wheel, ⅝-in. iron rod is the stock to use. Cut the spokes ½-in. longer than the required length and upset them in the hub, marking each one so it will be put in the right place. Cut threads at the outer ends of the spokes and use jam-nuts.

Drive the spokes in the hub and true up the wheel with jam-nuts, tapping the spokes in the meantime. When true, head the spokes and see that all the nuts are tight. A correspondent of the American Blacksmith says he respoked a wheel of a 50,000-lb. threshing machine in this way four years ago and that it is solid yet.

Spokes can be removed from buggy wheels by the following method: Place the spoke in the vise with the inside of the wheel up; place a short block of wood against the hub above the spoke and strike with a 6-lb. sledge. One blow will bring it. A piece of felt will protect the paint.

HAND PUNCH FOR SHEET METAL

This device for punching holes in sheet metal is extremely simple and will be found a great convenience to those who possess no punching machine, says a correspondent of the American Machinist. The guide con-



Convenient Hand Punch

sists of a bit of steel doubled over with a free hole drilled through the ends. The illustration is self-explanatory.

That device that saved you so much trouble the other day would help your brother mechanic, if he but knew about it. Send us a sketch and brief description.

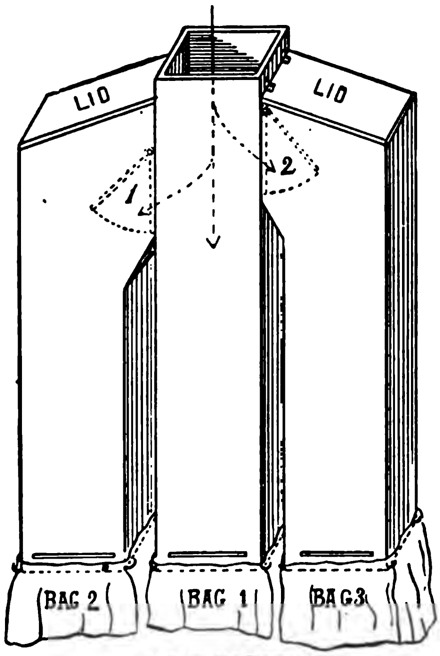
A blueprint is ready for washing when a slightly moistened finger touched to it, leaves a mark nearly purple.

Coal containing a large amount of carbon gives the best heat; the oxygen being combined with hydrogen as water is of no value. An excess of hydrogen in gas coals, however, is an important item in the production of heat.

HOW TO MAKE AN AUTOMATIC BAGGER

The sketch shows an automatic bagger for elevators and mills that will fill three bags in succession without attendance. The device is very simple in construction and works as follows:

The stock falling through the central spout fills bag No. 1 first and backing up in the spout forces valve No. 1 in the spout leading to bag No. 2 up and fills No. 2. Observe that valve No. 2 is higher than valve No. 1. When bag No. 2 is filled, the stock will be at suitable height to lift valve No. 2 and fill bag No. 3. The stock is then shut off and empty bags replaced for the filled ones.—Contributed by F. S. Cummings, 289 Forsyth Ave., Detroit, Mich.

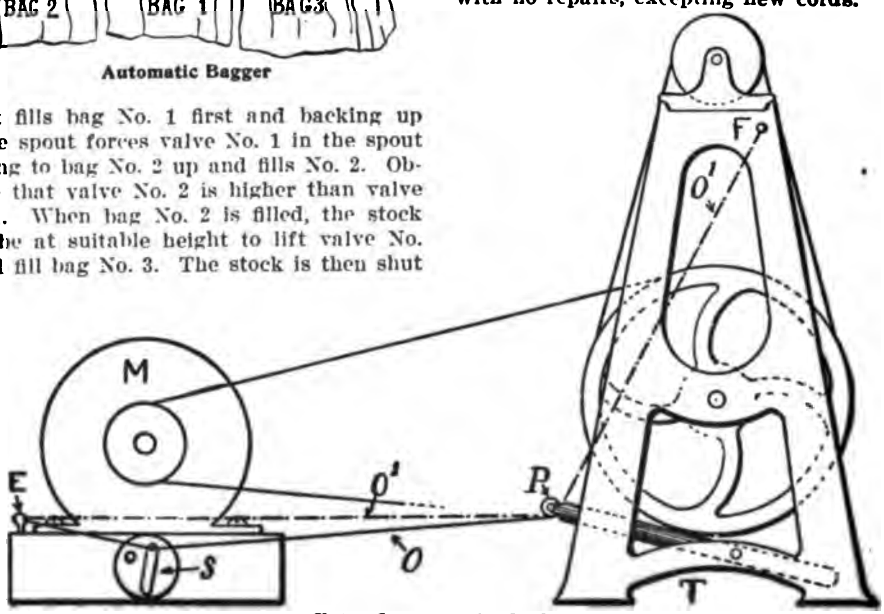


Automatic Bagger

RUNNING THE LATHE WITH A MOTOR

The accompanying illustration shows how Eugene F. Tuttle, Jr., of Newark, Ohio, connected up a small footpower wood-turning lathe with a 1/16-hp. electric motor. The lathe treadle, T, was disconnected from the flywheel, and the flywheel was then belted to the motor, M. On the base of the motor was mounted a one-point switch, S, which was connected up as indicated.

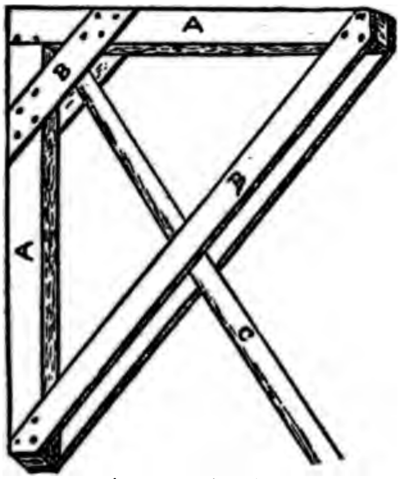
A small pulley, P, large enough to turn in the place where the driving rod works on the treadle, T, was made and put in place and a cord, O′, was run from the switch, S, through a screw-eye, E, under the pulley and up to the bed of the lathe, where it was fastened at F. When the front of the treadle is depressed it pulls on the cord, O′, and opens the switch. The switch is closed by another cord, O, running from the switch direct to the pulley where it is fastened at the side of the pulley. This string must be kept tight to give satisfactory results. The switch may be obtained of any electrical dealer and should have a 1½ or 2-in. spark gap when opened. The arrangement has been in use two years with no repairs, excepting new cords.



Motor Controller for Lathe

A HANDY SCAFFOLD BRACKET

In the scaffold bracket illustrated here, A A are pieces of 3x4; B B, pieces of inch board, and C is a long pole used to elevate the bracket to some high or difficultly

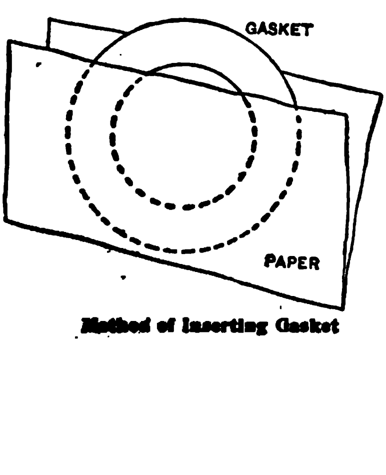


A Handy Scaffold Bracket

reached part of a building where it is to be used. The foot of the pole, says the Master Painter, may be secured by a stake driven into the ground. Two or three poles, with a board or more across, can be raised simultaneously and a safe scaffold is up ready for use.

HOW TO CUT AND APPLY GASKETS

There are a few simple kinks which, if observed in cutting and applying gaskets, will make the work much easier, says a correspondent of Machinery. While cutting the rubber, have a dish of water at hand and keep wetting the cutter. Excellent results may be obtained by this method on rubber gaskets 1 in. thick. A gasket



Method of Inserting Gasket

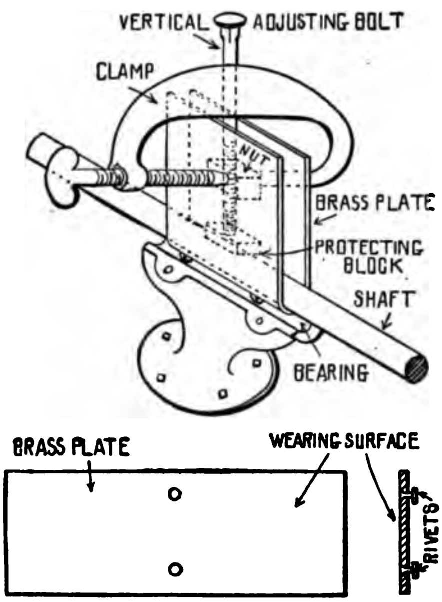
will be much more easily removed should the joint break, if the flanges are chalked at the time the gasket is put in place.

Where two flanges cannot be separated any great distance and there is trouble in inserting the gasket, place it between a folded sheet of paper as shown in the sketch, and it will go in more easily. After some of the bolts have been entered, tear out the paper.

BABBITT JOURNAL BOX KINK

A babbitt journal box with a brass wearing surface for either large or small shafts, may be made as follows:

Have the brass of suitable thickness and length for bending around the shaft, and at



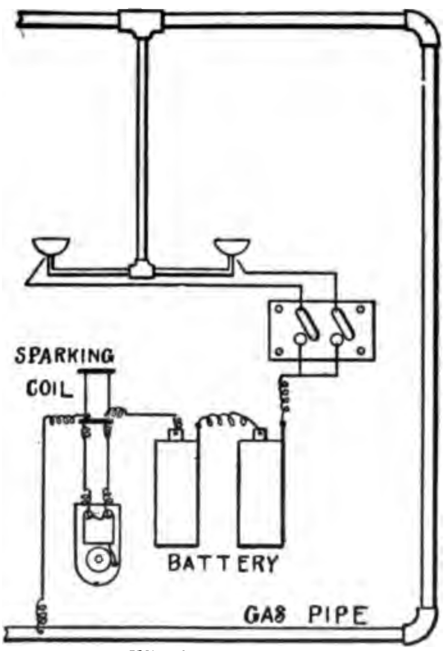
Adjustable Journal Box

the center of the plate drill and countersink holes for soft metal rivets, having heads that project slightly, so the filling of metal can take hold. The countersink is for the small end of the rivet. Smooth down to fit shaft, and in case of rivets being too large, after bending follow up the dents near the rivets with gentle tapping.

Where the shaft can be had of suitable temperature the smooth plate can be treated in the usual way by soldering on the under side and near the rivets. After filling with the babbitt metal, let cool and then file off any surplus brass. Then, in case of overheating, the rivets will hold the brass, if the heads project far enough. This box may not be suitable for all shafts, such as conical shapes, etc.—Contributed by August Rinne, 937 Alameda St., Los Angeles, Cal.

WANTS TROUBLE ALARM PLAN

The accompanying sketch is sent us by W. Williams, of 100 Stockton St., Brooklyn,



What's the Matter ?

N. Y., and is a plan of an electric gas-lighting system of five burners, which he has installed in his house. Mr. Williams wishes to know how to connect a bell with this system, so that, if there is any trouble on the line—a short circuit or a ground—the alarm will sound. Can any one offer a suggestion? With the wiring indicated the alarm worked for awhile, but finally stopped.

HOW TO MAKE GRAFTING WAX

A good grafting wax can be made by breaking up fine 4 parts resin and 2 parts beeswax and melting them with 1 part of tallow or linseed oil. When thoroughly melted, pour the liquid into a vessel of cold water. When it is hard enough to handle, take it out and pull and work it until it becomes tough and of the color of very light manila paper. The wax may be applied hot with a brush, says a bulletin of the Department of Agriculture, but care must be taken to avoid injury. If applied by hand, first grease the hands with tallow. Spread the wax over all cut or exposed surfaces and press closely, so that when cool it will form a coating impervious to air or moisture.

To make waxed string, put a ball of No. 18 knitting cotton into a kettle of melted grafting wax. In five minutes the cotton will be thoroughly saturated and will remain suitable for use indefinitely.

SHADE FOR ELECTRIC LIGHT

Procure a piece of tin of suitable size and strike out a circle on it about 8 or 10 in. in diameter, and a smaller circle 1½ in. in diameter in the center of the first circle, as shown in Fig. 1. Cut out the large circle with a pair of shears and cut an opening in it, as shown at A, Fig. 1.

Punch out the center circle by means of a punch and finish it round with a file. Fold the edges together and solder or rivet,

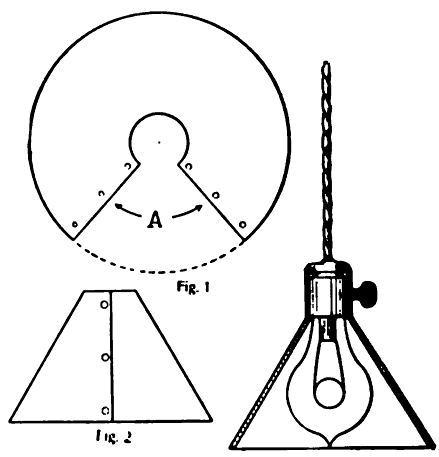


Fig. 1 Fig. 2 Fig. 3

as in Fig. 2. To adjust the shade to the lamp, put the lamp up inside the shade, so that the end that screws into the socket projects through the opening at the top and then screw the lamp into the socket. The large part of the lamp will prevent the shade from coming off (Fig. 3.) Such shade is cheap, easy to make and all purpo- may b- uts

All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

CHEAP PAINT FOR ROUGH WALL SIGNS

A solution consisting of green vitriol stirred into lime milk makes an excellent cheap yellow coating for large signs on rough dead walls, rocks, cliffs, etc., says the Master Painter. The paste will be green at first from the separating protoxide of iron, but after it is applied and dry will become yellow by oxidation in the air. It adheres firmly to any surface and will not wash off. The color is darker or lighter, according to the amount of green vitriol used.

HOW TO FASTEN A RING TO A ROPE

The writer has used the method shown in the accompanying drawing in fastening a halter rope to the ring of the halter, but it is apparent that the method applies to any similar case where ropes and rings are used.

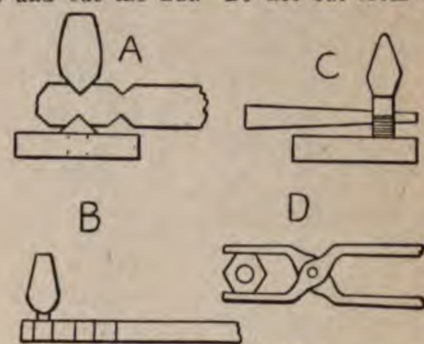
The advantage is that the ring has two thicknesses of rope to wear through before a break can occur. The free end of the rope is fastened down to the other with a cord or wire. If heavy wire must be used, it may be wrapped as tightly as possible and then hammered flat. — Contributed by Joseph B. Keil, Marion, Ohio.

PIERCING PUNCH OF PIANO WIRE

Piano wire makes an excellent piercing punch for piercing holes in sheet metal, says a correspondent of the American Machinist. The punch is rather difficult to make, but is good for piercing holes of the same diameter as the thickness of the metal, or when the metal is unusually tough.

HOW TO MAKE SIX-SIDED NUTS

Good iron will be required for this purpose as poor iron will not stand the thread cutting. Take a piece the size the nut is to be and cut the nut. Do not cut from the

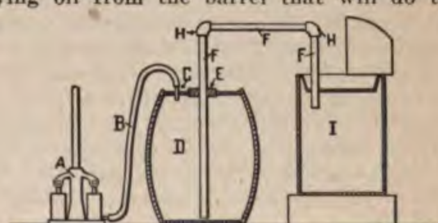


Making a Six-Sided Nut

flat side, says the American Blacksmith, but hold the iron on the hardy as shown in the illustration at A. B shows the punching operation, C finishing the shape and D shows a pair of tongs for holding the nut, which must be made thinner, as ¼ in. is a little too thick. Finish the nut on a pin from 16 to 18 in. long.

EMPTYING AN OIL-BARREL

The illustration shows a method of emptying oil from the barrel that will do the



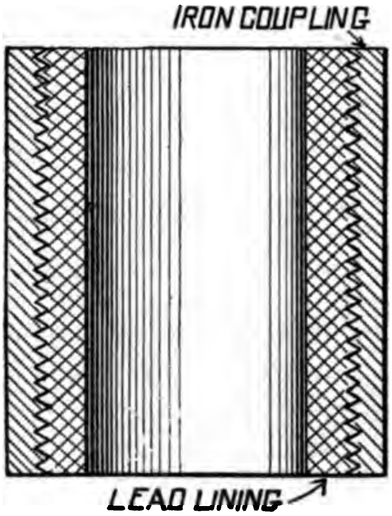
Emptying An Oil Barrel

work in from ten to fifteen minutes. The apparatus includes the following parts:

A, pump (any old pump will do); B, hose; C, bush on hose; D, oil barrel; E, large bushing; F, ¾-in. pipe; H, ¾-in. elbow; I, oil tank. The oil is forced out by air.—Contributed by Alex Mattley, Menominee, Wis.

PIPE CLAMP THAT WILL NOT CRUSH OR MAR PIPE

Having occasion to do some pipe fitting with brass and nickel pipe I made use of the following kink to hold same in an ordinary pipe vise, the object being to grip the pipe



Safe Pipe Clamp

tightly, but not mar or scratch or even crush it, as an ordinary pipe vise would:

The clamp is made of a common iron coupling one size larger than the pipe to be held, i. e., for ¾-in. pipe use a 1-in. coupling. Slip the coupling over the short piece of pipe, and using the pipe as a mandrel, pour melted lead around it, filling up the coupling. When cool, slip the coupling off the pipe and saw it in halves, using a back saw. You will now have a clamp made of two halves, one of which is shown in the illustration. When using sprinkle the clamp with plaster of paris and you will get a never-slip grip. The threads of the coupling are all that is required to hold the lining. It is cheaper to make a whole set of these clamps than it is to buy a special machine.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

SIZE FOR PLASTER WALL

Boil flaxseed in water and apply to the *wall, or* it may be applied over a first coat*ing of paint. This size* is useful on wood, *also.*

HOW TO ESTIMATE WEIGHT OF WROUGHT IRON AND OTHER METAL BARS

The weight of a bar of iron, steel, copper, lead or brass may be very quickly and quite accurately estimated by the following formula. Multiply the dimensions and add one cipher to the result. Then divide by 3 and the final result is the weight in pounds.

For example: Take a bar of wrought iron 20 ft. long by 2 in. thick by 4 in. wide, and we have 20x2x4=160. Add a cipher, which gives 1,600 and this divided by 3 gives 533⅓, which is the weight in pounds.

For cast iron deduct 1/16 from the weight of wrought iron.

For steel add 1-48 to the weight of wrought iron.

For copper add 1-7 to the weight of wrought iron.

For lead add ½ to the weight of wrought iron.

For brass add ⅛ to the weight of wrought iron.

Contributed by Anthony Haselman, Newark, N. J.

A HOOK KINK

Fig. 1 shows a common hook whose bad feature is that when hoisting, point A catches on any projection it may encounter. If the eye is turned around as shown in the side view, Fig. 2, point B will strike a projection

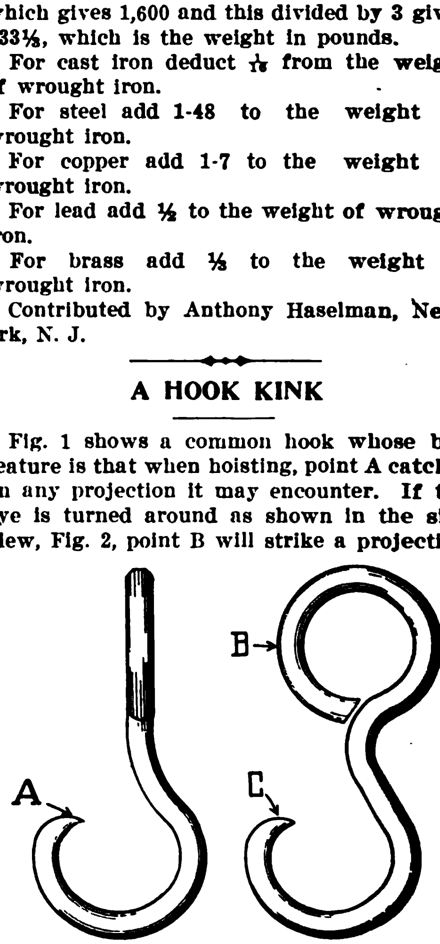


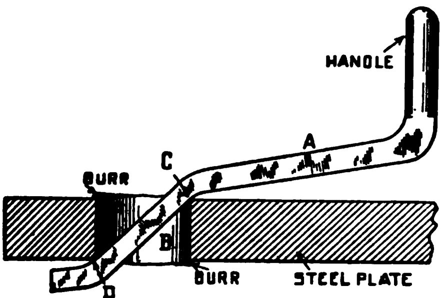
Fig. 1 Fig. 2

first. This will cause the hook to bounce off and point C will safely pass by the projection.—Contributed by John Weldon, 433 Columbia St. Brooklyn, N. Y.

A gill of shellac varnish added to a gallon of asphaltum is a good hardening agent.

HANDY BURR REAMER

When rolled steel plates have been drilled, especially ones 1½ in. or more in thickness, they have a burr around the upper and lower edge of the hole. A reamer that will quickly cut these off and save a lot of chiseling may be made as follows:



Burr Reamer

Have the blacksmith bend a piece of ½-in. square tool steel, about 15 in. long, to the shape shown in the illustration at A. Temper this device, grind it square and sharpen at the points C and D, where it is to cut the burrs. Place this reamer in the drilled hole (B in the sketch) and turn it round and round a few times until it has cut the top and bottom edges of the hole smooth.—Contributed by W. J. Slattery, Emsworth, Pa.

DRESSING OIL OR WHETSTONES

When it is necessary to dress oil or whetstones, level them on the emery wheel, holding them on the flat face. This requires from three to five minutes and makes them like new stones.—Contributed by J. W. Brown, Rensselaer, Ind.

ADVANTAGES OF ZINC ROOFING

The advantages of zinc roofing over other roofing materials is receiving more or less attention in this country of late. The claims for the superiority of zinc for this purpose is based on its tenacity, its density, its durability, the fact that it is not inflammable and that a thin coating of oxide forms upon the zinc when exposed, this coating being insoluble in water and becoming a permanent protection, preventing further corrosion and doing away with the necessity of

one-half times lighter than the same sub- en stripped from half its orig-

The largest zinc sheets used for roofing are 8x3 ft. in size, 0.053 in. thick, and weigh 1 lb. 14 oz. per square ft The roof must be laid so as to give the material plenty of play, as the expansion and contraction of zinc is greater than that of any other metal. Under extremely high temperatures zinc gives off a bright green flame, which fact has given rise to the belief that it is inflammable.

CONVENIENT CENTER GAUGE

The sketch shows a method I have found very convenient, and which will be understood from the drawing, for truing or lining

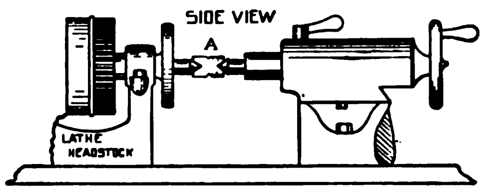


Fig. 1 SHOWING GAUGE ON LATHE CENTERS AT A.

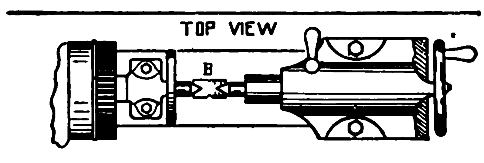


Fig. 2 WITH GAUGE ON CENTERS AT B.

up the centers in an iron turning lathe. By taking a piece of sheet steel 3/64 in. in thickness any skilled machinist can make one in a short time. This device can be used for thread tool centering as well as lathe centers at 60 deg., graduated pitch. This gauge

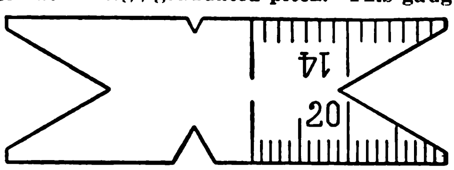


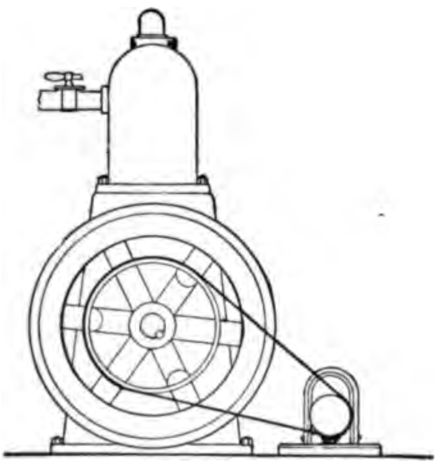
Fig. 3 FULL SIZE

can be graduated the same as any other center gauge; on one side 14ths and 20ths, and on the other 24ths and 32nds in fractions of an inch.—Contributed by F. M D., Rock Falls, Illinois.

Rubbing a window pane with fine sand and water will make it obscure, yet diaphanous, says the Master Painter. Another method is to cleanse the glass thoroughly. then moisten it with hydro-fluoric acid. When the acid has eaten the glass enough, wash it off with plenty of clean water.

FIRING A GAS ENGINE WITH A TELEPHONE MAGNETO

The magneto out of an old broken telephone can easily be used, instead of batteries, for running a gas engine. The batteries are usually a source of trouble, especially if the engine is used very much.



Magneto Connected to Engine

To connect the magneto, saw out a pulley a little narrower than the large cogwheel on the machine and ¾ in. thick. Then screw off the handle and bore a hole in the center of the pulley large enough to fit the screw from which the handle was taken. Now screw on the pulley and you will find it will hold very securely. Fasten the magneto to a block of wood and nail the block to the floor. Take an ordinary sewing machine belt and connect it around the main pulley on the engine, and a V-groove on the wooden one of the magneto.

To make connections take the two wires from the magneto and join them to a spark coil and from there to the engine.—Contributed by E. H. Klipstein, 116 Prospect St., East Orange, N. J.

SOLDER FOR ALUMINUM

What is reported to be the most successful solder for aluminum yet secured, consists of tin 64 parts by weight, zinc 30 parts, lead 1 part and aluminum 1 part, to which add a small portion of resin. To solder, clean the surfaces and face with the solder. No chemical is used, but the surfaces of the parts to be soldered should be gently heated to assist in making a good adhesion.

USE OF THE COMPASS IN LOCATING POLES OF A GENERATOR

Numerous letters have reached us asking if the following statement, which recently appeared in this magazine is not a mistake. The statement was:

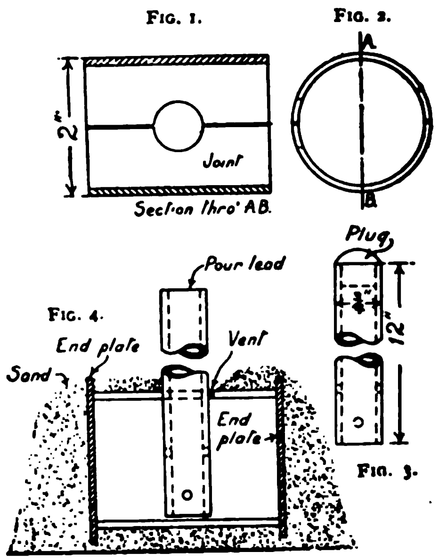
"While the dynamo is in service, bring the north-seeker end of a compass needle near each of the poles. Those that attract this end are north poles and those repelling it are south poles."

What has misled is the common mistake of calling the north-seeking end of the compass needle a "north pole." In reality that end of a compass needle is the south pole of the compass; otherwise it would not seek the north magnetic pole of the earth, because like poles repel. Hence when a compass is brought within the influence of a generator that is the north or positive pole of the generator which attracts the north-pointing end of the compass needle.

HOW TO MAKE A LEAD HAMMER

Lead hammers are useful when assembling parts which it is important not to mar. Such a hammer can be made in the shop, says a correspondent of the Model Engineer, London.

In the center of a piece of 2-in. tube, 3 or 4 in. long, drill a ¾-in. hole and then, cutting through the center of this hole, saw the tube in two. Through a foot-length of ¾-in. tube, drill two ⅜-in. holes at right angles to



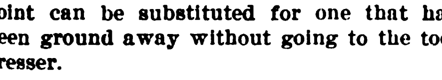
Details of Lead Hammer

each other, one ¾ in. from one end of the tube and the other 1½ in. from the same end. This last tube is for the handle.

Procure some ordinary moulder's sand and bed the two halves of the large tube in it, so that the sand holds the two parts together. Into the ¾-in. hole in the large tube insert that end of the handle tube that has the two holes. Against each end of the 2-in. tube, place a piece of tin to keep the molten lead from running out. Bank up the tube and ends well with sand, leaving a vent hole on top for air to escape. Pour molten lead down the inside of the handle until the large tube is full. When cold remove the halves of the large tube and the lead head will be secured to the handle by the two ⅜-in. holes in the handle. Fig. 1 is a sectional view of the 2-in. tube; Fig. 2 is an end view of the same; Fig. 3 shows the handle, and Fig. 4 shows mould with handle, ready for casting. File around the edges of the outer end of the handle.

INTERCHANGEABLE SCRIBER POINTS FOR PRICK PUNCHES

The prick-punch shown in the illustration is made so that a number of interchangeable scriber points may be substituted as required. This is a handy tool for the portable kit of a traveling mechanic. Its principal advantage, says a correspondent of Machinery, is that the point can be kept sharp easily, since the cross-section does not increase in size much up to the holder. A



Prick Punch With Interchangeable Points

point can be substituted for one that has been ground away without going to the tool dresser.

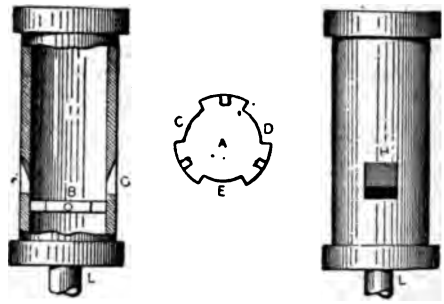
FILLING FOR CRACKS IN FLOOR

Cracks in a new floor that is to be stained and varnished may be filled with a putty made as follows. Dissolve 2 parts common glue in 14 parts water, then mix in 4 parts plaster of paris and 2 parts litharge.—Mas-

HOW TO MAKE A WHISTLE FOR A STEAM PLANT

In a plant where there is no whistle this convenience can be contrived out of a piece of 4-in. brass pipe 1 ft. long. A correspondent of the Engineer's Review tells how to make such a whistle.

Make a center piece, A in the sketch, out of a piece of brass and drill three holes in it.



Home-Made Whistle

File away three sides of this disk, C, D and E to provide for steam passages. Make holes in the tube to correspond to those in the disk, fit the disk in the tube as at B, Fig. 1, and run pins through the holes in the tube to those in the disk. Cut the pins off even with the outside of the pipe and solder firmly.

Above the steam passage in the disk and in line with them file three rectangular holes, F, G, in the brass pipe. On the upper side file the edges down to form a sharp lip (H, Fig. 2). Fit round disks to the top and bottom of the whistle having the lower one drilled and tapped for a steam pipe, L. This whistle makes a sound that can be heard all over the plant.

STEEL-BLUE ENAMEL FOR ANY METAL

An enamel for use on any metal and which will keep so long as it is tightly corked is made as follows:

Dissolve 1 part of borax in 4 parts of water. Macerate 5 parts bleached shellac in 5 parts of alcohol, saving out a small portion of the alcohol for dissolving methylene blue of sufficient amount to give the color desired. Heat the watery solution to boiling and, constantly stirring, add the alcoholic solution. Stir out all lumps and add the blue solution. Before applying, clean the metal bright with an emery cloth. Apply enamel with a soft brush.

TOOLS AND DEVICES FOR BENDING PIPE

A corner fitted up with tools and devices for working with and bending pipe will be found a convenient and profitable department in many shops. Very little space would be required, and with the proper apparatus the difficult task is rendered light and easy.

The result of trying to bend tubes or pipes with a section of steel rod is shown in Fig. 1. The tube wall is crushed in and when further doubled over is completely ruined (Fig. 2). Sometimes, where it is attempted to bend the metal back to restore the fractured place, it splits as in Fig. 3. At this point the workman probably tries to

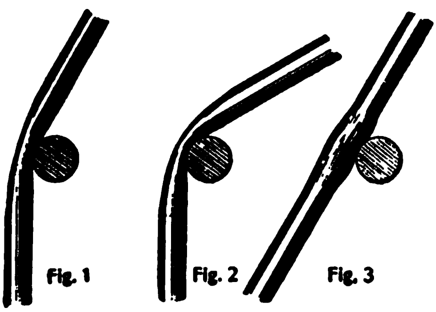


Fig. 1 Fig. 2 Fig. 3

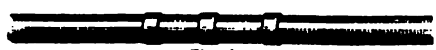


Fig. 4

remedy the matter by brazing on metal rings, as in Fig. 4.

All this trouble could be avoided by melting rosin in a good-sized glue pot and then with a ladle pouring it into the hollow of the pipe or tube, as in Fig. 5. When the pipe is filled, plug the other end with a wooden stopper and you have a solid wall as at F, Fig. 6, a sectional view. Or, if preferred, or more convenient, the tube may be packed with clay, as at G. The spiral spring method is shown in Fig. 8 and a set of springs for this purpose ranging in size from ¼ in. to

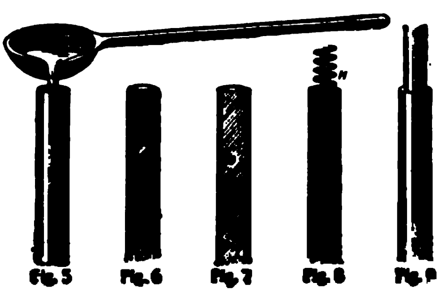


Fig. 5 Fig. 6 Fig. 7 Fig. 8 Fig. 9

Fig. 10 Fig. 11 Fig. 12

1 in. in diameter could be made from common steel wire and hung up in order in the pipe-bending corner. The method shown in Fig. 9 involves the use of a piece of wire to fit the inside of the tube. This is a good method for bending tubes of small diameter. By all these methods the pipe can be bent cold.

Pipe-bending forms are shown in Figs. 10,

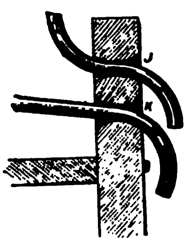


Fig. 13

Fig. 14

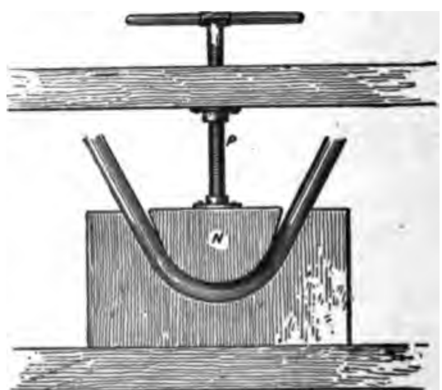


Fig. 15

11 and 12. The small round forms are metal, but others may be made of common hardwood stock. Shaft stock, 2 or 3 in. in diameter, may be used for a form like Fig. 1[illegible] Secure the shaft to a firm base of [illegible] effect the bending much [illegible] the point of [illegible]

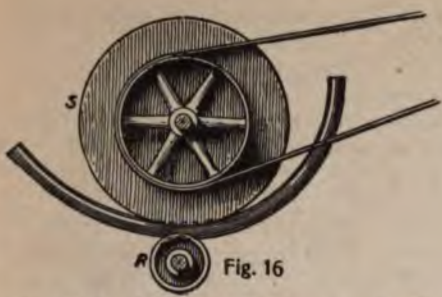


Fig. 16

The bending device shown in Fig. 13 is made of wood and is very handy. To make it select a piece of hardwood 4 in. square and 3 ft. long. Bore straight through one side, using an inch bit, and then shape the beveled places by working down the tapers of the two holes. Fasten it securely to the work bench by means of bolts. This is for light service, says the Blacksmith and Wheelwright. For heavier pipes and tubing a wooden form like Fig. 14 is useful, and may be bolted to a projection of the bench. Bend the pipe over as far as possible with the hands and then drop a loop of rope, M, over to hold it in place.

A set form bending device is shown at Fig. 15. The block for the base is cut out in the desired curve and a piece of hardwood, N, is shaped to correspond with the curve in the base and is fitted to the shaft P. The shaft can be raised and lowered, turning the crossbar as it is threaded.

Fig. 16 shows a revolving disk bending device. This consists of a small lower wheel of iron or steel having a shallow groove (just deep enough to grip the pipe) and a larger upper wheel, S, driven by a wheel for a belt as shown. Both the upper and lower wheels revolve in substantial wooden bearings on metal shafts. Pipe sleeves are used to line the bearings in which the shafts turn. The curve is made by running the pipe between the grooved wheels.

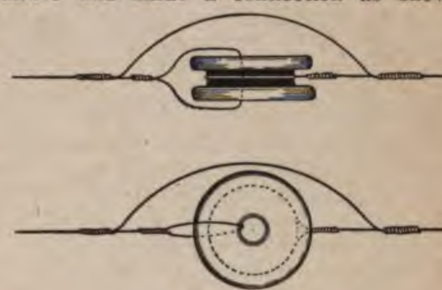
A grip form for pipe-bending is shown in Fig. 17. It is made of two pieces of hardwood, jointed at T, and having a series of holes of various sizes bored for receiving the tubing to be bent. The clamping arrangement is bolted to the bench and the pipe is held firm while being bent.

Fig. 17

TO STOP HUMMING OF TELEPHONE WIRES

The following is recommended as a positive cure for the humming of telephone wires.

Procure a porcelain spool insulator with a deep groove and place in the groove a rubber band (a piece of inner tube from a bicycle will do); then place around the rubber and in the groove the line wire, preferably insulated. Pass another piece of insulated wire through the hole in the insulator and make a connection as shown


Anti-Hum Device

in the sketch. With another piece of wire bridge around the connection so as to complete the circuit. The device is cheap and efficient.—Contributed by Walter La Homadue, Cherry Valley, N. Y.

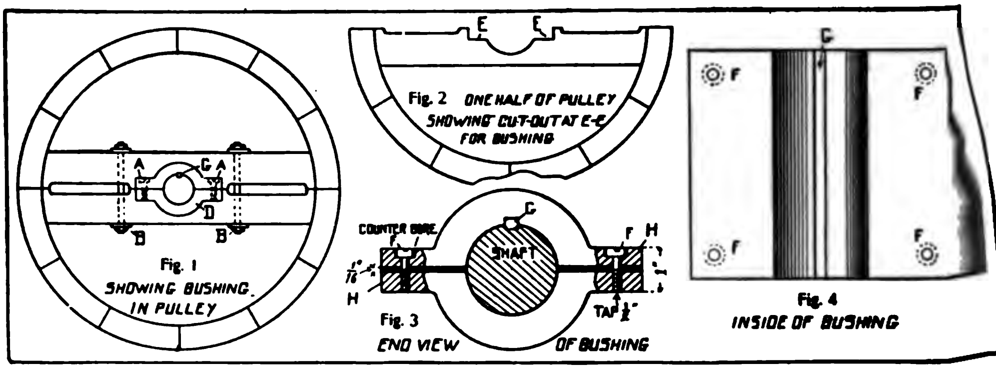
UNITED STATES STANDARD BOILER IRON THICKNESS

The following table gives the thickness of boiler iron required by the laws of the United States, for the various pressures given in each case. The Practical Engineer states these figures are for pressure equivalent to the standard for a boiler 42 in. diameter and one-quarter inch thick.

Thickness in Sixteenths	Diameter.						
	34 Inches.	36 Inches.	38 Inches.	40 Inches.	42 Inches.	44 Inches.	46 Inches.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
5	169.9	160.4	152.0	144.4	137.5	131.2	125.5
4⅔	158.5	149.7	141.8	134.7	128.3	122.5	117.2
4⅓	147.2	139.1	131.8	125.1	119.2	113.7	108.8
4	135.9	128.3	121.6	115.5	110.0	105.0	100.0
3⅔	124.5	117.6	111.4	105.9	100.8	96.2	92.0
3⅓	113.2	106.9	101.3	96.2	91.7	87.5	83.0
3	101.9	96.2	91.2	82.6	82.5	78.7	75.0

SAFE BUSHING FOR A WOOD SPLIT PULLEY

Oftentimes when a large wood pulley is tightened on a small shaft, it is a hard matter to keep it from slipping, especially a new pulley, where it would only take a few minutes work to cut a keyway in the shaft with a cold chisel without taking down a section of shafting.



Make an iron bushing of forged or cast steel to fit the hole for the former wood bushing, with two projecting lugs as at H H, Fig. 3. Cut out the pulley on each side of the hole as at E E, Fig. 2, to make a place into which the bushing will fit.

Drill four holes in the bushing, two at each side as at F F, Fig. 4, and tap ½ in. or larger in one-half of the bushing for blind cap screws.

Bolt the two halves of the bushing together and bore them out the size of the shaft. Put pasteboard between the halves before boring. Then keyseat and put on shaft over key at G, Fig. 3.

This bushing can be made from a pattern, cast iron or steel, and as long as the web of the pulley it is used with. This is a good method where a large pulley has to transmit power to a heavy load.

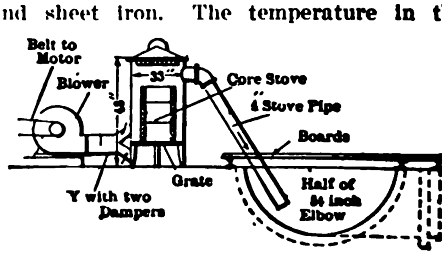
Fig. 1 shows bushing in pulley at D, keyed on to shaft and bolts, B, B, all set.—Contributed by F. M. D., Rocks Falls, Ill.

Use a very soft iron for brass molds, as the best iron for the purpose is one that cuts easily. Common machinery iron is not at all adapted to the purpose, as it soon develops cracks on the surface of the mold casting.

HOT BLAST STOVE FOR SKIN-DRYING MOLD

A hot-blast stove used for skin-drying molds for large pipe castings is described by a correspondent of the American Machinist, who recommends it on the grounds of cheapness and high efficiency.

An ordinary coke stove (four gray-iron rings set up on a circular grate with four legs) is surrounded by a cylinder of No. 16 steel, 33 in. diameter, 48 in. high and fitted with a cover. The cylinder fits the grate casting. The stove has a Y inlet, each branch fitted with a butterfly damper, and at the top one outlet. Air is supplied to the heater by a small blower mounted on a plank and driven by a motor. The hot air is driven into the mold, as shown in the sketch. The combustion of the coke is controlled by means of the damper in the inlet under the grate. The half-mold shown in the sketch is covered with boards, sacking and sheet iron. The temperature in the



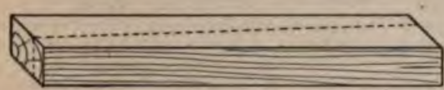
Hot Blast for Skin Drying

mold will register 300 degrees F., and a bushel of coke will last ten hours, continuous run.

Many of the parts required for this stove will be found lying unused about the shop.

FENCE POSTS BOTTOM UPWARDS

Many years ago while engaged in running a saw mill in eastern Connecticut I had a lot of fence posts to saw from small chestnut logs. The posts were to be sawed tapering and to economize in lumber the logs were



Post Economy

first sawed square and then split diagonally like the accompanying diagram. Of course they were to be set in the ground large end down, which would bring one-half of them bottom up in regard to the position in which they grew.

I remembered hearing an old farmer say that posts set that way would outlast those set "right end up" and I determined to improve the opportunity at hand to test the matter. So I marked all the inverted ones and as the fence was to be built in the neighborhood I watched the result.

Examining the fence about nine years after it was built convinced me, as the inverted ones were practically sound while the others showed very much more decay.—Contributed by Andrew Whiton, Hartford, Conn.

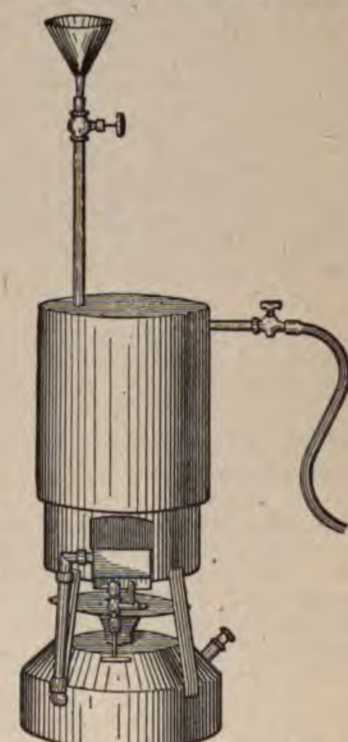
LINOLEUM COVERS FOR WORK BENCHES

Heavy linoleum makes a fine covering for the tops of work benches, says a correspondent of the American Machinist. The bench may have a pine top instead of one of hardwood, but should be constructed quite as usual. Use tongued and grooved pieces for the top and fill all holes with plaster of paris. The linoleum costs about $1 per yard.

To fasten it to the bench glue the edge next the workman for about 3 in. and secure over night. Then trim the edge flush with the bench and hold the other edges in place with wooden strips arranged so the linoleum will move under them as the top of the bench shrinks. The linoleum is so stiff it will always lie flat and it will last for years. Two benches covered with it have been in use five years and though the covers are marred some, they are still in good order for work.

APPARATUS FOR THAWING OUT PUMPS

For thawing out frozen pumps, the handy portable apparatus shown in the illustration was contrived by a correspondent of the Metal Worker. It consists of an ordinary gas firepot with a galvanized iron can of suitable size, the top of which is provided with two outlets, made from small pieces of galvanized iron pipe soldered securely in place. One outlet stands vertically from the



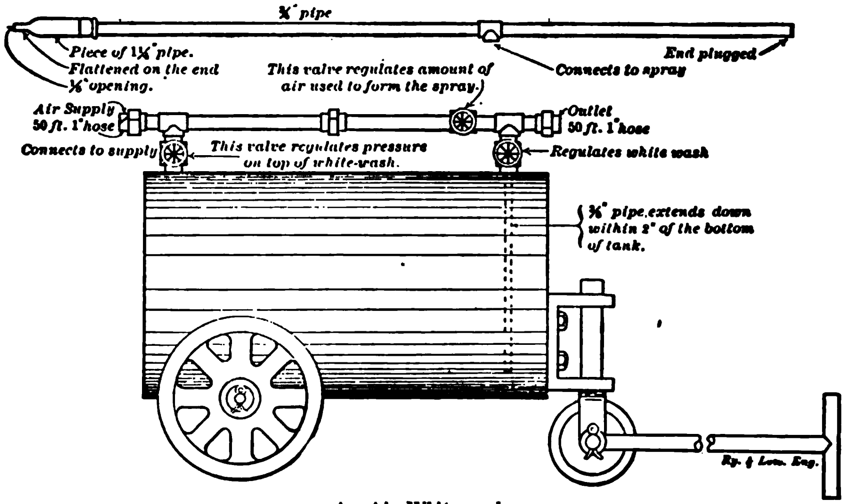
Thaws Ice 60 Feet Distant from Apparatus

top of the can and has a small globe valve on it, just above a T arranged to receive a safety valve. Above the globe valve is soldered a small funnel.

The other outlet is connected from the side of the boiler into a small valve, or petcock, which receives a rubber hose. To use the apparatus the boiler is heated until sufficient steam pressure is generated, when the hose is inserted in the pump, finds its way readily to the ice and the steam speedily thaws it. Ice 60 ft. distance from the boiler can be thawed in this way. Most shops contain all the materials required for such an apparatus.

AIR WHITEWASHER

A whitewasher operated by compressed air, says a correspondent of Locomotive Engineering, accomplishes in two hours an amount of work that would keep one man busy a month. The construction of the machine is fully explained in the illustration.



An Air Whitewasher

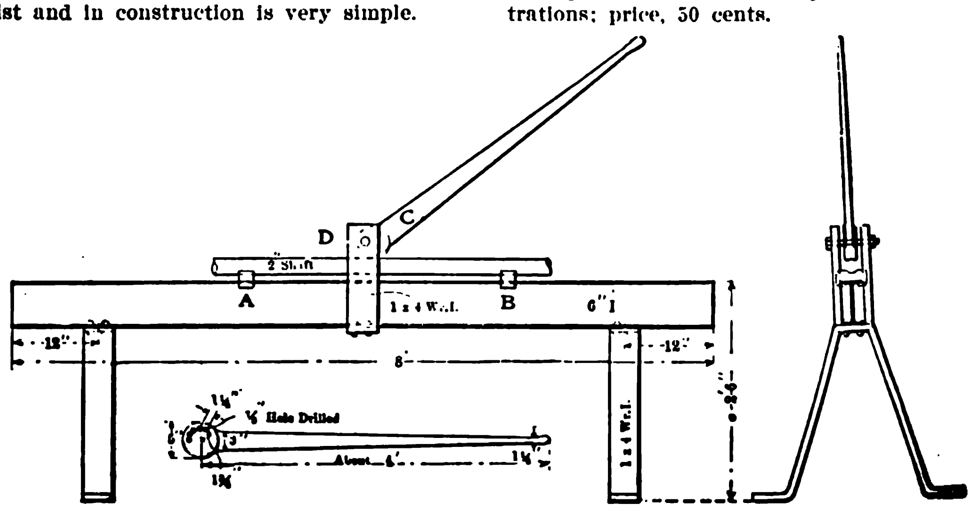
MACHINE FOR STRAIGHTENING PIPE AND SHAFTING

The press shown in the illustration can be used for straightening pipe and shafting or for bending pipe. The device was contrived by a correspondent of the American Machinist and in construction is very simple.

Blocks A and B are forgings fitted over the top of a 6-in. I-beam, so that they are free to move the length of the beam, which is 8 ft. long. C is a lever with the lower end enlarged and the edge ground some. One end of the lever acts as a center and can have any number of holes drilled in it. It is very easy to straighten 2-in. pipe in such a press.

Rubbing with a piece of chamois leather or cotton flannel moistened with alcohol will readily reduce a too strong high light in a negative.

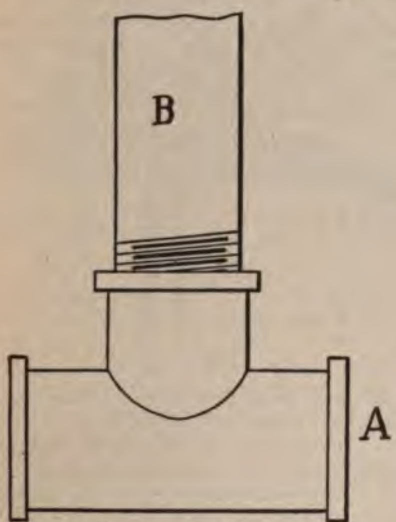
Shop Notes for 1905; 200 pages; 385 illustrations; price, 50 cents.



Pipe and Shaft Straightening Device

DEVICE FOR BENDING ELECTRIC CONDUIT

A device for bending the smaller sizes of electric conduit is made by screwing a piece of pipe into a tee, A. To use slip the tee over the conduit till it reaches the point where the bend is to be made. Then stand



For Bending Electric Conduit

on the conduit and pull or push handle B. Any curve can be bent in this way and different sized tees may be used for different sizes of conduits.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

HINTS ON GLUE

It requires more water to dissolve good glue than to dissolve poor glue. The best glue, says the Wood-Worker, will require from one-half to more than double the water required for poor glue.

Good glue breaks hard and tough, with a splintered edge.

Cleanse the glue kettle often.

Frozen glue is so porous that it can be made up at once.

IMPROVING A WASHER

A thick washer can be made out of an old nut or a thinner one can be made of a piece of sheet iron or a metal button, says Gas Power. A very simple and easily made washer is a ring made from a piece of wire of suitable thickness.

A GOOD FLUID PASTE

Dissolve 10 lb. gum arabic and 2 lb. sugar in the amount of water required. Then add 1¾ oz. nitric acid and heat to the boiling point. This liquid paste will not mould and dries to a transparent layer on the paper. The Western Painter says it is well adapted for the flaps of envelopes, fine bookbinders' work, etc.

TO FIND CENTER OF SHAFT WITHOUT CENTER PUNCH

Procure a block of wood 1 in. thick and with an auger bit bore a hole in the block until just the point of the bit shows through

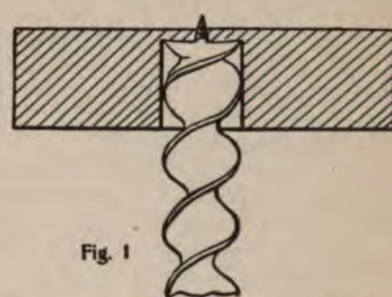


Fig. 1

the block as in Fig. 1. Then place block over the end of the shaft, Fig. 2, and with a sharp pointed punch and a hammer the center can

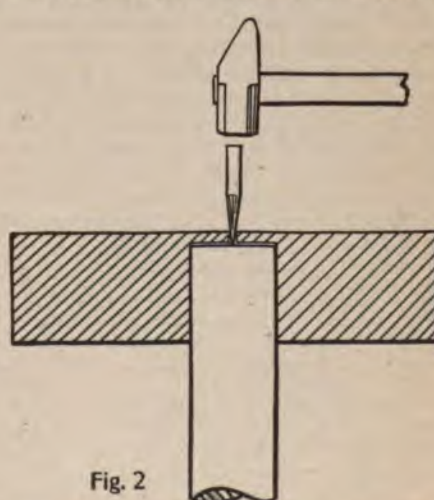
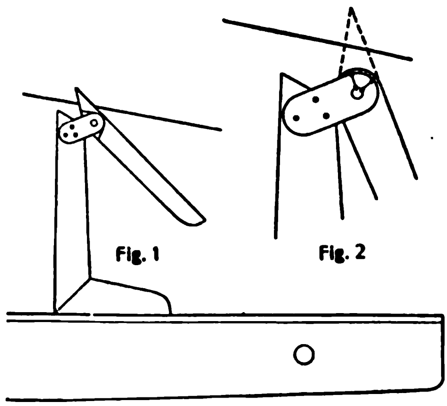


Fig. 2

be marked slightly. Then use a drill and drill out. The hole in the block must be the same size as the shaft.—Contributed by Eli Tolliver.

IMPROVING THE CLINOGRAPH

The clinograph is a set square used by draughtsmen for drawing inclined lines, section lines, and for shading, etc. It comprises two parts, one having two rectangular edges and another part, termed the "blade," which



Two Forms of Clinograph

is hinged to the first part. In using the appliance, one of the fixed edges is placed against the T-square and the blade adjusted to any position desired, where it is held by friction.

The instrument is slid along the T-square to any part of the drawing paper, for drawing parallel lines, says Technics, London, or for perpendicular lines, it is set and then turned with its other edge against the T-square. The illustration shows two forms of the clinograph. Fig. 1 shows a form in common usage, but the form shown at Fig. 2 is an improvement upon the first form, in which the edge can only be brought to coincide with a line by trial. In the second form the concentric portion is brought to the line and the blade swung around to coincide with the line without a trial. The alteration can be made with a pocket knife.

A GOOD STAPLE PULLER

A good staple puller that will do the work quickly and easily and leave the staples in better condition than such tools do ordi-

Fig. 1.

narily, is made of ½x½-in. steel; a correspondent of the Blacksmith and Wheelwright says he uses old harrow teeth for the purpose. The steel is first shaped as

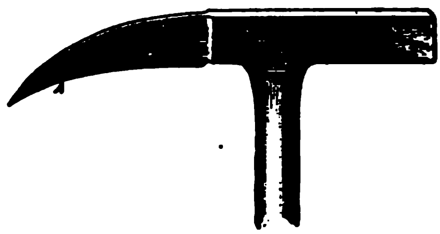


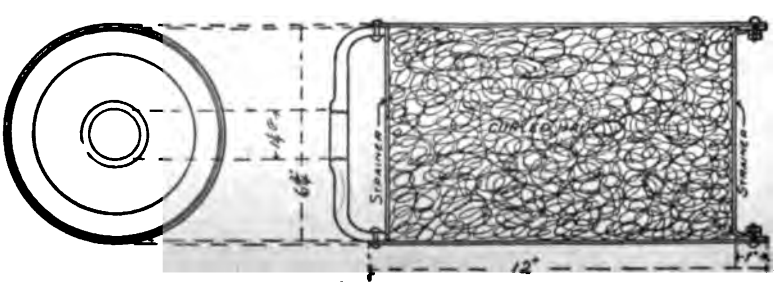
Fig. 2.

in Fig. 1, a bottom view, and then as in Fig. 2. The edges at A, Fig. 2, are rounded a little so they will not injure the wire. The handle may be of any length desired.

A sewing-machine that will sew directly from two reels of thread instead of using a spool of thread and a shuttle is the reputed invention of an Irishman. The machine is of simple mechanism and can be manufactured and sold at a greatly reduced price. Experts say the machine will revolutionize the sewing-machine trade of the world.

STRAINER FOR AIR PUMP

A strainer for the air cylinder of an air pump consists of curled hair held between two strainers. The device is screwed on the air cylinder and strains the dirt out of the air. A correspondent of Locomotive Engineering has used this strainer with excellent results.



Air Pump Strainer

DRIVING STAKES BY COMPRESSED AIR

A unique stake-driver and one that saves considerable hand labor is used by the Barnum and Bailey circus, says Air-Power. The apparatus consists of a rock drill suspended between two vertical guides. The two side rods of the drill are continued below the lower head and support a round anvil. This anvil rests on the head of the stake to be driven and holds it firmly by means of spring clasps. As the stake is driven into the ground the driver is lowered by means of a cylindrical hoist and follows the stake downward until it is driven in securely.

CROW BRIDGES FOR DRILLING HOLES IN DIFFICULT PLACES

For drilling holes in difficult places, the crow bridge can be used to advantage many times.

Fig. 1 shows how a crow or brace may be used. It is made of 1x1½ in. iron. The arms may be extended if required by two extension pieces, B.

When it is possible to pass a chain around the casting, cylinder, or material to be drilled, the crow may be used on work as in Fig. 2. Two holes are drilled at C C and the end link of a small chain passed through one, and a small bolt D pushed through the link to hold the chain. The chain is then passed around the work and pulled through the other hole until taut and fastened there with a small bolt.

The beauty of these crows, says a correspondent of the Engineer's Review, is that it is only necessary for an engineer to get hold of the bar iron. He can then shove it into his furnace fire, get a red heat on it and bend it as required. A couple of holes drilled completes the job and he has two handy tools.

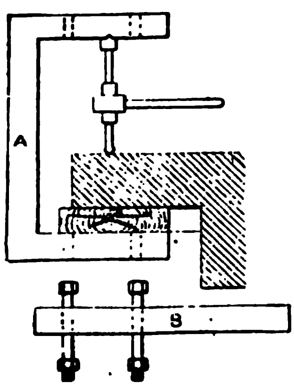


Fig. 1

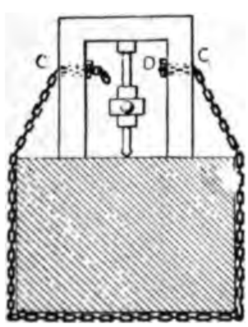
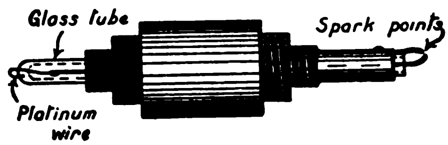


Fig. 2

HOW TO MAKE A SPARK PLUG FOR A SMALL GAS ENGINE

For a small gas engine (⅛ h. p.) a spark plug may be made and substituted for the ignition tube. A correspondent of the Model Engineer, London, tells how to make such a spark plug.

FIG. 1.—SPARK PLUG.



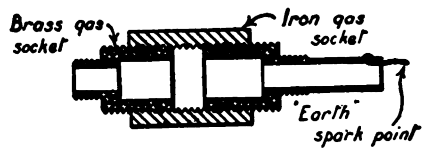


FIG. 2.—SECTION.

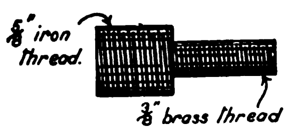


FIG. 3.—BRASS SOCKET

Make a stuffing-box of three ordinary gas sockets, packing them with asbestos string moistened with paint. Insulate the "live" wire by a glass tube (Fig. 1), passing it through the stuffing-box. Connect the outer end of the "live" wire to a short piece of thin platinum wire and then hermetically seal this wire through the end of the glass tube. Pack the wire tightly in the tube with paint-moistened asbestos.

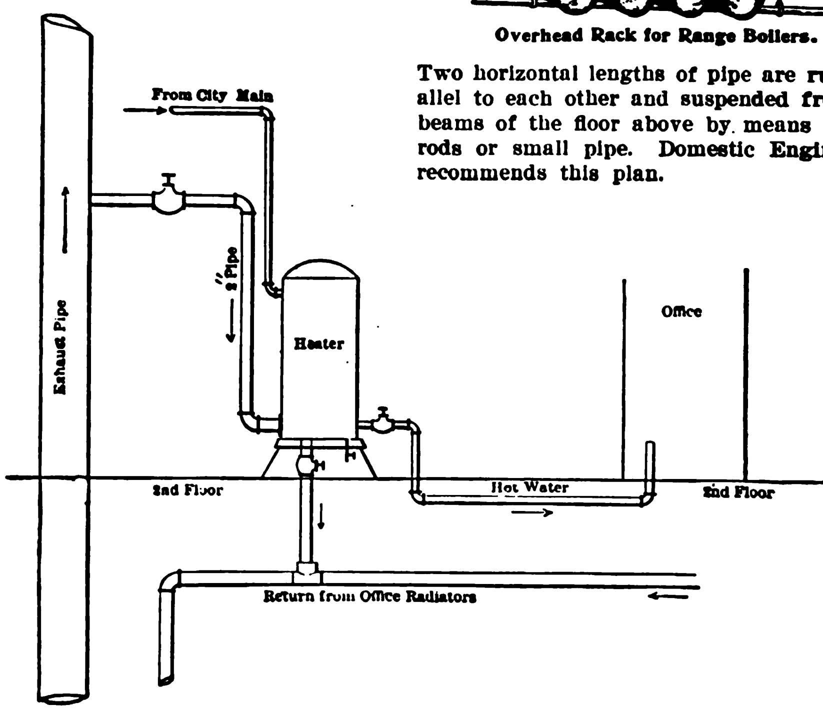
Rivet the "earth" spark point through a hole in the brass tube, which hole may be made by filing or turning off the lower part of the thread of the bottom brass gas socket (Fig. 3). Then bake the whole plug in the oven.

The spark plug screws into the ⅜-in. hole previously occupied by the ignition tube.

HOT WATER FOR OFFICE USE

A system for heating water for office use was planned by a correspondent of Power. An old feed-water heater of the enclosed type, that had become too small for its original purpose was moved from the engine room to the second floor of the building and placed near the main exhaust pipe of the engine.

A 2-in. hole was tapped in the exhaust pipe and a pipe run from this hole to the heater. The outlet of the heater was connected to the return pipe of the radiators from the office. The cold water entered the heater from the city main at the top and the delivery was piped under the floor to the office, as shown.



For Providing Hot Water for Office Use.

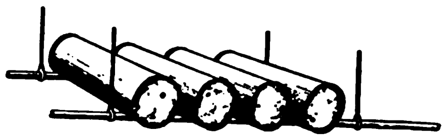
HOW TO REVIVE BURNT STEEL

A burnt tool may be revived so that it can be used in nearly every case, and if not the experiment has cost nothing, writes a correspondent of the Model Engineer.

Harden the tool in the usual way three times and then temper to the desired degree. This method can be used on hand tools, drills and small chisels with advantage.

STORING RANGE BOILERS

Range boilers not only take up considerable space in the shop, but are apt to suffer damage by being tipped over. The sketch shows a convenient means of storing them.


Overhead Rack for Range Boilers.

Two horizontal lengths of pipe are run parallel to each other and suspended from the beams of the floor above by means of iron rods or small pipe. Domestic Engineering recommends this plan.

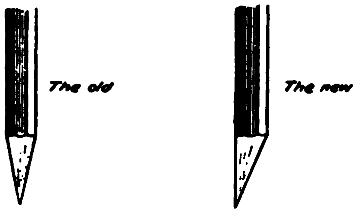
TO APPLY ASBESTOS NEATLY

In applying asbestos about the steam plant a neat, quick method pays. The following is given by Machinery as such:

Make the asbestos plastic by mixing it thoroughly with water. Apply the first coat rough and about ½ in. thick, using a pointed trowel. Let dry and apply a second coat ¾ in. thick, and straighten down with a large trowel. Wind the second coat with No. 16 annealed wire, having the coils about 3 in. apart at all points. In case of a flat surface, bind it with horizontal wiring. Apply a third coat of asbestos to cover the wire and make a smooth surface. A 100-lb. bag of the material will cover about 40 sq. ft. of surface in this way.

SHARPENING DIGGING BARS

The method of sharpening the digging bars used for digging post holes, commonly is to give the point a bevel like a chopping or cold



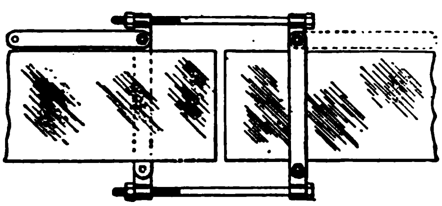
Two Ways of Sharpening Digging Tools

chisel. In hard or gravelly soil this shaped tool is apt to make a funnel-shaped hole and it is difficult to get the workmen to do any better with it.

A correspondent of the American Telephone Journal says that if the bar is beveled all on one side and the other side is left straight like a wood chisel this difficulty of funneled holes will be greatly overcome and that the men can make better time using this shaped tool.

HANDY BELT CLAMP

This simple and convenient clamp is made of ½-in. by 2-in. iron and is intended for belts not larger than 12 in. wide and ⅜ in. thick. The dimensions of the clamp can be increased in proportion for larger belts, however, says the Engineer's Review. The side



Belt Clamp

bolts of the clamp are of ⅞-in. stock, 24 in. long and the bolts clamping the crosspieces are of ½-in. stock, 2½ in. long with square heads.

In taking the clamp off, first slacken up on the long bolts, then on the small bolts and take two of them out.

To make new tin roofs hold paint well, a good rubbing with No. 1 sand- applying the paint.

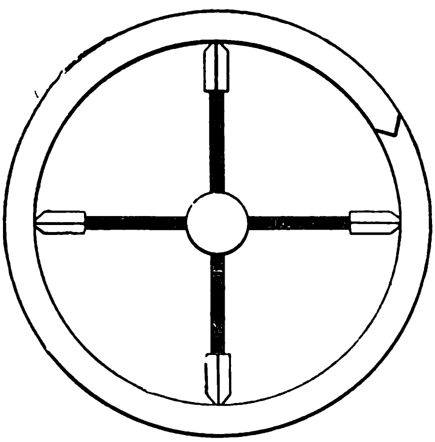
— rubbing it with

SPRINGING PACKING RINGS OVER PISTON

In putting a snap ring on the piston of the high pressure cylinder of a tandem compound engine a correspondent of the Engineer's Review made use of the following kink. This job is very difficult for as soon as the ring is started on one side it slips off the other, and yet, for fear of breaking the ring the engineer must proceed cautiously.

Four pieces of square iron were cut off in 3-in. lengths and threaded to a depth of 2½ in. One end of each block was made tapering, coming down to a sharp point to prevent slipping of the ring surface.

Four bolts were threaded and screwed into these four blocks, which were placed in position as shown in the illustration. To put the



Method of Springing Packing Ring Over Piston

ring on the piston, the bolts and blocks were put in place and tightened up so as to spring the ring evenly until it was large enough to slip on over the piston.

MIXING CONCRETE

A concrete mixture of the following proportions is recommended by engineers.

To 1 bbl. Portland cement add 3 bbl. clean, sharp sand. Mix the two intimately, either manually or by a mechanical mixer. Add enough water to bring it to the proper consistency, the amount required being judged by one of experience in the work. Add 5 bbl. of broken stone and intermix the whole, which is then ready for use. This is known as a "1-3-5 mixture." The nature of the ingredients and the purpose for which the concrete is intended make the proportions variable, however.

HOW TO MAKE AN ELECTRIC ILLUMINATED FOUNTAIN

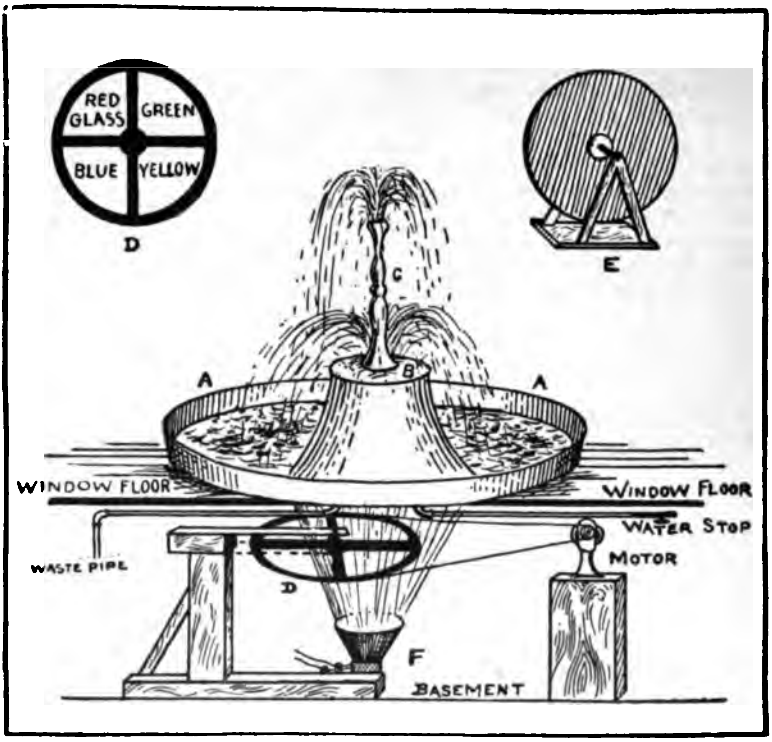
One of the prettiest and most attractive displays for a show window is an electric illuminated fountain. The Keystone tells how such a fountain may be constructed.

Have a tinsmith make the center bowl A of tin, of any size desired, according to the size of your window. This center bowl should be shaped like a large cake tin, hollow in the center. Cut a hole in the center of the window floor and place the tin bowl over it. Put a large rubber band around the center tin cone. Secure a circular glass shelf, B, having a hole in the center, and rest it upon the cone.

Have the tinsmith make a fancy stem, C, enamel it white, punch fine holes in it at the top and bottom and solder it to the water pipe, which passes through the hole in the center of the glass shelf and which is attached to the main pipe in the basement. Put a rubber washer on the glass shelf to make it watertight. The waterflow is regulated by water stop and the surplus is carried off through the waste pipe.

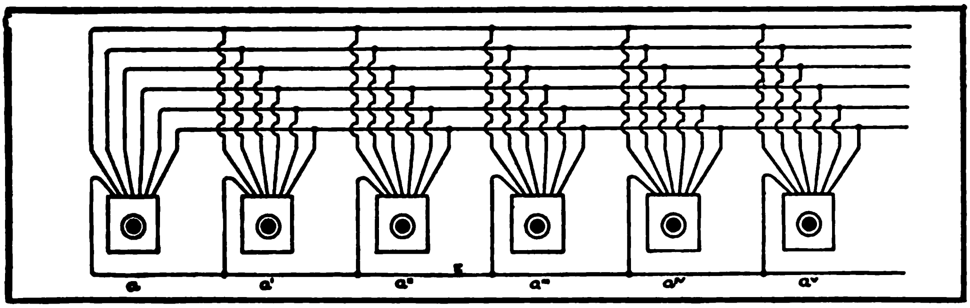
Make a skeleton pulley, D, with a piece of colored glass in each of its openings. Use red, green, yellow and blue glass and fasten it in position with tacks. Arrange this pulley so that half of it is in the center of the fountain.

Place a strong electric light with a reflector in the position shown at F, so that it sends its rays upward through the colored glass and through the center cone on the water. The effect will be most beautiful. The changing of the colors can be reduced to speed by means of the reducer E. In the lower bowl lay three electric bulbs colored green, with wires made waterproof, well insulated and enameled. Pond lilies and gold fish may be added and a magnificent display created.



Electric Illuminated Fountain

A good cement for metal joints consists of ground white lead worked up with enough powdered red lead to bring it to the consistency of putty. Then add boiled linseed oil.



Plan of Wiring for Intercommunicating Telephone System

INSTALLING INTERCOMMUNICATING TELEPHONES—PLAN FOR SIX TELEPHONES

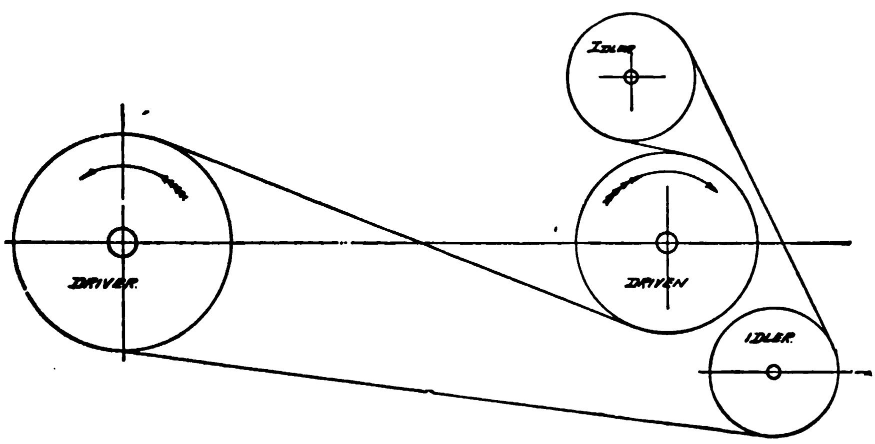
The approved plan of wiring for intercommunicating systems is shown in the accompanying diagram, which we reproduce by courtesy of the American Telephone Journal. The diagram shows six telephones, a, a', a'', etc., to each of which six wires are run. The circuits are completed from the other terminals of each telephone, through the common return wire. The diameter of this return wire should equal the sum of the diameters of the separate wires, where the lines average over 1,000 ft. in length.

Switch board cable should not be used on the intercommunicating system because of creating mutual induction between two circuits, being twisted in pairs. Ordinary house wire, No. 19 B. & S. gauge, with a rubber insulation and a covering to match the woodwork along which it is run is recommended as best. Each separate wire should have a distinct color or combination.

ANOTHER METHOD OF REVERSING COUNTERSHAFT WITHOUT CROSSING BELT

Commenting on the article on reversing a countershaft without crossing the belt by means of two idlers, which appeared in the July Popular Mechanics, W. B. Burrows, of Minneapolis, Minn., says:

"The use of the two idlers for this purpose is all right, but according to my way of figuring they are not used correctly for the reason that the strain of the full load is brought on one of the idlers. I herewith submit a sketch of what I consider the better method for this kind of a drive, as it brings all the strain on the main shafts (where it belongs), leaving the idlers to simply guide the belt and carry the weight of the slack side, as well as allowing lighter shafts and bearings to be used for the idlers. I have used both ways, the latter up to 600 r. p. m., carrying a heavy, uneven load, and find that it gives a great deal better satisfaction all around."



Strain Comes on the Main Shaft, the Idlers Merely Guide the Belt

WIRELESS TELEGRAPHY IN EVERY DAY USE.

It is hard for the layman to realize that in a comparatively short time wireless telegraphy has passed from the merely experimental stage to the point where it is giving constant and practical service. Already it has figured importantly in a great conflict and has become an adjunct of every great navy.

Since June, 1902, the Marconi system has been an important part of the equipment of the Belgium mail packets plying between Dover and Ostend. Experiments were begun on these packets in 1900. A coast station having a mast 151 feet high was established at La Panne and the floating station was established on the "Princess Clementine" which had a mast 98 feet high. The transmitter system of each station consisted of an oscillator having one terminal connected to the earth and the other to an antenna. In October, 1901, the tests resulted satisfactorily. Then the government began installing the system.

A new station was established at Nieuport Bains, the building being of brick with the terminal of the antenna carried to it. The mast is in its immediate neighborhood and the station has the ordinary telegraphic communication with the interior of the country. Two government employes are on duty at this station during the day; during the night, one employe of the wireless telegraph company. Each vessel sends an average of three telegrams during a night voyage, and during day trips each vessel receives one message. In the messages, the signal of the message, a number, is first given, then the number of words, the nature of the telegram (service, private, or government), the name of the boat and the text which is usually of the following character: "Left Dover at 11:03 P. M.; thirty-two passengers; 220 postal sacks; clear; wind E. S. E."; signature. The commander and his officers have charge of the manipulation. The steamer stations receive no outside messages nor interfere with any apparatus having a different pitch, the government contracts calling for this syntonizing. Signals are exchanged best on damp moonlight nights.

The transmitting station, says the Electrical Review, consists of a storage battery of eight cells which supply the Ruhmkorff coil with eight amperes at sixteen volts, equivalent to 160 watts. The coil transforms the current to 40,000 volts. The storage battery is charged by the dynamo which lights the station. The antenna consists of three wires soldered together at the extremities. The total length of wire is 180 feet. The height varies on the packets from 49 feet to 89 feet, according to the height of mast.

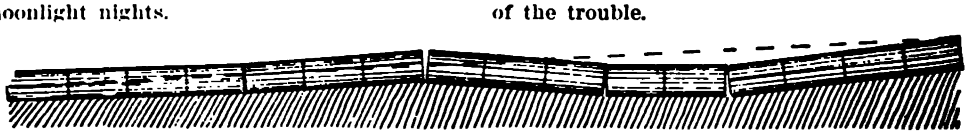
The receiving apparatus consists of a receiver complete: relay, decoherer, coherer, jigger, box of batteries, next a Morse register and a signal bell. Each station is provided also with reserve apparatus, a storage battery, a coil complete, three Leyden jars, a receiver complete, and twelve batteries.

Service in some of the packets is now public, the charge being 10 cents for fifteen words. Wind, rain, snow, cold or heat, the service remains as efficient—and at times has been of great importance. For instance a packet once encountered a Norwegian bark with a broken rudder. The condition of the bark was reported by wireless telegraphy and a tug despatched to its aid. Once a thief was believed to have escaped by way of a packet. Upon being informed while at sea the captain instituted a search for him and made sure he was not on board.

There have been other instances—broken propellers, light buoys going out, danger of losing routes in heavy fogs, etc., all of which have been safely met by this wonderful new agency, which means more to the navigator than to any one else.

DRAINS AMONG TREES.

Tile should not be run among trees, especially willow or cottonwood trees, says Brick. The illustration shows the probable effect on the drain, if this advice is not heeded. The small fibrous roots will soon choke the tiles and entirely shut off the water they are intended to carry, so that it will be necessary to dig them out and clean them. In such case, do not replace them, but run in the same size sewer pipe, cementing the joints to prevent a recurrence of the trouble.



What May Happen to Tile Run Among Trees

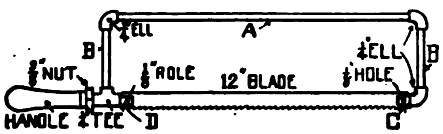
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

A PIPE HACKSAW FRAME

To make this frame, three ¼-in. ells, two pieces of ¼-in. pipe, 3 in. long (B B), one piece of ¼-in. pipe, 15 in. long (A), and one



Pipe Hacksaw Frame

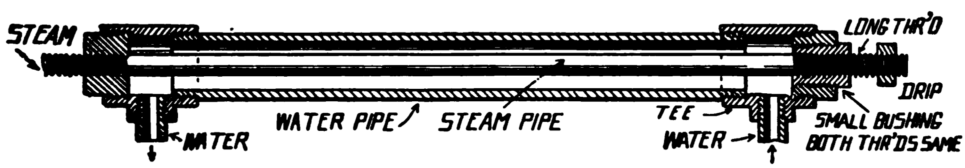
¼-in. tee will be required. C is a piece of bolt iron, pipe-threaded and screwed into the ell; D is a piece of the same metal, 4 in. long, which is bolt-threaded and passed through the reamed tee with about 4 in. of thread on the handle side of which is a nut by which the tension of the blade may be adjusted. Parts C and D both have slits sawed in them parallel with the blade, into which the blades are fastened by means of pins passing through holes drilled for the purpose. Fittings without bosses on them make a neater appearance, and all brass pipe for the frame looks better, also.—Contributed by Apprentice.

HOME-MADE WATER HEATER

A water heater to have steam and drip connection hitched into steam heating system, the same as a radiator, water entering lower tee and being discharged from the upper tee, is shown in the illustration.

The heater may be used either vertical or horizontal, though it should be pitched toward the drip end, and may be used with or without tank. It consists of outer pipe through the center of which passes for steam, the water being maller pipe; heads or bushings in the end make the shell watertight where the steam pipe enters with a long thread at both ends.

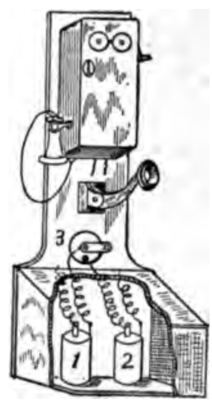
A 1½-in. outside pipe with tees 1½ in. x ½ in. or equivalent; with bushings 1½ in. x ¾ in. for the end and bushings ¾ in. x ½ in. for connecting and making watertight joints with ½ in. steam pipe at the ends, will heat a volume of water 6 or 8 ft. long.—Contributed by W. J. Barber, North Adams, Mass.



Home-Made Water Heater

BATTERY ECONOMIZER FOR TELEPHONES

By the use of a switch (3) placed on the telephone box or on the wall and wired up with the batteries (1 and 2) as shown in the diagram, a great deal of wear on the batteries can be saved and they will last a long while. — Contributed by Geo. R. Bowers, Shelbyville, Mo.



VARNISH PRECEPTS

One coat of varnish never cracks.
Two coats of varnish seldom crack.
Three coats of varnish often crack.
Four coats of varnish always crack.
—Master Painter.

Shop Notes for 1905 contains 200 pages; 385 illustrations. Price, 50 cents. Write for a copy to-day.

DRAWING FIVE-POINTED STARS

One of the easiest methods of making a five-pointed star by the use of the steel square is to describe a circle of a given diameter, then divide up the circumference by indicating chords equal to seven-twelfths of the diameter. The five points where the chords intersect the circumference will be the points of the star, says the Metal Worker.

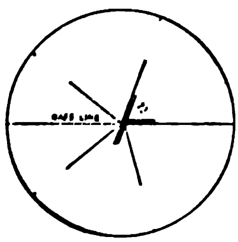


Fig. 1.

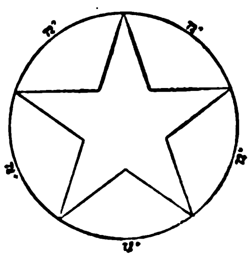
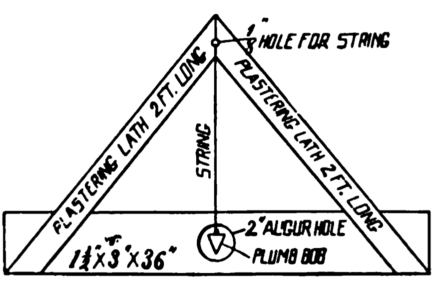


Fig. 2.

Another good way is to divide 360 by the number of points the star is to have, which will give the distance between points in degrees. Then get the angle on the bevel square with the protractor, and using any diameter as the base line, the points may soon be obtained. This operation is illustrated in Fig. 1, while Fig. 2 shows the star with points joined.

HOME-MADE LEVEL

A home-made level which suffices for all ordinary purposes is shown in the diagram. The level is made of a 1½ in. x 3 in. x 36 in. piece of wood, two plastering laths,



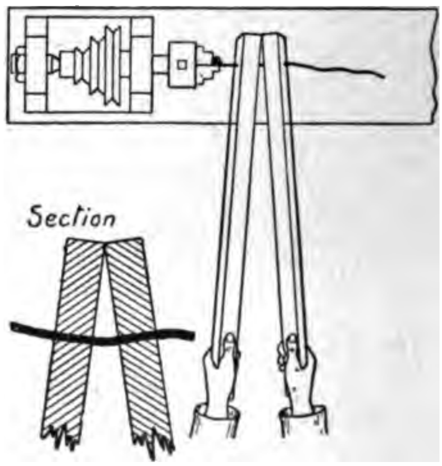
Home-Made Level

2 ft. long, a string and a plumb bob. The illustration explains the construction. The laths may be nailed to the bottom piece with shingle nails.—Contributed by Jas. Dunn, Tenn.

STRAIGHTENING WIRE IN THE LATHE

Short lengths of thick wire are very hard to straighten with the mallet, but the work can be done in the lathe, quickly and easily, says the Model Engineer, London.

Grip the wire in the chuck, and roughly straighten it with the hand, so that it clears the bed. Now get two pieces of hardwood about 1 ft. by 2 in. by ½ in., and bore a hole in each about 2 in. from one end to fit the wire. Slip them on the wire close up to chuck, and start the lathe. Grip the pieces of wood in the position shown in the sketch, keeping the ends farthest away pressed close together and twisting the pieces of wood in opposite directions. Move slowly along the wire, keeping in the same position. If necessary, repeat the operation. New holes



Straightening Wire

can be bored in the wood at a short distance from the old ones when these become too large.

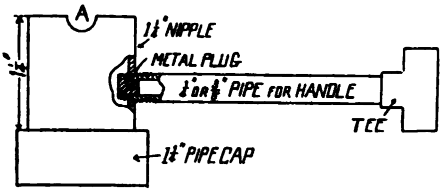
WATERPROOF ELECTRIC LIGHT SOCKETS

Electric lights so located that they are exposed to water may be made waterproof by the following described means:

Before putting the lamp into the socket fill the receptacle with a lump of soft putty, then screw the lamp in. This will force the putty into every crevice and make it absolutely tight. Unscrew the lamp aga
the w
not

BABBITTING LADLE MADE OF PIPE

Into a 1¼-in. pipe cap screw a 1¼ x 1¼ in. nipple, threaded on one end only. On the inside of the nipple file a mouth or lip (A) for pouring a small stream. Make a handle of 1¼-in. or ⅜-in. pipe of whatever length is

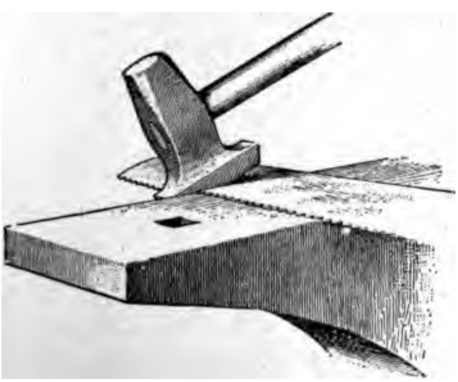


Babbitting Ladle

most convenient for your use. Screw the handle into the nipple about ¼ in. to brace it and plug it at that end with a pipe plug, or an old bolt threaded in. On the other end of the handle screw a tee, making it convenient to hold. Have all the threads neat and tight, so the ladle will not be unsightly.—Contributed by Apprentice.

TO CUT THIN STEEL WITHOUT TEMPERING

A simple method of cutting a thin piece of steel as from a saw blade, without drawing the temper, is shown in the illustration.


Cutting Thin Steel

A correspondent of the Blacksmith and Wheelwright recommends this method.

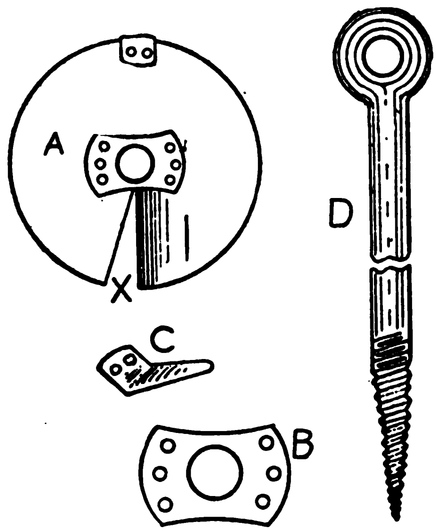
NO SMOKED CEILINGS

ng may be cleaned
of starch and
then brush-
h

HOME-MADE POST AUGER

Any circular disk that is wide enough and not too thick—as, for instance, the broken blade of a disk harrow or a circular saw blade—may be used for the auger blade. Center punch the plate, mark the size required with a compass and cut in circular shape.

At the center of the disk punch or drill a ¾-in. hole, then split the disk from the center to the outer edge and cut out a small strip as at X in the sketch, so as to leave a better opening, says the American Blacksmith. Sharpen both sides of this split and turn one down and the other slightly upward. Forge a piece like B and rivet it on the blade as at A. Forge a lip, C, from a



Home-Made Post Auger

piece of spring steel and rivet it to the blade on the edge opposite the split part. This lip is intended to cut the soil on the outside, while at the split the cutting is directly down into the soil. The whole blade should be concaved on the outside edges—turned upwards.

Make the stem D, of ¾-in. round iron, 4 ft. in length, with an eye for a cross handle and with its point extending 6 in. below the blade and twisted like a twist drill. Cut a thread on the stem and screw into plate B.

This auger is particularly useful in boring holes in stiff clay soil. It makes a clean hole and can be used without water. The boring can be fast or slow, according to the downward bend given the cutting lip of the disk.

CHEMICAL FORMULA TABLE FOR PAINTERS

The painter who has some knowledge of chemistry will find it greatly to his advantage in the preparation of his colors. For those who cannot take such a course the following table compiled by the Master Painter will be found useful and worth memorizing.

THAWING FROZEN GROUND WITH LIME

Lime may be successfully used in thawing frozen ground where excavating must be done to gain access to frozen pipes. Apply one barrel over night, covering well, for thawing out frost 1 ft. deep, in a trench 2 ft. wide and 8 ft. long. Hot water may be used with the lime to good advantage.

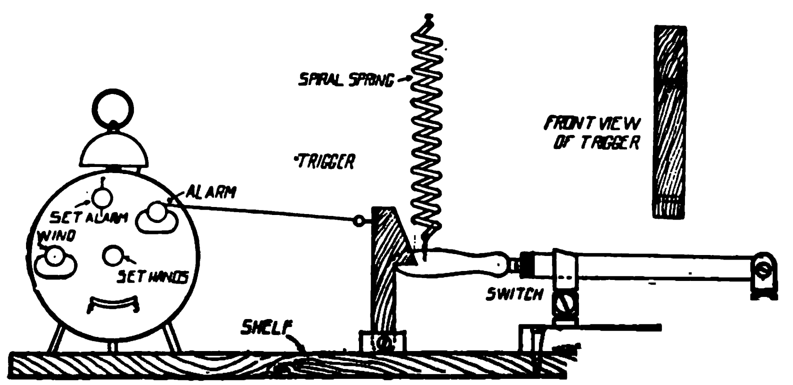
Common Name	Chemical Name.	Formula
Barytes, Blanc Fixe,	Sulphate of Barium,	$BaSo_4$
Gypsum, Terra Alba, Plaster of Paris,	Sulphate of Calcium,	$CaSO_42H_2O$
De-Hydrated Plaster of Paris,	Sulphate of Calcium,	$CaSO_42H_2O$
Whiting, Lime Carbonate, Lime, Paris White, Spanish White, English White, Marble Dust,	Carbonate of Calcium,	$CaCo_3$
Sublimed Lead, "White Lead,"	Sulphate of Lead,	$PbSO_4$
White Lead, Corroded Lead,	Basic Carbonate of Lead,	$2PbCO_3PbH_2O$
Silex, Silver White, Infusorial Earth, Wood Filler, Ground Quartz,	Silica,	SiO_2
Zinc White, Zinc Oxide,	Oxide of Zinc,	ZnO
China Clay, Clay,	Hydrated Silicate of Alumina,	$2SiO_2A1_2O2H_2O$
Litharge, Lead Oxide, Massicot,	Lead Monoxide,	PbO
Red Lead, Orange Red,	Lead Oxide,	Pb_3O4
Chinese Vermilion and Mercury Vermilion,	Sulphide of Mercury,	HgS
Venetian Red, Indian Reds, Mineral Brown, Etc.	Oxide of Iron,	Fe_2O_3
Chrome Yellows, M and L,	Chromate of Lead,	$PbCrO_4 + PbSO_4$
Chrome Yellow, O,	Chromate of Lead,	$PbCrO_4$
Lamp and Gas Black,	Carbon,	C
Ivory, Bone, and Drop Black,	Carbon, etc.,	C
Graphite,	Graphite,	C

AUTOMATIC CUT-OFF FOR ELECTRIC LIGHTS

Fasten an alarm clock on a shelf, and about 10 in. away place a switch. Make a trigger as shown in the sketch and mount it on an axle, so it will move backward and forward. At a point on the wall above this arrangement, fasten a spiral spring at such a height that when the switch is closed and then let go, it will stretch the spring. Fasten the spring to the switch with a screw eye.

Attach a stout cord to the alarm key of the clock and run the cord to the trigger. Put a hook on the string, so that it may be hooked to the trigger, showing that the alarm is wound up. Wind and set the alarm; pull the switch down and put the handle in the trigger, then fasten the string on the trigger.

When the alarm goes off, the key will



Automatic Cut-Off for Elec

wind up the string, thus pulling the trigger out and releasing the switch handle, which is pulled up by the spring and so cuts out the lights. This device is convenient for store keepers who wish to keep lights burning in show windows until a late hour.—Contributed by W. J. Slattery, Emsworth, Pennsylvania.

TO MAKE A STEAM GAUGE ALARM

A steam gauge alarm that will sound whenever the steam pressure falls to a predetermined point is described by a correspondent of the National Engineer.

Connect up an ordinary annunciator bell with the gauge, running one wire to the post of the pointer and the other to a piece of copper fastened to the face of the dial, but insulated from it. The wire to the gauge pointer will make contact with the piece of copper on the dial face whenever the steam pressure drops to the predetermined point, thus closing the circuit and ringing the bell. The alarm may be thrown out of service at any time by a switch placed in the circuit.

HOW TO PAINT IRON, ZINC AND GALVANIZED IRON

The best time for painting new iron is at the foundry as soon after casting, or being wrought or rolled, as possible, says the Master Painter. Paint it when a dry wind or warm sun will act upon it; do not paint it in the early morning or damp evening. First see that the iron is thoroughly dry and free from rust, and then coat with red lead and linseed oil, a thin coat, just enough to penetrate the pores of the iron. The first coat must dry hard. Follow up with three other coats containing red or white lead in as great proportion as possible.

To paint old iron, burn off all rust and scale, brush with turpentine or paraffin and proceed precisely as with new iron.

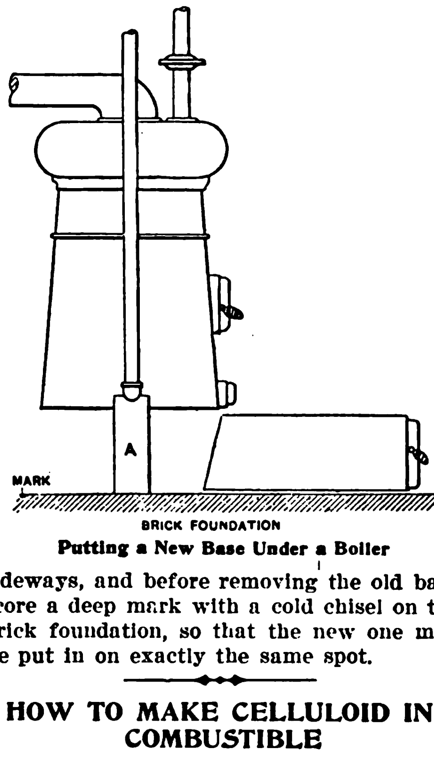
For zinc, the first coat should consist of white lead, red lead and turpentine, tempered with varnish. Wash new rolled sheet zinc with a solution of a tablespoonful of hydrochloric or nitric acid to a gallon of water, or scratch the surface with No. 2 glass- ... -inting.

...on the same as zinc, ... preparation, nor ... plate must ... first

PUTTING A NEW BASE UNDER A BOILER

In substituting a new base under a boiler for a broken one, a correspondent of the Metal Worker tells how the job can be done quickly and without disturbing any of the connections.

Saw out two hardwood wedges and drive them under the two return pipes in position as shown at A in the sketch. These should be of proper height to lift the boiler off the base just far enough to allow the broken base and grates to be slipped out and the new base slipped in. Brace the boiler from the walls to keep it from slipping



Putting a New Base Under a Boiler

sideways, and before removing the old base score a deep mark with a cold chisel on the brick foundation, so that the new one may be put in on exactly the same spot.

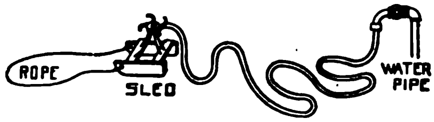
HOW TO MAKE CELLULOID INCOMBUSTIBLE

Make an ether-alcohol solution of celluloid and an ether-alcohol solution of ferric perchloride, then mix the two solutions. This will give a clear, syruplike liquid, yellow in color and yielding no precipitates. Pour it into a suitable vessel and leave for spontaneous evaporation. A shell-colored substance will be produced, which after washing and drying, gives the result desired, says the Model Engineer, London.

Celluloid so treated will be pliant, transparent, uninflammable and incombustible.

SLED FOR MOVING LAWN SPRINKLER

In watering a lawn in the old-fashioned way one has to do much walking in moving the sprinkler from place to place, shutting off the water and turning it on again, and is certain to get his feet wet in the operation.



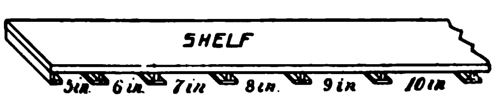
Sled for Moving Lawn Sprinkler

To avoid all this trouble, make a little sled of 1x4 in. pine, 24 in. long, with ½-in. board nailed across the runners, which should be about 20 in. apart.

Then fasten the sprinkler on the sled, well toward the front, attach about 8 ft. of rope to the sled to draw it by, and arrange the hose so it will run out back of the sled to prevent its tipping over. The sprinkler can then be moved to any point on the lawn without one's running back and forth through the wet grass to turn the water on and off.—Contributed by J. S. Wallace, San Jose, Cal.

RACK FOR KITCHEN UTENSIL COVERS

Tin covers for stew pans and kettles are a nuisance when not in use, as they are apt to slip off the shelf, if piled upon it, and are sure to get out of order so that one must search for one of the right size. To make a convenient rack for these covers get some strips of ½-in. boards, half of them 1 in. wide and the other half 3 in. wide and all as long as the shelf is wide. Have as many of each width strips as you have covers, or more. Fasten these strips with shingle nails to the bottom of a shelf that is about 5 ft. from the floor as shown in the sketch. The strips should be fastened at various distances apart in order to accommodate the several sizes of covers. Place the covers with knobs or handles downward.—Contributed by J. S. Wallace, San Jose, Cal.



Rack for Kettle Covers

EASY METHOD OF BURNING 50 BUSHELS OF CHARCOAL

In our February number instructions for burning 100 bushels of charcoal were given; the accompanying directions are for a smaller quantity—say, forty or fifty bushels.

Pick out a spot where rocks are not too plentiful and where perpendicular walls of ground will not crumble too easily and dig a hole 6 ft. long, 4 ft. wide and 6 ft. deep. Cut into lengths of about 4 ft. 7 in. enough of sound dry wood to fill the hole. Pile the wood alongside the hole where it will be within easy reach. Get an armful of dry kindling, split lengthwise, and a couple of armfuls of green evergreen brush or green hay (wet gunny sacks will do as well).

Put the kindling at the bottom of the hole and set it on fire; next pile in the wood on top of it, packing it close together. For the first 2 ft. work rapidly. Proceed with the filling until the hole is full and round it up a little, making it highest in the center. Then lay on the covering material—green grass, wet sacks or whatever it may be. Spread this material along the center, leaving a 6-in. space at the edges of the pit uncovered, then throw dirt on the covered portion. The 6-in. space left is for ventilation and escape of smoke.

The pit will not require much tending. When the flames break through, close it a little at that place, but not more than is necessary. By starting the burning at six o'clock in the morning, the material will be burned to coal by nine o'clock in the evening—fifteen hours. Along in the afternoon the fire will be getting pretty well to the top. Tramp on the pit, and if any holes in it can be felt, remove the covering at those places and trample in some short pieces of wood about a foot long until the hole is filled up even with the top, then replace the covering. Toward the last it must be watched closely, as the flames are apt to break out.

If for fifteen hours a thick cloud of smoke has rolled above the pit, at the end of that period it should be burned to coal. Put damp covering over the 6-in. marginal space, pile on dirt to a depth of 8 or 10 in., wet it and trample down till solid. In morning wet the dirt ag
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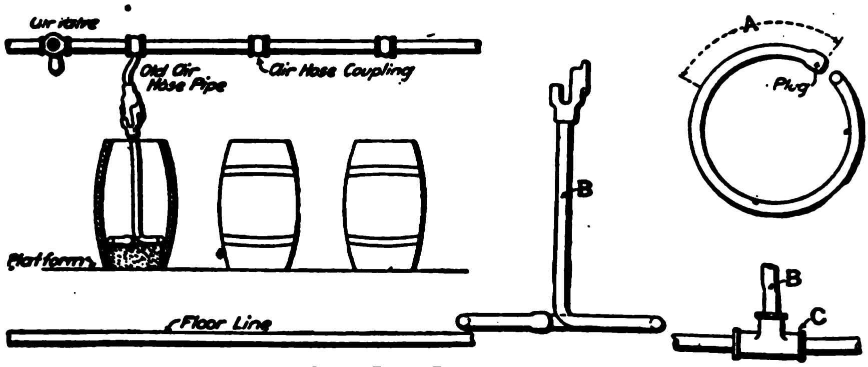
HOW TO MAKE A PNEUMATIC PAINT MIXER

A pneumatic paint mixer may be made of ½-in. iron pipe, with an air hose coupling attached to the upper end and the lower portion of the pipe bent into a circle slightly smaller in diameter than the inside of the bottom of the barrel. In the circular portion, drill a number of 1/16-in. holes spaced 2-in. centers. Air escaping through these holes, agitates the paint in the barrel and mixes it thoroughly. The end of the pipe in the circular portion may be merely plugged up, but is apt to clog in the section indicated at A, because the force of the air expends itself before this point is reached. Probably a better way would be to connect B to the ring by a T, as shown at C, so that the air will circulate from both directions, says the Canadian Machine Shop.

The mixer may be connected to an old air hose and this, in turn, connected to the main line with an air hose coupling.



Mixes Paint Pneumatically

Contributions to our Shop Notes department are invited. Brief, clear descriptions and rough sketches are acceptable.

Life subscription to Popular Mechanics, $10; five years, $3.

ACID-PROOF INK FOR ZINC

An acid-proof ink which may be used with a drawing pen on zinc, says the Draftsman, consists of 1 dram verdigris, 1 dram sal-ammoniac powder and ½ dram lampblack mixed with 10 drams of water.

MENDING PORCELAIN AND GRANITE WARE

Porcelain and granite ware, which cannot be soldered, may be mended satisfactorily in the following way:

Mix together litharge and glycerine to about the consistency of putty and then apply to part to be mended. Apply it at each side of the hole and press it through, then finish off smooth and let dry. When dry it will be as hard as the porcelain and will withstand any heat that porcelain will.—Contributed by W. C. Telford, Santa Barbara, Cal.

SIMPLE TAP WRENCH

A simple tap wrench is made of 5/16-in. steel rod in two parts each 4 in. long. One end of each part is treated as shown in Fig. 1. Fig. 2 shows the two parts joined to form the wrench.—Contributed by M. Frank Jordan, 45 Jackson Pl., Chicago.

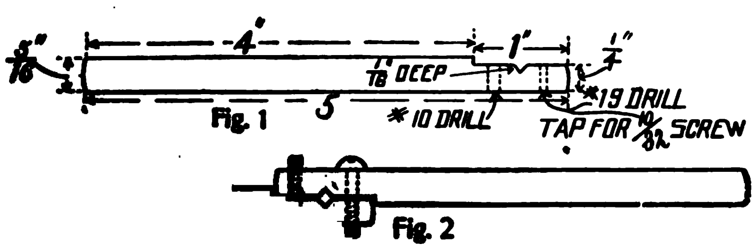


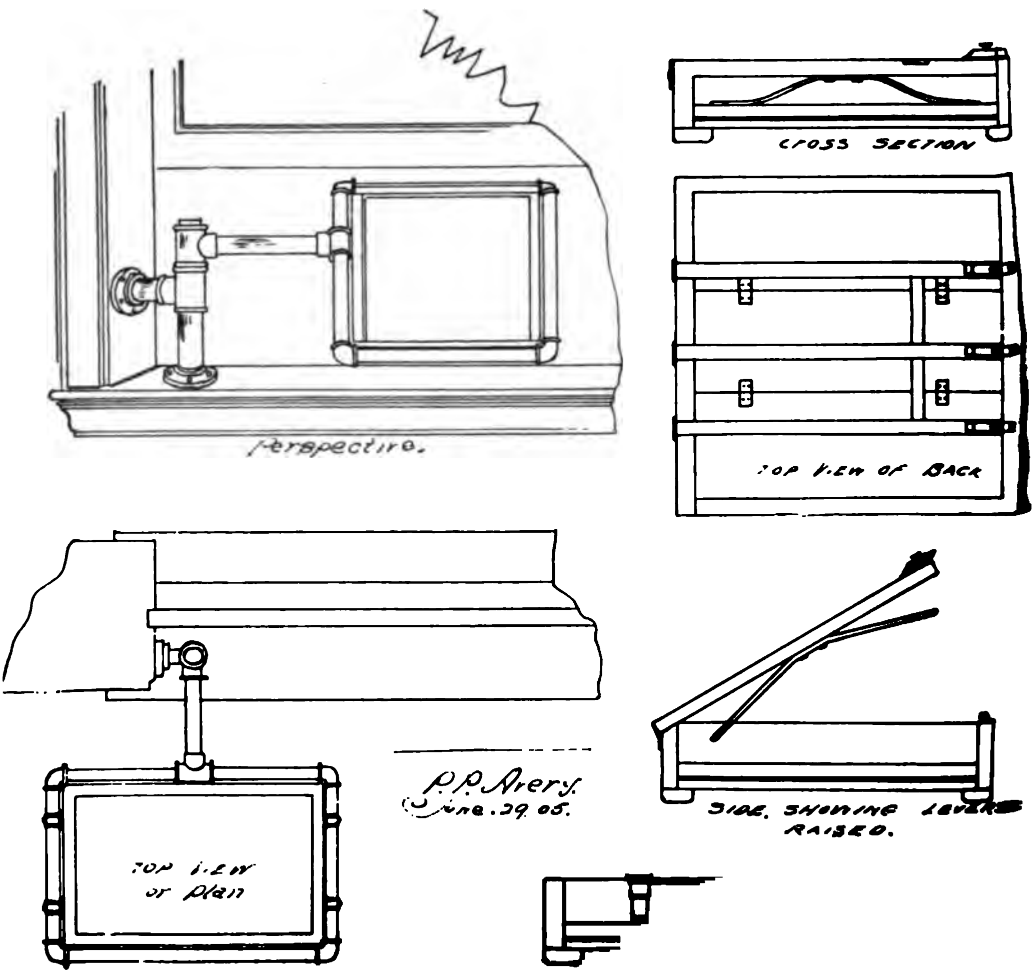
Fig. 1

Fig. 2

HOME-MADE BLUEPRINT FRAME

The frame itself is made of pine wood, bound on the corners with iron corner bands. The sides should be at least 1¼ in. thick by 3 in. wide, and the front piece which is planted on the edges of the sides, should be 1¾ in. by 1¼ in. and screwed on very securely; they must lap over about ½ in. on the inside of the frame to make a rest for the glass. The back should be made in three pieces, held together by hinges, and should be ⅝ in. to ⅞ in. in thickness, according to the size of the frame.

In the building of this frame, the most time should be given to the spring levers, which must be accurate and have close contact. The levers are hinged to the side and are pressed down on the back, forcing the back of the frame tightly against the glass by the three brass springs and being held in place when down by three cupboard door snap locks. The three levers should be held together and in line by the iron or wood brace across their backs, this brace is very essential and should be securely attached. A thick piece of felt should always be laid on top of the paper so that the back may bear evenly on the print and make close contact between the blueprint paper and the tracings, which fact is absolutely necessary. The iron frame as shown, is ordinary black iron pipe, ½ in to ¾ in., according to size of frame, and the stand, which is fastened to the window trim, is heavier weight, 1½ in. to 1¾ in. The collar must fit snugly around the nipple, and a drop of oil once in a while is necessary. After the iron frame



is built, it is a good plan to set-screw the connection between the frame and arm, as this joint would have a tendency to drop down on the treads. The frame can then be revolved on the arm treads, to put in the drawings and then turned glass side up and swung out the window to print. I have made and set up one of these frames in our drafting room, and it has given universal satisfaction.—Contributed by Prentice P. Avery, 39 Woodside Av., Ridgewood, N. J.

PRESS STOPPING DEVICE

The accompanying illustration shows an arrangement installed by W. Schafer of San Francisco, Cal., on a press used for baling dry goods, to stop the press in case of a careless packer letting it run up too far. As the movable platform rises, weight B, which is a little heavier than weight A on the other side, is pushed up and so lowers weight A (securely fastened to the cord so that it cannot move along it) and the lowering of weight A throws the circuit breaker, C. In case the man making a bale should neglect to stop the press when his bale is made, the circuit breaker will throw in the usual manner, so that it is not necessary to have any arrangement for stopping on the descent. The pulleys must be good ones and so arranged that the cord, when loose, will not work out of the groove. Mr. Schafer has used this device for about three years and states that it has never given trouble of any kind. This stop could be adapted to other purposes, for stopping elevators, for instance.

HOW TO MAKE AN S-WRENCH

From the scrap heap select a piece of good cast steel, $\frac{1}{2}$x1 in. by 3 in. long (Fig. 1). Draw down the center and round the ends. At SS (Fig. 2) fuller to $\frac{1}{4}$ in. thick, and leave the middle a little thicker. Make holes


Fig. 1

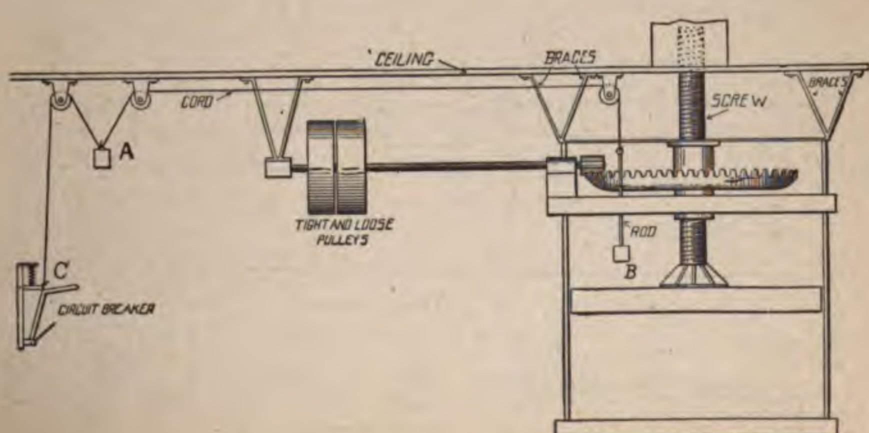
in the ends as shown by the dotted lines, Fig. 2, using a square punch. Put a flatter on and smooth up side nicely.

Cut out AA on both sides with a sharp thin chisel, which will spread the jaws. Round up again and shape like Fig. 3 to suit your taste. Heat to a cherry red and lay in some unslaked lime which will soften. Let it cool and then dress. Make one end for, say, $\frac{3}{8}$, and the other for $\frac{5}{16}$, or any


Fig. 2


Fig. 3

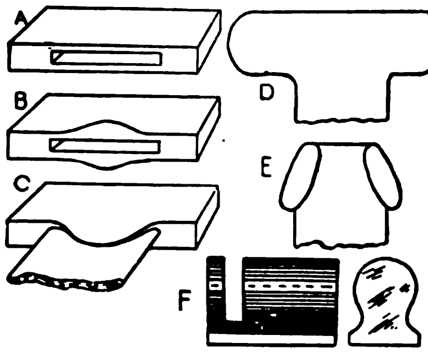
size you want. Now heat to a very low red. Lay it between two green pine boards or drop in linseed oil, says a correspondent of the Blacksmith and Wheelwright, and you will get a good color and a good temper.



Automatic Stopping Device for Presses

MAKING A SPRING HEAD

There are many smiths who do not know how to put a head on the upper main leaf of an ordinary elliptic spring, says a correspondent of the American Blacksmith. The following is an excellent method:



Making a Spring Head

Cut off steel the length wanted, less ½ in. for each end. The instructions are for only one end, but apply to both. Take 3 in. of ⅝-in. square Norway iron. Split through from one side as at A, and have the split the width of the steel to be used. Now fuller as at B, insert steel as at C and weld. Then trim as shown by the dotted lines at D. The ears can be bent in the vise, without danger of injury from cold, shut and should be bent as at E. Now dress up thread in the tool F, after fullering between the ears. Fullering will bring the ears parallel and after dressing them, the holes are drilled.

Mechanics for Young America, an illustrated book for boys. Price, 25 cents.

BORING ON THE TURRET LATHE

Boring to Size vs. Boring Undersize and Re-reaming by Hand

At one time I worked in a large manufacturing concern where all gears, sprockets, pulleys, collars, etc., were bored in the turret lathe by a system that, I admit, was new to me. I had worked in different shops, had seen many turret lathe fixtures and systems, but never before had I heard of boring articles undersize and reaming them to size by hand with an expansion reamer. The system I refer to could be bettered, in my estimation, by the suggestions offered below. Their boring was done by first running a drill, slightly smaller than the reamer, through, then reaming.

By use of a little oil and a new reamer a good fit could be secured, but it would not be advisable to keep buying new reamers; consequently when the reamer becomes slightly worn (which will happen in a very short time by continuous use) the bore will be small. If reamed dry, the bore will be too large, even with a worn reamer. The firm in question used oil on the reamer, which made the hole as small as possible, with the result that every piece had to be reamed by hand with an expansion reamer to obtain a good fit. In a large plant this labor of re-reaming will amount to a large sum in the course of a year.

I have often wondered why a system as explained below would not be satisfactory to others. I have rigged up turret lathes in this way, and it gave satisfaction in every respect. Furthermore work can be done more quickly, besides, no reamer is used.

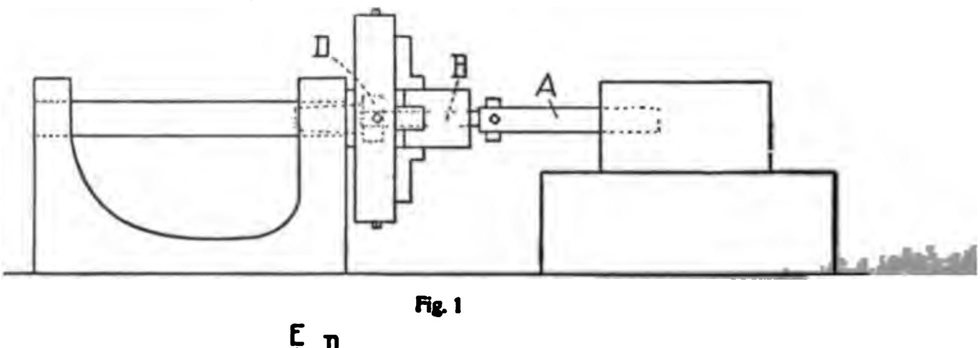


Fig. 1

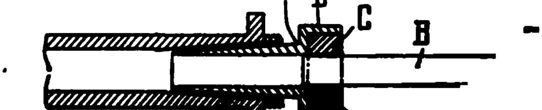


Fig. 2

Referring to the diagrams, Fig. 1 shows a view of the boring bar in position for boring. Fig. 2 is a sectional view of bar, bushing for same and lathe spindle. Fig. 3 shows the cutter in the bar and the method of holding it. In Fig. 1 and Fig. 2, A is the boring bar turned on end B, so as to pass through the core and enter the bushing C in the lathe spindle, which steadies the end of the boring bar. D is turned to fit in spindle with shoulder at E for bearing against the end of the spindle and is bored out at F, to receive different sized bushings, which are fastened in by a feather key and can readily be changed. The bushings could be placed directly in the spindle without the use of D, but D is used to keep the bore of the spindle from wearing, by frequent changing of bushings, etc.

The bar is fitted with cutters the same as a facing tool, but these are not held by a key, as they have to be centered exactly, because both sides cut and with a key too much time is lost in setting. The cutters are fastened as shown at A, Fig. 3. The cutter is countersunk to receive cone head set screw and it is turned to size while so fastened. It is obvious that when replaced, it will always be central and different sized cutters can be used by turning them to size in the same bar they are to be used in.

With the end of the bar supported in the bushing, all material can be removed in one cut and as the cutter is turned to size, and being straight from cutting edge, no reamer is necessary. One cutter can be ground an hundred times without changing the size of the bore.

While this method is very old to some, it will no doubt help someone who is still toiling away with a monkey wrench and an expansion reamer.—Contributed by Norman Baker, Hoopeston, Ill.

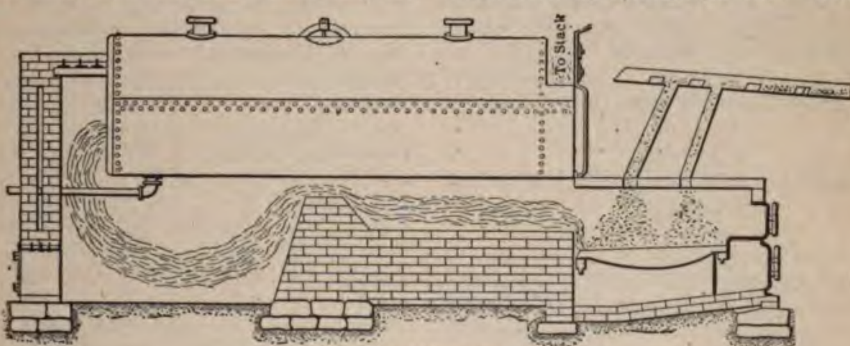
HOW TO BURN SAWDUST

A furnace and boiler setting like the one shown in the diagram is an excellent arrangement for burning sawdust, says a correspondent of Power.

The boiler setting itself is like that usually used in a horizontal boiler, but the grates are in an oven or projection built in front of the boiler instead of being under it. The oven is about 10 ft. long and should be full width of the boiler, or if convenient, 2 ft. wider than the boiler is preferable. The grates should have ¼-in. openings.

The sawdust, brought by a mechanical carrier of some kind is dropped through two chutes on to the grates and lies in two cone-shaped piles that cover the entire grate surface.

The fire should be started with shavings or other dry material and will burn principally around the edges where the draft will force itself up through the fuel. When well ignited the surface of the cones will be covered with flames and the sawdust will burn furiously.



Arrangement for Burning Sawdust

The supply of sawdust may be regulated by slides in the chutes. It is not necessary to use a firebar, simply fill up with the fuel and let it burn. To bank the fire at night fill the furnace well up to the top with the sawdust and level it off, close all doors and the damper and let it alone.

A threshing outfit equipped with a system of electric lights enables an Ohio thresherman to work till 10 p. m. during the busy season. The engine supplies the power for the dynamo and the lamps are attached to the separator.

If you want any machine or device and do not know where to get it, write us. Information free.

ANOTHER SAFE RAIL GRIP

The illustration shows a rail grab made by F. A. Crans of 207 Williams St., Waverly, N. Y., and used by Mr. Foley, wrecking foreman of the Lehigh Valley R. R. tool train located at Sayre, Pa. Mr. Foley says of this grip:

Rail Grip

"We are using the rail grab or grip in our wrecking equipment and it is a first-class grip, as it can be used in any place, and will fit any rail from 58 lbs. to 90 lbs. We have two of these grips and we use them very often for a stop to put ahead of our steam crane on the rail at the end of the track to keep the crane from moving when we have a hard end pull."

Anyone wishing details of construction of this grip may secure them by writing Mr. Crans.

REPAIRING A CRACKED WATER JACKET

A cracked water jacket in a gas engine is a common trouble. Often cylinders and cylinder heads that could easily have been repaired are consigned to the scrap pile on this account.

In repairing, when the crack is rather open, it is best to use a piece of sheet copper for the patch, as it can be hammered into almost any shape easily. The edges should be caulked to make them watertight, though sheet asbestos may be used as packing. The patch is best fastened on with small screws along the edges and not over an inch apart.

Small cracks may be repaired by forcing in solder with a blowpipe, or by driving a sharp-cornered cold chisel along the crack, making it wider and deeper near the outside, then pounding in a piece of lead wire or a narrow strip of lead and the job is done.- Contributed by Royal Wolfe, 915 S. Broadway, Lancaster, O.

We are always glad to receive contributions to this department from our readers. Make your story concise but plain.

SOME ELECTRIC PLANT TROUBLES AND WHAT CURED THEM

In an extremely interesting series of articles on "Experience on the Road," H. L. Stephenson, an electrical expert, tells in the Electric Journal some of the things he saw, from which the following are selected:

A RUNAWAY ENGINE.

A recent case of trouble with an engine will serve to illustrate the point. This particular engine was a small, high speed, piston-valve type, direct connected to a 75 kw. lighting machine to be driven at 270 r. p. m. When this outfit was started and the engine given full steam pressure, the first speed would probably be 276, and as quickly as another could be taken, 281, then 287, 293, 297, 301, 310, continuing to creep up slowly. With any load from ten kw. up, the speed regulation was very good, but whenever the load was thrown off, the speed would begin to creep. We ran it throttled until all of its parts had reached an even temperature, but with no better results. The engine-man then took out the valve to look for steam leaks but it seemed to be in good condition and a trial showed that we had not improved it. An improvised device showed that the governor did its work so that it looked reasonable to believe, despite our indicator cards, that there must be some error in the valve setting. This was checked over, and the piston was taken out and examined. We took cards until there was no more paper to fit the indicator. And so it went for three or four days, until we got hold of the theoretical curve such as engine builders send out as a sort of an advertisement.

In comparing the card with one of our no-load curves the trouble was as apparent as though it had been printed in words across the paper. The valve leaked steam. Taking the valve out for the second time, we peined the inside of the rings to spread them out thereby increasing their pressure against the walls of the steam chest. We had solved the problem, for engines are not made that run better than this one now does.

A TRANSFORMER FIRE.

A telegraphic request, "Trouble with new transformer, send man at once," took the writer off once on an eighteen-h
The customer
putting "
tion.

house in such volumes that it was thought the whole building was on fire. An investigation showed that it was only the new transformer and a careful examination revealed nothing further than that the smoke came from the grease and dirt burning on two of its low tension terminals, which from all appearances had reached a temperature far above 100 degrees centigrade. The attendants were at a loss to account for this as these terminals were joined together by a short copper strap and were therefore necessarily at the same voltage and, of course, there could be no heating on account of a slight leakage of current jumping from one to the other. This transformer was of that type designed to give either 110 or 220 volts on the low tension side, and as it was operated on the latter voltage, this copper strap put the two windings in series. The reader can imagine the chagrin of the attendants when the trouble was remedied by sand papering this strap and the terminals and screwing up the bolts tight enough to make a good contact for carrying the current. As this transformer was run with a load very close to its rated capacity, we afterwards took the precaution to insert an additional jumper.

A TIME-HONORED TROUBLE.

A paper of this kind would not be complete without mentioning some experience with the series fields of compound machines. Tell a roadman that a motor's speed is not right or that a generator will not hold up its voltage and the first thing that comes to his mind is the series field. This seems a simple thing, but any one with road experience can cite a number of cases where trouble was due to wrong connections on this part of the machine. It is not at all uncommon to find machines that have been run so long at an excessive speed to keep up the voltage at full-load, that the proper pulleys have been lost and when the trouble is discovered it takes a month or two before the change can be made and the generator belted properly.

Alternating-current apparatus is not altogether free from this same trouble. A good example comes to mind in the case of a composite wound generator which had been in service for two years, but only at the
ime did it begin to receive any-
ted load. A complaint was
chine would not hold up
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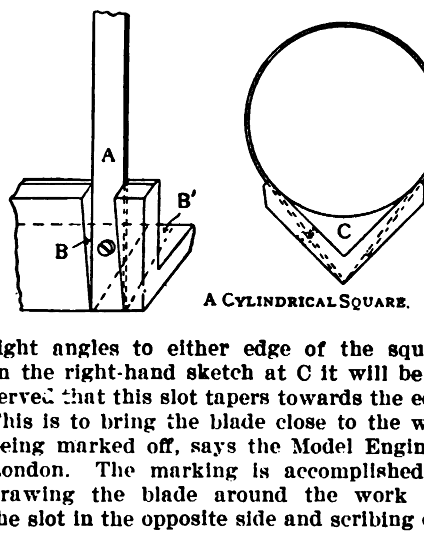
power-factor was responsible for some of it and with that end in view an elaborate test was arranged to be taken in the presence of the officials of the power company. The engineer who went to the plant discovered that in all probability during the two years they had been running, the self-excited coils had been bucking against the separately excited winding and reversing this—well, the truth is, we do not care to hurt the feelings of any one by commenting on things of this sort. Reversing this cured the trouble.

HOW TO MAKE AND USE A CYLINDRICAL SQUARE

In sawing off square a piece of metal tube or rod in the vice a round-square is needed, and the box square can be converted into one in the following way:

A thin flexible steel blade and a small cheese-headed screw will be required. Referring to the left-hand sketch, the blade A must be parallel its whole length. Cut slots BB directly in line with each other and at



A CYLINDRICAL SQUARE.

right angles to either edge of the square. In the right-hand sketch at C it will be observed that this slot tapers towards the edge. This is to bring the blade close to the work being marked off, says the Model Engineer, London. The marking is accomplished by drawing the blade around the work into the slot in the opposite side and scribing off.

WEIGHT OF LEAD PIPE

The weight of lead pipe of any thickness and diameter may be determined by subtracting the square of the internal diameter of the pipe from the square of the external diameter (both in inches) and multiplying the remainder by 3.86. The result will be the weight in pounds per running foot.

HOW TO BUILD A CHEAP WATER WHEEL

The wheel should be made of good hard pine and the dimensions given are for a wheel 10 ft. in diameter and 4 ft. wide, but a wheel of any size can be made in the same way and in proportion, says a correspondent of the Blacksmith and Wheelwright.

Gain eight pieces of joist 2 x 6 in. by 8 ft. long as shown at G, Fig. 1, and put them together in pairs (A A and B B, Fig. 2). Bolt the two pairs together, making eight spokes or arms, and forming one side of the wheel. Against the offset or depression of 2 in. at the end of every second spoke on each side, fit a piece 2 x 6 x 42 in. long, made as shown in Fig. 4. This will make the spokes 4 x 6 in. Between each piece and its spoke, near the ends, gain in as at C, Fig. 2, for the standards for the buckets. F, Fig. 3, indicates the standards for the buckets. They should be 2 x 4 x 16 in., tapered, and bolted clear through as shown. The faces of the spokes at this stage will all be level. To the outside as at E, Fig. 3, bolt a cast-iron plate 18 in. in diameter. This plate should have a hub H, of about 4 in. on the outside for set screws or keyway for fastening it to the shaft, and a short hub on the inside to go into the wood. Have the shaft about 3 in. in diameter and the buckets about 10 in. deep, 10 in. on the bottom and 4 ft. long.

The other side of the bucket is made in exactly the same way and the parts then ...ther.

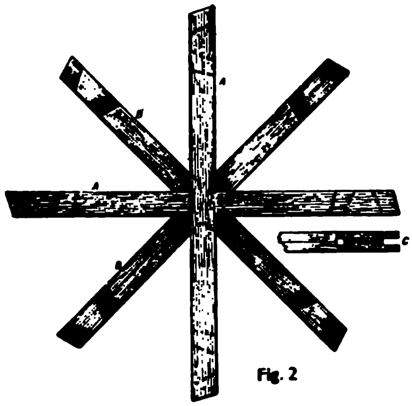


Fig. 2

Fig. 1

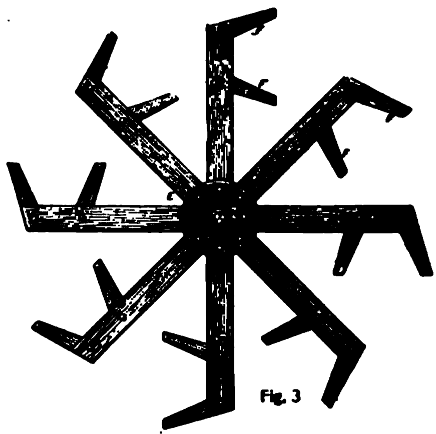


Fig. 3

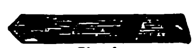


Fig. 4

CEMENT REQUIRED FOR SURFACING

The following table gives the amount of cement and sand required in several instances. From this table one can readily estimate other areas as may be required.

Bbls. of Cement.	Bbls. of Sand.	Thickness of Coating.	Area Covered in Sq. Ft.
1	1	1 inch	67
1	1	¾ inch	90
1	1	½ inch	134
1	2	1 inch	104
1	2	¾ inch	139
1	2	½ inch	208
1	3	1 inch	140
1	3	¾ inch	187
1	3	½ inch	280

MAKE THE SAW FIT THE WORK

"The right thing to do with any sawing machine is to use the smallest saw possible for the work." This is the deduction made by J. Crow Taylor in the Wood-Worker, after recounting how a man running a saw mill, thinking that there was no use in running a 16-in. saw for cutting a 1-in. board, cut down a number of thin and unsatisfactory 16-in. edger saws to 12 in. and secured excellent results, as well as saving power. By reducing the diameter of the saws, they were stiffened, and the volume of saw blade in the cut being reduced, a thinner saw could be run, with the same results [illegible] duced with a bigger and thicker ... quiring more power. Large coll... ommended for all kinds of

TO KEEP SHOW WINDOWS FROM SWEATING

If the window has no partition between it and the store room, make one of ceiling boards or of glass. Glass is preferable. (See

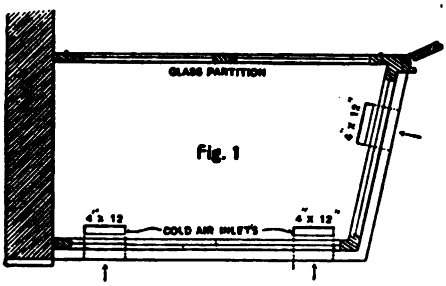
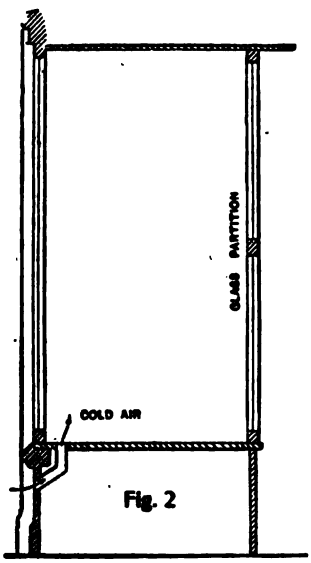


Fig. 1, plan view.) In a window of ordinary size make three openings 4 or 5 by 12 in. Case these up tightly with galvanized iron or wood. A good way, says a correspondent of the Metal Worker, is to put in galvanized iron, then on top of the floor on the inside over the whole tack a piece of ¼-in. mesh wire screen, using small staples to



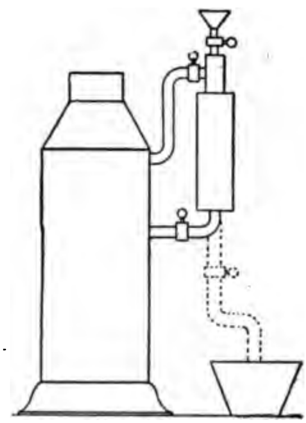
fasten it with. 'Fig. 2 is a sectional elevation ... this method is followed there will ...er trouble from sweating.

...nted 'ends of the ... made easier to

IMPROVED EMERGENCY BOILER FEED

In regard to the emergency boiler feed described in our July number, A. G. Knight, of La Salle, Ill., writes as follows:

"I understand the emergency boiler feed was like the accompanying sketch. In place of the funnel on top of the pipe, the party could have run a pipe, as shown by dotted line and supplied with a valve; he could have poured the water into the tub on the floor. When the two valves connecting his apparatus to the boiler were closed the steam in the big pipe would condense, causing a partial vacuum. Then on opening the



valve to the tub the water would be forced up into the large pipe by atmospheric pressure."

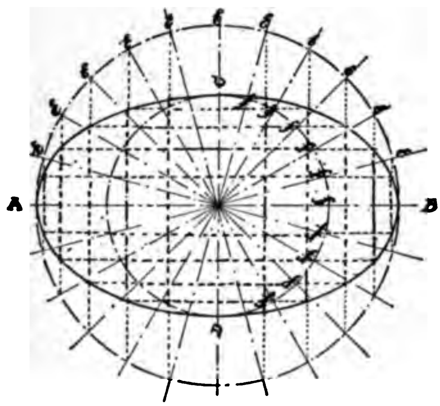
HEATING IRON IN COLD WATER

A lead-lined glass or porcelain vase or cupola filled with acidified water, to which is connected a strong positive conductor and a pair of tongs with insulated handles attached to a flexible negative conductor will constitute the forge and furnace of the future, declares Science and Art of Mining. Into the sour water the smith plunges his piece of iron, manipulating it with a pair of insulated tongs. The water is agitated with a boiling motion immediately, and the great resistance created brings the iron first to red, then to white heat and so quickly that that portion of the iron not immersed is but slightly warmed.

Is there anything you want but don't know where to get it? Write Popular Mechanics. Information free.

SIMPLE METHOD OF DRAWING AN ELLIPSE

An ellipse is a figure that is incorrectly drawn more often than any other geometrical design. A simple way of developing and laying out an ellipse is shown in the illustration. As all ellipses have two diameters, viz: major and minor, it is necessary to know these two points before one can be drawn.



To Draw an Ellipse

Describe a circle with the length of the major axes A B of the ellipse for its diameter; then describe another circle, using the same center as the first circle and having for its diameter the length of the minor axes C D.

Divide the circle in any number of equal parts—the more, the easier to draw and the more perfect the figure will be. The figure in the illustration is divided by twelve lines passing through the center. Draw lightly the perpendiculars, using the points of intersection on the outer circle marked "e," then the horizontal lines indicated "f." By then connecting the first points of intersection, e and f, as shown in the sketch, a perfect ellipse will result.

Any ellipse may be drawn in this way and it saves the trouble of making the trammel and guider that are so commonly used.—Contributed by Jos. E. Stanton, Los Angeles, Cal.

FLEXIBLE VARNISH

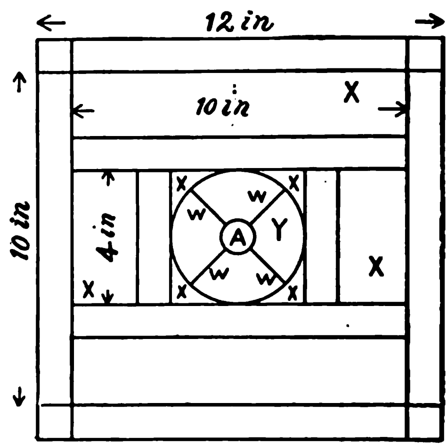
This varnish is sometimes called "balloon varnish." Boil together 2 gal. linseed oil, 6 oz. copperas, 6 oz. sugar of lead and 1 lb. litharge, stirring constantly. When it strings well, remove from fire and when cold, thin, if necessary, with drying oil.

METHOD OF PROTECTING WATER PIPES FROM FREEZING

To properly protect pipes is perhaps a little expensive, but the extra expense will save greater expense in the long run, says the Rural New Yorker.

Make a 4-in. pipe of heavy galvanized iron in sections like stove pipe, each section made to slip over the next. In every second section run four copper wires through holes in the pipe on four sides and opposite to each other. Solder the wire on the outside and solder the holes up tight. As each section is put on over the water pipe fasten the wires so that the water pipe is in the middle of the galvanized pipe. If it is not possible to disconnect the water pipe in order to slip the protection pipe over it, crimp and fasten at the top and bottom with small short stove bolts, having the screw heads on the outside. Put the boards on as shown in the diagram. Be sure to always break the joints. Leave the pipes bare.

In the diagram, A, is water pipe, W, wires for holding pipe in the center, the circle represents the 4-in. galvanized iron pipe, and the rest are 1-in. boards carefully trued. Put two thicknesses of paper under each



Protecting Water Pipes

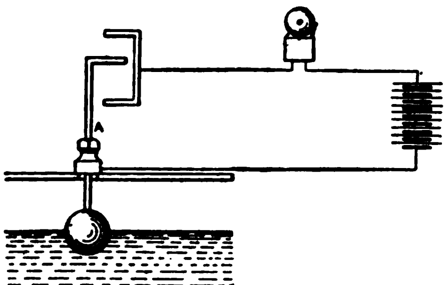
joint to act as an air-tight washer. X represents dead air spaces and Y inner dead air space.

Do not let the water run in the hope of preventing freezing, unless the supply is from a windmill. On very cold nights set a lamp in the box to heat the air. Have the chimney of the lamp of tin 8 or 10 in. long, and fit it tightly through a hole in a [illegible] of tin under the box. Use a ½-in.

This plan was tried on a 60-ft. standpipe under a tank and a 32 ft. pipe each 1½-in. diameter, and was found to work to perfection

SIMPLE HIGH AND LOW WATER ALARM

A high and low water alarm that is exceedingly simple and wholly dependable is designed for use at the top of the boiler. The bell is installed and connected up as shown



High and Low Water Alarm

in the illustration. Contact is provided for by a rod of very small diameter attached to a float. The packing, says the Engineer's Review, is soaked in oil and ground graphite so there is the minimum of friction on the rod.

HOW TO WIND A SINGLE CYLINDER MOTOR

To wind a single cylinder motor, using three and four terminal coils, connect the primary wires to the end binding posts, and always have the secondary on top of the coil. The Motor Age gives a number of diagrams showing the arrangement for several numbers of terminal coils.

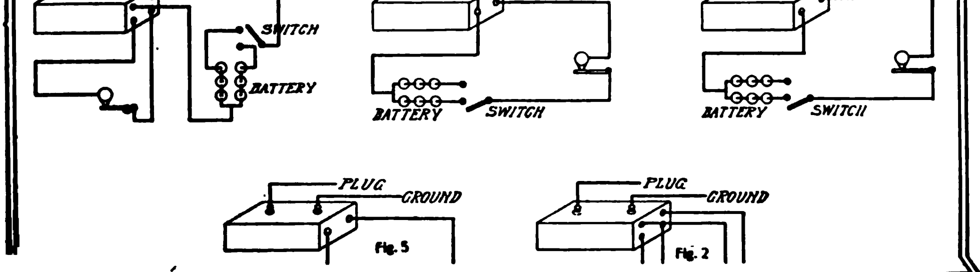
Fig. 1 represents a five-terminal coil, with two sets of batteries and but one secondary terminal. A wire is shown connected to the circuit breaker cam, but in making the connections this wire is always grounded on the engine. Fig. 2 shows a six-terminal coil, the primary being connected as in Fig. 1, and the extra secondary is grounded to the motor. Fig. 3 is a three-terminal coil, Fig. 4 a four-terminal coil, and Fig. 5 is another way to connect the coil of Fig 4. These diagrams represent the usual methods of connecting coils with terminals from three to six.

MATCHES FOR CUTTING GAGE GLASSES

The easiest method of cutting gage glasses is with red-headed matches. Measure off the glass, wet the head of a match thoroughly, and with it mark a circle on the inside of the glass at the point where it is to be cut. Strike another match, hold it on the outside of the glass under the marked circle and the glass will break off with smooth edges at the point marked. The trick can be done with but one match, says a correspondent of Power, and is so simple and easy that a gage cutter is wholly unnecessary. If you cannot reach far enough into the glass the first time, make a second cut.

GRADE THE STEAM PIPE

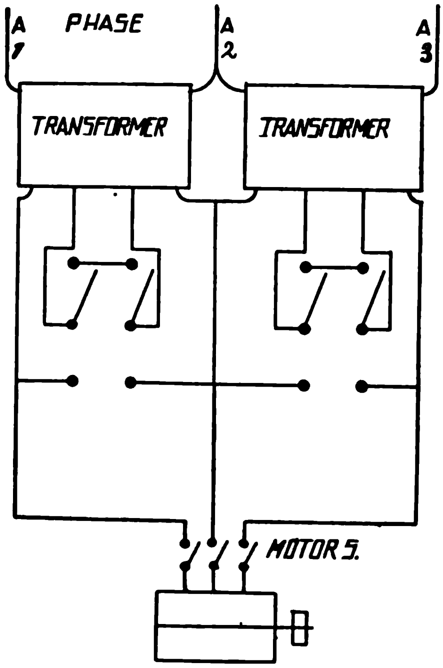
The steam pipe should be graded from the boiler towards the engine, says the Practical Engineer, because the water of condensation can move in no direction save along with the steam. Provision for catching or disposing of this water should be made at the engine.



Winding a Singel Cylinder Motor

SUBSTITUTE FOR AUTO STARTER

We recently had an auto starter for a 50-hp. three-phase induction motor burn out and were badly in need of motor, but could not use same on account of large starting



Auto Starter Substitute

current and our small generating capacity, writes H. H. Cloyd, of Trenton, Mo.

The transformers for this motor were located close by and with the use of two D. P. D. T. switches I made the transformers take the place of the starter by cutting the starting voltage from 200 to 100 volts at transformers' terminals. With this voltage the motor started with very little jerk on our line and with about 60 per cent of its rated load. The enclosed rough sketch will show use of switches.

One 4-pole D. T. switch would be much better, as with the two D. P. D. T. switches both must be thrown at the same time. This will also apply to any two-phase motor, also three-phase and three transformers, provided another switch is added.

Referring to sketch, when the switches are thrown downward the secondary coils of the transformers are in multiple, giving the motor 100 volts starting current. Throwing switches upward simply short circuits two middle transformers' leads, throwing secondary coils in series, giving motor 200 volts, or its rated voltage. The upper switch terminals act simply as single pole switches.

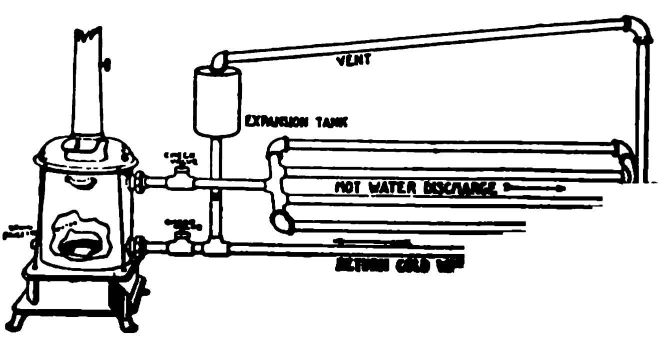
This idea, though not always practical, might be of some good if any one were caught as we were without immediate means of repairs.

SIMPLE BABBITT LADLE

When rebabbitting stern bearings, or any time I need a ladle, I take a piece of 2-in. gas pipe, 18 in. long and put an elbow on one end and the ladle is made. To make the metal run readily take a good chisel and dig a trench through the threads on the elbow.—Contributed by E. S. Stout (marine engineer), San Pedro, Cal.

HEATING SYSTEM

The system of piping shown in the illustration used in connection with a small laundry or tank heater is suitable for heating a stable, small conservatory or a chicken house. The system is cheap and simple to rig up, says Domestic Engineering. The illustration explains the connections and most of the materials can be picked up at home.



Heating System 5

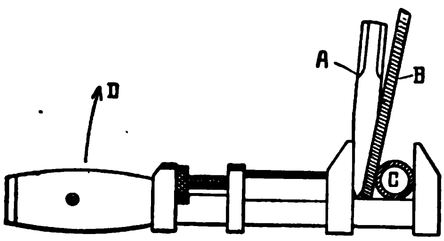
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

SUBSTITUTE FOR PIPE WRENCH

The hot water front was to be removed from my stove, but I had no pipe wrench. I had a 12-in. monkey wrench, a cold chisel



Substitute for Pipe Wrench

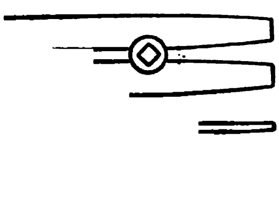
and a flat file, however, and the sketch shows how the job was done. A indicates the chisel, B the flat file, C the pipe and D shows the direction of pull. It took all the power I could exert on the wrench to start the pipes, but it did the work.—Contributed by W. L. Dines, Jr., 74 Mason street, Worcester, Mass.

TO TEST TURPENTINE

To test the purity of turpentine drop a small quantity on a piece of white paper and expose to the air. No trace will be left if the turpentine is pure; but if it contains oil or other foreign matter, the paper will be greasy.

SUBSTITUTE FOR AN OFFSET FILE HANDLE

Take two files and bolt them together, one on top of the other with suitable small bolts. Two ¼-in. or ⅜-in. bolts with nuts



and two washers each will do nicely. This makes a simple and convenient substitute for an offset file handle.—Contributed by M. M. Frickling, Southern Railway Shops, Columbia, S. C.

HOME-MADE STEAM WHISTLE

This whistle may be made from whatever materials one may have on hand and so the dimensions may vary with the requirements.

Take a piece of pipe, say, ¾ in. for the whistle stem and 3½-in. pipe for the bell and base. Put a thread on the stem long enough to reach through the whistle base and make connection. Mark the stem flush with the top of the whistle base and cut a thread on

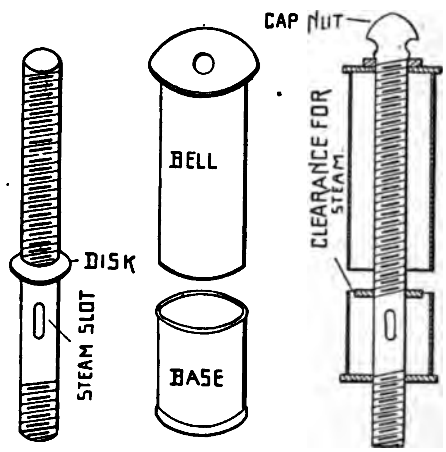


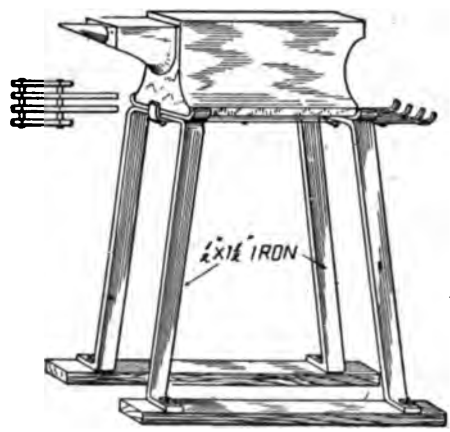
Fig. 1 **Fig. 2** **Fig. 3**

that end all the way down to the mark, in order to get the disk down just flush with the top of the base, and leave a clearance of about 1/32 in. between the walls of the whistle base and the disk. Cut holes in this stem just below the disk for steam. Now screw on the bell, which should be tapped the same size as the stem, until it comes over the opening in the base. Then screw on a cap nut and you have a pretty good whistle.—Contributed by L. C. Haskine, 866 6th street, Laramie City, Wyoming.

IMPROVED HOME-MADE ANVIL BLOCK

The anvil block shown in the sketch is made of 1½x½-in. iron, which is about ordinary wagon tire—something that most blacksmiths have on hand. The feet are bolted to 2x4's, which may be nailed or otherwise fastened to the floor.

The advantage of using such a block is



Home-Made Anvil Block.

that it is not in the way when bending a long piece of iron. With a wooden block one cannot make a square bend in a piece of iron that comes down over the block, unless the block is small, and especially one cannot make the bend over the center of the anvil. With the iron block the work comes between the legs of the block.

The shelves on the block can be removed when in the way and are handy for holding tools. Underneath the anvil there is room for scraps of iron and tools that are used very often. A sledge may be used on the anvil without affecting the block.—Contributed by B. W. Woldridge, Hickory, Mo.

HOW TO DEMAGNETIZE A SAW

One of our readers asks how to demagnetize a saw. He laid a saw on the floor of an electric car and next day when filing the saw, found that it was so highly magnetized that he was obliged to brush the filings off constantly.

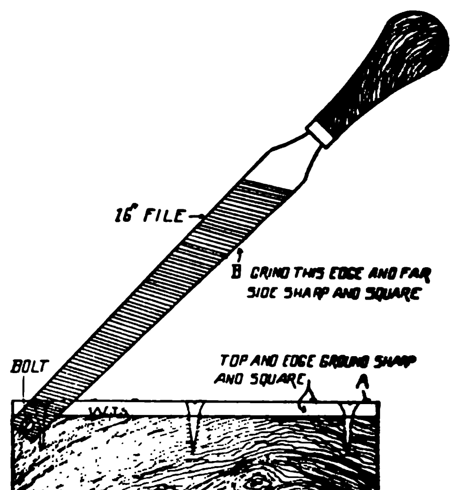
One way is to let the saw fall a few times on the floor. If this does not work, try the following plan: Attach a string to the saw twist the string. Hold the saw over the place where it was magnetized while the electric car is in motion, or over any other dynamo. Then walk slowly away from the field of the dynamo or motor (which is sometimes a distance of six or ten feet), allowing the string to untwist and rotating the saw.

CHEAP SHEARS FOR CUTTING TIN

The materials required for this device are two old 16-in. files, a small bolt, a block of wood and a couple of screws.

Cut one of the files to the length you wish the knife (A in the sketch) to be and grind one side and one edge sharp and square. Drill holes in the top for fastening the knife to the block of wood, using the screws.

Grind the top and an edge of the other file (B) sharp and square. Drill a hole in the end of the file and one in the end of the block and mount the file with a bolt. These



Shears for Cutting Sheet Metal

shears are handy for cutting tin, sheet iron, etc.—Contributed by W. J. Slattery, Emsworth, Pa.

CAPACITY OF A HOPPER

Multiply, in inches, the length by the breadth and multiply this product by – third the depth. Divide by 2,150.4 answer will be the number of hopper will hold.

TROUBLE ALARM FOR GAS LIGHTING SYSTEM

In response to the request in our July issue for a trouble alarm plan for a gas lighting system a number of our readers have favored us with replies and diagrams.

Figure 1 is submitted by Geo. W. Bentley, Chicago, and shows the right wiring for Mr. Williams's system as it now stands.

Figure 2 is a system of wiring recommended by W. J. Slattery, of Emsworth, Pa.

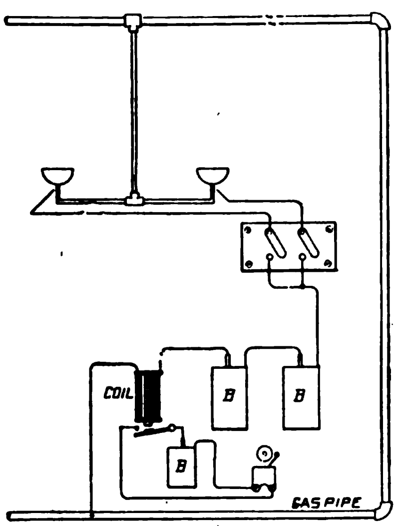


Fig. 1

A is the spark coil; B is a soft iron armature suspended in front of the coil about ¼ in. from the iron core of the spark coil; C is a regulating screw and binding post, such as is used to regulate induction coils. In case of ground the soft iron armature and the soft iron core of the spark coil will contact, closing the circuit at D and ringing the alarm. Harry W. Krug sent in a plan essentially the same as Fig. 2, and says:

"The bell will ring for a second every time the gas is lighted or extinguished. If the same battery is used for the five lights it is best to use marked or tagged wires so that a ground can be located. Each wire should also be provided with a separate When the bell begins to ring, open after another. The one last ceases to ring is the

Figure 3 is sent us by J. M. Berger, 717 9th street, N. W. Washington, D. C. A soft iron armature is pivoted on one end of the spark coil (see A in sketch) and one wire of the alarm circuit is connected with it. The other wire is connected at B. In case of a ground the core of the spark coil attracts the armature and closes the circuit at B. Mr. Berger says:

"It is a very good plan, when you are going to use a large number of burners in a house, to run a separate wire to the battery for the pendant circuits and also for the automatics. That is, make a separate circuit for each floor and a circuit for the automatics on each floor to the battery wherever it may be placed, then connect them to switches. This will be found a very good arrangement and costs but a trifle more. When a ground occurs with a system arranged in this manner it is only necessary to open the switches in succession until the circuit that is in trouble is reached. This switch should be left open and the fault traced while the rest of the lighting system is left in full working order."

The installation submitted by J. H. Eddleman, Philadelphia, Pa., corrects the faults in Mr. Williams' system. He says: "Mr. Williams has his spark going through his bell. If he will ground wire A with gas pipe and connect wire B with wire between sparking coils and batteries his bell will give an alarm whenever there is a short circuit or ground any place along his system. I use six wet batteries." The arrangement is shown at Fig. 4.

In a diagram submitted by A. M. Larson, Minneapolis, Minn., the wiring of the lighting circuits remain the same as in Mr. Williams' plan. At A, Fig. 5, however, an arma-

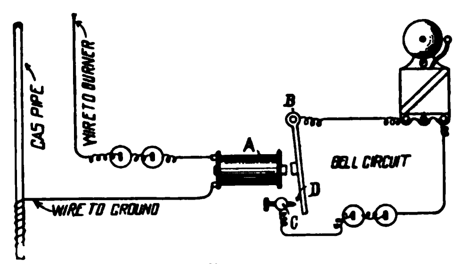


Fig. 2

ture lever, kept away from the end of the spark coil by means of a small spring of sufficient strength, is introduced. This lever is connected to one terminal of an independent bell circuit, the other terminal is connected to a small metal point to the right of the lever. When a switch is closed, completing one of the lighting circuits, the gas is turned on and lighted, and in the meantime the current passing through the coil has made a strong magnet of the core, which, acting upon the lever, draws it until it touches the metal tip, thus completing

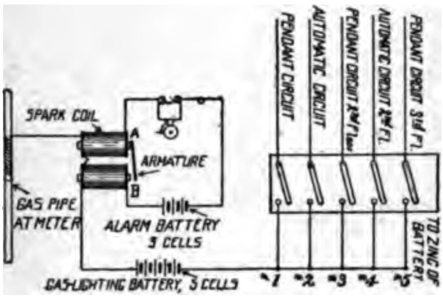


Fig. 3

the outside bell circuit. As the lighting switch is usually operated by making two or three quick connections, if the system is working properly, each switch, when thus operated, will cause the bell to make these same short rings. A short circuit would cause continuous ringing. A break in the line would be indicated by no action in the bell whatever. With this plan the electric door bell of the house could be used as the alarm, or, if desired, a cut out switch could be introduced and use it merely as a test, whenever desired.

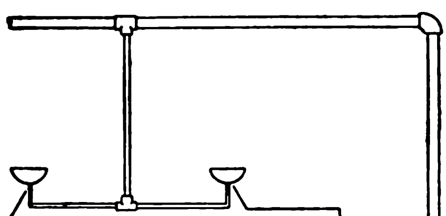


Fig. 4

Figure 6 shows plan of wiring as suggested by Geo. S. Barnet, Chicago, the principle being the same as in Fig. 5. Mr. Barnet suggests putting the bell in the basement, or other out-of-the-way place, as it taps every time the gas is lighted.

"Providing the resistance in the sparking coil is greater than the resistance of the bell, there is no excuse for Mr. Williams' system failing to work," writes D. D. Morin, Chicago. "If the resistance of the coil is lower than that of the bell, it can easily be seen that the greater part of the current will flow through the coil and to the ground, thus leaving very little, if any, to pass through the bell.

"The reason the alarm failed to work after a time, must have been that the batteries had become exhausted by ringing for some time without his knowledge. I would suggest that he put a two-point switch between the coil and line that comes from the lighter, so as to cut out the coil entirely, thus giving the bell the full benefit of the current. Of course, the switch must be put on the coil before he attempts to light the gas. Referring to Fig. 7, when the switch is on at A, the coil is in position to be used; when on at B, the alarm bell is in position. If the switch plan is not convenient, he might replace the bell with a 'drop,' so that when the lighter becomes grounded or short circuited, the 'drop' will fall and thus close a local circuit having a closed circuit battery in it, so the bell can ring for some time without injuring itself or the other circuit. Referring to Fig. 8, switch No. 1, when on C, is used on the coil; when on D, is used to throw the drop. Switch No. 2 is used to stop the bell from ringing when the drop contacts at A."

W. S. Hodill, East Liverpool, Ohio, repeats D. D. Morin's statement in regard to resistance, and suggests merely adding another battery so that more current will pass by way of the bell.

L. J. Voorhees, Sayre, Pa., says it is uneconomical to divide the current in this way, and recommends putting in a switch as shown in Fig. 9. In this plan when there is a short circuit in the line A, B or main circuit for lights, it magnetizes the core of coil C, causing the steel [illegible] to come in contact with point [illegible] circuit through ba[illegible] interfering with [illegible] way.

In Fig[illegible]

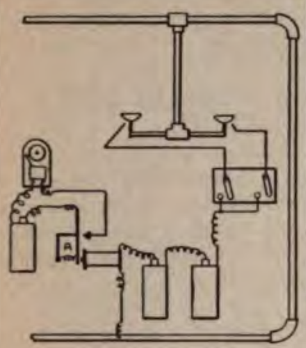


Fig. 5

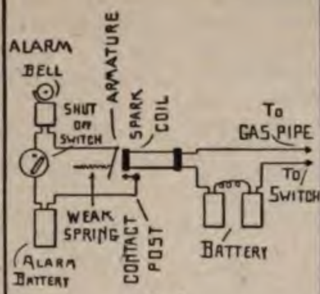


Fig. 6

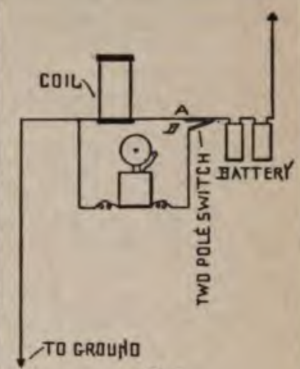


Fig. 7

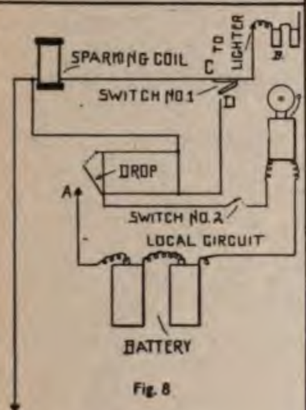


Fig. 8

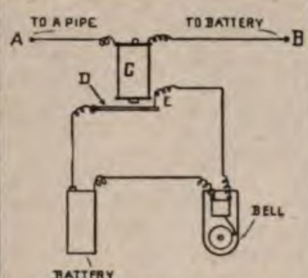


Fig. 9

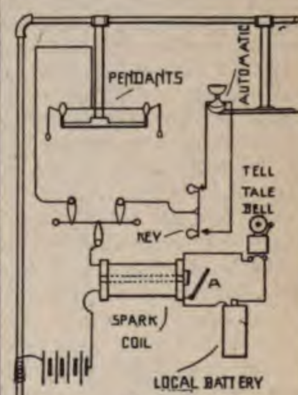


Fig. 10

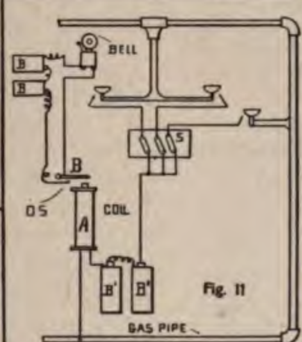


Fig. 11

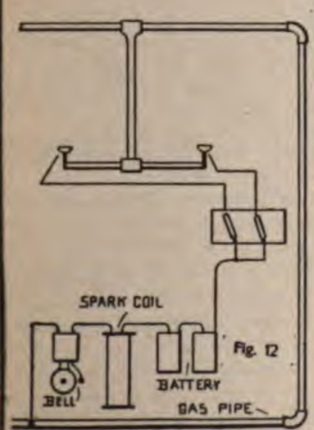


Fig. 12

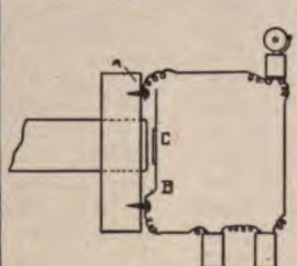


Fig. 13

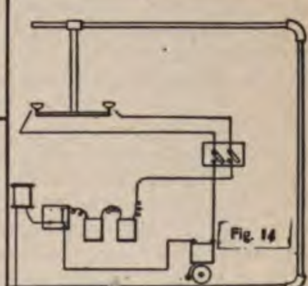


Fig. 14

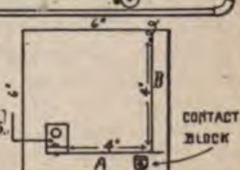


Fig. 15

and pendant burners, also the tell-tale bell on a separate circuit, is shown. The armature, A, is pivoted to the end of the spark coil and held a short distance away from the magnet core, either by means of a spring or by gravity, in such position as to be attracted by the magnet core when the circuit is closed, thus closing the local circuit. This will show a heavy ground or a short circuit, writes Wm. Lachman, Chicago, but a slight leakage, which is a drain on the life of the battery, must be found with the aid of a galvanometer or magneto.

In Fig. 11, plan submitted by Wm. T. Hall, Chicago, A represents a spark coil, with the end of one wire grounded to gas pipe, while the other end passes to terminal of battery cells, and thence to switches, S. A lead of wire is then run to each gas jet in service, and the gas can be lighted by operating pendant. For detecting ground and short circuits, B is a spring with a soft iron at one end and fastened at the other. O S is a second spring made fast at one end. The terminals of two cells of batteries with a bell in series is connected to the springs as shown in the diagram. When short circuits or grounds occur, the iron core of the spark coil will become magnetized, thereby attracting B, which, in turn, will contact with O S. This closes the circuit and causes the tell-tale bell to ring. Trouble can be located by opening switches.

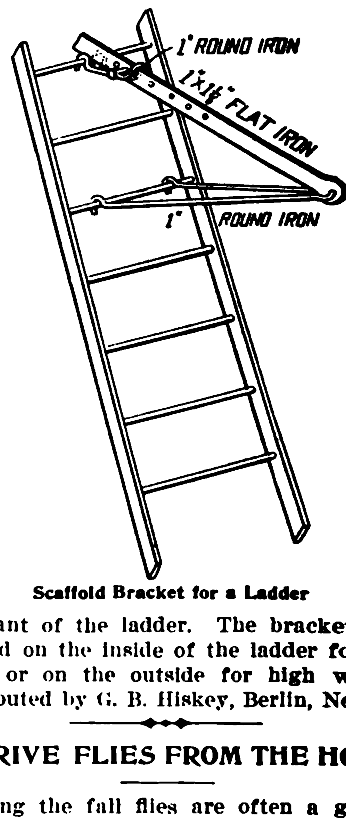
In Fig. 12 the bell is in series with the lighter spark coil and batteries. The plan is suggested by J. S. Gibbs, Dallas, Texas.

Henry H. Peebles, of Cleveland, Ohio, sends us Fig. 13, and says: "Make a relay on end of spark coil and connect in series with a bell and battery. Contact, in case of trouble on the line, will be at H. The spark coil to be connected up in the usual manner."

W. J. Barber, North Adams, Mass., comments on Mr. Williams' system as follows: "The alarm resistance wire should be of suitable size to operate upon the circuit in question. If of high resistance, or very long, or very fine wire, resistance wire should be fine also. In Fig. 15 the contact arrangement is shown. A is a spring tending to touch the contact block and B should be iron wire about 22 or 24 B. & S. gauge. (For wiring plan, see Fig. 14.) The idea is to let all the current that goes to lighter or burners traverse the spring and resistance wire, so that if it is on long enough to heat the same, it will expand and allow the spring to touch the contact of the bell circuit. The time element is governed by the size of the wire, longer wire being slower to respond. The alarm can be gauged to sound in from 10 seconds to two minutes after ground or short circuit.

SCAFFOLD BRACKET FOR A LADDER

A good scaffold bracket for a ladder is shown in the accompanying illustration. It is made of 1x1/8-in. flat iron and 1-in. round iron. The key-holes at A are for adjusting



Scaffold Bracket for a Ladder

the slant of the ladder. The bracket may be used on the inside of the ladder for low work, or on the outside for high work.—Contributed by G. B. Hiskey, Berlin, Nevada.

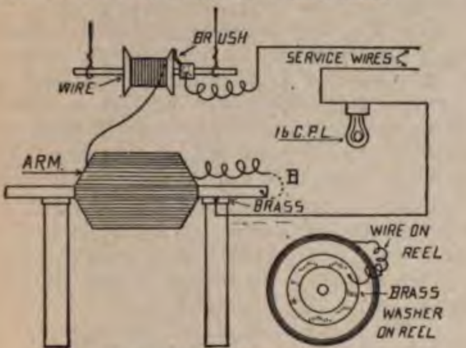
TO DRIVE FLIES FROM THE HOUSE

During the fall flies are often a greater nuisance than at any other time of the year. A good way to rid the house of them is to saturate small cloths with oil of sassafras and lay them in windows and doors. The flies will soon leave.—Contributed by B. F. Lamb, Minier, Ill.

The Department of Agriculture are experimenting with the cold storage preservation of seeds which, if kept in a warm place, are subject to attack from insects which hatch eggs among the seeds.

TO DETECT GROUNDS AND SHORTS

The outfit illustrated herewith is useful for detecting grounds and shorts in armature and field winding and saves the extra work of testing every now and then.



Ground Detecting Device

When there is a ground the 16 candle-power light is turned on. Shorts may be found by connecting wire B to the brass box as indicated by the dotted lines. If there is any amount of wire on the reel, the light will burn dimly and when a short is made in the winding the lamp will burn brighter.—Contributed by B. R. Van Valkenburg, 2212 E. Lake Ave., Seattle, Wash.

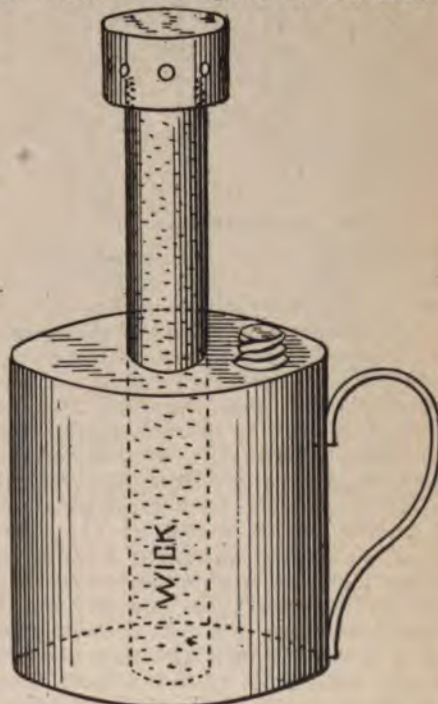
A METHOD OF CLEANING RUSTY PIPE

At the annual meeting of the Pacific Coast Gas Association, in San Francisco, in July, an interesting experience on the cleaning of rusty pipe was described. Some plain and steel tubing for use in high pressure lines came from the factory to the point of shipment on flat cars, and in consequence was badly rusted before it could be gotten under cover. Cleaning machines not being immediately available, a part was cleaned by hand and efficient tools proved a serious problem. Coarse and fine files were not much of a success, because they would not clean out pitted spots and irregularities in the surface of the pipe without removing valuable metal. Emery cloth and sandpaper did not last long enough to make a showing. Steel wire casting brushes proved quite efficient, coarse brushes being used to loosen the larger pieces of scale and rust and fine brushes to work into the pits and clean the dust off. Soft red brick, such as would be used only for filling, and furnace slag were found excellent, the fine particles working into the pitted spots and irregularities as they broke off. The dust left can best be removed by a fine wire brush, leaving the surface of the pipe clean and bright, ready for receiving the paint.

HOME-MADE GASOLINE TORCH

Procure an old tin can, pint size, with a screw top, for holding the gasoline. Punch a hole in the center of the top and insert a piece of ¼ in. gas pipe to within ⅛ in. of the bottom of the can, letting the pipe extend out of the can 4 or 5 in., soldering it in position. Screw a common cap on top of the pipe and drill eight or ten holes around the cap. Fill the pipe with wicking or asbestos.

When ready to light the burner, heat the can on the top and hot gas will flow from the holes. When lighted it will burn as



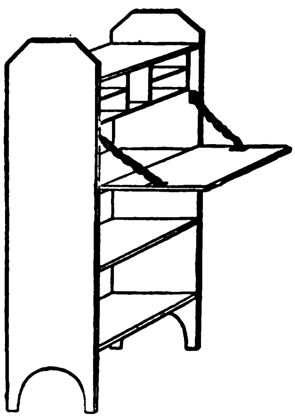
Gasoline Torch

steadily and brightly as gas light. This is a handy torch for use around the shop or outside, as it takes a very strong wind to blow it out.—Contributed by Thiede.

HOW TO MAKE YOURSELF A DESK

In constructing this desk care must be taken in particular to always have the pieces of wood of exactly the right dimensions and cut with square angles. Further than this the work presents no difficulties to one of average ability. Oak is the most suitable wood for the purpose, though white wood makes a nice desk also, says the Engineering World.

Make the side pieces 50 in. long, 12 in. wide and 7/8 in. thick, with curved openings 6 in. high and 8 in. wide at the bottom. Send the sides to the mill to have the pieces cut out, sending a drawing showing what you want done, also. Make the bevel at the top 45° or 3 in. each way. Cut the four cross-pieces from 7/8-in. material 24½ in. long, two of them 12 in. wide for the top and bottom and two 11½ in. wide for the middle. In the top and bottom pieces cut ¾-in. rabbets on the back inner edge for the backing, which should be of ½ in. matched stock. Cut grooves ¼ in. deep in the side pieces to receive the cross-pieces. Place the top piece 5 in. from the top of the side pieces, the second cross-piece place 14⅛ in. lower, the third 12⅜ in. lower yet and the bottom piece 10 inches lower than the third piece and 8½ in. above the floor.



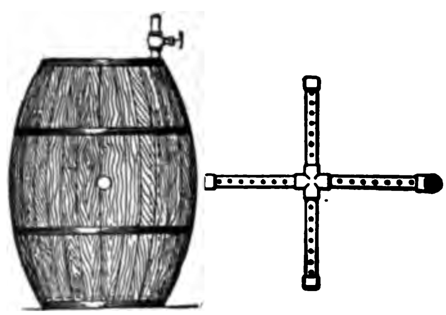
Home-Made Desk

Make the partitions for the pigeon holes of ⅜-in. material 10 in. wide, two pieces being 23¼ in. long, two 9 in. long, two 6¾ in. long and two 6 in. long. Nail the two end pieces to the ends of the cross-pieces, then nail the two vertical pieces in place, first nailing to them the ends of the two short shelves. Nail the other ends of the short shelves through the end pieces. Attach this frame to the desk by screws put through from the inside. When the backing is on, further support the frame by a ½-in. square strip screwed to the backing. The backing should be in 36½-in. lengths and may be nailed on with small nails.

Make the drop-leaf from two pieces glued up, 24 in. long by 14⅛ in. wide. Fit a cleat 2 in. wide and ⅝ in. thick at each end to corresponding rabbets cut on the upper side. After fitting and gluing the cleats keep the shelf in clamps until the glue is dry. Attach the shelf to the desk with ornamental T hinges of brass or black iron and put on side chains as shown. Fit a lock to the outer edge and to the inside upper corners of the case glue stop blocks to hold the leaf flush when desk is closed.

WASHING WASTE

Though waste is cheap, in a plant where economy in all branches is practiced, a good method of cleaning it for second use will not be scorned. Save the waste as it is used, allowing it to accumulate in a receptable provided for it. When sufficient is on hand fit up an old barrel with a heating coil, says a correspondent of the Engineer's Review, fill it half full of water and, using sal-soda or soap, boil the waste until it is clean. When dry it will be as good as new.



Waste-Washing Apparatus

"A wooden floor laid over hollow tile or concrete with not more than ½-in. space between the wood and concrete, burns very slowly, and would have but little effect in feeding a fire."—Kidder.

AN INEXPENSIVE JACK

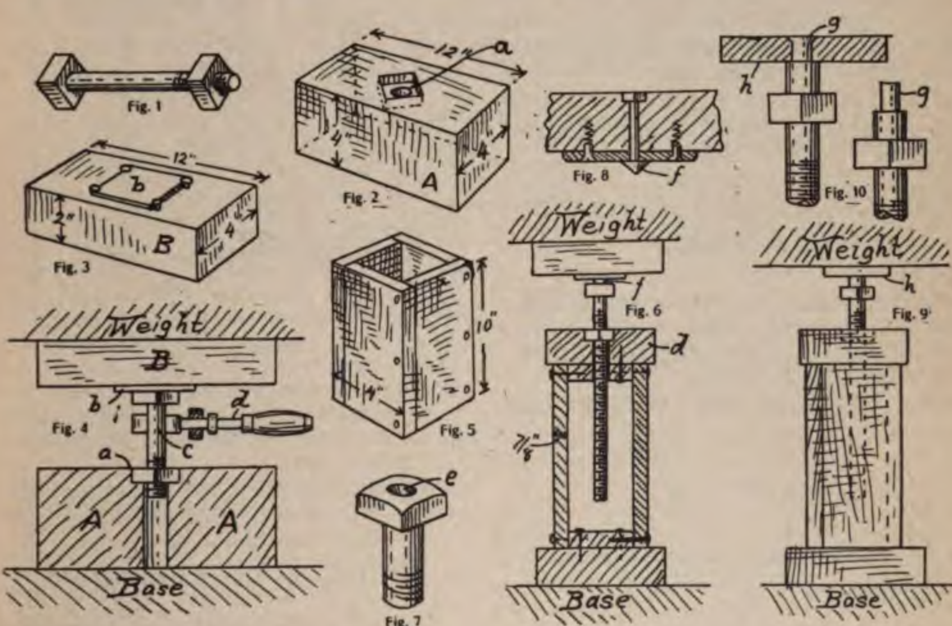
A jack suitable to meet with an emergency may be constructed at a cost of three cents, as follows:

Take an ordinary machine bolt (Fig. 1) any size and length that will bear the weight to be lifted or let down—say, $\frac{1}{2}$ to $\frac{3}{4}$ in. diameter by 4 in. to 10 in. long. Get a block 4x4x12 in. and bore a hole about $\frac{1}{8}$ in. larger in diameter than the bolt through the center; also cut a mortise the size of the nut as at a, Fig. 2. The mortise is to keep the nut from turning.

Get another block about 2x4x12 in. and on one side in the center fasten a plate (b, Fig. 3) $\frac{1}{8}$ to $\frac{1}{4}$ in. thick and 2 to 4 in. square or round. If there are not holes drilled in the plate, fasten it to the block by driving in four or five nails at its edge and allowing the heads of the nails to hook over the edge of the plate.

When blocks A and B are ready, place block A on the base or foundation, setting the bolt and nut in the hole and the mortise, the head of the bolt being up, and put block B with plate b on the head of the bolt on the underside of the weight. (See Fig. 4.) Fit a pipe wrench (d) around the stem of the bolt (c) and proceed to tighten or release as the case requires.

An ordinary bolt is only threaded an inch or so at the point end, therefore only a short lift or release can be made at a time. To raise or lower more than the thread will allow, two jacks of similar construction would hasten matters, using one until the thread is exhausted, then setting the other and using its limit of thread; then setting the first jack again, and so on until the weight is adjusted as required. If only one jack is used it will be necessary to block up for each adjustment. If a long lift or lowering is desired and a tap and die are handy, it would be well to thread the bolt to within an inch or so of its head; this will give a longer movement of bolt. A jack of this description will lift a very heavy load; the writer has one in use that is made out of a machine bolt $\frac{3}{4}$ in. in diameter and $3\frac{1}{2}$ in. long that cost 3 cents, and which lifts one corner of a house.



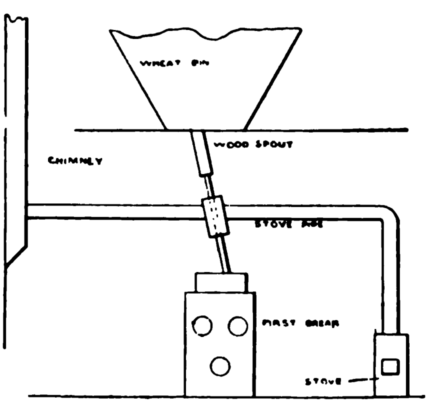
A jack for general use can be made at small cost, as follows: Get a machine bolt $\frac{3}{4}$ to 1 in. in diameter and 10 to 12 in. long. Have it threaded to within one or two inches of the head and make a countersick (e, Fig. 7) in the head of the bolt. Make a square box (Fig. 5) out of $\frac{7}{8}$-in. strong, light timber and fasten a block about 2 in. thick by 4 to 5 in. square (d, Fig. 6) at the top of the box. In the center of this block cut a mortise for a nut, as at a, Fig. 2. At the bottom fasten a pasteboard 2 in. thick and 6 in. square. Prepare a block as at B, Fig. 3, fastening the plate in this case with countersunk screws and a bolt with a sharp-pointed head (f, Fig. 8) in the center. This bolt is to set in countersink in head of bolt at e, Fig 6.

A better and more substantial way is to make a screw with a permanent swivel plate, as follows: Have the bolt forged for the purpose. (See Figs. 9 and 10.) Have the square head set about an inch below the point end, then turn down the point end (g) about half its diameter for a distance ⅛ in. longer than the thickness of the swivel plate h. Plate h should be ¼ to ½ in. thick and about 3 to 4 in. square with a hole bored in the center of the same size as pin g and slightly countersunk on one side to make swivel, taking the place of block B, Fig. 3, thus making a cheap and handy jack.—Contributed by C. N. Leonard, 1319 Barth avenue, Indianapolis, Ind.

HOME-MADE WHEAT HEATER FOR A MILL

For the country mill where steam is not used a home-made wheat heater will be found serviceable. The American Miller describes such an installation.

Cut a hole in the middle of a stove pipe

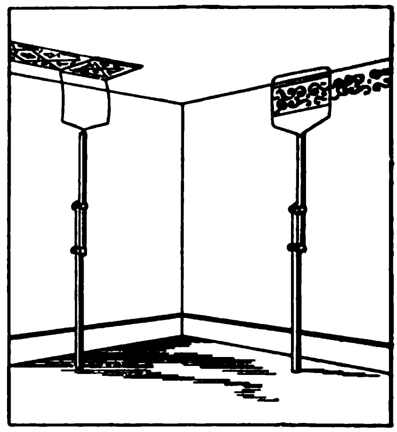


Home-Made Wheat Heater

and join two half links of pipe on each side. Cover the ends of the short pieces with sheet iron, making an opening in each large enough to admit a 2-in. gas pipe. Run the gas pipe from the wooden spout at the wheat bin, through the hot air chamber so made to the rolls. The stove pipe, of course, runs from stove to chimney. Keep up a good fire in the stove and the wheat as it moves through the gas pipe will be put in good condition for grinding.

CONVENIENT STENCIL HOLDER

For applying stencil decorations a new stencil holder, a recent invention, will be found convenient. The device holds the stencil in working position against either a

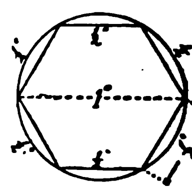


Stencil Holder

side wall or a ceiling while the pattern is being reproduced upon the surface against which it rests. The holder is adjustable to any height within its limit and is also collapsible, making it convenient for transportation from one job to another.

TO DRESS UP A HEXAGON

Turn the work round in the lathe, caliper the diameter and file a flat on round equal to one-half the diameter. File the next side of the hexagon in the same way, and let the edge of this flat just reach the edge of the first flat. Proceed in this way until the



eight sides are filed. If carefully done the work will come out exactly as shown in the sketch.—Contributed by F. A. Sustins, Stevens Point, Wis.

Life subscriptions to Popular Mechanics, $10, or, sent five years for $3.

TO FIREPROOF PAPER

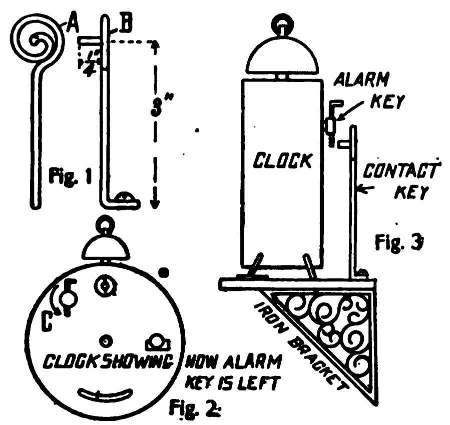
By immersing paper (plain, printed or written on) in a strong solution of alum water and then drying it, the paper will be made fireproof. Some paper, however, requires several immersions and must be immersed and dried until saturated. Test by holding saturated paper in the flame of a lighted candle. Money can be fireproofed in this way.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

CONNECTING UP AN ALARM CLOCK TO RING AN ELECTRIC BELL

Construct a shelf 6 in. x 4 in. of any hardwood. Get a strip of thin brass 4 in. x ¼ in. Bore a small hole ¼ in. from each end to admit a small round-headed screw. Screw the brass strip 1¼ in. from the front edge and 1 in. from each side of the shelf.

When this is completed make a contact point out of a piece of No. 16 iron or copper wire about 4 in. long. Bend one end of this wire in the shape shown at A, Fig. 1, so that ¼ in. of the end at the center of the coils will project at right angles to them. Bend the other end of the wire so that it can be fastened to the shelf. Fasten this contact point 2 in. from the brass strip and 2¾ in. from the right hand side of the base. The distance from the center of the coiled part to the base should be 3 in. B, Fig. 1, shows a side view of this part.

Remove the alarm key from the clock, and

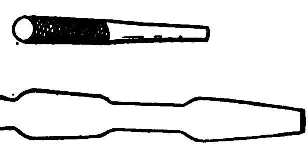


if it has square corners cut it so it may be bent in the shape shown at C, Fig. 2, if it is round fasten a piece of No. 16 wire, bent in the shape indicated at C, to it, using wires to hold it in place.

Connect one wire from the electric bell to one of the screws in the brass strip and connect the other wire to the contact point. Set the clock on the shelf with the front legs resting on the brass strip and so the contact point is a little to the right of the set key. The clock may be taken down to wind, and in winding the alarm only one turn is necessary. Leave the bent part of the key pointing upward so that when the alarm goes off the key will turn downward, striking the contact point and closing the circuit, remaining so until someone comes to move the clock, and stop the ringing. The advantage of this method is that there are no connections to loosen when the clock is taken down to wind.—Contributed by R. M. Taylor, Cincinnati, Ohio.

HOME-MADE SCREWDRIVER AND NAIL PUNCH

A good screwdriver can be made out of an old flat file about 8 in. long by grinding it smooth on both sides and on the edges



Home-Made Screwdriver and Punch

to the shape of a screwdriver. One of these screwdrivers after a year's use is as good as when first made.

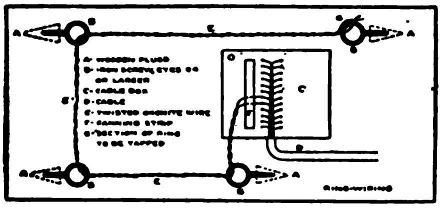
A nail punch may be made of an 8-in. rat-tail file by taking a piece 4 in. long out of the middle and grinding the point half smooth and leaving the other half as it is.—Contributed by Edgar Robertson, Castleton, N. Y.

LINSEED OIL AS FLUX IN TINNING ROOFS

Tin roofs need have absolutely no preparation previous to painting, if the tinsmith uses linseed oil for a flux. The oil is not quite as rapid as rosin or acid, but it leaves nothing objectionable to be dealt with afterwards. Acid will run into the seams and cause corrosion, while rosin is extremely hard to remove, especially from pits and irregularities in the surface.—Contributed by James H. Beebee, Rochester, N. Y.

RING WIRING AND DISTRIBUTION

Circuit distribution in closely built districts is a problem which differs largely from that encountered in suburban or rural localities. The most improved method utilizes a scheme called The Block, says the American Telephone Journal. In the center of blocks consisting of the area enclosed within four streets, terminal boxes are installed. From there the twisted pairs are run through rings fastened to fences or



Ring Wiring, Showing Details of Installation

walls, and in this manner distributed to the subscribers' stations. The cable leading to the terminal box is brought in underground and the box placed in a dry cellar to which access can be readily secured at all times. The supports employed for this method of distribution consist of iron screw eyes or rings not smaller than No. 4, and of sufficient size to allow all the present and prospective lines along any route to readily pass through them without binding. These supports should be covered with an insulating enamel which not only adds to the resistance of the line in damp weather, but also prevents to a large extent any chafing of the insulation when the wires are pulled in.

These rings are shown at B in the accompanying illustration. In placing them, if in brick or stone, the hole should be drilled and a wooden plug driven in to give a sufficiently strong holding point for the screw thread. Insulated rings should never be driven in, as by so doing, the enamel will be cracked off, destroying its insulating quality, and also forming a rough surface upon the ring which will wear away the insulation upon the wire. For turning corners, rings with angle irons in place of the screws should be employed. Where the line route is along fences no trouble will be experienced in screwing the eyes to the woodwork. At the final ring where the twisted pair leaves the run to enter a subscriber's premises, it should be tapped off as shown at G. This gives additional strength to the circuit and prevents the wires slipping.

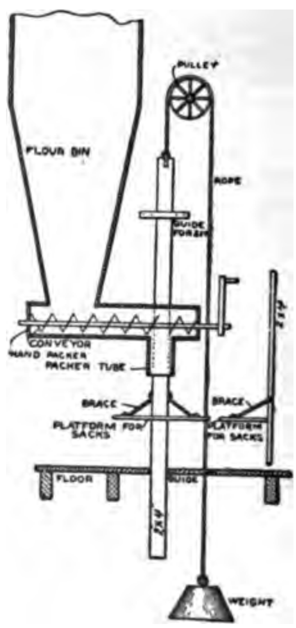
This method of distribution is sightly and affords excellent protection to the circuits in cases of storm, by holding them close to the building or fence, which acts as a shield against the wind.

SAND THE SECOND COAT OF PAINT

If the second coat of paint is well sanded with fine sand, it will not need to be painted again in twenty-five years, writes James H. Beebee, of Rochester, N. Y. Use seashore sand, well washed and freed from all impurities.

HAND-PACKER FOR SACKING FLOUR

The accompanying sketch shows a handy packer for sacking flour by hand. There is little to explain in the sketch, as anyone can see at a glance all that is required to make it. It can be put on any hand packer, says American Miller.



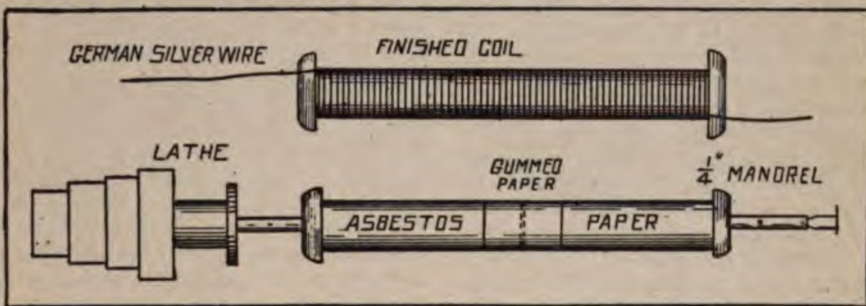
Hand-Packer for Sacking Flour

It can be made by anyone, and all that is required is a 2x4, a rope, rope pulley and weights to little more than counterbalance and draw up the sack platform.

METHOD OF WINDING COILS

In replacing some burnt-out coils in a controller I hit on the accompanying kink, writes O. N. Tait, electrician, Mountain View, California:

In a piece of ¼-in. iron 12 or 14 in. long



Good Coil-Winding Method

drill two holes, one near each end. Over this rod slip two common bushings, such as are used to go through walls. Have the heads of the bushings away from each other, and use gummed paper to hold the ends together. Then with a piece of asbestos paper take one turn around the tubes, holding this in place with gummed paper also. Put the work in the lathe and wind on the wire its own width apart. Cut off the wire and put the other end in the other hole. Then take the work out of the lathe and place in a gas flame, turning it once, until the wire is red hot all over. Allow to cool slowly; by doing this the wire may finally be cut off without danger of its unwinding. When cold coat with shellac. Knot the ends of the wire and you will have a coil that is noncombustible and can easily be removed from the mandrel.

I have a set of these coils in a controller on a huge rotary press and they have given good service under hard usage.

TO FIND HOW MUCH GRAIN ANY BIN WILL HOLD

For finding how many bushels of grain any bin will hold try the short cut of multiplying the length, breadth and height in feet together and then multiply by 0.8. The result will be the number of bushels the bin will hold. This rule is shorter than the old rule, says the Grain Man's Guide, and is accurate.

HOW TO PRESERVE POSTS

Wood can be made to last longer than iron if treated according to the following directions, writes Anthony Haselman, 80 Morton street, Newark, N. J.:

Into boiled linseed oil stir pulverized coal until the mixture is of the consistency of paint. Put a coat of this over the timber, and there is not a man living who will see it rot.

HOW TO HEAT LARGE BODIES OF WATER

Large volumes of water, such as contained in swimming tanks, etc., can be rapidly heated by means of the arrangement shown in the illustration. It consists of an ejector having space for steam around a

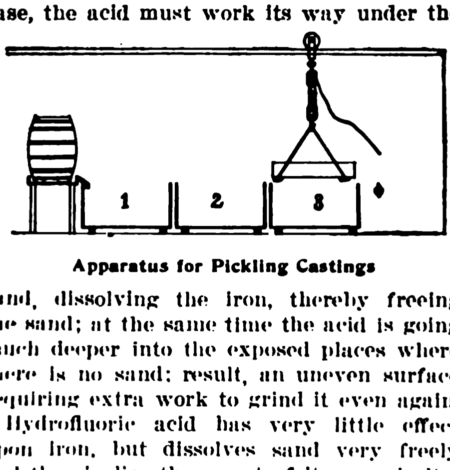
Heating Large Bodies of Water

central tube through which the water passes. The steam is turned on and rushes out of the concentric opening, drawing the water after it. One hundred gallons of water can be raised 50 degrees in three minutes in this way with only a ½-in. steam connection, and a 1½-in. water inlet, or in one minute with a 1-in. steam pipe and a 2½-in. water opening.

HYDROFLUORIC ACID vs. SULPHURIC ACID FOR PICKLING CAST IRON

By F. W. Hobbs, Electroplater.

The use of hydrofluoric acid for pickling cast iron preparatory to polishing and plating marks a great stride in the reduction of cost and quality of work produced. The old method of pickling with sulphuric acid was very unsatisfactory at best; in spite of the various alkali baths used after pickling, the work nearly always behaved badly in the nickel path, owing to the acid remaining in the pores of the iron, and the result was a dark unsightly deposit, especially in the backgrounds or unpolished surfaces, and a contaminated solution. Suppose a plain surface is to be pickled: If the sand is burned in in patches, which is often the case, the acid must work its way under the



Apparatus for Pickling Castings

sand, dissolving the iron, thereby freeing the sand; at the same time the acid is going much deeper into the exposed places where there is no sand; result, an uneven surface requiring extra work to grind it even again.

Hydrofluoric acid has very little effect upon iron, but dissolves sand very freely and therein lies the secret of its superiority. Its use results in a smooth grey casting free from sand and scale, and one which, when rinsed and soaked for ten or fifteen minutes in lime water, will grind easily and come out of the nickel bath a perfect white, and the condition of the solution will not be affected in the least. After using hydrofluoric acid for two years, I can positively say that the use of sulphuric acid for pickling is simply a loss of time and material as compared to hydrofluoric. Hydrofluoric saves emery, glue, wheels, solution and time and produces a far better class of work than could be had by the use of sulphuric acid or no acid.

A convenient method of using the acid is shown in the accompanying sketch. At the ... bench a trifle higher than top of the tanks. On this bench is a shallow lead tray large enough to permit the barrel of acid to be stood in it. A small lead pipe leads to the first tank, which should be lead-lined with seams burned, not soldered. This tank is to contain the acid, one part to fifteen parts of water. Tank No. 2 is for clear water, and Tank No. 3 for hot lime water. The lime water can best be heated by inserting a coil of steam pipe. Above the tank is a track with a set of small falls connected to a truck on the track. The cage or car is made of soft wood doweled together with wooden dowels and slung from falls by an iron strap sheathed in lead pipe. The cage is first loaded and lowered into tank No. 1, then raised, run along the track and lowered into No. 2, then up and along and into No. 3, then up and run back and lowered on to pieces of scantling placed across No. 2, where it may dry by the heat caused by the hot lime water. Have two or more heavy hoops made and rolled in hot lead, and when a barrel of acid is received, place the hoops on as a protection, should the acid find its way through the pitch lining and attack the slender hoops on the barrel. Put a strap on the barrel and raise it into the tray, then puncture the side near the lower head with a nail in such manner that when the acid runs out it will strike in the tray and be conducted to the tank by the small lead pipe. When the proper amount has been drawn off, stop up the puncture with a wooden plug. Should this leak a little or should the joints leak a little, the acid will be conveyed by way of tray and pipe to the tank so none will be lost. When the barrel is empty it may be lowered and the heavy hoops knocked off for use on the next barrel.

The acid is shipped in pitch-lined barrels or lead-lined carboys; the carboys soon become leaky, owing to rough usage in transportation and are expensive; therefore, I recommend that the barrels be used for transportation.

MADE A WASHER OF A KEY

While looking for a washer, which I failed to find, I ran across an old brass key with a round ring at the top and flattened at both sides. Using a cold chisel, hammer and file I cut the ring off, then filed it perfectly round. It worked like a charm fo-

-ted by W

HOW TO TIE A JURYMAST KNOT

This knot is also known as a masthead knot and a bottle hitch and is used at the top of a temporary derrick in place of a mast iron to fasten the guys to. A correspondent of the American Machinist tells how to tie the knot.

these two bights with the left thumb and forefinger, measure off another 6 in. and throw the last "bight." Place it on top of the last one made and you have Fig. 3. Take the part E in the last bight at Fig. 3 and—while holding the other parts in place

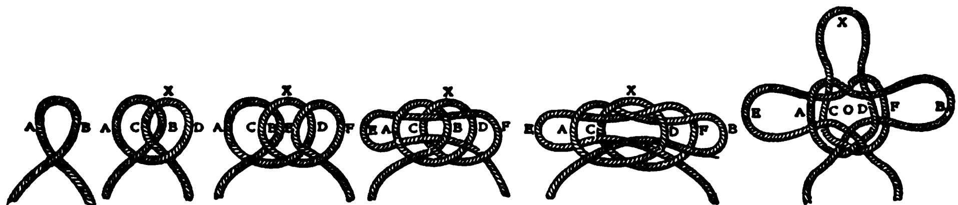


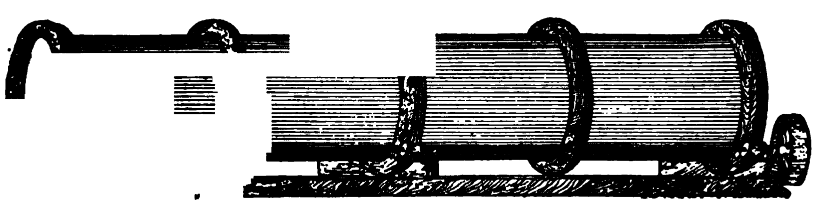
FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5 FIG. 6

Take a piece of stout cord and hold it between the thumb and forefinger of each hand with a space of about 6 in. between the hands. Then twist the cord right-handed with the thumb and forefinger of the right hand only. This will throw up a "bight" like Fig. 1, with the part A under B. Grasp the loop thus formed between the thumb and forefinger of the left hand at the point where the two parts cross. Then move the thumb and forefinger of the right hand along the cord about 6 in., and throw up another "bight," laying it on top of the first one. You then have Fig. 2. Hold —pass it under B, over C and under A. This makes Fig. 4. Then take B, Fig. 4, and pass it under D and over F. The result is Fig. 5. Then, while holding E in the left and B in the right hand, take hold of X with the teeth and pull it. The result will be Fig. 6. In practice the part O in Fig. 6 goes over the reduced part of the mast or derrick head. The forestay is made fast to X. The stays to E and B. Y and Z form the back stays. Any strain on the stays tightens up O. By pulling Y and Z in opposite directions the knot comes out. Every workman should know how to tie this knot.

PIPE-CLEANING MACHINE

A machine for freeing pipe of oil and rust preparatory to painting, consists of a wooden drum, 4 ft. in diameter and 22 ft. long, which is worked at about ten revolutions per minute, says the Journal of Electricity, Power and Gas. The pipe to be cleaned is placed in the drum and nearly covered with clean, sharp sand. Sand is added as required after the first charge.

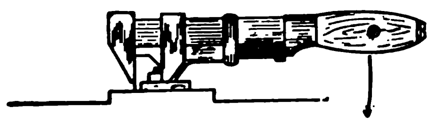
There is enough pipe for one time in the drum when the top piece drops and rolls over the other pipes, about one each turn, or so. If it drops too often, remove one piece at a time until right, or if it drops not at all, add pipe until it does. This method will clean the pipe bright inside and out. All the cost is for power to run the machine and help to handle the pipe.



Wooden Drum for Cleaning Pipe

REMOVING KEYS FROM VALVE STEMS AND SHAFTS

While adjusting a high duty pumping engine with Corliss valve motion, I frequently found it necessary to remove the



Removing a Key

keys from the valve stems. Most all keys are driven in to stay and it is no easy matter to start one without breaking off the head or bending the key, but by means of the following wrinkle I found it quite easy to remove most any key.

Place a monkey wrench on the head of the key as in the illustration, and drive a chisel or wedge between the head of the key and the stem, or the shaft, or whatever it may be. While driving, press against the handle of the wrench.

The wrench puts an even strain on the key and also keeps the wedge or chisel in place. Squirting kerosene oil around the key will also aid in extracting it. I learned this scheme in a machine shop where it was used to remove sprocket wheels keyed on the ends of shafts.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

SAID TO CURE FELON

A very simple cure for a felon is given in the Medical Visitor by Dr. Whitman. The doctor says that for the last fifteen years he has used egg to cure felon, and has yet to see a case it will not cure. The way to apply the egg is as follows:

Take a fresh egg and crack the shell at the larger end. Make a hole just large enough to admit the thumb or finger, whichever it may be, and force it into the egg as far as possible without rupturing the shell. Wipe off the egg which runs out and bind a handkerchief or soft cloth around the finger or thumb, leaving the egg on over night. This will generally cure in one application, but if not make another application.

White spots on polished furniture, caused by hot dishes or alcohol, may be removed b· ·e of spirits of camphor.

HOW A GAS ENGINE TALKS

To the experienced man the gas engine has a language of its own which the man who runs it must at all times understand, says Gas Power. If he cannot do this then his experiences with the engine are going to be varied, but they won't be pleasant. When the engine is right and is, in consequence of being so, doing what is right, the only sound it emits are such as are made up from the clicking of the valves, the inhalation of the air and the exhaust. When the usual sounds are well understood, any unusual ones will be promptly noticed and their cause located and removed. The trained ear is probably a better trouble detector than the eye. The best way to become acquainted with the natural sounds is to first operate or run the engine for a time, say from a half to an hour, free; without a load.

It will be noticed that under no load, besides driving itself, if it is a hit-and-miss governor engine, it will produce an inhalation sound followed immediately by a loud exhaust report. If the governor is the least bit off or sluggish a second or third of this pair of sounds may follow in quick succession. But usually the first is followed by an intermission, which is made up of a series of suction sounds at the end of the exhaust pipe, if the governor serves to hold up the exhaust valve when no impulse is needed. These suction or blowing sounds are due to the inhalation and expulsion of the air through the exhaust pipe, at each movement of the piston, so long as the governor holds up the exhaust valve. The moment this valve is released a loud suction or inhalation sound is again heard at the mouth of the receiving pipe, followed immediately by the loud report at the end of the exhaust pipe, which pair of sounds is the result of taking into and igniting the charge within the cylinder and exhausting the burnt gases under the pressure that remains in the cylinder at the time the exhaust valve opens.

Now, if the inhalation sound at the receiving pipe is heard and the loud exhaust report does not follow, the operator knows at once that the charge taken during the inhalation was not ignited or exploded. He knows there is a natural sound missing which signifies an abnormal condition reasons, if the charge isn't explod not? Did the gasoline fail to the proper mixture? or did it overcharge the air? or was the mixture right and did the battery fail to make a spark? or if proper mixture and spark were both present, is there a leak of sufficient gravity through the valve or around the piston, by the packing rings, to allow practically all of the charge to escape before the spark is made?

The absence of a natural sound production will often point out an abnormal condition as readily as the presence of an unnatural one will. A careful operator notices all of these things. None of them escapes his ears so long as he is within hearing distance of his engine. To him the absence of one natural sound is the letter that misspells the two words, successful operation, consequently the importance of being able to detect the absence of the natural sounds. To know them is the only sure way to notice their absence.

The frequency of the exhaust reports increase as the engine is put under a load. And the heavier the load the more frequent the reports, until a full load is reached. A trained operator can be away across the country and within hearing distance of his engine, or rather the exhaust reports of it, and be able to say that the engine is running well and easily carrying its load, or that there is something wrong with it.

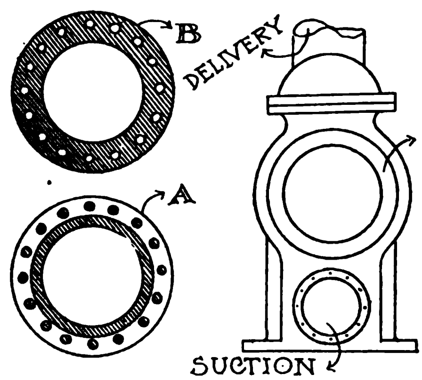
Now, one of the common expressions of discontent the engine makes is pounding in the cylinder; and this usually occurs when the engine is under a heavy load. The interior of the cylinder gets so hot that some burnt carbon or projecting point of iron becomes heated to the igniting point. This in connection with the heat generated by the compression pressure ignites the charge before the piston has completed its compression stroke. The result is a sudden conflict between the explosive and compression forces. This sudden collision of forces causes a heavy pound in the cylinder. A loose flywheel causes a thump, usually at every impulse the engine takes. Looseness at the wrist box causes a knock. A loose crosshead box usually causes a clatter. A knock once located around the connecting rod may be due to either the crosshead or wrist boxes being adjusted too tightly. One may be so tight as to lift and depress the ...d at each revolution. Often a ...atter at the crosshead or wrist ...ured by simply loosening ...ox at the other end of the connecting rod from that where the knock is located.

A flywheel loose on the shaft sometimes makes a rubbing sound, caused by some part of the circumference of the rim of the wheel rubbing at each revolution against some object near the engine. There is a barking or coughing noise at times from the cylinder, due to escape of the explosive force past the piston rings. This seldom occurs unless rings are badly worn or poorly fitted to the piston. Sometimes gummy oil will cause rings to stick in their grooves. A blowing noise just in advance of the exhaust report at the mouth of the exhaust pipe indicates a leak at the exhaust valve.

GASKETS FOR CYLINDER HEADS

Cylinder head gaskets sometimes have a frayed or chewed appearance after being in use a short time, due to a breathing action or movement of the cylinder head outward, which action permits water to escape between the gasket and head.

If a gasket similar to the one shown at B in the illustration is made, treated to a



Gaskets for Cylinder Heads

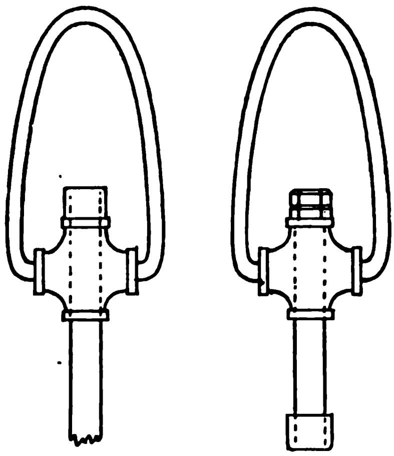
coating of graphite and cylinder oil and inserted in place, a water-tight joint will result, says the National Engineer, even though the breathing action of the cylinder head continues. The method of applying the gasket is shown at A.

Varnish should not be thinned with turpentine, says the Master Painter. It reduces the gloss and if the turpentine has been adulterated with mineral oil injures the varnish.

Shop Notes for 1906 will be ready December 1st Price, 50 cents.

A ROPE SWIVEL FOR A WELL DRILLER

Take a 1¼-in. cross and run a 1-in. nipple through from top to bottom. Screw 1¼-in. pipe in the top and saw off flush with cross

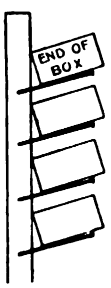


Making a Rope Swivel

for swivel surface. Screw two lock nuts or one old coupling on the top of the 1-in. nipple and a coupling on the bottom for a 1-in. drill rod. Bend a piece of ¾-in. solid iron to the required shape for a bail and put the ends in the sides of the cross as shown in the illustration.—Contributed by N. G. Hall, Parker, S. D.

HANDY BOX RACK

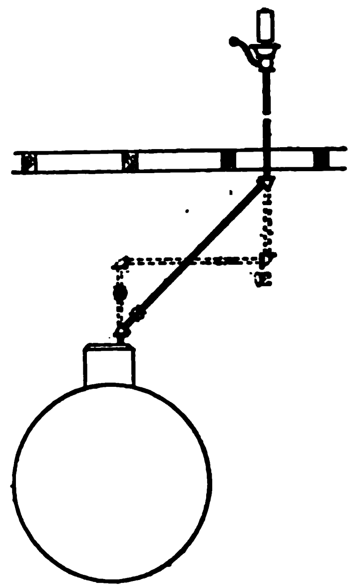
Any one who has a large and varied collection of small stuff such as nuts, bolts, screws, washers, etc., will find a handy method of keeping them by using old cigar boxes. A label should be pasted on each box naming the contents. Then by using long nails driven into the wall above the bench the boxes can be arranged in a convenient order. The plan saves both time and supplies, besides giving a greatly improved appearance to the place.



A mixture of 1 part pitch, 1 part resin and 1 part plaster of paris is said to be a good cement for coating acid troughs.

HOW TO REMEDY A "SQUEAKY" WHISTLE

In a plant where the whistle squeaked it was found that water settling in a corner of the piping (E in the sketch), caused the trouble. A plan of the old piping is shown by the dotted lines in the sketch. To remedy the trouble two 45-degree elbows and two nipples were used as shown so that there was no pocket for the water to settle



To Keep a Whistle from Squeaking

in, says the Practical Engineer. Others annoyed in this way, may, on investigation, be able to apply a like remedy.

Weak sulphuric or hydrochloric acid in the proportion of one part of acid to six to ten parts of water is excellent for removing efflorescence from artificial stone. Scrub the facing of the stone with the liquid thoroughly.

To harden plaster of paris quickly, add powdered alum to the plaster water. This is better than salt for the purpose.

WE HAVE A PROPOSITION FOR ONE REALLY ALIVE

SHOP NOTES

PROPER METHOD OF USING SANDPAPER.

Of a piece of mahogany or clean pine about 5¾x3x1 inch make a rubber shaped as in Fig. 1 and glue a piece of sheet cork on the face of the rubber. Fold into three a piece of sandpaper 6 inches wide and 10 inches long and place the face of the rubber on the middle division, the sand side of the paper being downwards. The rubber should be grasped firmly, the ends of the sandpaper being held on its back and sides, as in Fig. 2, and then the work may proceed. This method is recommended by Fred T. Hodgson in his New Hardwood Finishing.

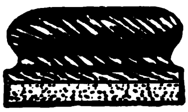


Fig. 1

Fig. 2

Another method of making the rubber block is by glueing a piece of rubber belting to a piece of basswood, or a solid rubber about one inch thick may be used.

SOME GOOD PAINTS FOR STACKS AND BOILER FRONTS.

A good paint for this purpose is asphaltum cut down with turpentine to the right consistency; coal tar mixed with graphite and thinned with turpentine is good, also.

Steam pipe used for heating, says a correspondent of the Engineer, should not be painted, but can be given a thin coat of lampblack and linseed oil, which will greatly improve its looks.

A SIMPLE FIRE EXTINGUISHER.

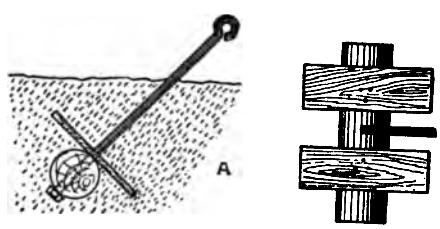
A [illegible] extinguisher easily made and ready [illegible] instant use consists of a [illegible] which is added three [illegible] one-half pounds [illegible] liquid and [illegible]

A HANDY CONCRETE FORMULA.

There are a great many formulas and a great many estimates for the cost of concrete, and here is another. A gentleman, who has had some experience, says that good concrete can be laid for about $2.00 to $2.25 per yard. Cellar floors and sidewalk can be laid down, furnishing everything for 12 to 14 cents per square foot super. Foundation work: One part of cement, three parts of plain sharp sand, six parts stone or broken brick so as to pass a 2-in. ring, properly moistened will make a good strong foundation.

THE BEST METHOD OF FASTENING GUY LOGS.

In setting poles, says the American Telephone Journal, guy logs should be placed so as to offer the greatest resistance to the strain. The illustration shows the best



Best Method of Guying

method of doing this. To the guy log, B, are fastened two crosspieces as shown, the rod passing through the center of the log and fastened with a nut (Fig. A). Its position is clearly shown in the sketch.

The quantity of pure platinum produced in this country during 1903 was 110 ounces, valued at $2,080. This does not include $6,000 worth of platinum reported as contained in slimes from copper ore from a Wyoming mine. This is an increase of 16 ounces over 1902, but in 1901 the production was 1,408 ounces of refined metal. For two years the average price has been $19 per ounce.

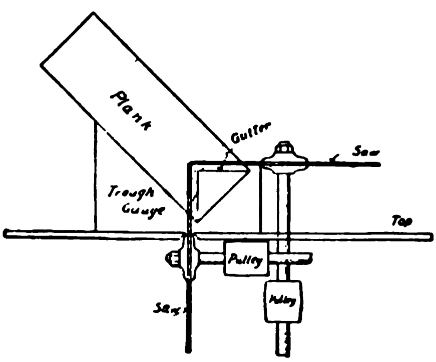
USE OF MURIATIC ACID IN COPPERING STEEL OR IRON.

A few drops of muriatic acid will make copperas take hold of the metal in coppering a surface of steel or iron to take scratch marks, even though the metal be oily. It is not necessary to wait for it to dry; merely wipe off all surplus acid with a rag.

DEVICE FOR CUTTING WOOD GUTTERS.

Ordinarily gutters are cut on a rip saw with one saw and by turning the stock around. The machine for making wood gutters shown in the sketch is a device of a correspondent of the Wood-Worker and by means of it gutters can be cut in just half the usual time.

It is a combination of two saws, one



Device for Sawing Wood Gutters

upright and one horizontal, so that the two cuts can be made at one time. When a plank is started all that is necessary is to return it, repeating the operation. Each time the stock passes over the machine one gutter is made, and the operation is continued until the plank is used up, the only waste being the saw kerf and the corners. The same rig can be attached to a self-feed rip saw and the stock fed by power.

HOW TO CANVAS A BOARD CEILING.

When canvasing a ceiling on which to hang paper, the strips of canvas should first be stitched on the machine into a sheet the size of the ceiling, making each seam about one-half inch, says the Master Painter. The sheet should then be rolled on a pole and the outer edges tacked.

The cloth can be put on so that all tacks are on the inside and do not show. To do this unroll the cloth a foot beyond the first seam and have an assistant hold the roll back out of the way. Grasp the seam betwen the thumb and finger and stretch the first strip and drive tacks one-fourth of an inch outside the stitches through both thicknesses of the cloth as lapped together to make the seam. Proceed in this manner with each seam in its turn until the ceiling is covered, then stretch and tack across the other sides of the room. The side of the cloth which shows will be stretched clean and smooth and the quarter inch between the seam and the tack will let the cloth give and take as the boards shrink or swell and thus keep the cloth from sagging. This method of putting on cloth is called blind tacking. Unbleached muslin should be used.

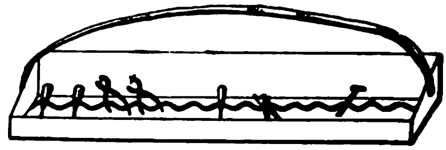
POLISH FOR HOT METAL.

The following polish for hot metal is highly recommended by a correspondent of the Engineer:

Take the ash of anthracite coal from under the grate bars and shake through a fine sieve, then use kerosene oil and mix into a good paste. Use any kind of cloth, and apply this to your cylinder heads and rub very hard. Always rub with the grain of metal so you will not scratch it. Leave the paste on until dry, then use a dry cloth and polish it to suit your taste.

TOOL BOX FOR MILLERS.

For millers or in any trade where such tools as a claw hammer, tack hammer, belt punches, spring punches, screw driver, wire cutter and any number of other small tools are in constant demand the tool box shown in the sketch is especially handy, as the full



Handy Tool Box

outfit of tools can be carried from place to pla[illegible] the a[illegible]

ECONOMICAL METHOD OF GETTING UP STEAM IN AN EXTRA BOILER.

Starting up an extra boiler a couple of times a week for a few hours only naturally would consume a great quantity of coal to get up steam from cold water. A correspondent of Power who faced this difficulty tells how he got around it and had a supply of hot water ready for emergencies also, he says:

"I put a tee on the blow-off pipe and took a branch to the suction of my boiler feed pump, and before starting up would circulate that water in the boiler through my feed water heater into the front head of the boiler and back again for about an hour, thus warming the water up with the exhaust steam from the engines. This also prevented sudden strains on the boiler, due to getting steam up quickly from cold water."

HOW TO SLING A BARREL.

It is sometimes necessary to sling a barrel containing small castings and liquids and with both heads on it is an easy job, says the American Machinist, but with one head

FIRST THING TO DO IN CASE OF ACCIDENT.

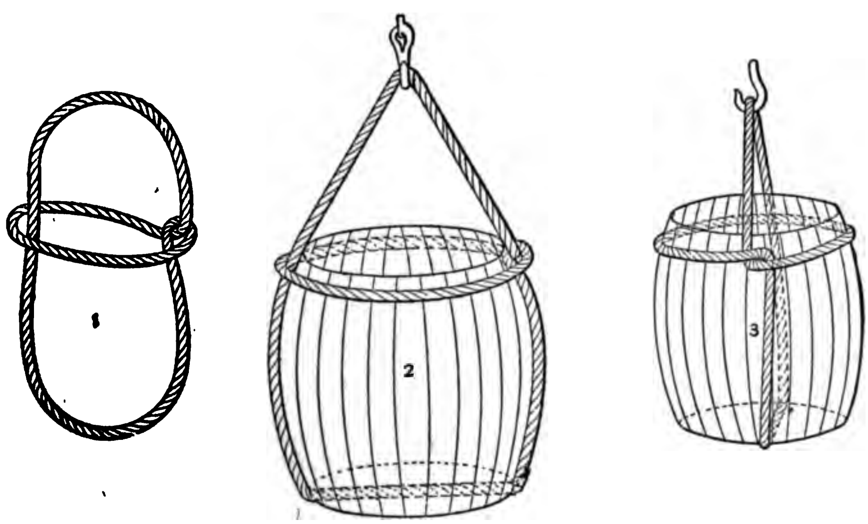
Keep cool. Summon a surgeon at once. Send a written message, describing the accident and injury, if possible, in order that the surgeon may know what instruments and remedies to bring.

Remove the patient to a quiet, airy place, where the temperature is comfortable, but never to an engine room, and keep bystanders at a distance. Handle the patient quietly and gently.

Arrange the injured person's body in a comfortable position; injuries to the head require that the head be raised higher than the level of the body; when practical, lay the patient on his back with the limbs straightened out in their usual natural position. Unless the head be injured, have the head on the same level as the body. Loosen the collar, waistband and belts. If the patient should be faint have his head rather lower than his feet. If the arm or leg be injured, it may be slightly raised and laid on a cushion or pillow.

Watch carefully, if unconscious.

If vomiting occurs, turn the patient's body on one side with the head low, so that



Slinging a Cask Having One Head Out

workman handles it very a great deal of rope ...h shows how it may sling and in the

the matter vomited may not go into the lungs.

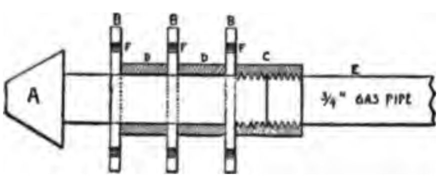
If a wound be discovered in a part covered by the clothing, cut the clothing in the seam. Only remove sufficient clothing to uncover and inspect the wound. In case of burns, pour lukewarm water containing a little baking soda over the clothing before attempting to remove it. All wounds should be covered and dressed as quickly as possible. If a severe bleeding should occur, see that this is stopped, if possible, before the wound is finally dressed. Do not touch the wounds with the hands either during examination or while applying dressings, unless they have been previously made surgically clean. After dressing a wound, do no more to the patient unless necessary to restore him to consciousness or relieve faintness.

If suffering from shock, place him in a comfortable position and await the arrival of the surgeon.

CLEANING CLOGGED PIPES.

The device shown in the sketch is a tool used by a correspondent of Domestic Engineering for cleaning pipes which have become clogged by a deposit of mud.

The tool is made up of a solid bolt of iron, with a conical-shaped head, A, the



Tool for Cleaning Clogged Pipes

point being moderately sharp for driving with a mallet. Washers, B, of not more than 2¼ inches diameter are slipped over the bolt and kept in position by sleeves (D) cut from gas pipe slightly larger than the shank of the bolt. Not less than four holes should be bored in each washer, as at F, to let the water pass and carry out the mud cut loose by the cleaner.

If the joints are properly made up the ¾-inch pipe is best, as it does not weigh as much as the 1-inch and two or three men can handle more feet when cleaning. Bolt A should be about 2 inches between head and the coupling; this enables one to hammer loose if the cleaner should become fastened.

To operate, take the tool and insert at the discharge end of the pipe. First connect on length of pipe, shove and pull until this length gets too short, then add another, and so on up to the limit of your power. With four men over 300 feet in a stretch can be cleaned. Then draw out your cleaner, measure along your pipe line to point it reached, dig out two or three lengths, cut the coupling nearest the discharge, raise the pipe gradually until the free end is above the trench, add a length so as to carry the water away from your pit; then start and work your cleaner as at first, and repeat until the entire line is clean. Bear in mind that each time you cut your pipe the water must be cut off until you are ready to start the cleaner; never attempt to use it until the water is flowing.

REPAIR FOR A CUT JOURNAL.

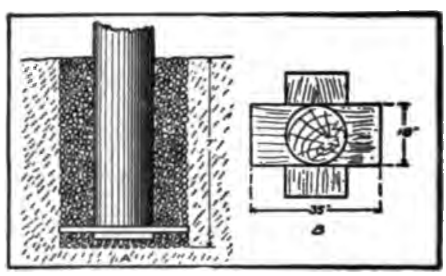
For a hot brass in a locomotive that has cut the axle the following method of treatment is recommended by one of our readers, Harry A. Tradsham, foreman of the Canada Eastern Ry. shops at Gibson, N. B., Canada. He says:

Remove the brass and tin it all over the wearing surface and then drop little daubs of solder all over the tinned surface. This will be found a sure cure for a badly cut journal.

SETTING POLES IN SOFT GROUND.

An excellent method of setting poles in soft ground without sinking them in is given by the American Telephone Journal. It says:

Set the pole in a concrete envelop composed of rubble; one part cement, two parts



Setting Poles in Soft Ground.

sand, and four parts stone. To the bottom of the pole a platform should be attached, as shown in the figure. This eliminates all possibilities of the pole sinking and at the same time the use of the concrete secures a foundation which has a great amount of stability.

SOME PIPE PROBLEMS SOLVED.

The following kinks, which may be of practical benefit to other workmen, were given by T. F. McMackin in the Engineer:

Fig. 1 represents a difficult job of pipe-

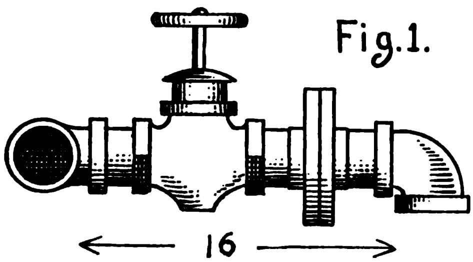


Fig. 1.

fitting recently done on some boilers installed in New York. The boilers were divided into two sections or batteries, one section being placed in a vault or fire-room directly under the sidewalk, and contained two boilers, one placed on the right of the building. The boiler on the left had just been installed and the steam cut off from that side of the building, the main being kept hot from the boiler on the right, which made it necessary to make connections after 12 o'clock Saturday night.

The mains were 4 inches in diameter and

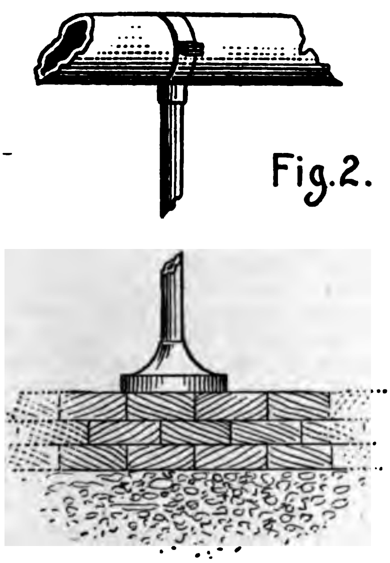


Fig. 2.

carried cast-iron fittings, the openings between the two tees being only 16 inches apart, as shown. In this instance we had to put in a 4-inch valve, the 4-inch flanges necessary nipples. All kinds of short nipples were tried and discarded. The piece containing the valve was made up on the floor several times, but without success, because both pipes were immovable and could not be sprung 1-16 of an inch. The valve measured 7 inches, the flanges 2 inches, and the three nipples 1½ inches. Finally we made up the two halves on the floor, and by means of a crowbar and several blocks of wood we managed to force them into place.

Fig. 2 represents a supporting column for carrying a steam main between two hothouses. The distance between the two houses was 15 feet. The column or stand is composed of pipe and fittings and an ordinary pipe-hanger. The main is 5-inch pipe.

In order to render the column secure, a

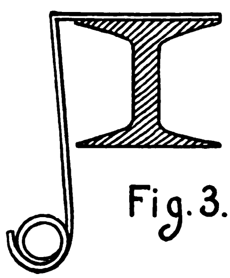


Fig. 3.

hole 2 feet deep was dug and a foundation built by first imbedding broken stone in cement, and laying on this brick in cement. After placing the flange, the whole was covered with cement, which was heaped up cone shaped around the 2-inch pipe as shown.

An improvised pipe-hanger is shown in Fig. 3. This is made by heating and bending a piece of ¾-inch wrought iron or steel about 3 feet long to fit over the I-beam and bending the lower end to receive the pipe. This is a simple and very good hanger for temporary use.

CEMENT FOR CLOSING LEAKS IN IRON PIPE.

The following formula is good for this purpose, but must be used as soon as mixed and rammed tightly into the joint or leak:

Five lb. coarsely powdered iron borings, 2 oz. powdered sal ammoniac, 1 oz. sulphur, and enough water to moisten. This cement hardens rapidly. However, the sulphur may be left out and it will set even more firmly, but require a longer time.

KEYS FOR SHAFTS.

Some Common Errors Which Should Be Avoided

Keys for securing pulleys, hubs, gears, flanges and kindred work on shafting are of several kinds: There are the flat keys, the round keys, the oval keys, the oblong keys and even threaded keys. The flat keys are in use for crank shafts of engines, large-sized gears, while the square key is found in use in machine work requiring extra accurate fitting. The illustrations given will assist in distinguishing the different types of strut and feathered keys as found in every-day service in shops, mills and general manufacturing establishments where modern mechanisms are employed.

Figure 1 is the deep setting square key; Fig. 2 the flat key; Fig. 3 the diamond-shaped key and Fig. 4 the round key; Fig. 5 shows the setting of the square key as at A. It is calculated that the sides of the key will sink equally into either part of the union. These square keys can be made to take a very firm grip if tapered right, so as to drive home to the keyway. The oval or partly rounded form of key at B, Fig. 6, is suitable only in special cases. The extremely accurate adjustments of fine mechanical motions cannot be made with this key, unless the work of the parts is light. The key serves for common purposes in light service, however, and may be found in use quite frequently. The diamond-shaped key is not often used. This is shown at C, Fig. 7. The round key is good enough when the parts are of such nature that a true hole may be drilled. Otherwise the key will wobble in an untrue seat and soon loosen and fall out. This key is used sometimes with a threaded shaft, the hole being tapped accordingly.

Sliding Keys.

The sliding feather is commonly utilized for bearings which are required to move from one side to the other in specific work, such as is required in the case of a clutch. This form of key is also used for spindles for drilling machines in which the shafts or the bosses move. The feather is loose in one seat or the other. Often we find that the combination is made with one key only. In other cases the double key system is used, thereby distributing the service. The feathered key is shown at Fig. 9. This key is not only useful for this purpose, but is the kind employed freely in the set unions and other types of key connections. Figure 10 illustrates another combination sometimes seen in shops and mills. This involves the use of two keys, each made alike, with edges binding one upon the other, and fitted to the coupling, flange, gear or wheel by driving one key at a time each from its own side. The keys thereby bind in the center of the work, and usually quite a substantial grip is afforded on the parts.

The Tapered Key Seat.

It is essential that the keyway be accurate in proportions. Key systems often fail because of the fact that the key seat is untrue. Sometimes the seat is made smaller at one end than the other, with the intention of using a straight key. Through error, a beveled key is driven in, with the result that the parts bind incorrectly. The parts hold a little while and then work apart.

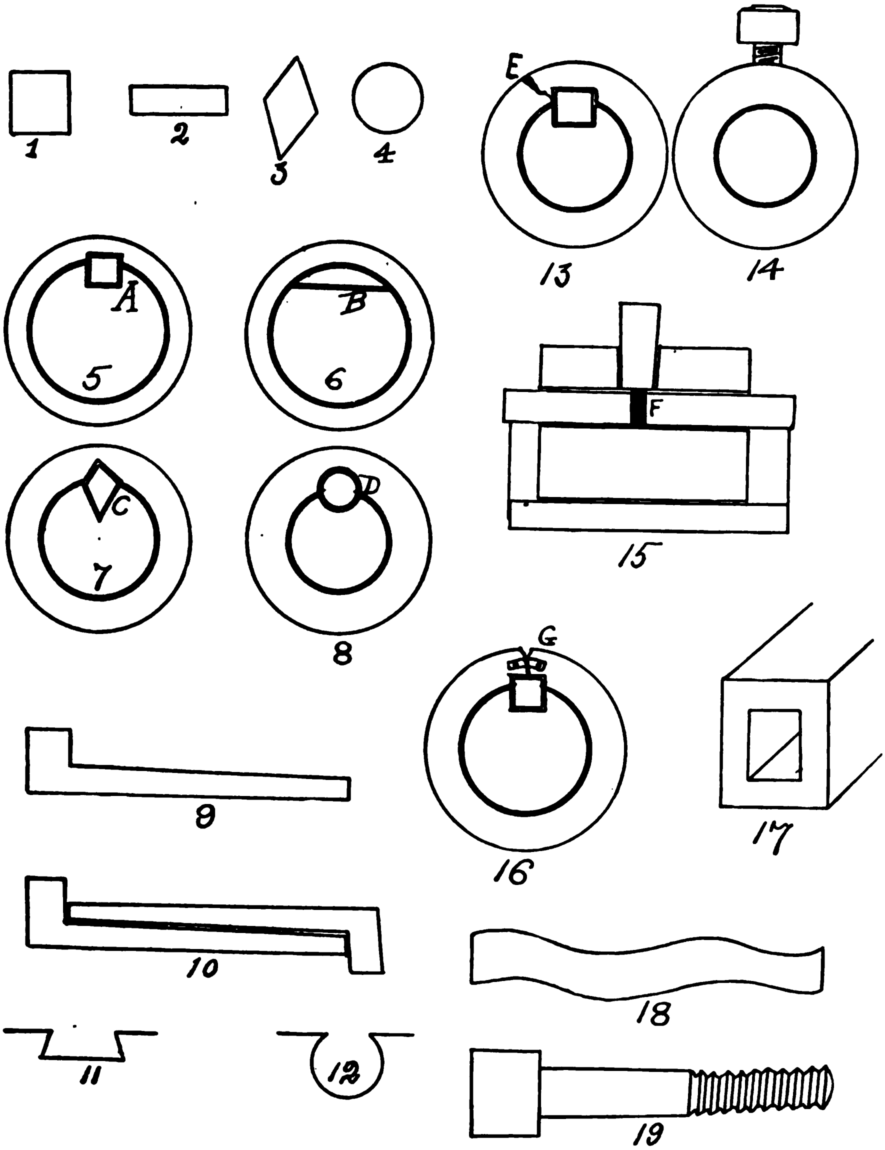
Sometimes the seats are made with a dove-tail idea in mind, as suggested in Fig. 11. This involves the use of a key similarly shaped, with the "head" extended up into the keyway of the opposite part. Then again some machinists employ a keyway of the type exhibited in Fig. 12 for the purpose of utilizing round keys. The round key is driven home and, of course, presents a proportion of the key above the seat line, and this proportion is what grips in the round keyway of the opposing work. These specially formed keys are useful only in the particular cases in which they are employed.

Some Mistreatment of Keys.

Figure 13 is a sketch of what one often notices in shops and power plants. It seems queer that this should be the case, but often a really good man gets careless, and unthinkingly delivers a blow to the key he is driving with such force that the collar or the hub is cracked as at E. The parts may cling together indefinitely, even though fractured. Then again the fact that the collar or hub is split, will cause the key to loosen and work its way out. Then a new collar must go on. Sometimes no collars are at hand, then the fractured collar must be strengthened with a band of metal shrunk around it. The set screw is utilized in place of the key now and then. In Fig. 14 we show the set screw substituting the key. In certain instances both the key and the set screw are used.

The set screw point is arranged to contact with the key, and this serves to hold the key in position. Fig. 15 is a sectional sketching of a combination given to illustrate the carelessness of key insertion at times. This error was observed in a first-class shop. The parts were of such nature that the fastening key had to be driven through the sleeves to the shaft, much as pins are used. The drawing shows the parts at the center bearing where the oil hole is completely closed by the point of the tapering key as at F. This combination ran well for ...s, then the stopping of the oil supply produced heating, grating and wearing off of the metal. The arrangement had to be taken apart and restored with proper key-setting.

In another case a patched collar was used on a shaft, keyed as in Fig. 16. A piece of strap metal G was riveted over the open parts. This developed a weakness in the collar, so that although tight, the key could not retain a positive bite on the metals, and



constantly worked free. The workman would drive the key home with a blow with the hammer now and then. This collar was substituted finally with a perfect one. A hollowed key is shown in Fig. 17. This was made for a large overshot water-wheel shaft of wood. The key itself is constructed from hardwood, with the hollow fitted with a shaft of metal. Thus the big wooden hub of the overshot wheel is secured to its shaft with a wooden key strengthened with a core of metal. The curved key seems to be a strange affair, still they may be found in use. Fig. 18 is a drawing of the snake-like pattern. This key cannot be driven. The seat for the key is modeled out in both the shaft and the hub of the work to receive the curls, and the curled key is dropped into place. It is curved likewise to suit the conditions of the roundness of shaft and hub. Figure 19 is a set screw made in key form. The key is made first, in rounded form, and then the threads are cut. This style of key is practically a threaded shaft.

"MACHINIST."

A NOVEL WAY OF BUSHING A FLY-WHEEL.

In a certain shop, where I worked some time ago, I was amused as well as interested at a job they were doing, writes one of our readers.

In one department of their works they had about a 22-horsepower steam engine, and for some reason or other the foreman of the department wanted a heavier flywheel put on. Finally a little heavier one was found, being about $4\frac{1}{2}$ feet in diameter, 10 inch face and 3-inch bore. The engine crankshaft was $2\frac{1}{2}$ inches in diameter, consequently it required a bushing $\frac{1}{4}$ inch thick.

The job of making the bushing was given to the machine shop and within a few hours it was ready. The bushing was put into the flywheel, and the wheel slipped on to the shaft and tightened. (The foreman of the department was standing watching the job without a word, as he had nothing to say over the machinists.) Finally the engine was started, and to the men's surprise the face of the wheel ran out considerably. They at once set aside to make new bushings, and in the meantime our foreman was getting very angry over what he called a bum job and besides the time lost in stopping the engine.

... looked for a warm time when they 'o bush it the second time, and certainly were not mistaken. When the second bushing was finished and after considerable time spent in getting the old one off, it was finally placed on the engine again, ready to run. When the engine was started it ran out the same as the old one. They stood and watched it for a few minutes, until the boss got mad and told them to go back to their department, that he could do a better job with a rough sheet-iron bushing. The boys were rather offended at this and said he would never get it bushed to run true. "Well," said Mr.——, "I'll bet any one of you $50 that I will take a rough sheet-iron bushing and bush that wheel to make it run perfectly true." This seemed like a one-sided bet in favor of the boys, and they were overly-anxious to take it, and agreed to do so. The boss gave them until next day to get the money. The next day came, but no money was up by the boys, and the boss must have been in good humor, for he went out to the machine shop and told the several machinists who had helped on the job to come in and he would teach them something free of charge.

He straightway set about and took a piece of $\frac{1}{4}$-inch boiler plate and bent it around a shaft until it fitted the flywheel (this bushing was not turned on the outside, but left rough), he then put the flywheel on to the shaft and started up. It ran out ten times as badly as the boys' job and, consequently, they all laughed. But, alas! the job was not done yet, and he evidently had started it to see what they would say; at the same time he knew it would be worse. He never said a word, but picked up a piece of chalk, and while yet running marked the wheel where it was out. When they stopped the engine he took a fuller and, by aid of a helper striking, he caulked the side opposite to where it ran out, and by starting and stopping a few times to chalk and true the wheel, he had done the job within three-quarters of an hour after it was placed on the engine, and a more perfectly running flywheel on an engine you never saw.

This job proved very interesting to me and I thought it was well done, and I trust it will interest all who read it. N. M.

The article "Trimming Arc Lamps by Automobile," appearing in our No-
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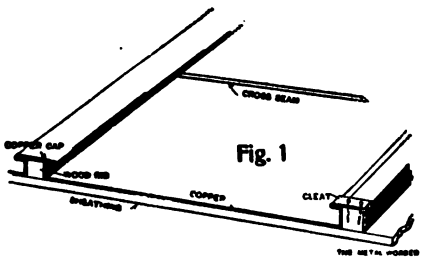
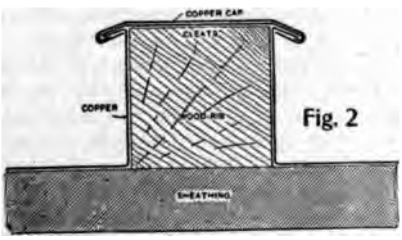
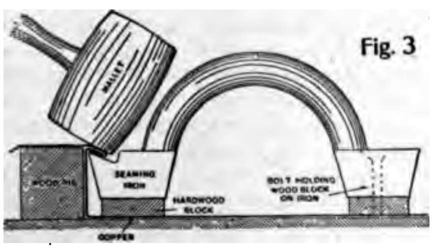
LAYING A COPPER ROOF.

A copper roof laid with 140-lb. copper costs, including material and labor, about $35 per square. Such a roof will last a long time. The Metal Worker gives excellent directions for the work. If a rib roof is desired use dressed wood strips 2 in. square, with the strips 20 in. apart. The cuts show manner of turning the edges. The copper is rolled out and 2½ in. turned up square on each side, then ½ in. is turned in square toward the center of the sheet.







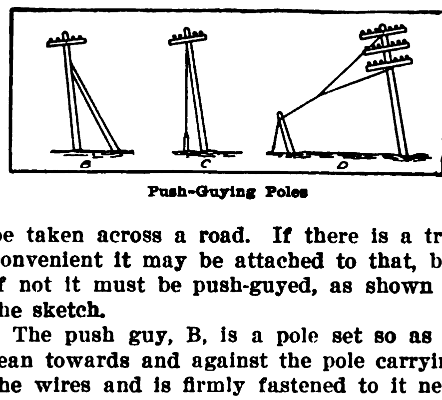
This edge is then cleated at intervals of about 6 or 8 in. to the wood strip. A cap strip of copper, cut about 4 in. wide, is then locked onto the edges of the copper, covering the wood rib and hiding the cleats. No nails should be driven through the copper. The sketch, Fig. 1, shows the method better than any written explanation.

Whether put on with ribs, as above de-
...ed or like a standing seam roof, the
...ut together in rolls the
...referable to use
28-in. sheets.
of copper,
...e ribs are
...ound that
there will be required to cover the space from the edge of one rib to the corresponding edge of the other rib, 4 in. for the cap, plus ½ in. on the top of the course, plus 2 in. up against the rib, plus 18 in. to the next rib, plus 2 in. up, plus ½ in. out, or a total of 27 in. is required to cover 20 in., net, of space.

A nice way of closing up the edges after the caps are put on, and also of turning the same down slightly, is to take an ordinary seaming iron, such as is used on tin roofs, drill two holes through it on each side, bolt on hardwood strips on each side, thick enough to raise the iron to the desired height, and then have it channeled out on one edge to the desired bevel. Then, by running it along the seam, the edges can be closed tight with a mallet and turned down to the angle desired at the same time. This operation is shown in the sketch, Fig. 3.

PUSH-GUYING TELEPHONE POLES.

Sometimes in constructing telephone lines a pole is so located that it cannot be guyed directly to the ground, says the American Telephone Journal, and the guy wire must



Push-Guying Poles

be taken across a road. If there is a tree convenient it may be attached to that, but if not it must be push-guyed, as shown in the sketch.

The push guy, B, is a pole set so as to lean towards and against the pole carrying the wires and is firmly fastened to it near its top. The push guy thus serves to push the pole away from the direction of the strain of the wires. A method of guying a pole from a point near its butt by means of an anchor is shown at C, and D shows a "Y" guy for heavy leads.

TO LETTER ON CANVAS.

In lettering on canvas, if the canvas is first dampened with water, the paint will not spread, nor will it dry too soon.

BRAZING CAST IRON.

Brazing cast iron is no longer one of the things which cannot be done. On the contrary, in the hands of an experienced workman the results are extremely satisfactory. In places remote from sources of quick supply the process is almost invaluable. A correspondent in the Blacksmith and Wheelwright tells his method.

We take a hack saw and put into the broken parts like Fig. 1, then we put in

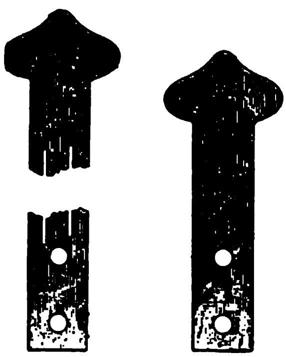


Fig. 1 Fig. 2

Brazing Cast Iron

a piece of steel like Fig. 2 to hold the parts in place while brazing, then place in the forge and apply the brazing compound. Powdered borax will answer the purpose, but leaves more scale on than the brazing compounds. After the iron is heated to a bright red and the flux has flowed over the joints, apply the brazing spelter with an iron (one-fourth inch flattened on one end will do) and heat until the brass flows freely over all parts of the joint; then remove from fire and let cool slowly. If plunged in cold water while hot the sudden contraction may spoil the brazing. We use a three-burner gasoline brazing forge, and can do a much better job on it than can be done in an ordinary forge. There is not as much danger of burning the iron and one can always see what he is doing, besides it makes a much cleaner fire than coal.

We have successfully brazed brass castings and some very difficult iron castings. We do a large amount of boiler work, such as retipping flues, etc., and braze all the flues, making a much neater and stronger job than can be done in welding, and consider this forge as one of the best invest- a smith can make, as many times it will save a thresherman or farmer a delay in the busy season. In successfully brazing cast iron all grease should be removed and paint (if there is any) should be removed from the near joint.

AUTOMATIC ELECTRIC CIRCULAR SAW MILL.

A man who owns a large plantation on the island of Sumatra has invented an automatic electric circular saw mill which is a great improvement in this line.

Two kinds of mills have been fitted up—log saws and resaws and in both the saw is fed along the log instead of feeding the log to the saw. In the log saw mill an iron track is made fast to the middle line of the log by means of clamps extending down to grip the center of the log. A carriage bearing a small electric motor runs on this track and on the under carriage is a cross carriage which can be rotated about a vertical axis by means of a handwheel and a screw. This cross carriage bears the principal motor that carries the saw. The small motor feeds the carriage along the track and the large motor runs the saw through the wood during the cut. By means of the cross carriage or slide the saw can be fed across the log the width of the board to be cut plus the kerf and by turning the carriage on the vertical axis the saw can be turned 90 degs. about the axis and makes a cut in the reverse direction at the same speed as in the first cut. This avoids shock at the reversing points and also saves time.

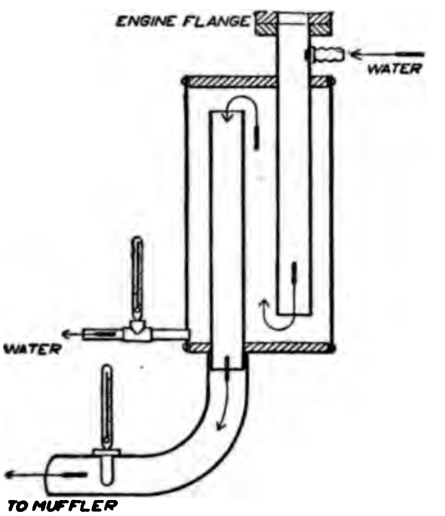
"The resaw," says a correspondent of the Wood-Worker who saw the invention in operation, "is lighter and more simple. The balks or planks are laid on round wooden supports and piled up to the maximum height of one foot. The planks are clamped together. The track and carriage are then set on the pile and fastened thereto by clamp bolts at the ends."

Power can be brought any distance to the machine by insulated wires, in this instance it was brought a distance of 3250 yds. and for small logs 60 h. p. was required.

Twenty-eight-inch logs can be cut by a saw 6 ft. in diameter. For logs larger than this a cut is made to the depth the — can handle and the saw is then — degs. about its axis — the opposite be the sa— for a li— [illegible]

MEASURING WASTE HEAT FROM GAS ENGINES.

A method of measuring waste heat carried off in the exhaust from gas engines consists of a calorimeter mounted in the course of the exhaust gases, close to the engine, in which the gases are cooled by jets



Method of Measuring Waste Heat from Gas Engines

of water in such a way that the temperature of the entering and outflowing water can be readily ascertained. A very simple form of this device is shown in the sketch by means of which the gases from a 10-hp. engine were cooled to 107 deg. F.

The calorific value of the gas supplied to the engine was determined and its quantity measured, while the indicated horsepower, the rise in temperature of the circulating water, and the heat carried off in the exhaust were observed. The engine had a cylinder 7 in. in diameter, and a stroke of 15 in., and ran at 250 revolutions per minute.

The results showed that the jacket water carried off 32 per cent of the heat energy supplied to the engine, the exhaust gases gave up 34.5 per cent to the calorimeter and ay 1.5 per cent to the chimney, work amounted to 26 per w. leaving 6 per cent erature of the F. in the it was at icated horsepower was 14.2. The missing 6 per cent was mainly attributable to radiation and conduction from the engine.

RECIPES FOR POLISHING BRASS.

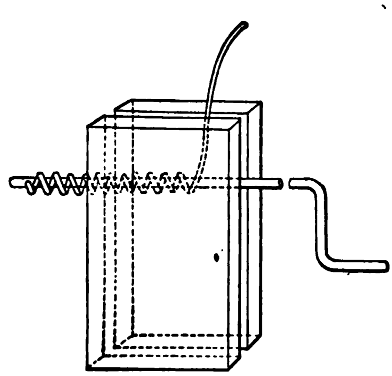
Three parts oxalic acid dissolved in 40 parts hot water; add 100 parts powdered pumice stone, 2 parts oil of turpentine, 12 parts soft soap and 12 parts fat oil.

Or: Four oz. rottenstone, 1 oz. oxalic acid in fine powder, 1½ oz. sweet oil, enough turpentine to make a paste.

SIMPLE METHOD OF WINDING COIL SPRINGS.

Coil springs of any pitch and of wire up to ⅛ inch in diameter may be wound by the simple device shown in the illustration, says a correspondent of the American Machinist. Make a winding mandrel of a piece of iron rod about 1-32 inch smaller than the inside diameter of the spring is to be. Bend a crank on one end and drill a hole for a wire inlet. Near the other end clamp two softwood blocks in the vise with the mandrel in position, small hole up. Insert the wire and turn the crank.

The pitch can be regulated by holding the wire at the proper angle. When the



Winding a Coil Spring.

spring reaches the outside of the blocks it has cut grooves in the wood corresponding to the pitch of the spring. On short springs the pitch can be duplicated, or a spring can be made of any length by opening the vise slightly, pulling back the mandrel and clamping the spring to the mandrel with a lathe dog. Springs made in this way acquire a good polish.

A TABLE OF PRINCIPAL ALLOYS.

A combination of zinc and copper makes bell metal.

A combination of copper and tin makes bronze metal.

A combination of antimony, tin, copper and bismuth makes britannia metal.

A combination of copper and tin makes cannon metal.

A combination of copper and zinc makes Dutch gold.

A combination of copper, nickel and zinc, with sometimes a little iron and tin, makes German silver.

A combination of gold and copper makes standard gold.

A combination of gold, copper and silver, makes old standard gold.

A combination of tin and copper makes gun metal.

A combination of copper and zinc makes mosaic gold.

A combination of tin and lead makes pewter.

A combination of lead and a little arsenic, makes sheet metal.

A combination of silver and copper makes standard silver.

A combination of tin and lead makes solder.

A combination of lead and antimony makes type metal.

A combination of copper and arsenic makes white copper.

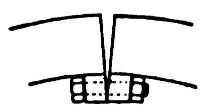
WHY FLYWHEELS BURST.

A simple explanation of the operation of a flywheel in bursting appears editorially in Page's Weekly, London, as follows: The tension upon the rim of a revolving wheel augments as the square of the velocity—that is to say, supposing for the moment that we had a wheel with a rim a foot square, revolving at the rate of 100 feet per second—the material being cast-iron—the total resolved forces tending to tear the rim asunder would be, say 144,000 pounds. Now, imagine this velocity to be increased by the failure of the governor to act, or otherwise, to 150 feet per second, or one and a half times as fast as before—a perfectly possible case and we have 324,000 pounds to deal with. Double the original speed, and we have [illegible] pounds.

Just one more fact about our hypothetical wheel before we turn these figures to account. Supposing the wheel to break up stress due to the last-named sp—200 feet per second—there is energy resident in that rim sufficient to project any part of it which might happen to be discharged vertically 600 feet into the air. This will give some idea of the potential force lying dormant in a flywheel. A well-known American writer who has made this subject his specialty, thus records his opinion: "A flywheel is just as dangerous as a boiler, and should be subject to inspection in like manner. The time to investigate a flywheel is during its lifetime, and the one to investigate it is a trained inspector, who can pronounce intelligently on its safety, or condemn it if dangerous."

The bursting speed of a solid cast-iron rim—i. e., without joints and free from contraction stresses, is about 425 feet per second. If the rim be built up of several parts, the sectional area at the joints may be reduced by recessing for dowels or cramps, to an extent which at once lessens its ultimate strength by one-half. It is too much to expect the joints to be of equal strength with the solid metal, but in proportioning the relative sectional areas of cast-iron rim and steel bolts or cramps it is not difficult to arrange them inversely as their respective tensile strengths, and so obtain the maximum efficiency.

Wheels with deep rims should never be joined by internal flanges and bolts; centrifugal force tends to open the joint and bring a leverage to bear upon the bolts which may be as much as four to one, compared with the same bolts in direct tension.



In the case of thin-rimmed wheels, as rope or belt pulleys, for example, where internal flanges are almost a necessity, this leverage is not nearly so pronounced, but still it exists, and should be taken into account.

Each rim-section of a wheel, built up of segments with the joints midway between the arms, is in the condition of a beam supported at the ends, and uniformly stressed. The maximum bending moment occurs, of course, at the centre of the beam, and consequently the joint is in the least favorable position possible. It should be either at the arm or as near to it as practicable.

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PISTON RINGS.

A correspondent to the National Engineer writes as follows regarding the development of piston rings, and the advantage of steel packing rings over cast-iron rings:

Many years ago railroad master mechanics employed spring steel packing rings in the cylinders of locomotives, and at first they thought they had a good thing. The piston consisted of a spider, a follower, a spring steel bull-ring set out by three elliptic springs and two spring steel packing rings. The packing wore down very rapidly and the engineers were continually complaining of "blowing" pistons, which necessitated constant setting out of the packing. After some time the use of steel rings was abandoned, and babbitted brass packing rings substituted for them, the same spider, etc., being retained. This packing gave better satisfaction than the steel rings, but still it did not completely fill the bill, since the engineers still complained of "blowing" pistons. Later on a man named Dunbar invented a steam packing. This packing was made entirely of cast iron, and consisted of a large number of segments of a circle, and it was set out by the action of the steam in the cylinder. This packing was durable and gave most excellent satisfaction, but there was one objection to it, and only one, but a serious one—it was entirely too expensive to make and fit in the different sized cylinders. After a time a man named Stevenson invented a substitute for Dunbar packing. Stevenson packing consisted of a cast-iron solid bull-ring—that is, the ring was not cut across—and two cast-iron packing rings. The bull-ring was centered on the piston and then pinched in place by the follower. The packing rings were cut across diagonally, and they were set out by their own tension. This packing was cheap to make and gave the best of satisfaction. After a time master mechanics came to the conclusion that they could very well dispense with Stevenson's bull-ring and follower while retaining his cast-iron packing rings. This led to the adoption of the ...d solid piston with two grooves sunk in ... packing rings, which, as in ...re set out by their own ...ngement makes the ...a ever put into a ...ing-steel con- ... while the ...contains 3½ per cent of carbon. Thus it will be seen that the packing rings when made of spring-steel—the softer metal—will wear down very rapidly.

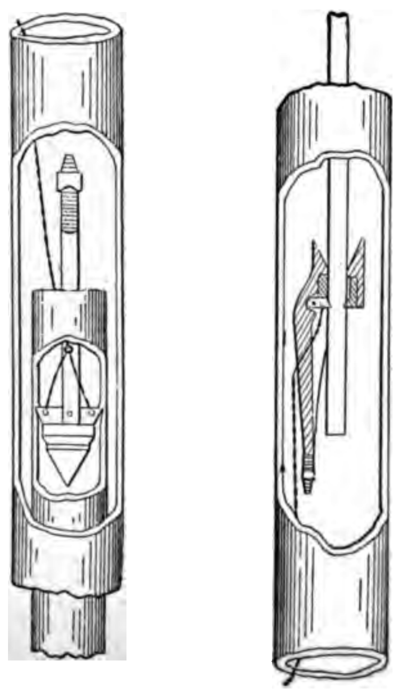
TO PREVENT WATER FROM FREEZING.

A fire insurance company in one of its reports calls attention to the use of chloride of calcium in small quantity at little cost in buckets and pails where the water may freeze in very cold weather. This material can be had on a large scale. It tends not only to prevent freezing but in a certain measure acts like salt in preserving the water from deterioration.

FISHING TOOLS FOR USE IN DEEP WELLS.

The job of fishing broken rods from deep wells has occasioned many a man no end of trouble and loss of time. A correspondent of Power has devised a tool for fishing for rods and another for pipes which he used successfully for this purpose. He says:

"I had a 4-in. pipe 21 ft. long drop to the bottom of my 300-ft. well, wedging itself



Tools for Fishing Broken Rods and Pipe Out of Wells in a tapered hole. It had a coupling on the lower end and it was no easy matter to pull it. Having broken several tools, I designed this one which did the trick, standing a pressure of about 25 tons on the jacks before it loosened. You will see I have applied the same method for lifting rods. I use different sized bushings for various sized rods. The pawl works against a bearing in the carrier and has an oblong hole so as to relieve the shearing strain on the rivet. The ring on one tool and the bushing on the other are the fulcrum for the pawls to rest on.

POWER REQUIRED FOR AIR LIFT.

The following data may be of interest to readers who have to deal with the air lift, says A. H. Goff of Roswell, N. M., in the Engineer. For the proper working of an air lift a certain amount of submergence is necessary. For the most economical and efficient results a submergence of 60 per cent should be used. That is, 60 per cent

RATIO OF WATER TO AIR REQUIRED.

For Lifts Not Exceeding					
25 feet	2	vols. of air	to	1	of water
50 feet	3	vols. of air	to	1	of water
75 feet	4½	vols. of air	to	1	of water
100 feet	6	vols. of air	to	1	of water
125 feet	7½	vols. of air	to	1	of water
150 feet	9	vols. of air	to	1	of water
175 feet	10	vols. of air	to	1	of water
200 feet	12	vols. of air	to	1	of water

VOLUME OF FREE AIR, AIR PRESSURE, SUBMERGENCE AND HORSEPOWER.

Lift Ft.	Submergence Ft.	Air pressure.	Free air per min Cu. ft. per gal.	I. HP. per gal.
25	38	17	0.3	0.0184
50	75	33	0.4	0.0426
75	113	49	0.6	0.0828
100	150	65	0.8	0.1320
125	188	82	1.0	0.1910
150	225	98	1.2	0.2544
175	263	115	1.4	0.3150
200	300	130	1.6	0.3808

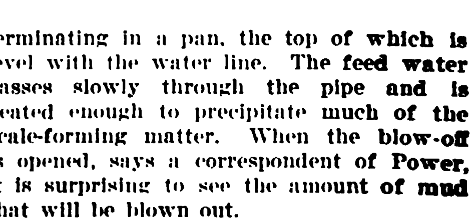
of the total length of the water discharge pipe should be below the water level in the well when pumped to its full capacity. For instance, let us assume that in a well 200 feet deep when pumping the water sinks to 40 feet below the surface of the ground, and it is desired to lift the water 20 feet above the surface of the ground. This gives length of pipe 60 feet to the water level in the well, and, as this does not include the submerged part of the pipe it is only 40 per cent of the total length of water discharge pipe, the total length will, therefore, be 60 feet plus 1½ times 60 or 90 feet submergence, making a total length of 150 feet of water discharge pipe.

It is not safe, unless under very favorable conditions, to figure on raising the water by the air lift system more than 200 feet above the lowest water level in the well. Nor is it always safe to extend the horizontal discharge more than 500 feet, as the air lift is not adapted to pumping horizontally to any great distance, unless reinforced by a pneumatic direct pressure pump, or an ordinary piston pump. Either of which, however, could be operated by compressed air from the same pipe that supplies the well.

Suppose, for instance, that it is desired to lift 120 gallons of water 100 feet high per minute. It will be seen by the above table that this will require 150 feet submergence, thus making 250 feet of water discharge pipe, 65 pounds air pressure, 96 cubic feet of free air per minute and a compressor developing 15.84 horsepower.

GOOD ARRANGEMENT OF BOILER FEED AND BLOW-OFF.

A very satisfactory arrangement of an internal feed pipe and a blow-off connection is shown in the accompanying sketch. The pipe, which is larger than is generally used, makes a circuit of the boiler, entering at about the water line at the front head and



BOILER FEED AND BLOW-OFF ARRANGEMENT.

terminating in a pan, the top of which is level with the water line. The feed water passes slowly through the pipe and is heated enough to precipitate much of the scale-forming matter. When the blow-off is opened, says a correspondent of Power, it is surprising to see the amount of mud that will be blown out.

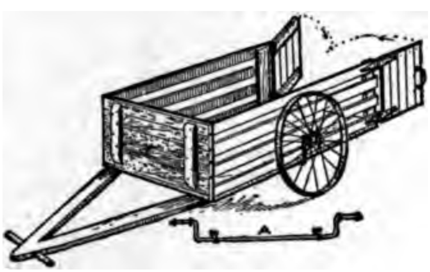
TO MAKE BLUEPRINTS BROWN.

Young as well as older photographers may be interested in learning how to make blueprints turn brown. The method is simple. Dissolve a piece of caustic soda the size of a kernel of corn in about five ounces of water. Immerse the blueprint in this till the print changes to an orange yellow. Then wash the print thoroughly in a bath composed of a heaping teaspoonful of tannic acid dissolved in eight ounces of water. You may leave the print in this mixture till it has become the desired tint of brown, after which thoroughly wash the print and allow it to dry slowly.

HOW TO BUILD A STOCK CART.

Any farmer can make his own stock cart after the manner of the one shown in the illustration and will find it a great convenience whether he has much stock or not.

The cart has a drop axle (A) worked over at a blacksmith forge from two discarded buggy axles. It should be left standard track width and have pieces 1 ft. long inserted near the stubs at each end to form the drop. This is to bring the bed nearer the ground. The bed can be made of any lumber about the farm and should be just the width to fit into the axle



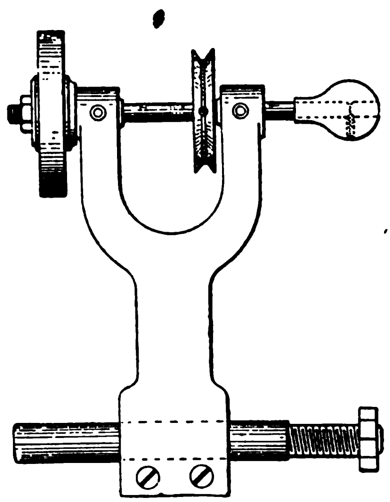
A Handy Stock Cart

and 5 ft. in length, and bolted to the axle near the middle of the bed. Bolt a cart handle on the front and fit the rear with two doors and a strong latch. Mount the whole on wheels and, according to a correspondent of the Ohio Farmer, you will have a "stock chariot" which cannot be surpassed.

This cart can be readily backed up, when mounted upon wheels, to any pen, the rear-end dropped to the ground, doors closed behind, the cart attached to the rear of any other vehicle, and the animals transported as many miles as desired, with ease. By making the front end-gate and cart handle detachable, this "rigging" can be wheeled up to the rear of a wagon and used for a chute in loading hogs or sheep.

DEVICE FOR TRUING COLLECTOR RINGS.

The machine shown in the sketch was fitted up by a correspondent of the Engineer, for truing up badly worn cast-iron rings on



Machine for Truing Collector Rings

a G. E. compensated revolving field alternator. He describes its operation as follows:

The emery wheel is passed across the rings while the machine is running slowly. The wheel is run at a speed of 3000 revolutions per minute by a small motor. It puts the rings in fine shape and saves taking the head to a machine shop. Then, too, while turning the rings they are liable to get out of place. Strips bolted in where the brush-holder is taken off and the rig clamped to the bolt by two screws, the bottom of the casting being split to insure a tight grip, will serve the purpose.

Very few people can draw two different pictures simultaneously, but an Englishman, Sir Edward Landseer, recently proved that he could. With the right hand he drew the profile of a stag's head with antlers, complete, while with the left he drew a horse's head. One drawing was as good as the other and the acts of draftsmanship did not alternate.

Tables Showing the Percentage of Cotton, by Weight, on Magnet Wires of Various Sizes

These Valuable Tables, Which We Have Not Seen Anywhere in Print, are Contributed by W. S. Holmes

RECTANGULAR WIRES.

Single Wound.

Size.	Per Ct.
.070 x .050	.019
.074 x .056	.0175
.090 x .054	.017
.092 x .050	.0175
.095 x .075	.013
.100 x .050	.015
.100 x .065	.014
.100 x .074	.013
.100 x .080	.0115
.105 x .090	.011
.122 x .095	.010
.125 x .070	.0125
.125 x .115	.0095
.135 x .095	.0095
.140 x .505	.015
.200 x .030	.017
.200 x .042	.012
.200 x .070	.012
.215 x .055	.012
.215 x .090	.008
.225 x .028	.0175
.232 x .020	.022
.240 x .075	.011
.250 x .075	.011
.260 x .064	.0105
.270 x .070	.010
.280 x .062	.0105
.280 x .095	.007
.300 x .080	.009
.300 x .110	.0065
.310 x .060	.012
.320 x .075	.0095
.320 x .082	.009
.320 x .125	.0055
.330 x .035	.019
.335 x .115	.006
.340 x .045	.014
.340 x .088	.008
.350 x .080	.009
.350 x .090	.008
.355 x .075	.009
.355 x .120	.008
.360 x .100	.007
.360 x .105	.0065
.360 x .110	.008
.370 x .064	.0095
.375 x. 075	.0085
.375 x. 090	.008
.380 x .065	.0095
.390 x .110	.008
.420 x .115	.008
.435 x .110	.008
4375x .065	.009
.460 x .080	.0085
.490 x .105	.008
.5625x .084	.008
.550 x .110	.0065
.675 x .052	.011

Round Wires.

No.	Size.	Per ct. S. W.	Per ct. D. W.
2	.2576		.010
3	.2294		.011
4	.2043	.007	.012
5	.1819	.008	.013
6	.1620	.009	.014
7	.1443	.010	.016
8	.1285	.011	.018
9	.1144	.013	.020
10	.1019	.012	.022
11	.0907	.013	.024
12	.0808	.015	.027
13	.0719	.018	.030
14	.0640	.021	.033
15	.0571	.022	.037
16	.0508	.026	.041
17	.0453	.030	.046
18	.0403	.033	.055
19	.0359	.036	.059
20	.0320	.038	.062
21	.0285	.040	.070
22	.0253	.041	.080
23	.0226	.045	.094
24	.0201	.051	.097
25	.0179	.048	.100
26	.0159	.052	.115
27	.0142	.060	.135
28	.0126	.072	.155
	.0113	.087	.190
30	.0100	.010	.210
31	.0089	.011	.220
32	.0080	.125	.250
33	.0071	.150	.300
34	.0063	.170	.340

Square Wires.

Size.	Per ct. S. W.	Per ct. D. W.
.068 x. .068		.026
.064 x .064	.016	.026
.075 x .075	.015	
.072 x .072	.013	
.077 x .077		.023
.081 x .081		.023
.085 x .085	.012	
.0907 x .0907		.021
.098 x .098	.011	
.108 x .108		.017
.1144 x .1144		.019
.120 x .120	.008	
.121 x .121	.008	.017
.128 x .128		.016
.135 x .135		.015
.143 x .143		.012
.162 x .162		
.187 x .187		
.195 x .195		
.325 x .325		

RECTANGULAR WIRES.

Double Wound.

Size.	Per ct.
.034 x .071	.026
.092 x .071	.023
.100 x .050	.032
.100 x .063	.028
.100 x .085	.021
.104 x .091	.020
.110 x .096	.019
.120 x .050	.027
.122 x .105	.018
.125 x .040	.034
.125 x .075	.023
.125 x .095	.019
.130 x .070	.025
.130 x .100	.020
.131 x .090	.021
.141 x .109	.017
.141 x .095	.018
.145 x .119	.015
.145 x .128	.015
.150 x .035	.034
.150 x .040	.030
.150 x .100	.018
.150 x .110	.018
.155 x .080	.020
.158 x .142	.015
.160 x .100	.018
.160 x .110	.016
.162 x .127	.015
.170 x .060	.024
.170 x .075	.020
.170 x .090	.020
.170 x .100	.016
.175 x .075	.020
.175 x .109	.015
.176 x .130	.014
.178 x .157	.013
.180 x .040	.029
.180 x .045	.028
.180 x .060	.019
.183 x .077	.020
.185 x .075	.020
.185 x .090	.019
.185 x .125	.014
.187 x .050	.027
.190 x .060	.027
.190 x .145	.013
.192 x .087	.019
.200 x .020	.053
.200 x .035	.032
.200 x .086	.018
.200 x .095	.019
.200 x .105	.018
.200 x .120	.015
.210 x .070	.022
.210 x .125	.014
.210 x .155	.011
.215 x .085	.019
.215 x .105	.015
.215 x .140	.013
.219 x .167	.010
.220 x .045	.028
.220 x .070	.022
.220 x .095	.018
.220 x .115	.015
.220 x .120	.014
.220 x .125	.013
.220 x .193	.0095
.225 x .022	.051
.225 x .025	.046
.225 x .055	.027
.230 x .190	.010
.232 x .132	.013
.232 x .162	.011
.232 x .180	.011
.235 x .075	.019
.235 x .085	.018
.240 x .095	.017
.250 x .050	.025
.250 x .062	.021
.250 x .069	.035
.250 x .080	.021
.250 x .093	.017
.250 x .095	.017
.250 x .100	.015
.250 x .125	.014
.260 x .040	.030
.260 x .060	.021
.260 x .100	.017
.265 x .185	.011
.270 x .090	.016
.275 x .110	.018
.280 x .034	.032
.280 x .080	.020
.280 x .115	.014
.280 x .120	.014
.280 x .180	.012
.282 x .063	.020
.290 x. 052	.026
.290 x .084	.019
.295 x .115	.014
.300 x .050	.028
.300 x .055	.026
.300 x .080	.019
.300 x .100	.014
.300 x .107	.014
.300 x .110	.014
.300 x .115	.014
.300 x .120	.014
.300 x .140	.011
.310 x .060	.023
.310 x .065	.022
.310 x .120	.013
.320 x .105	.015
.325 x .160	.011
.340 x .040	.025
.340 x .050	.023
.340 x .060	.022
.340 x .080	.019
.340 x .090	.016
.340 x .100	.014
.340 x .125	.013
.340 x .175	.009
.345 x .100	.014
.350 x .100	.014
.350 x .130	.011
.360 x .085	.018
.365 x .132	.011
.370 x .072	.019
.370 x .100	.014
.370 x .140	.010
.370 x .250	.008
.375 x .070	.019
.375 x .090	.015
.380 x .034	.085
.400 x .029	.038
.400 x .070	.019
.400 x .085	.018
.400 x .090	.015
.400 x .110	.014
.400 x .115	.013
.400 x .140	.010
.415 x .055	.026
.420 x .095	.013
.420 x .125	.011
.450 x .120	.012
.455 x .024	.060
.460 x .070	.019
.475 x .100	.013
.500 x .090	.015
.500 x .095	.013
.500 x .100	.013
.500 x .110	.012
.500 x .120	.012
.520 x .060	.021
.535 x .085	.015
.540 x .125	.011
.550 x .100	.013
.563 x .100	.013
.570 x .125	.011
.575 x .105	.012
.650 x .105	.012

TO BLACKEN BRASS.

A—Nitrate of silver, 120 grains; water, 5 ounces; B—Nitrate of copper, 120 grains; water, 5 ounces. Mix in equal quantities sufficient to cover the piece of metal which has to be blackened. Cleanse the brass of

in hot soda water and dip in the

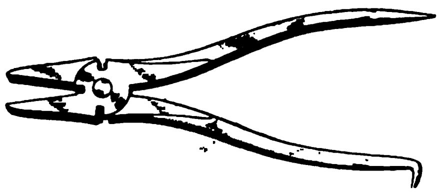
tion. then heat it in an oven un-

WIRE SOLDER.

Tin, one part; lead, one part; bismuth, one-half part. Melt together and pour through a perforated dish onto a stone or metal slab, moving the dish along as the solder runs through and cools. Some prefer to use a funnel with a fine orifice instead of the perforated dish in pouring the solder on slab.

TOOL FOR USE IN LACING BELTING

A very handy tool for use in lacing belting consists of a pair of ordinary pliers having one end made into a hook for use in taking out old belts, which is usually very difficult, and the other sharpened to a point like an awl, so that, should the holes in the new belting be a trifle too small they can be punched to suit. The pliers are used to grab the lace when it is started. In stretching bolting silk or any cloth, the pliers, having the nose ground thin, are very handy for holding the cloth while tacking or nailing.



Handy for Lacing Belts

The pliers may be used also for cutting wires, or cutting wire nails shorter when the right size is not on hand.—Contributed by J. F. Gunsolley, Independence, Mo.

A GOOD METHOD OF REPAIRING RUBBER ARTICLES

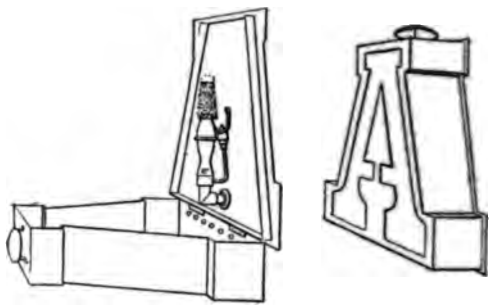
Cut up into tiny bits a 1½-in. square piece of red rubber, put it into a bottle, pour a teaspoonful of chloroform on it, and cork it up tightly. Let stand for ten minutes, when it will be melted sufficiently for use.

Cut a piece of rubber dam considerably larger than the place to be mended, and if the hole is large take a few stitches in it. Wet the impaired article with chloroform and as quickly as possible apply a layer of the melted rubber over as large a surface as the piece of dam you have cut. Use a small stick for applying the melted rubber. Wet the dam with chloroform and stick it on. If the hole is very bad, a second piece of the dam and more of the melted rubber may be used. Five cents' worth each of the red rubber and the dam will suffice and the remainder of the melted rubber may be used again by adding chloroform.

The little kink that saves you trouble and labor every day or week would help the other mechanic, too, if he but knew it. Send us a rough sketch and brief description. This department is for men of every cra[illegible] t includes you.

GASLIGHT FLASH SIGNS FOR SHOW WINDOWS

Flash signs for show windows using gas instead of electricity may be fitted up so satisfactorily that the effect produced is quite the equal of that produced by the electric flash sign, says a correspondent of the Acetylene Journal.



Gas Flash Light for Signs

A diaphragm having a varying pressure upon it regulates the flow of the gas. When enough gas for a flash has entered the pipe, the diaphragm is forced up and automatically works a plug in a supply pipe. By this means a small quantity of the gas is let into the lamps at regular intervals, makes for an instant a flash of bright light and then goes out, except the little point of light which keeps the burner going.

The illustration shows how the gaslight flash signs are managed abroad. The lower part of the letter is hinged at the bottom and each letter is a sheet iron lantern with a reflecting back wall and fitted inside with an incandescent lamp. The front of the lantern is of opal glass to show up the characters. To prevent overheating and undue action of the wind, the air currents are carefully calculated. Clockwork regulates the flow which acts upon the gas supply to each letter, and each letter has a separate outlet, all being controlled by the rotation of the same cylinder.

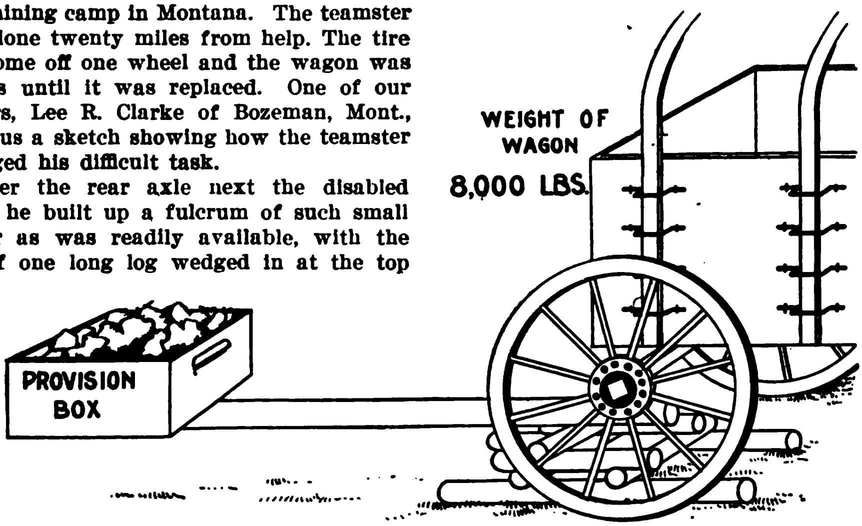
The consumption of coal gas per letter is about half the full consumption of the incandescent burner used, and for ten letters, ten incandescent burners are enough, with a consumption of about 4.5 cubic feet each —that is, about 2.25 cubic feet of coal gas each in actual use, while with electricity 122 [illegible] candles each would be re[illegible] [illegible]rrespondi[illegible]

SHOP NOTES

REPAIRING A WAGON LOADED WITH 8,000 LBS. OF MACHINERY.

A wagon loaded with heavy machinery, wagon and load together weighing 8,000 lbs., broke down while on the way to the Crooke City mining camp in Montana. The teamster was alone twenty miles from help. The tire had come off one wheel and the wagon was useless until it was replaced. One of our readers, Lee R. Clarke of Bozeman, Mont., sends us a sketch showing how the teamster managed his difficult task.

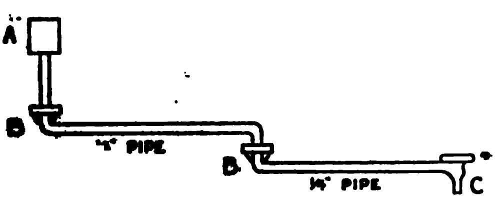
Under the rear axle next the disabled wheel he built up a fulcrum of such small timber as was readily available, with the end of one long log wedged in at the top next the axle to serve as a lever. At the other end of this log was fastened a provision box, and into this were piled rocks until the weight was sufficiently great to bear down the end of the pole on which it rested, and so lift the wagon resting on the other end, when the wheel was easily repaired.



Repairing a Loaded Wagon.

A HANDY SHOP LAMP.

A very handy shop lamp may be made in the manner shown in the sketch. A is the



Shop Lamp.

swivels, and C is
be used.
any position,
shop use.—

WHAT TO DO IN CASE OF INSENSIBILITY OR UNCONSCIOUSNESS.

Concussion or stunning, caused by blows or falls upon the head or fall upon the feet, may cause mental confusion for a time, and may be accompanied by laceration of brain substances with hemorrhage and clot.

Alcoholic intoxication closely resembles apoplexy. Every doubtful case should be treated the same as cases of apoplexy until the attending physician has decided which is the condition.

In all cases, before the arrival of a physician, it is safe to secure quiet and rest by laying the person flat upon the back, with the head a little raised; heat may be applied to the body if it should appear cold. If there should be great heat of the surface, especially during very hot weather, cold may be applied to the body and head, or the body rubbed with ice. Use no whisky or wines.

The cautious inhaling of smelling salts or hartshorn, followed by some warm drink, may be permitted, provided there is a long wait before the arrival of the physician. But all this must be done with care, with the head lifted up so that the patient may drink more readily, for in this condition the liquids are liable to enter the lungs instead of the stomach, if poured in too rapidly

ANOTHER PUMP-ROD FISHING DEVICE.

A description of another device for fishing broken pump rods is sent us by E. H. Harrison, of Dallas, Tex. He writes:

We have a well 1,230 ft. deep from which we have to pump our water, using a large lift pump. The rods are coupled together,

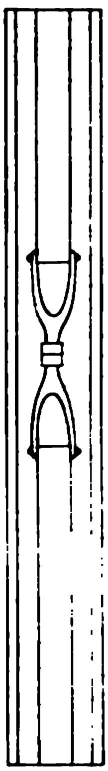


Fig.1.

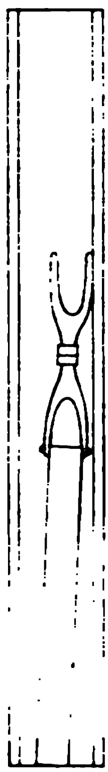


Fig.3.

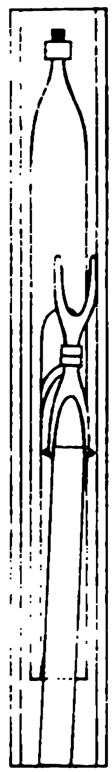
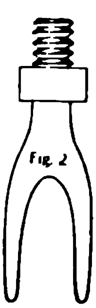


Fig.5.



with couplings as shown in Fig. 2, with the end of the rod put in the fork of the coupling and fastened there with brads, Fig. 1, and the couplings having male and female ends are screwed together.

Sometimes the rod pulls out of the fork leaving it in the shape shown at Fig. 3, with the fork against the side of the casing, making it very unhandy to get at. The cheapest and quickest method of fishing them out is as follows:

A fishing trap as in Fig. 4 is made, using 3-in. pipe, with a 2-in. slit about 4 ft. long in one side, with a steel dog on the opposite side to catch under the shoulder of the coupling. The slit in the pipe allows the fork to pass up the pipe far enough to allow the dog to catch under the shoulder of the coupling as in Fig. 5. Where the rod is broken the pipe without the slit is used.

BORING TENONS ON WAGON SPOKES.

Boring tenons on wagon spokes is a hard job where a common brace is used and one which requires a great deal of muscular power. Nearly every shop nowadays, however, is provided with an upright self-feed drill, which reduces the difficulties to a minimum.

To bore the tenons, make a small countersunk hole in the floor perfectly plumb under the drill shaft. Fit the spoke auger so it will run true and straight, put the wheel in place and proceed as though drilling a hole. The tenons will be perfectly straight and square with the wheel, every one alike, and the job done with no hard work.—Contributed by W. H. Raymond, New Sharon, Ia.

A GOOD CEMENT FOR CRACKED IRON POTS.

Knead 60 parts of clay and 10 parts of iron filings with linseed oil to make a thick paste. Add a little linseed oil just before applying and let it dry slowly. Will harden in two or three weeks.

OIL CEMENT FOR PORCELAIN.

Into 10 parts boiling linseed oil previously boiled stir 20 parts white lead and 12 white pipe clay. Knead the mass thoroughly. Let articles cemented stand several weeks to harden.

The height of a column of water in feet multiplied by .434 gives its pressur-
po

HOW TO BURN CHARCOAL.

First get good sound wood, black jack, black oak, elm, cedar, pine or walnut, and cut in four-foot sticks. Build a three-cornered pen out of wood eighteen inches across and about four feet high, says a writer in the Blacksmith and Wheelwright. Then begin to stack the wood on it and around the pen. Stack it close, and when you have a space large enough on top of the stacked wood, build the three-cornered pen higher. Then begin to stack short wood on its end until you can use long wood again, and so on. Then cover the wood with straw or hay about two inches deep. Have the straw even and as smooth as possible. Then begin to cover with dry dust and cover as thin with dirt as possible. Open a hole in the top of pit where the pen is and drop the pen full of chunks that are afire in order to start the pit to burning. Then make about five or eight holes at the bottom of the pit to give it air. Don't let it burn too fast. When it is well afire cover the top with short chunks, and straw and dirt; watch it closely. Punch a few small holes in the pit at the top to allow the smoke to

When the smoke is blue, stop

blue smoke is coming out

ite as much air at

m.

into coal next

the dirt

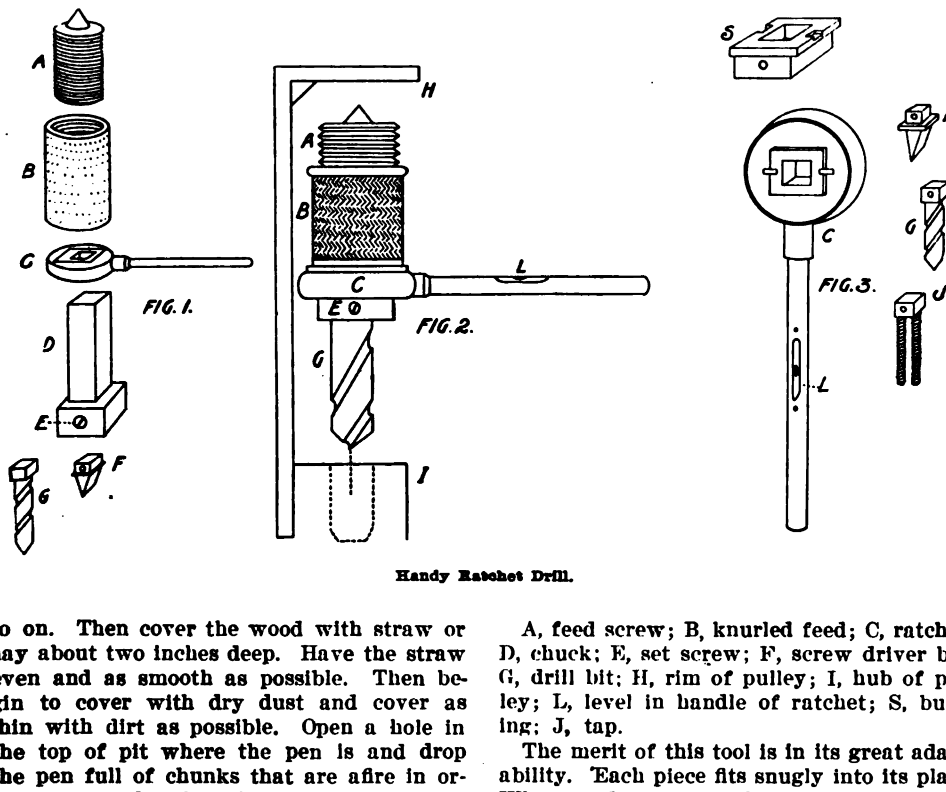
the

it.

to the coal and stop all the air-holes. The fire will then go out. Then draw out a little at a time and let the dirt still lay on the pit till it is all drawn. Coal is harder to burn under green dirt. It should burn about eight or ten days in a pit with one hundred bushels in it.

A HANDY RATCHET DRILL.

This handy ratchet drill is in six pieces and is shown in several combinations in Figs. 1, 2 and 3, in each of which the parts are correspondingly lettered as follows:



Handy Ratchet Drill.

A, feed screw; B, knurled feed; C, ratchet; D, chuck; E, set screw; F, screw driver bit; G, drill bit; H, rim of pulley; I, hub of pulley; L, level in handle of ratchet; S, bushing; J, tap.

The merit of this tool is in its great adaptability. Each piece fits snugly into its place. When used as a wrench or screw driver the tool may be used right or left-handed by turning the ratchet over. The handle may be taken out and used as a level; the bushings are in six sizes from ½ in. to 1 in.; screw driver bit, four sizes; tap, six sizes.

Such a tool made by a skilled workman from the proper materials would be a convenience hardly to be overestimated.—Contributed by Lee R. Clarke, Bozeman, Mont.

When an English journal tells about "petrol" it means gasoline; and "paraffin" is their way of saying kerosene, while spirits of wine means alcohol.

HOOKS AND POWER TRANSMISSION.

A Study of the Weak Points and Their Remedies

The employment of hooks for wires, cables and certain types of coupled belt ends in power and transmission is much more common than formerly. Hooks are very convenient for the purpose of unclasping the drive temporarily, and various designs of them are in use. The sketches herewith explain some of the points relating to their use. The hook shown in Fig. 1 is one of the usual type employed for joining any two ends of cable, endless chain system or belting arrangement in drives. The hook is found designed in several ways. Possibly the weakest type is that as exhibited, for the reason that there is a lack of ample bulk of metal at the point B where excessive strain occurs when the hook is drawn by the coupled parts. The hook circle at A may be properly described and a secure style of oval obtained for locking, but the shoulder portion at B, where the part is reduced in size, is fatal. To overcome this defect it is customary, therefore, to use hooks in drives in which the back of the hook at the point B is described in larger proportions by using a surplus of material, thus assuring great resisting power. Then, again, in many of the patterns of hooks in use in belt drives of smaller proportions, the simple line of wire seems in vogue, resulting in the describing of a hook circle like that shown in Fig. 2. This type of hook is faulty. The least undue strain in the cable system is likely to pull the hook open and perhaps fracture it, as at C. The hook in its original form is shown in Fig. 3. Its weak point is at D.

Hooks manufactured on the order shown in Fig. 4 may be found in practical service in rope and other descriptions of driving systems. This form of hook is made with a view of having strength in the back of the hook, but the shaft, F, is neglected. The result is that whenever any unusual strain exists, the chances are that the hook shaft will break off at this juncture and the combination be rendered non-effective. In order to avoid this trouble, many power and transmission engineers have the hooks made on the eye-plan, as shown in Fig. 5. Then when the draft of the coupling on G occurs, there is opportunity for the hook shafts to grip themselves, as each end is locked in with the nuts as shown. This ma... quite a positive union. It is one that ...ned readily in case it is n... ...e the link G. It is c...

make them pass through the wheel grooves if used in that form. Usually, however, the hooked ends are employed only on sprocket systems, for elevating weights, where speed is slow and the opportunities for traveling of bulky parts ample. These styles of hooks may also be seen in use for supporting parts of the cable drives. The employment of guides, idlers, etc., all call for some kind of a supporting system, and often the journals are hung by means of hooks produced along the lines of the drawings. In the running

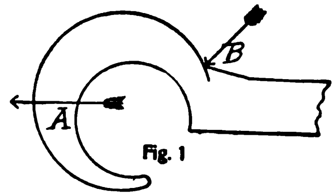


Fig. 1

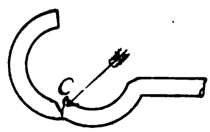


Fig. 2

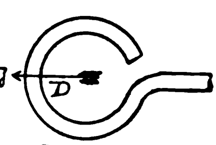


Fig. 3

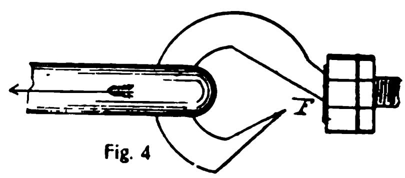


Fig. 4

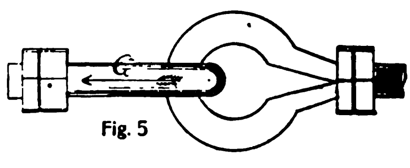


Fig. 5

system, however, it is desirable that the joints of all connections be as rounded and smooth as possible. Fig. 6 illustrates one style of connection for a drive in which coal is moved from point to point by a conveyor system. Where a joint occurs, the union is made by interlocking the split hook shaft ... link or ...

weak it is liable to fracture, thus permitting the parts to open and releasing the union.

In most drives the socket system is preferred. The other forms are chiefly patched work, seen in miscellaneous shops, and used for slow drives under special conditions. The socket plan is next described. The caps may be made in halves, one side being arranged to lock with the other, as by the

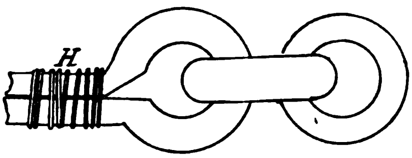


Fig. 6

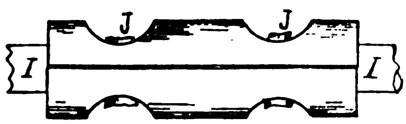


Fig. 7

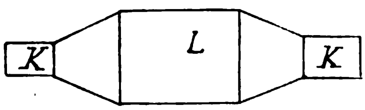


Fig. 8

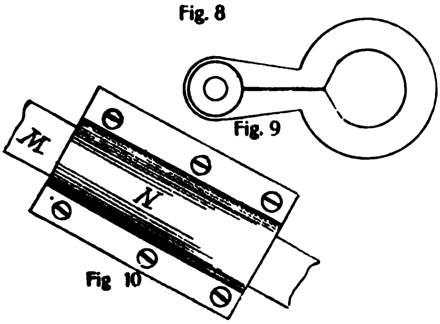


Fig. 9

Fig 10

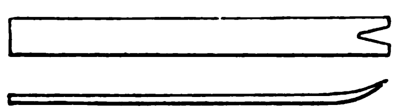
use of rivets, Fig. 7 at J, J, or by brazing into the stubs and locking with other devices. The sockets are often welded and bored for the rivets. Sometimes they are cast in molds. Some are iron and others brass or other metal. Copper is used now
cable ends are inserted into
the inner sides of the
and the circle, when
d. there is a ten-
or rope quite
int is made,
heavy
ends
wheel

belt shifters when the shifter is up above one or two floors and a long shifter rope is needed. The ends of the cable inserted into the locking sides are marked I, I. In Fig. 8 is shown the socket which is cast like L with tapered ends. The parts K, K represent the cable placed within the shoulder coupling. The ends are introduced from either side and they meet in the center. Then the soft metal is compressed in a specially prepared apparatus and the roughened interior surfacing so securely bites the wire or rope that a very strong union results. The form of link for locking with a cable hook or corresponding part, shown in Fig. 9, is also in use. This style of locking eye is made by turning the ring on a stub and uniting the ends as shown. There is a chance left at the jointed ends to insert a bearing clasp by which union is made with any desired connection.

One also sees the common type of screw-fitted clasping sides, as in Fig. 10. This consists of two portions, each portion being shaped like box caps, and the caps are placed together and either united by means of screws or by bolts with nuts. Sometimes rivets are utilized and the rivets are headed up. The letter N designates one of the caps and M the inserted cable end. This is for uniting parts which do not pass in grooves.—Contributed by "R."

A TOOL FOR PULLING STAPLES.

Draw a piece of steel, an old rasp, or something of the same size, to the shape of a thin chisel. With a chisel cut a claw about 1½ in. long and shaped like the claw



Tool for Pulling Staples.

of a hammer. The bend of the claw is shown in the illustration. This is a good staple puller, says the Blacksmith and Wheelwright, but does not save the staples.

USES A POCKET MIRROR.

"In doing some kinds of work one is sometimes obliged to get down on his back to put in a screw or to see that everything is right," writes one of our readers, "for this purpose I often use a small pocket mirror having a handle and joint for turning it to any position."

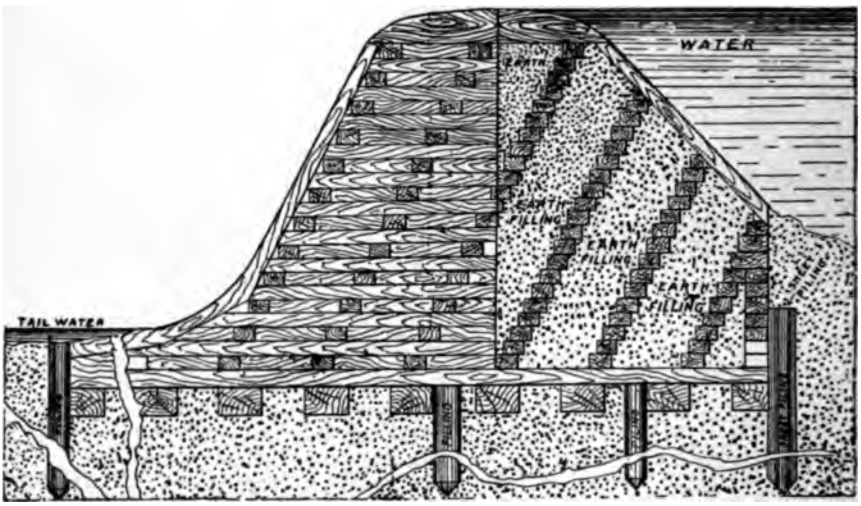
EARTH AND TIMBER DAM ON SANDY FOUNDATION.

An earth and timber dam involving no special engineering problems and which is specially adapted for use on a sand foundation is shown in the cut. A writer in the American Miller says:

A peculiar feature of this dam lies in its circular construction and earth filling, making an earth dam, held together by timbers laid up, for all the world, like a laminated wheat bin. Each cell is 5 feet by 5 feet, and the earth is tamped in as the dam is raised a foot or two, a stream of water pouring into the cell during the operation.

It will be noticed that the cells are not perpendicular, but lean at an angle toward the upstream of the dam. This is intended to act as a brace to the structure and avoids getting the spikes too close together in the cross timbers. No attempt is made to have the planking on the upstream side watertight, but that on the downstream side is very carefully and strongly laid so that no water escapes and that it cannot be torn off by ice. The capillary action of the earth filling is depended on to keep the cell timbers wet and away from the air so they will not decay.

While this particular dam, which is 700 feet long and 19 feet high, cost about $80,000, others on the same principle, but differently located, need not cost much more, if any, than an ordinary timber dam. But it represents one of the best types of modern dam construction for sandy bottoms, and rightly put in, will stand for generations. In sections where timber is still plentiful, this principle can easily and profitably be applied to many different uses, such as wing walls and re-enforcements for waterways and race banks.



Construction of Dam on Sandy Foundation.

COMPRESSED AIR FOR CLEANING BOILER TUBES.

Compressed air works like a charm for cleaning boiler tubes, leaving them as clean as on the day they were put in. This is the verdict of a correspondent of the Engineer, who had formerly used steam hose for this purpose, but upon the installation in the plant of a large air compressor for pumping water, tried the compressed air method.

The air pressure was about 200 lbs. per square inch, and the rest of the apparatus consisted of a ¾-in. hose with a straight piece of ¾-in. pipe for the nozzle.

BLACK WATERPROOF DRESSING.

Mix together 7 lb. best black paint, ½ lb. powdered litharge, 1 pt. oak varnish, ½ pt. boiled linseed oil, ½ pt. thick boiled oil. Apply as ordinary paint. This dries sharp with a good gloss, says the Master Painter, and is durable and elastic. Especially good for railway and wagon covers, tarpaulin and such purposes.

The

TOOL FOR CLOSING CAR DOORS.

Shippers, in particular, will appreciate the simple tool shown in our illustration. Many car doors made, apparently, to close by hydraulic power, refuse to work properly at the critical moment and cause any amount of annoyance and delay—then is the time when the tool is handy. Fig. 1 shows the two parts which any blacksmith can make. A is a piece of 1-in. drawn shafting, flattened at one end, making a rather prominent chisel-shaped hook on end C, which should be hardened, as some doors are iron-bound.

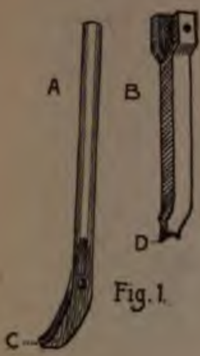


Fig. 1.

B is the leg or brace which must have a very sharp point on end D, with shoulders as shown to prevent burying too deeply in side of car. Fig. 2 shows the tool put together.

A (Fig. 1) is 3 ft. long; B is 2 in. Hole for bolt should be about 6 in. from end, or two or more holes can be bored. Fig. 3 shows how tool is used having a ratchet effect by working the bar back and forth and pressing leg firmly up against car.—Contributed by S. J. Hoag, Jonesville, Mich.


Fig. 3.

Fig. 2.

The diameter of a piston squared and multiplied by .7854 gives its area.

PORTABLE ELECTRIC PLANER.

An electric railway in California which had occasion to plane several hundred wooden trolley poles, and found it difficult and expensive to haul the poles to a mill, built a home-made portable electric planer as shown in the illustration.

It consisted of a planer head mounted on a substantial wooden truck and belt-driven by a 5-horsepower 500-volt direct-current General Electric motor. The rollers were made of two sections of 10-inch wrought-iron pipe, castings being fitted in the ends for the axle bearings. A pair of plow handles were used to push and guide the planer, the starting box for the motor being mounted between the handles, as shown. The entire outfit cost but $60 outside of the motor, which the company had in stock. The poles were 35 feet in length, with 8-inch tops, and it took about one minute to plane down one of the four sides of a pole. The poles were planed as they were unloaded from the cars, at the rate of six poles an hour. There was not only considerable saving in time, but also a great saving in expense, as it cost but ten cents per pole as against $1.15, the price estimated for doing it by hand.

Handy Portable Electric Planer

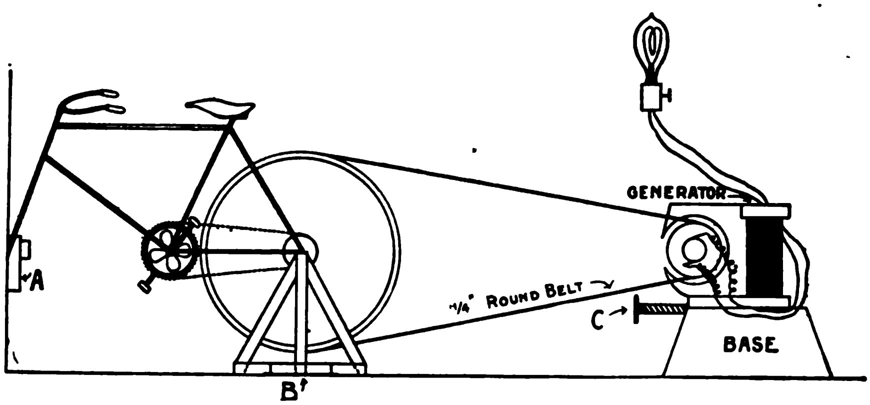
A good imitation mahogany stain consists of 1 part Venetian red and 2 parts yellow lead mixed with thin glue size and laid on with woolen cloth.

RUNNING A GENERATOR WITH A BICYCLE.

One of our readers, W. J. Slattery, of Emsworth, Pa., uses an old bicycle for running a small 10-volt generator; he says:

"The front forks of the wheel are securely braced to the wall and the back forks are then braced up so as to have the back wheel clear the floor about 3 in. The generator is set 5 or 6 ft. distant. To keep the belt tight a sliding brace can be made and worked by a screw.

"I have one of these rigged up and it is just the thing for charging small storage batteries, running small motor and for all experimental purposes where light power is required for a short time."

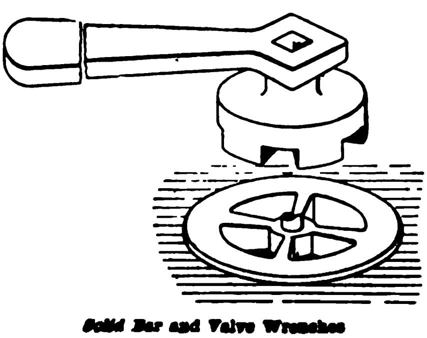


Running a 10-Volt Generator with a Bicycle

METHOD OF REMOVING BROKEN PUMP-VALVE SEAT.

A solid bar wrench fitted over the head of a valve wrench was the instrument used by a correspondent of the Engineer for taking out a valve seat in which the guard stem had been twisted off. As only one hand could be got into the chamber at a time it was impossible to drill or chip it out. The valve was in the suction chamber of a triple compound direct acting pump with 15 x 24 inch water plungers. The broken valve seat was in the lower left-hand corner and could not be pulled with a wrench.

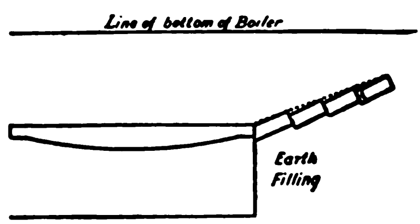
The combination instrument, however, worked amazingly well.


Solid Bar and Valve Wrenches

The machinist blocked up against the handle of the wrench with a 4 x 4 pine block, which extended through one of the hand-holes far enough so that he could put the cap of a jackscrew against the heavy brick wall. He then slowly turned the screw. In a few minutes he was rewarded with the loosening of the valve seat. Upon taking it out he drilled out the old guard stem and fitted another, and put the seat back in place again.

BRIDGEWALL FOR WOOD FUEL.

The accompanying sketch is used by a writer in the Wood-Worker to show how brick is placed on a bridgewall to prevent wood from dislodging it when firing.



For Wood Fuel

The front end of the brick, being below the back end of the row in front, prevents the ends being caught and loosened by passing wood over them.

About twice a year evaporating tests to determine the efficiency of the boiler be made. This does not require an

A KINK FOR THE PLANER.

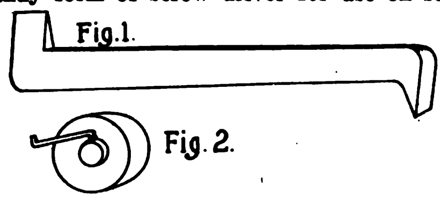
We have a considerable number of plates about 2 feet by 3 feet by ¾ inch to plane. A great many of them are warped so they will not lay flat on the four planer blocks we have and with these warped plates considerable time was lost in hunting sheet iron bushings, etc., to shim up with.

To remedy this I had four more blocks cast, just like the ones we had with the exception of a lug put on them at c. This lug was tapped for a ½-inch set screw which allows for enough adjustment to accommodate all warpage.

With this simple device the plate could be set up in half the time ordinarily used in shimming up with bushings. The bushings were a nuisance, also, for they frequently dropped out.—Norman, Muscatine, Iowa.

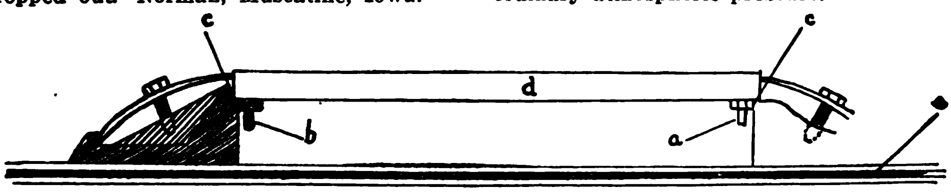
SCREW DRIVER FOR SET SCREWS.

The accompanying illustration shows a handy form of screw driver for use on set



screws. Fig. 1 shows the shape of the tool, while Fig. 2 shows its position when in use. —Contributed by Lee R. Clarke, Bozeman, Mont.

One cubic foot of steam is produced from one cubic inch of water evaporated under ordinary atmospheric pressure.



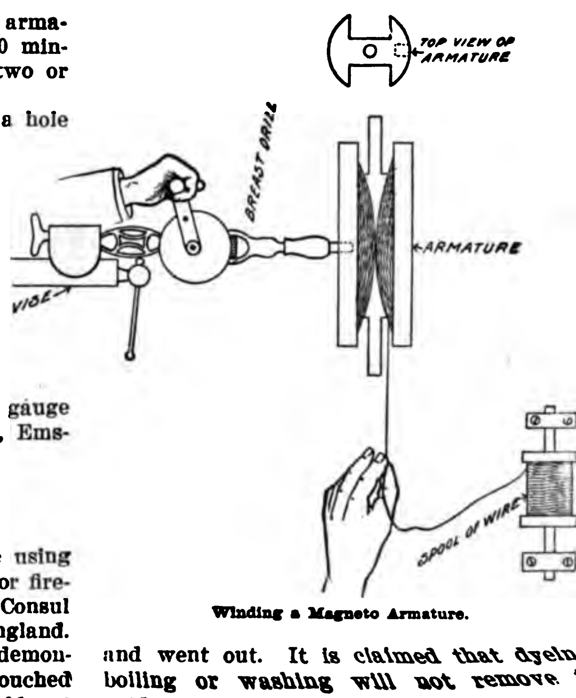
A Kink for the Planer.

How to Wind a Magneto Armature.

By the following method a magneto armature may be wound in from 15 to 20 minutes, when by hand it would take two or three hours.

Usually the armature already has a hole tapped in it where it was fastened on the coil-winding machine in the factory, where it was first wound. At this hole fasten it on the chuck of a Miller's Falls breast drill with a piece of wood and then put in a vise as shown in sketch.

Put the reel of wire on a spindle so it will revolve as the wire is wound on the armature. Have a friend turn the drill while you guide the wire. Use No. 40 B & S gauge wire.—Contributed by W. J. Slattery, Emsworth, Pa.



Winding a Magneto Armature.

FIREPROOFING CLOTH.

Dyers at Manchester, England, are using titanic acid (the oxide of titanium) for fireproofing cloth, reports United States Consul Frank W. Mahin of Nottingham, England. [illegible] ted with this acid was demon-[illegible] -inflammable. When touched [illegible] match the fire smoldered and went out. It is claimed that dyeing, boiling or washing will not remove the acid.

AUTOMATIC SHUT-OFF FOR A PRIVATE COAL BIN.

An automatic shut-off for a private coal bin will be found a great convenience and is one which may be easily constructed by any man or boy.

The bottom of the bin is constructed so as to convey the coal to the spout. When not in use the spout takes the position shown in Fig. 1. When coal is to be taken from the bin all one has to do is to press down the spout until the lever L (Fig. 2) drops and catches it by the pin P, which holds it down for the coal to run out.

The pail which catches the coal is placed on a stand which acts as a lever D. (Fig. 2). On the end of this lever is a weight, W, made in the form of a box so that when

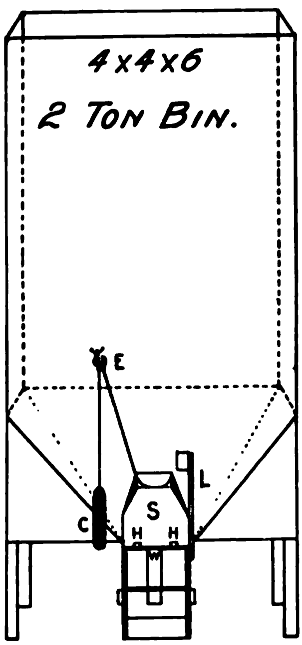


Fig. 1.
Front View

a pail of larger capacity is to be filled the weight can be increased, or vice versa. When the pail is full of coal it over-balances the weight and causes the bar, F, to turn forward, thereby striking the lever and releasing the spout, which flies upward (impelled by the weight C, Fig. 2), and so shut off coal.

action of this coal bin is not ... but in all cases cert...

clogged or otherwise out of order. This makes it very convenient for the person not

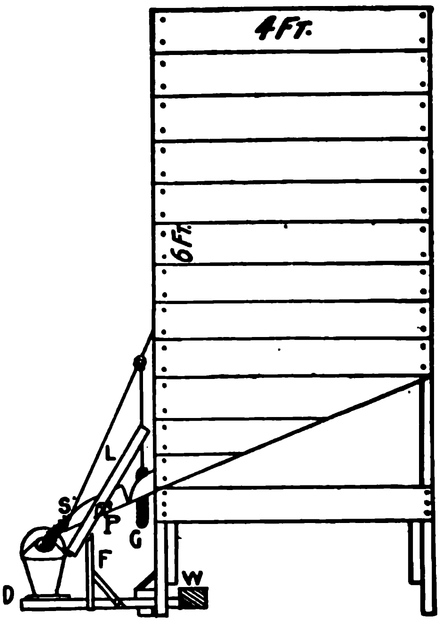


Fig. 2.
Side View

desiring to use a fire shovel in zero weather. —Contributed by F. Blessin, Eldorado, Ia.

HOW TO MAKE A WOODEN AXLE.

Select a piece of wood of the proper size, find the center and draw a chalk line on all four sides the whole length, as at A, Fig. 1. The end view (Fig. 1) shows a gauge mark across it. If the wheels have an inch dish, measure 7-16 in. down from the horizontal line and 1-16 in. in front of the perpendicular line, stick dividers in the dot and strike a circle as large as the outer end of the journal is to be (end view, Fig.

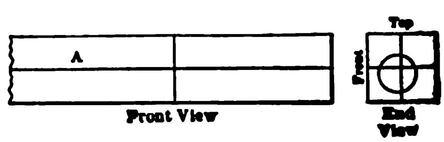


Fig. 1

1). With the square draw a line on all four sides of the circle and from these draw lines to the collar (B, Fig. 2.)

Draw a line, C, across the ... circle and ... point to ...

out to one side from the center, reverse the square and get the line all around.

To cut the top and bottom off, strike the end all out and cut off the front and back

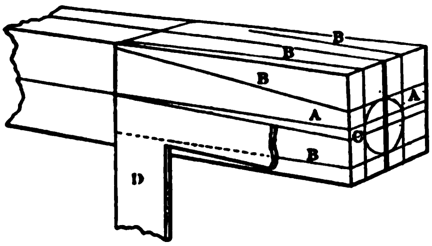


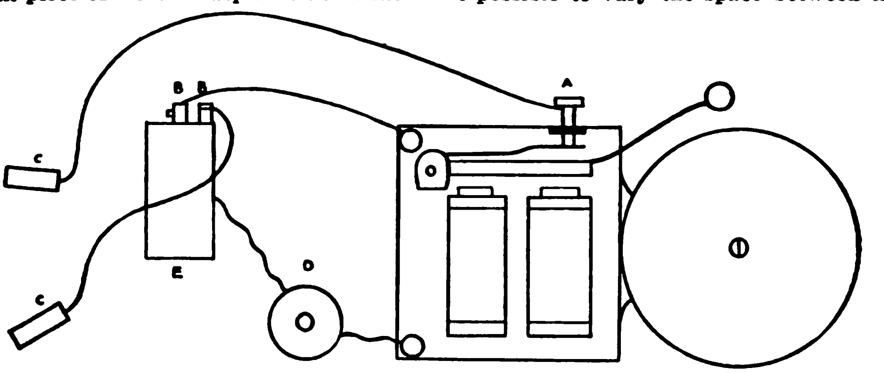
Fig. 2.

sides. The arm is then the right size and set right. Make it 8 in. square and round it up. A correspondent of the Blacksmith and Wheelwright, who describes this method, says he usually puts steel skeins on the bottom.

ANOTHER SHOCKING MACHINE.

The shocking machine shown in the sketch is very easy to rig up and will produce the same results as an expensive machine.

Take an ordinary bell outfit. Connect up the bell. Attach an extra wire to A, which is a regulating screw. To B on the battery attach another wire the same as to A. To the free end of these wires attach a small piece of iron. Grasp an iron in each



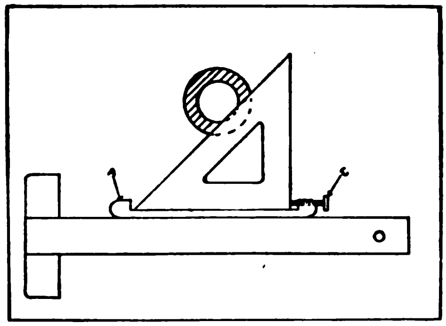
Home-Made Shocking Machine.

hand and have a friend turn on the bell. As the friend makes the connection you will receive a delightful shock. To intensify the shock, plunge C into a pan of water, grasp F in one hand and place the tips of ...gers of the free hand in the pan of ... proceed as before.—Contributed ... Vine St., San Jose, Cal. ...—Regulating screw. ...—Handle. D— ...Same as C.

DEVICE FOR SECTION RULING.

The little contrivance here shown, I have found very convenient in section ruling, writes Signa L. Hatfield, of Wagoner, I. T.

Little explanation is needed. A is made of wood or other suitable material about ⅛ in. thick (I have used cigar-box material). The notch cut out is slightly (say ¼ in.) longer than the triangle which is to be used in it. Placing the device as



Device for Section Ruling.

shown in the sketch the spaces between lines may be made very regular. Draw a line along the triangle, and then holding the triangle stationary slide the device as far as it will go to the right, then slide the triangle until it strikes the adjusting screw, when it will be in position for making the next line. The adjusting screw, C, makes it possible to vary the space between lines. The head of this screw should be filed off on the sides until one dimension of the head is the same as the thickness of the wood.

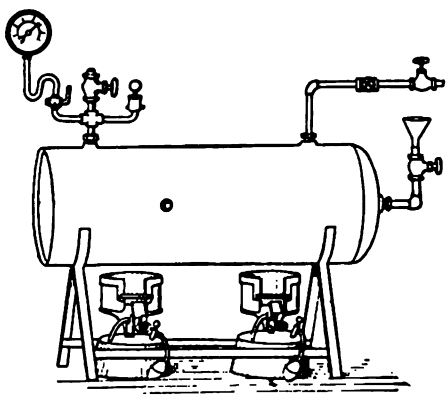
REMOVING VARNISH STAINS.

To remove resin, varnish or sealing-wax stains from fabrics, warm and apply strong methylated spirits. In rubbing the material apply the friction the way of the stuff, or a rough spot will be left.

THAWING UNDERGROUND FROZEN WATER SERVICE PIPES.

Thawing underground pipes is one of the plumber's hardest problems at this season when the pipe is sometimes frozen from the cellar wall to the main in the street and thus very difficult to get at. The machine shown in our illustration was devised by a correspondent of the Metal Worker just for this purpose, and will open any job on a straight line.

It consists of an ordinary 15-gal. expansion tank resting horizontally on legs made from the band iron taken from bundles of sheet iron. In one of the openings intended for the water gauge is a short nipple and a ½-inch cross. On one side of this cross



For Thawing Underground Service Pipes

is an ordinary steam gauge to register 35 lbs., and on the other side is an ordinary safety valve, set to blow off at 30 lbs., for safety. On the top of the cross is a nipple and a gate valve to let out the air when filling the boiler with water. In the other water gauge opening there is a ½-in. nipple and a ½ x ¼-in. reducing elbow, with a short nipple, and a swinging check valve, then another nipple and a ¼-in. gate valve. This is where the steam supply is taken from. In one end of the boiler is an elbow and a short nipple and a ½-in. gate valve with a tin funnel on the top to fill the boiler with water. The other openings are plugged.

To put this apparatus in operation put two pailfuls of water—hot, if possible—into the boiler, and with two good gasoline furnaces under the boiler run the steam up to 25-lb. pressure. On a ¾-in. service pipe use a coil of pure tin pipe for tubing, 75 ft. with a ¼-in. brass coupling solder end to fasten about 10 ft. of hose for steam. On the other end attach a union for connection to the ¼-in. valve on the boiler. Unroll 15 to 20 ft. from the other end of the tin pipe and push it in the service pipe until it strikes the ice. Then everything is ready for the steam to be turned on slowly, and soon the hot water and steam will be seen returning; but it is necessary to keep pushing the tubing into the pipe as fast as the ice melts, for if it is not kept well up to the ice it will not thaw, even if only 6 in. from the ice. In fact, it works decidedly better if it be kept against the ice in the pipe all the time. The tin tubing should have a ¼-in. opening, leaving plenty of space around it for steam and water to return.

A good round way stop or gate valve should be placed on the end of the pipe before starting, to avoid receiving a bath before it can be put on after the pipe is opened. When the water starts, have the helper pull the pipe out as quickly as possible and close the stop valve, when the job is completed without much trouble. If the water in the boiler gets low, which can be told by the steam suddenly dropping off, exhaust the steam in the boiler into a bucket of water and then empty the water into the boiler. This will warm the water that is to enter the boiler and aid in getting up steam again quickly. With this outfit its inventor has opened 86 ft. of ¾-in. service pipe in the ground in three hours' time without a helper, and the service seemed to be frozen solid.

When using it outside of a building three furnaces and a sheet iron jacket to keep off the wind may be used. This machine is cheap to rig up and successful in operation.

SPLIT NUTS IN DRIVING THREADED WORK.

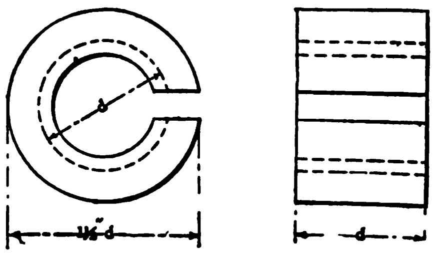
It is not good practice to use a nut with a saw slit in one side for threaded work, especially if it will not come off easily. If a cold chisel is driven in the slot to ease it, this soon results in a halved nut which is even more difficult to handle.

The split nut shown in the sketch is original with a correspondent of the American Machinist, who says he has used a set of 12 such, ¼ to 1 in., constantly for several years and finds them both cheap and effective.

The
full
thr

chisel, to insure their being turned on freely by the fingers after hardening. It takes but a jiffy to spin them on. They are hardened in oil and given a spring temper by burning off the oil.

A common lathe dog or a 3-jawed chuck

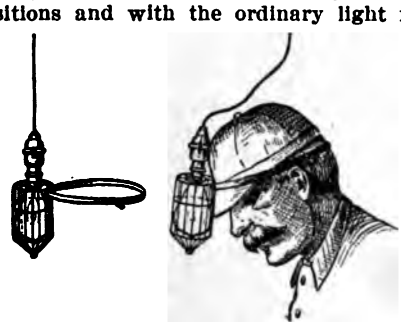


Split Nut for Threaded Work

closes them on to a thread very firmly. A set takes up a space of 1 in. by 8¼ in. placed tandem, with the slots over a narrow upright strip of brass.

LIGHTING DEVICE FOR STONE CUTTERS AND OTHER CRAFTSMEN.

Portable electric lights are now used by many stone cutters who require good light for granite and marble lettering, says the Monumental News. As the work proceeds the light must be moved to many different positions and with the ordinary light it is



Portable Electric Light for Close Work

hard to keep the shadow from falling on the stone.

The light may be satisfactorily arranged, where electric lights are used, in the manner shown in the sketch. A wire guard protects the lamp against breaking and a strap is convenient for fastening it to the
is arrangement causes the least
a light equal to the best

consists of 1
to which is
powdered

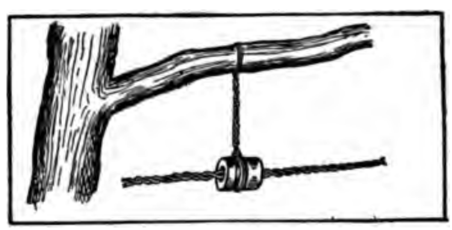
HOW TO BRONZE CAST IRON.

The Maschinenbauer describes the following process for imparting to common cast iron all the rich glow of bronze, without covering it with a metal or an alloy. Having thoroughly cleansed the surface and rubbed it down smooth, apply evenly a coat of vegetable oil, say sweet or olive oil, and heat the iron object, being careful that the temperature does not rise high enough to burn the oil. At the moment of decomposition of the oil the cast iron will absorb oxygen, and this forms upon the surface a brown oxide skin or film, which takes a fast hold and is so hard that it will admit of a high polish, thus bestowing upon the iron a striking resemblance to bronze.

SUSPENDING WIRES TO TREES.

In constructing telephone lines it is frequently desirable to suspend a wire to a tree. The American Telephone Journal gives the proper method of doing this.

The twisted wire is run through an insulator suspended from a limb as shown in



Insulated Suspension for Telephone Line

the sketch. If the wire were fastened directly to the tree the tree would sway with the wind and the wire might break. The insulator affords a flexible support which holds the wire in place without regard to the motion of the tree.

Often, when in need of a flat pulley, only a crown pulley will present itself. Now, we all know of several ways to crown a flat pulley, but when a friend of mine proceded to flatten a crown pulley (wood) with a rasp, the obvious simplicity of the thing almost killed father, says a correspondent of the American Machinist.

To make paint stick to tinware scratch the surface of the tin with a piece of rough pumice or sandpaper, apply a coat of thin shellac varnish and then paint of the desired color. This will prevent the paint from shelling off.

HOW TO MAKE YOUR CLOCK START FIRES FOR YOU.

BY WM. H. MATTHEWS.

You must have an eight-day clock or one which has an alarm that is wound from the outside of the clock.

Get an empty spool, A (Fig. 2); saw a

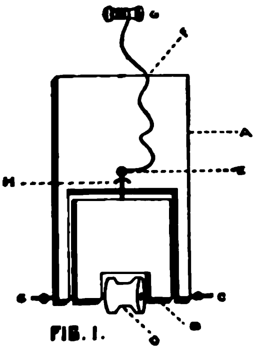


FIG. 1.

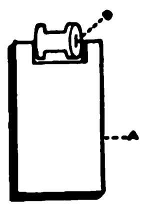


FIG. 3.

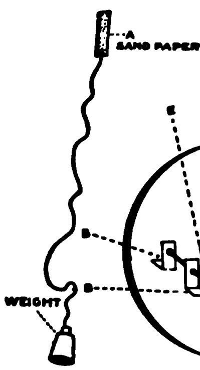


FIG. 5. STRING WITH SAND PAPER ATTACHED AND WEIGHT ALSO

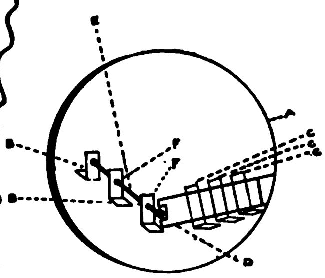


FIG. 4.

groove in it on one end, B; attach a string, F, with a short piece of wire attached to the loose end, E. The string should be about 16 in. long.

Get a piece of white pine about ½ in. thick, 6 in. wide and 16 in. long, A (Fig. 1); saw a piece out of one end of it as shown. The piece sawed out should be 4 in. by 5 in. Take the piece you sawed out and cut off about ¼ in. on one side and put it back from where it was taken; but before doing this, cut a small place in one end of this piece so that an empty spool can turn easily in it. (See D in Fig. 1.) Run a long wire, C, through the piece, A, and also through B, and the spool, D. This will make a trapdoor that will drop when the string F is wound on to spool, G, and the piece of wire, E, is withdrawn from under B when the alarm runs down. A close study of Fig. 1 will show you exactly how to make this part of the apparatus.

Take a heavy piece of wood, A and cut a piece out of one end … is place so it wi…

For the fire starting apparatus, procure a piece of tin; either a round or square piece will do. The top of a 10-pound lard bucket is just the thing. Fig. 4 shows how this is made. Take an old chisel and cut three pieces B, B, B. They must not be cut clear out of the tin but cut only on three sides. These pieces, B, B, B, must be bent upward to hold the match, E, They should be about 1½ in. high and about ½ in. wide. Make a hole in the two front pieces, B, B, large enough to let a match slip through easily. The last piece, B, should not have a hole in it. Take a piece of old rusty water bucket hoop about 6 or 8 in. long and cut a small notch in one end so that it will pass the head of the match, E. Then cut several (three will do) pieces of tin and bend them up, C, C, C, and over the spring and so mount it that it will press tolerably hard against the head of the match, E. All that now remains to be done is to take a piece of sandpaper about 1 in. wide and 4 or 5 in. long; tie a strong cord long enough to reach from the machine (Fig. 4) out to Fig. 3, which should be placed on the floor in front of fireplace and up to trapdoor,

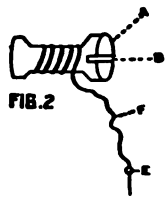


FIG. 2

which is laid on the mantel with the clock placed on top of it. A weight should be attached to the other end of this cord. (See Fig. 3.) A small sack of sand is best for the weight.

Now to put the fire-starter in operation. At night before retiring let the fire burn down low. Cover the coals after raking them to the back of the fireplace. Put on your wood. Take your fire-starter (Fig. 4) and place a match, E, through holes F, F, with the head next to spring, D. Place the sandpaper, A (Fig. 5), between the match and the spring, D, with the paper projecting toward rear of fireplace. Put Fig. 4 between the fire-dogs and run the string attached to the sandpaper over spool, B (Fig. 3) and on up to trapdoor, B (Fig. 1). Insert wire, E (Fig. 1), under trapdoor, … the weight on trapdoor …

between the match and spring and strike it, starting a fire. Be sure to have a notch in the spring so that it will pass the head of match, or it will put out the match when struck. Lay something that is easily burned close to the head of match to start the fire. Excelsior and paper are both good.

This is a good thing for a lazy man and costs nothing to make. I used such an apparatus several winters, and it is nice to have a warm fire to get up by. If you do not wish to attach it to your clock, run the string to your bed and pull it and start the fire yourself.

HOW TO MAKE AN AUTOMATIC FURNACE TENDER.

It is a simple matter to make a device which will open the furnace dampers at any desired hour day or night. It is particularly desirable for use in early morning in order that the house may be warm before getting-up time. The instructions are by a correspondent of the Metal Worker.

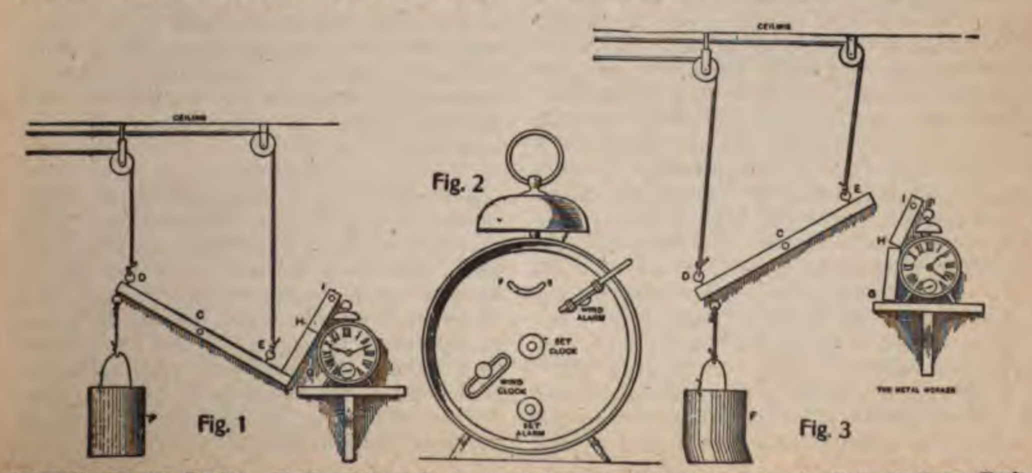
Most furnaces have two draft doors, a check draft at the back and a draft door, or lid, in front. When the furnace is checked the door in front is closed and the rear draft is open, allowing air from the cellar to go into the chimney without passing through the furnace. When the furnace is burning the rear draft is closed and the front one open, forcing the air to go through the grate to reach the chimney. The simple device illustrated will permit the draft to be shut off as desired, while a common alarm clock will close the check draft and open the front draft at any hour desired. Pulleys must be screwed into the ceiling, as shown in Fig. 1. Fine rope leads from the check draft to the end of the lever E and from the front draft to the end D. A hard wood stick 12 in. long is shown by D, C, E working loosely on a screw, C, driven into the wall or other convenient support. F is a weight, consisting of an empty tomato can, into which coal can be put until it is just heavy enough to operate the drafts.

To check the furnace the end E is drawn down, as shown in Fig. 1, raising the check draft and allowing the front draft to close of its own weight. The end E is held down by a lever, G H I, hinged in the middle on the bottom side and fastened to the wall by a screw at I, on which it works loosely. The alarm clock, Fig. 2, is set to go off at any desired time and is placed on a shelf, so that when the alarm goes off the winding lever for the alarm, which has been lengthened by binding a piece of hard wood, strikes the hinged lever from below at H, bending it up so that it flies out of the way, releasing the end E of the solid lever. The weight F then falls, as in Fig. 3, opening the front draft and allowing the check draft to close of its own weight.

PACKING FLANGE JOINTS WITH ASBESTOS

For packing flange joints, a correspondent of the Engineer claims that thin sheet asbestos (wet) is far ahead of the best rubber, if a permanent joint is required, though a rubber gasket can be put on much more quickly and easily.

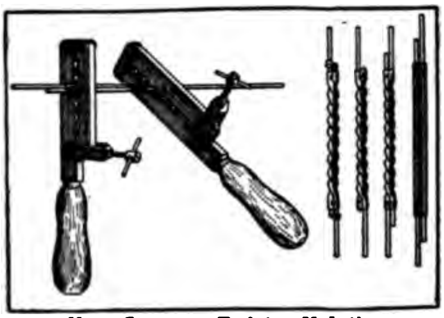
Great care is necessary in handling the wet asbestos, but if the joint is well made with very thin sheet asbestos and the flanges are in good condition, it will stand several hundred pounds pressure.



Automatic Furnace Tender. *Fig. 1.*—**Furnace Drafts Checked and Regulator Set.** *Fig. 2.*—**Back of Alarm Clock.** *Fig. 3.*—**Furnace Drafts Open.**

TWISTING A "McINTIRE JOINT" IN GERMANY

American linemen use only a pair of pocket pliers for twisting up a McIntire joint, says the American Telephone Journal, but in Germany the linemen have a pair of clamps especially for the purpose. These



How Germans Twist a McIntire

clamps resemble nut crackers somewhat, but have a number of slots fitting the different sizes of McIntire joints it may be necessary to make. Each clamp has a handle and a set screw by means of which its jaws are fastened about the sleeve to be twisted. With the sleeve in position and the two clamps applied the joint is made by revolving the handles in opposite directions.

AN EMERGENCY WATER FEED

The shop was away out in the woods; the boiler an upright and the engine a 5x12-in. The injector went all to pieces one afternoon and they had no pump. Most people would have shut down and waited till a new injector could be telegraphed for and received. This is what the engineer did. There was a piece of five-inch gaspipe under the bench; it happened to be about three feet long and threaded at each end. Caps were screwed on and one end connected by way of a one-inch pipe to the feed-pipe. This one-inch pipe was long enough to raise the five-inch length above the top of the boiler. The upper end was provided with a short length of one-inch pipe provided with a globe valve and ending in a funnel. This end was also connected with the steam space by a half-inch pipe running into the hole lately occupied by the third water-gauge cock. The shop started at seven the next morning and for four days that boiler was fed by gravity. The valve in the steam pipe and in the one-inch pipe below the five-inch piece would be ...d; the big pipe filled through the funnel; its valve would then be shut, the others opened and down would go the water into the boiler. Of course it made hard work lugging water up a ladder in pails all day, but the engine kept turning.

GLUES FOR RESISTING DAMP

1. Prepare ordinary glue with boiled linseed oil.

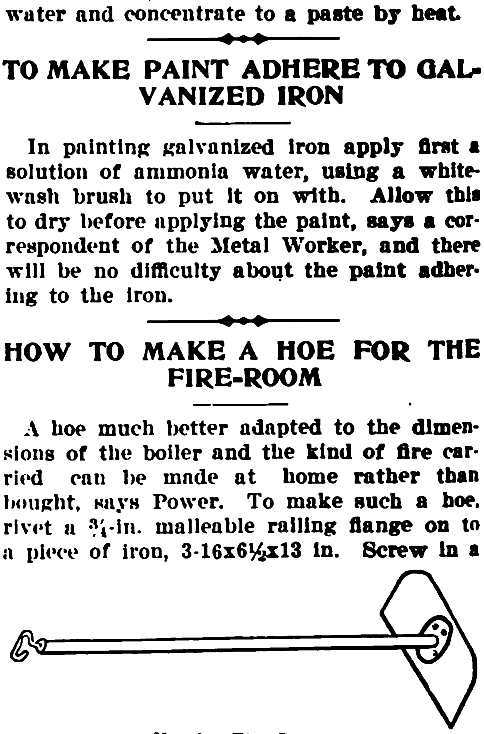
2. Melt 1 lb. glue in 2 qt. skimmed milk: shellac, 4 oz.; borax, 1 oz. Boil in a little water and concentrate to a paste by heat.

TO MAKE PAINT ADHERE TO GALVANIZED IRON

In painting galvanized iron apply first a solution of ammonia water, using a white-wash brush to put it on with. Allow this to dry before applying the paint, says a correspondent of the Metal Worker, and there will be no difficulty about the paint adhering to the iron.

HOW TO MAKE A HOE FOR THE FIRE-ROOM

A hoe much better adapted to the dimensions of the boiler and the kind of fire carried can be made at home rather than bought, says Power. To make such a hoe, rivet a ¾-in. malleable railing flange on to a piece of iron, 3-16x6½x13 in. Screw in a



Hoe for Fire-Room

piece of pipe of the proper length, and fit the other end of the pipe with a piece of iron bent as shown in the illustration. This can be put on by means of a reducing coupling.

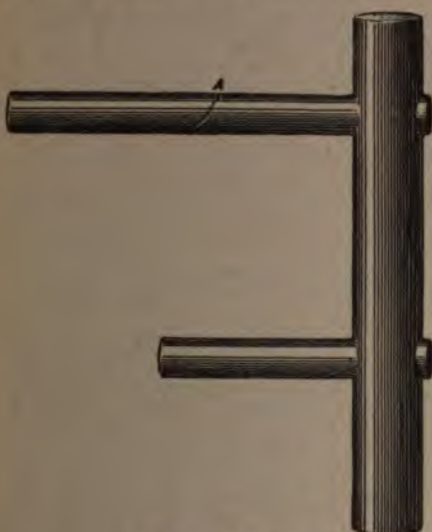
A machine for keeping the smoke tubes of marine or stationary boilers free of soot has recently been invented. Hitherto the tubes have been swept out about every seven days; by means of the new device the retarders in the tubes which break up gases on their way through the tubes are rotated by a handle on the outside. The ... is so simple that it can be perf... few hours, giving an econ... the coal ...

SHOP NOTES

A SPECIAL METHOD OF BRAZING CAST IRON.

The following process is given by a correspondent of the Blacksmith and Wheelwright as his particular method of brazing cast iron. The illustration shows a piece of windmill, all in a solid cast piece, with a break at A, and brazed from the inside in the manner described. The writer says:

"I take 1 part of pulverized glass, 2 parts of ground marble, ½ part of carbonate of iron, 2 parts of pulverized borax. For flux take 1 part of water and 1 part of pulverized borax. To grind your marble and iron take a bastard file or an emery wheel about No. 36 grit, so as not to make filings too fine. To pulverize the glass I take a piece and hammer on it on my anvil. One learns in a few hammerings the best way to pulverize it. There is a trick in it, but I don't know how to explain it.



Brazing Cast Iron

"When your casting is ready to braze, take your mixture and the flux and make a paste and put a thin coat on each piece and bolt, strap or wire them together so they will not move while in the fire. Put it in clean fire and heat to high red heat; put your brass spelter on it till it melts; use plenty of it on your work to be sure of a good job. When the brass is melted, cut off your blast and let it rest there till it turns nearly black, then you can remove it and put it away so you can use your fire if you are rushed. When cold take off braces, bolts or wire, whichever it may be, file up and your job is ready. Now remember, if there is any dirt or grease you won't get rid of it. I heat the iron to a red heat and use steel brush and give it a good brushing. Then let it cool. Don't bolt the braces too tight together; if you do, when you heat your casting it will expand and your brass won't go through where it should. You must use borax the same as if you were going to weld steel. To braze iron or steel do not use glass or malleable iron; use only borax with some carbonate of iron, and of course you must use the brass. You must cake your coal so there will not be too much sulphur or gas in it to spoil your job."

MAKING A FLOOR-CLEANER.

The floor-cleaner shown in the sketch was made by a correspondent of the Engineer from some rubber belting about 3 in. wide and 18 in. long. Two pieces of hardwood 6 in. wide, 18 in. long and ½ in. thick were cut in the form shown, and put

Rubber Floor-Cleaner

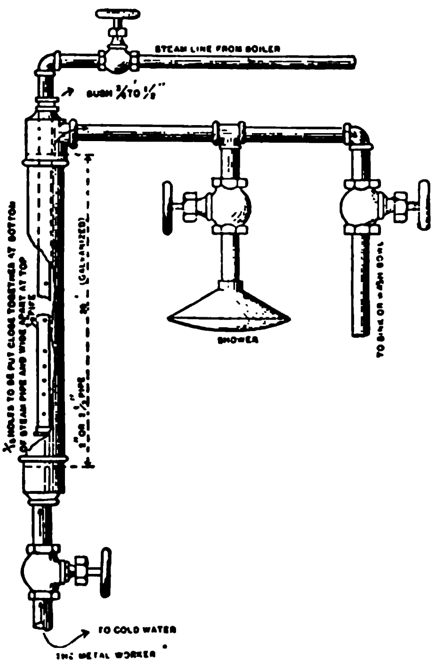
together with the rubber between them, so that the rubber projected below the wood about ¾ inch. An old broom handle was inserted and the cleaner was complete.

The floor on which this was used was a cement one, and the cleaner worked well for pushing water out of the room. It is also good as a mop for drying a floor after a scrub-down.

Aluminum, because it withstands the action of acids, is a suitable material for hooks for removing photographic negatives from acid baths. It makes good acid funnels, also.

WARMING WATER FOR SHOWER BATH OR WASH BASIN.

There are many establishments where steam is available in which a shower bath can be used with advantage by the employes of the plant, for their refreshment in the summer season, and for purely bathing purposes at the end of the day's work all



The Shower Bath

the year round. At a recent meeting of the Pacific Coast Gas Association the device shown in the accompanying illustration was presented in the "Wrinkle Department" for the consideration of men working in gas manufacturing establishments, and was met with strong approval.

It is made with a piece of 2-inch or 2½-inch pipe 2½ feet long. At the lower end it is reduced to ¾ inch. Where the cold water enters at the upper end there is a reducing T to ¾ inch. The side opening is where the hot water is taken off to the shower or basin. At the top of the T there is inserted a perforated tube of 1½-inch pipe with cap on the lower end. This tube is connected with the live steam line. The user can get the desired temperature of water by adjusting the valves on the cold water and steam inlets. This will be found very handy and a cheap shower for use at the works or any ·ce where steam is to be had.

THINNING ZINC PAINTS.

The proper medium for mixing zinc white is pale boiled oil. Many firms manufacture pale boiled oil especially for this purpose, and the painter will ordinarily save himself considerable trouble by procuring this proper medium at the outset.

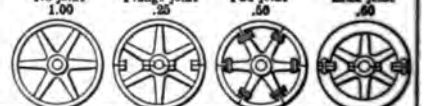
In mixing zinc paints, use as much oil and as little turpentine as possible, the oil being pale boiled, and keep the paint as "round" as possible. All zinc paints can be applied much rounder than lead paints.

Oxide of zinc and sulphide zinc white, when ground in oil in the form of a stiff paste, should be kept from air in the stock casks, and whenever a portion is removed the surface should be smoothed down and covered with a little raw linseed oil. Never use water, but always oil, for covering the surface of zinc paints.

SAFE SPEEDS FOR GRAY-IRON FLYWHEELS.

The following valuable table of safe speeds for gray-iron flywheels has been compiled by W. H. Boehm, superintendent of the flywheel department of the Fidelity and

Type of Wheels and maximum obtainable efficiency of rim-joint



Diam. in Ft.	No joint 1.00 R.P.M.	Flange joint .25 R.P.M.	Pad joint .50 R.P.M.	Link joint .60 R.P.M.
1.	1910	955	1350	1480
2.	955	478	675	740
3.	637	318	450	493
4.	478	239	338	370
5.	382	191	270	296
6.	518	159	225	247
7.	273	136	193	212
8.	239	119	169	185
9.	212	106	150	164
10.	191	96	135	148
11.	174	87	123	135
12.	159	80	113	124
13.	147	73	104	114
14.	136	68	96	105
15.	128	64	90	99
16.	120	60	84	93
17.	112	56	79	87
18.	106	53	75	82
19.	100	50	71	78
20.	95	48	68	74
21.	91	46	65	70
22.	87	44	62	67
23.	84	42	59	64
24.	80	40	56	62
25.	76	38	54	59
26.	74	37	52	57
27.	71	35	50	55
28.	68	34	48	53
29.	66	33	47	51
30.	64	32	45	49

Casualty Company. The American Machinist says: "The table is figured for a [illegible] of safety on [illegible] ·f approximat[illegible] which i[illegible] develo[illegible] [illegible]

CARE OF PACKING RINGS.

Packing rings used by air brake repairmen should never be hung on nails or hooks, as they are soon sprung out of a true circle by their own suspended weight, necessitating much filing away of the ring to make

Effect of Hanging on Nails

it fit the cylinder. This, says Locomotive Engineering, is especially true of governor, triple valve and equalizing piston rings.

For the small rings use tin boxes slightly larger than the rings, which should be laid flat in the box. Large air pump rings should be laid on shelves. If thus cared for, the circle will remain true and the rings may be readily fitted.

TO REPAIR CRANKPIN BRASSES.

The sketch shows a worn-out wristpin box from a high speed engine, the dotted lines showing where the pin had worn the metal away. A correspondent of the Engineer tells how he repaired it.

It was taken out, put in the lathe and bored out to the lines 1 and 2, and the six ½-in. radial holes (A, B, C, D, E, F) were drilled. A pin of dry wood ⅛ in. smaller in

Babbitting the Box

diameter than the wristpin was then turned and the boxes babbitted around it. The boxes were then put in the lathe and bored out to the size of the pin. The oil grooves were cut and the rod connected. The brasses have never given the least trouble since the repair and the babbitt does not require keying so often as the brass box did.

VISIBLE SIGNALS FOR TELEPHONES.

In a factory or plant where there is considerable noise at all times and where the room is so large it is not always possible to hear the telephone bell, an ingenious arrangement for visible signals may be used to advantage.

Red incandescent lamps of about 16 candlepower each will serve as good signals and several should be placed at various points where they will be likely to be noticed, if automatically turned on. Connect them all on the same pair of wires and run these to the telephone.

On the back of the closet or partition where the telephone is placed mount a block

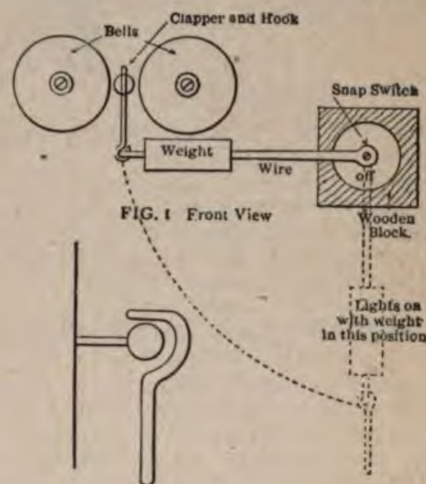


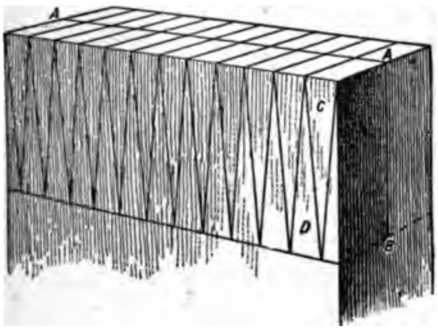
FIG. 2 Clapper and Hook

of wood thick enough to have its upper surface flush with the magneto case. On an ordinary snap switch without a handle attach a long bar having a weight at its outer end and small hook made of copper wire. Mount this on the block. Slip the hook over the clapper of the bell and balance it. Figs. 1 and 2 show this arrangement clearly. When the telephone bell rings, the hook will slip off, the weight fall and the switch will throw on the red lights, notifying any one in any part of the room who may see them that there is a call at the 'phone.

This ingenious apparatus was first used in a large steel mill where news of a fire in the town was noised abroad by the boiler house whistle upon notification over the 'phone, says a correspondent of the American Machinist.

A GOOD METHOD OF SAWING WEDGES.

For this purpose use a good, stiff back saw, sharp. First saw line A A down to B. Second, saw wedges C out and then raise them up one-eighth inch to make a guide for the sharp ends of the wedges D, all of



Sawing Wedges

which saw off at the line B after the C wedges are sawed off.

"We use pitchy floor scraps," says a correspondent of the Blacksmith and Wheelwright, "and after the first wedge cut, every cut makes two wedges, and they stick better than a shaved wedge."

BRACING A STEAM-HAMMER FRAME

A crack developed in one of the standards of a 10-cwt. steam hammer while some large motor pinions were being forged a short time ago. The Electrical Magazine, London, tells how the standard was braced

Bracing a Steam-Hammer Frame

so that though it has been used for heavy jobs several months it shows no sign of breaking more.

The crack is shown at A. A 2-in. square bar of steel was forged to the required shape, as shown in the sketch. Cooling contracted the bar and so braced the frame.

There were produced in the United St[illegible] year 280,000 tons of lead.

HOW TO FIX PEARL TO GLASS.

The design desired should be first carefully gilded in outline and the spaces between the lines filled with very clear varnish. Allow this to become tacky, and then with a little size on the end of the finger pick up some of the flakes of pearl, put them on different parts of the letter; fill in with smaller flakes and press some pearl powder on to cover the space completely.

Apply the varnish with a soft hair fitch, says the Master Painter and when the work is quite dry press a layer of tinfoil well into the breaks to fix the pearl to the back. Paint over with tinted white lead, mixed stiff in boiling oil with sufficient japan gold size to dry quickly.

A SIMPLE METHOD OF BURNING OUTLINE LETTERS ON GLASS.

Write the letters in with a weak solution of white matting acid. This will roughen the surface of the glass. Gild the letters with isinglass size, bringing the gold beyond the letters in order to obtain a bright margin line. Then write the whole of the letters, center and edges, with japan gold size and red lead. When dry remove surplus gold with water. Varnish, japan gold size or coachmaker's black japan makes a good protective backing.

CLEANING BOILER TUBES.

In discussing a previous article in the National Engineer Chas. B. Risley says:

There seems to be no objection to the use of a scraper as a cleaner of boiler tubes, except the laborious task necessary when it is used, as against the comparatively easy work of operating a steam blower. In my opinion neither of the above methods gives the best results. The great majority of scrapers are not efficient tube cleaners because they cause the soot in the tube to bulk up ahead of the scraper in a manner that necessitates the scraper passing over some of it and compressing to the sides of the tube, resulting in a poorly cleaned tube. The soot, so compressed, forms a surface upon which other soot finds easy and convenient lodgement.

With purely steam blowers, trouble arises from the fact that the moisture the exr[illegible] steam. cl[illegible] either or both of the methods previously mentioned.

With the hot blast system we have, for example, for a 4-inch tube, a steam nozzle ⅝ inch in diameter, which is used to syphon the gases from the furnace at approximately 800 to 1,000 degrees, the size of the gas inlet being 2¼ inches in diameter. In this way the volume of steam is superheated, thus preventing moisture or cold air entering the tube.

I have conducted a number of tests to determine the temperature and velocities of the discharge of steam tube cleaners, with results as shown in the following table:

TYPE OF CLEANER	Boiler pressure	Size of tubes	Size of steam nozzle	Area of air inlet, sq. in.	Degrees of superheat	Temperature of discharge	Velocity in feet per second of discharge	Relative temperature to water in boiler
Hot Blast Blower	90 lbs	3½-in	⅝-in	3.14	112	334 F	780	3 deg. above
Standard Steam Blower	90 lbs	3½-in	⅛-in	0	0	215 F	275	116 deg. below
Steam Blower with Air Inlet	90 lbs	3½-in	⅛-in	3.14	0	150 F	700	181 deg. below

FORGING HOLLOW SHAFTS HAVING LARGE HOLE IN CENTER.

Hollow shafts of large diameter having a large hole in the center which tapers toward the ends (Fig. 1) should be forged in the manner shown in Fig. 2. Bore straight through the largest diameter and then put the ends under the hammer or forging machine and bring them down to the diameter

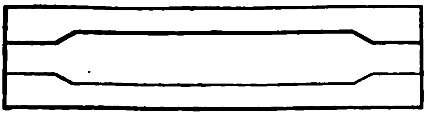


Fig. 1

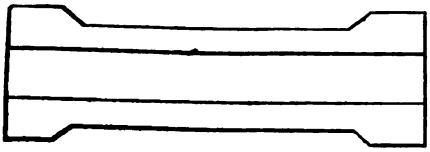


Fig. 2

shaft, says a correspond-
Machinist. This re-
at the ends and
the couplings

Such shafts are used in our large men-of-war. In a 16-in. shaft the hole for a few feet at each end is about 6 in. in diameter widening into a hole 9 in. in diameter at the center.

HOW TO BURN OUTLINE LETTERS ON GLASS.

The following instructions apply where each letter is to be outlined with a burnished line ¼ inch wide, the interior of the letter being in a dull gold.

Lay the glass flat on the table, and for the parts of each letter which are to be in dull gold leave plain glass; plate coat the rest with embossing black. The exposed portions of the glass should then be eaten away with hydrofluoric acid, which will not attack the covered portions and will do its work in a few minutes to a half-hour, depending on the strength of the solution. To ascertain the depth to which the acid has eaten draw a needle or other fine steel instrument against the edge of the letter. When deep enough, pour off the acid and wash the surface of the glass with clean water. Remove the black with turpentine.

Gild the letters, allowing the gold leaf to come beyond the edge of the letters to the required width of the burnished line. Use a weak solution of isinglass as a medium. When dry protect the gold line by a coating of red lead and gold size. When this is hard the surplus gold may be readily washed off.

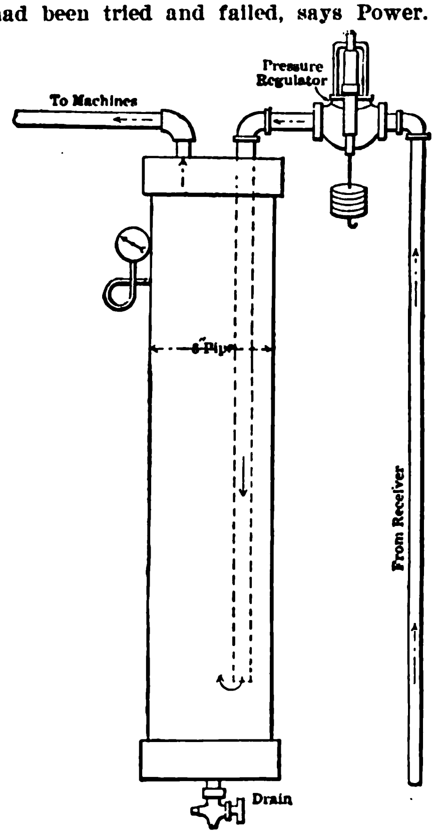
If the plate glass cannot be removed from the sash, the acid cannot be used in the manner described. In such case lay the gold around the edges of the letters on the back, on a weak solution of isinglass. Cut the gold on a cushion and place on the wet size. When dry, the gold from the face side will appear bright. It may be further burnished, if desired, by rapidly pouring hot water on the letters and allowing it to run off, using great care to prevent the gold washing off, if a weak solution is used. Paint the line of gold in with a backing of gold size or varnish and red lead, and when it hardens wash off the gold beyond the edge of the line. To make the letters appear dull done to the edge with isinglass, write the inner part in with pale varnish and when almost dry, gild.

Our readers are urged to contribute to "Shop Notes" any kinks which they have worked out, or may be using to advantage and which others might use with benefit.

MEANS OF REMOVING MOISTURE FROM COMPRESSED AIR.

Compressed air would be even more extensively used than it now is were it not for the presence of moisture which, in some instances, would do damage to the work in hand.

In a large plant where compressed air is used a great deal, the moisture was successfully disposed of after several means had been tried and failed, says Power.



Removing Moisture from Compressed Air

The receiver pressure being 80 pounds and only 25 pounds being necessary, a reducing valve or pressure regulator was installed, as shown in the sketch, which has made dry air a possibility.

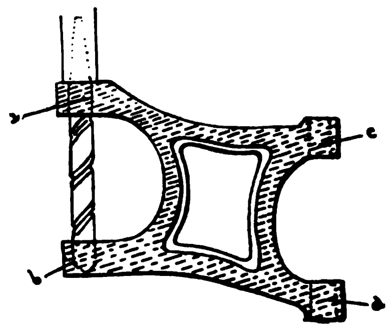
The drain shown at the bottom of the tank may be opened and a piece of paper held under it, and no moisture will be visible, except perhaps a little oil, if it has not been opened for quite a while.

Since this apparatus has been put in, there has not been any more trouble with moisture, and if it helped in this case it will surely help others.

LENGTHENING A TWIST DRILL WITH PAPER.

Some time ago I had a casting, as shown in sketch, to be drilled at a, b, c, and d. 1-inch hole. The holes had to be drilled absolutely in line through both lugs, for a 1-inch shaft to go through.

I clamped the casting to the angle plate, and after I had drilled through the lug, a, I found that the drill was not long enough by ½ inch to drill through lug b. Of course, I could have turned the casting around and drilled from the other lug, but this would have necessitated a very careful lining up to get them absolutely in line. Instead of



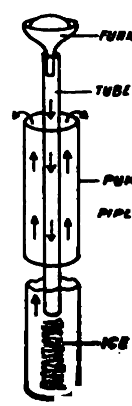
Distance Reached With a New 1-inch Drill.

reversing the casting, I took the drill out and wrapped paper around the taper socket on the drill, then by placing same in spindle of drill and tapping it gently, I succeeded in drilling through both lugs at one setting, and the drill never slipped in spindle.

I know of no rig that can be fixed up any quicker than this one, providing there is nothing at hand except the average length of drills.—Norman, Muscatine, Iowa.

THAWING A PITCHER PUMP.

To thaw a pitcher or common kitchen pump, unscrew the pump and put a hollow elder or small iron pipe down the main pump pipe. With a funnel at the top of the tube or small iron pipe boiling hot water can be made to reach the frozen part. Keep pouring the hot water. Two feet can be thawed in two minutes. Before retiring draw a pail of water so there will be a supply on hand.—Contributed by Carl Baum, Valparaiso, Ind.



HANDY TABLE FOR SPACING HOLES IN CIRCLES.

The following table for spacing holes in circles, sent us by J. C. Bush of Duluth, Minn., is a great time saver and avoids making numberless trials.

Suppose the problem was to divide a 62-inch circle into 44 equal parts. First find 44 in the table and on the same line under S is .071339. Multiply this by 62 which gives 4.423018 in. Having drawn two diameters at right angles to each other the dividers are set to 4.42, using a scale of one-tenth. Convenient for draftsmen and patternmakers.

No.	Degrees.	Seconds.	Sine.
3	60	..	.8660
4	45	..	.7071
5	36	..	.5880
6	30	..	.5000
7	25	43	.4339
8	22	30	.3826
9	20	..	.3420
10	18	..	.3090
11	16	22	.2817
12	15	..	.2588
13	13	51	.2393
14	12	52	.2227
15	10	..	.2079
16	11	15	.1951
17	10	35	.1837
18	10	..	.1736
19	9	29	.1648
20	9	..	.1564
21	8	35	.1492
22	8	11	.1423
23	7	50	.1363
24	7	30	.1305
25	7	12	.1253
26	6	55	.1204
27	6	40	.1161
28	6	26	.1120
29	6	13	.1081
30	6	..	.1045
31	5	50	.1012
32	5	38	.0980
33	5	27	.0950
34	5	19	.0923
35	5	05	.0896
36	5	..	.0871
37	4	52	.0848
38	4	44	.0826
39	4	36	.0805
40	4	30	.0785
41	4	23	.0765
42	4	17	.0747
43	4	11+	.0730
44	4	5+	.0713
45	4	..	.0697
46	3	54	.0682
47	3	49	.0668
48	3	45	.0654
49	3	41	.0641
50	3	36	.0628

This table can be extended to any number by consulting Trautwin, page 1022.

To test the purity of turpentine drop a small quantity on a piece of white paper and expose to the air. No trace will be left if the turpentine is pure, but if it contains oil or other foreign matter the paper will be greasy.

EASY METHOD OF REMOVING KNIVES FROM SICKLE BARS.

This is a difficult task unless the smith knows just how to go about it, and comparatively simple when he does. Many a smith has tried to remove worn out or broken knives from mowing machine sickle bars by means of a chisel and punch, with the result that the rib on the back was either bent

Taking Knives from a Sickle Bar

double or broken in two, says a correspondent of the Blacksmith and Wheelwright.

To make an easy job of it, catch the knife to be removed firmly in a vise, having the rib on top of the vise but not caught in it. Then with a set hammer placed so it will just catch the knife and not the rib, drive downward, and the rivet will be cut off, as if by magic, between the knife and the rib. Cut but one rib at first, and then cut the other one, and the blade will then drop off. In this way ten blades can be knocked out in as many minutes without trying the patience too greatly.

TAKING SPUDS OUT OF BOILERS.

Plumbers often find it difficult to take spuds or nipples out of old boilers as in hammering spuds to loosen them one is apt to disfigure or split them. To take them out without injuring them heat nipple or spud with torch or furnace and when hot put on pipe wrench and unscrew. If it does not come heat a little more. This method saves time, trouble and noise.—Contributed by Arthur Ed. Hauslein, Chicago, Ill.

CLEANING FLOORS.

One pound of common soda and one pound of quicklime melted or mixed in one gallon of boiling water, is good for removing hard paint and restoring color of floors, says the Master Painter. Saturate the floor with the solution, sprinkle clean, sharp sand over it and scrub with soap and water. This will clean and bleach the floor perfectly and it may then be waxed.

WIPING JOINTS IN HARD PLACES.

Where a building is equipped with a wrought-iron pipe screw joint drainage system and where a joint must be wiped

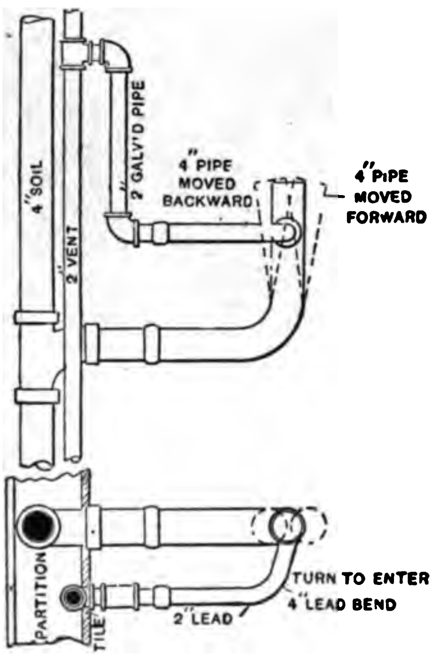


Fig. 1.—Where Joints Must Be Wiped

under the closet to connect the vent to the lead bend connecting the closet with the waste pipe, considerable trouble would be saved, says the Metal Worker, if the 2-inch vent pipe were connected with the lead bend before the cementing and tiling was set and if a 45 or 90 degree bend was made in the 2-inch pipe, so as to allow for any inaccuracy of the piping or fixtures when finally set. This would allow the pipe to be still further bent or straightened to meet the requirements. Some idea of the conditions met with under the floor where the joint must be wiped are presented in the plan and elevation given in Fig. 1. The dotted lines show the extent to which the lead bend may be moved in order to facilitate the wiping of a joint when the vent connection is made with the lead bend.

It is often difficult to hold the heat until the joint is properly made, where the pipe is as thin as the lead bend or the vent pipe. Fig. 2 shows an arrangement for maintaining the heat until the work is finished. An old piece of tin plate or sheet iron is bent in the form of a small basket with ends extending up to turn down over the end of the lead pipe and so support the basket at the point desired. Sufficient air spaces to allow free radiation of the heat and continued combustion of the hot coals which should be placed in the basket should be made. Perforations in the sheet metal will suffice. Stuff the top end of the bend with paper to prevent the generation of too much heat. This method is convenient where a

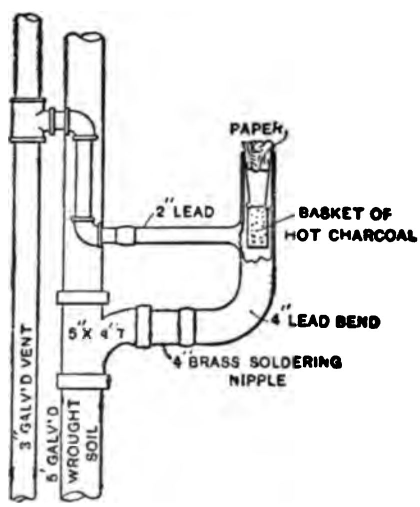


Fig. 2.—Getting Up a Heat

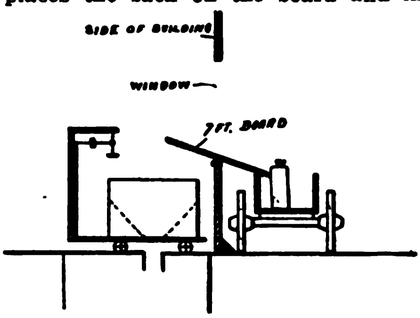
pipe must both be dried out and heated before proceeding with the work.

A SIMPLE FIRE EXTINGUISHER.

Where gasoline is used in any great quantity there is always danger of fire. In the ceiling over the tank containing the gasoline hang a fragile bottle containing a gallon of ammonia, by a string link. Should the gasoline will fall and the monia

WHEAT DUMP FOR CUSTOM MILL.

The sketch represents a method of receiving wheat at small custom mills. The farmer places the sack on the board and lifts



Dumping Board

it up until it tips, says the American Miller. Then the sack slides in and empties in a hopper scale. The advantage of this is that every sack of grain can be inspected, to say nothing of the saving of labor.

SOLDERING CAST IRON.

Soldering cast iron is a rather unsatisfactory undertaking at best. The ordinary killed acid is the best flux to use, says the Automobile. The surfaces to be united should be made bright and clean; this is most important. They should then be tinned separately and sweated together. The pieces must be kept hot, as any tendency to chill the solder will cause failure, and the parts should be pressed together as closely as possible while cooling. It will be seen at once, on commencing the tinning process, that solder has not the same tendency to adhere to cast iron as to brass, for instance. For this reason a soldered joint in cast iron can never be depended upon to stand much strain. Some of the better and closer cast irons can hardly be soldered at all. Gasoline motor cylinders are usually exceedingly difficult to solder.

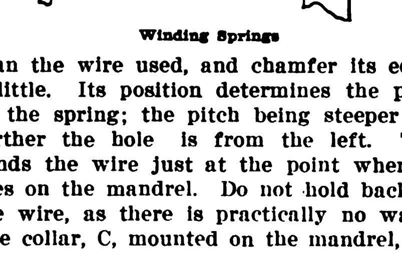
PREPARING TRACING PAPER

The following is a capital method of preparing tracing paper for architectural or engineering tracings, says the National Builder: Take common tissue or cap paper, any size sheet, lay each sheet on a flat surface and sponge over (one side) with the following, taking care not to miss any part ... face: Canadian balsam, two ... turpentine, three pints, ... of old nut oil; a ... for applying ... m. As each sheet is prepared it should be hung up to dry over two cords stretched tightly and parallel, about eight inches apart, to prevent the lower edges of the paper from coming in contact. As soon as dry, the sheets should be carefully rolled on straight and smooth rollers covered with paper, about two inches in diameter. The sheets will be dry when no stickiness can be felt. A little practice will enable any one to make good tracing paper in this way at a moderate rate. The composition gives the substance to the tissue paper.

ANOTHER DEVICE FOR WINDING SPRINGS.

Either close or open wound springs of any pitch may be wound by the device shown in the sketch, says a correspondent of the American Machinist.

Make the piece A of a suitable piece of flat stock, long enough to rest against the front of the lathe bed, and bend to fit over the mandrel, M. The mandrel should be smaller than the finished spring by the amount of spring in the material being wound. Drill the hole, H, a trifle larger



Winding Springs

than the wire used, and chamfer its edges a little. Its position determines the pitch of the spring; the pitch being steeper the farther the hole is from the left. This bends the wire just at the point where it goes on the mandrel. Do not hold back on the wire, as there is practically no waste. The collar, C, mounted on the mandrel, has a hole drilled longitudinally in it, for receiving the end of the wire.

To wind a spring, grip the mandrel in the lathe chuck, pass the wire through the hole, H; bend the end of the wire over at right angles and insert in the hole in the collar, C. Start up the lathe and wind the spring. Use a fairly stiff mandrel and no support for the outer end will be necessary. For slender mandrels an old chuck mounted in the tail spindle may be used, having the jaws tightened enough to support the end of the mandrel.

RAISING THE STACK.

The raising of a tall stack always becomes a matter of popular interest before it is accomplished and any bungling may bring embarrassment to the man superintending the job, who, in all likelihood, had not counted on the group of interested spectators. A correspondent of the Woodworker tell how he goes about this operation.

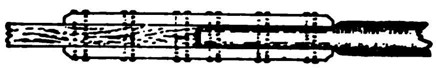


Fig. 1

Derrick pole, blocks, tackle and all necessary rigging were collected soon after the construction of the building had been started, as it is good policy to have them at hand and in readiness. The derrick or "gin" pole usually consists of three poles set in a tripod. In this case a poplar log "snaked" up the bank was the best available. The pole was 54 ft. long and 10 in. in diameter at the top end; the brick stack stump was 18 ft. high and the iron stack with the spark arrester, was 87 ft. long, consequently the pole was not long enough.

To meet this emergency a butt splice was made at the large end of the pole by means of a 12x12-in. by 16 ft. timber and two pieces 6x12 in. by 12 ft. (Fig. 1.) This gave 70 ft. of pole, hardly length enough, allowing 10 ft. for blocks, sling and lashing for landing the pole in the stump. To gain length a crib of railroad ties, 5 ft. high, d having a platform of 2-in. planks, was built and the pole set on it, which gave about 9 ft. of space between blocks when the stack was "high," ready to set over into place.

Blocks and tackle consisted of a double or two-sheave block having a becket to which was fastened one end of the 1¼ in. rope (500 ft. long) and a triple or three-sheave block. The other end of the rope was the "fall" of the line—or the rope to which power is applied. It was passed four times around the "crab" of the drum, which "crab" was a geared windlass consisting of a crankshaft, having a crank on each end and carrying a small pinion which geared into a spur gear, keyed onto one end of a spool shaft. The spool was tapered down from the flanges toward the middle so that the rope slipped toward the center as wound on, and one man pulling on the slack end would cause it to impinge on the spool enough to raise the load pulled by two men at the cranks. This crab was geared so that the pinion made six turns to the spur gear's one and by means of it, with the tackle blocks, two men could raise a load of 8,000 lbs.—more than 5 men could pull up bodily by hand.

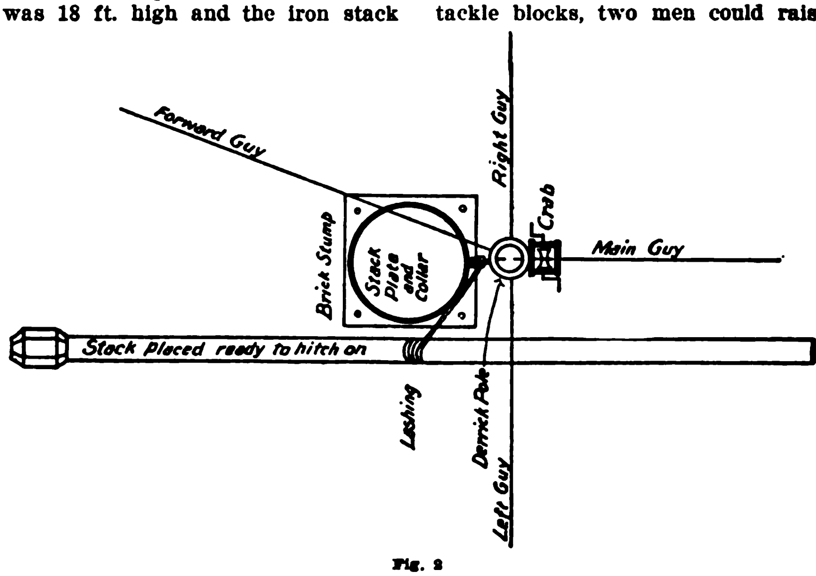


Fig. 2

The derrick pole to be raised weighed 4,000 lbs. A 3x4-in. by 24-ft. scantling and a pair of double ¾-in. blocks were first raised by hand. With this a larger derrick pole 5x5 in. by 40 ft. long was pulled up and securely stayed with four guy ropes. Then by means of blocks, tackle a
the main derrick pole was hoist
as shown in Fig.

this last operation the guys to the main pole were all pulled very tight by means of a pair of small blocks, each guy in turn until the slack was taken out of them. This was done by placing a "stop knot" on the guyrope, fastening one block to it and another to a sling around the post to which the guy is fastened. The "stop knot" is tied as follows:

We will say the guy is a 1¼-inch rope and the stop knot rope ⅝-inch. Take hold

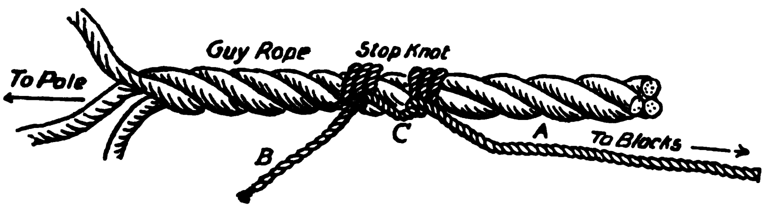


Fig. 3

of the end of the smaller rope marked A (Fig. 3), with the left hand; hold it against the large rope and make three round turns toward the right over the large rope.. Bring the end of smaller rope, marked B, back, and take three half hitches to the left. Bring the end marked A through the loop at C, and attach to the hook of block that has the larger number of sheave pulleys. It is very important that the guy ropes should be pulled tight, so that the stack does not take a lurch and gain momentum enough to break one or more of them.

In the instance mentioned, the tackle blocks and rope were not raised with the pole. Before the pole was raised "cleat" steps about 2 ft. apart were put on and a 1¼-in. hole was bored in the top of the pole and a 1-in. round iron davit put in, the hook part hanging over toward the stump when the pole was up. A man went up carrying a small line with which he pulled up a pair of small blocks and with this tackle the large blocks and tackle were pulled up.

The appliances all being in place, the crab bolted to the foot of the pole, all the guys pulled tight, and the 'makefasts" all secure, the lashing was put around the stack 3 or 4 feet above the center of the weight of the stack—that is, so that the bottom end of the stack was a little heavier than the top. This lashing is usually a rope of the size of the block line, passed six ...und the stack, and the hook of ... hooked into three of the ...e pulling tight around ...t slip up. As all the weight of the stack comes onto this lashing near the center, if the joints are not very strongly riveted the weight of the ends will sometimes shear the rivets off at the joint nearest the lashing. To avoid this three ribs of angle iron, ¼x2x2 in. about 20 ft. long were put in, placed equidistant on the inside circle of the stack, lengthwise, and securely riveted to it. Some boiler builders furnish these angle bars to be put in full length of the stack, but unless the stack is of very light weight material it is not necessary except at the middle.

A set of four guy ropes were then fastened to the stack 11 ft. from the top and another set of four 13 ft. lower down. Everything was made secure and taut and then, the stack laying alongside (Fig. 2) the blocks were hooked into the lashing, the winding of the rope on the crab was begun and the stack slowly went up. The lower end was held down by a hand line and thus an upright position was gradually assumed. When at the right point, it was pulled over into place, settled down on the stack plate, plumbed and the guys secured to the eight posts previously set.

POINTERS ON ARMATURE COILS.

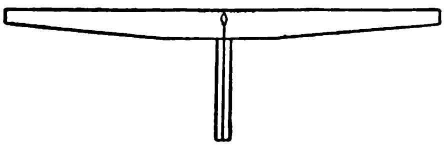
Wires should be of the proper size to obtain the requisite electromotive force, but as short and thick as may be, in order to give the least resistance possible. Their electroconductivity should be of the best, good copper wires being nearly equal to silver. Coils should be wound with air spaces, as some heat is always generated by their resistance, and ventilation cools them. Mica and asbestos are good for insulating armatures.

The wind pressure upon a flat surface is twice that upon a cylindrical surface of the same height and width.

Eleven pounds of nails will nail on the 1,000 laths required to cover 70 sq. yds. of surface.

HOW TO MAKE A LEVELING BOARD.

The board shown in the sketch is handy for grading pipe trenches or leveling ground. It may be made from an ordinary piece of lumber 6 ft. long, 8 in. wide and 1 in. or more thick. At the center and at right

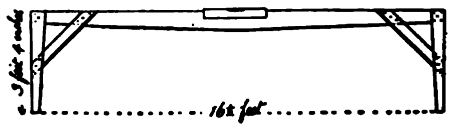


Home-Made Level

angles with the bottom edge of the first board rigidly attach a piece of the same lumber, about 3 ft. long. At the top of this upright piece attach a plumb bob. Mark a scale on the bottom of the board and at the center. The swing of the bob will indicate the grade.

LEVEL FOR GRADING DITCHES.

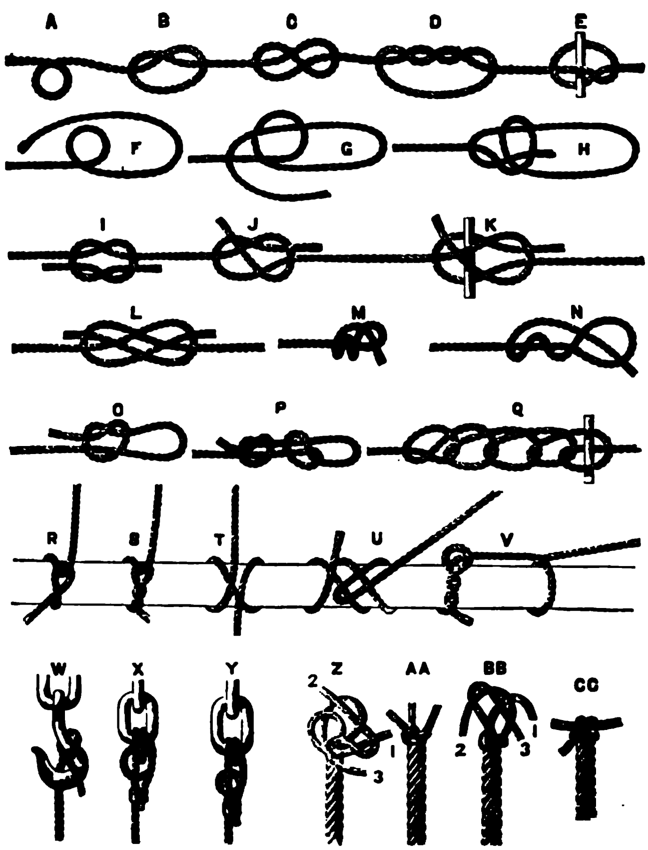
A level like the one shown in the illustration is used in Montana for grading irrigation ditches. The construction of the level is plainly shown. In operation the level is carried by one man and an assistant makes



Home-Made Level

marks with a shovel, to guide the driver of the ditcher, which follows about 200 feet in the rear. The usual grades allowed are from one-half to three-fourths of an inch to the rod. The level being just a rod in length is especially handy for the purpose mentioned.

Knots You Ought to Know



A.—Bight of a rope.
B.—Simple or Overhand Knot.
C.—Figure 8 Knot.
D.—Double Knot.
E.—Boat Knot.
F.—Bowline, first step.
G.—Bowline, second step.
H.—Bowline, completed.
I.—Square or Reef Knot.
J.—Sheet Bend or Weaver's Knot.
K.—Sheet Bend, with a toggle.
L.—Carrick Bend.
M.—Stevedore Knot completed.
N.—Stevedore Knot commenced.
O.—Slip Knot.
P.—Flemish Loop.
Q.—Chain Knot, with toggle.
R.—Half-hitch.
S.—Timber-hitch.
T.—Clove-hitch.
U.—Rolling-hitch.
V.—Timber-hitch and Half-hitch.
W.—Blackwall-hitch.
X.—Fisherman's Bend.
Y.—Round Turn and Half-hitch.
Z.—Wall Knot com
AA.—Wal

PUTTING RUBBER TIRES ON IRON BAND SAW WHEELS.

The following kink will be of use to those who experience some difficulty in making the tires stick. The reason they do not stick is because the wheel is cold and chills the shellac.

Fill a common oil can, having a small outlet, with gasoline. Have the wheel clean and keep it revolving slowly by hand. Put a little gasoline on all around the rim of the wheel and then touch a match to it and keep the fire all around the rim by putting in gasoline wherever the fire dies out. Keep this up until the wheel is very warm, then let the fire die out and put on very thick shellac and then the tire. The tire will stretch even all around and cause no more trouble by coming off.—Contributed by Chester R. Wyman, So. Paris, Maine.

HINTS FOR DRAFTSMEN.

Steel pens are soon ruined through not wiping, and even when faithfully cleaned after using, soon accumulate more or less deposit. They may be made as good as new in a few moments by rubbing with a bit of sandpaper until free from dried ink and rust. The sandpaper can be cemented on a tiny stick and take its place among the desk accessories, ready for instant use. Pens are cheap, of course, yet a good one one dislikes to part with, and the operation is so simple that it is worth while.

A fine or coarse pen can be created at will by means of an oil stone; a little practice will soon demonstrate the idea, rubbing at the sides reducing the lines, and across the end rendering the pen coarser. If any scratching ensues, a few trials will show where to apply the oil stone to remove the difficulty.

This method can be used to advantage also with etching pens. It sometimes occurs that the inking pens of a drawing set fail to ink properly and cut the paper. This is not only annoying but ruins the work. The oil stone, applied to each point after separating as widely as possible, will remedy the defect. Rub the finger over the points, to ascertain that there are no feather edges, and then continue with the oil stone until [illegible] obtained. Afterward [illegible] a little alcohol will [illegible]

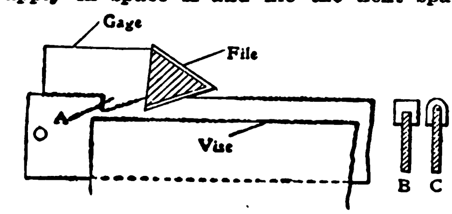
[illegible] is broken, [illegible] way to [illegible]

can be procured: Remove the broken glass, and cut a piece of cardboard to fit in its place; cut an opening to show the figures and lines, and string a hair across the opening, cutting a niche in the cardboard with a penknife for the hair, and being careful that it lines up properly. In this way one can use a slide rule until a new glass is obtainable.—Contributed by A. B. Weeks, Cleveland.

HOW TO MAKE A FINE-TOOTHED SAW.

Once in a while a saw having very fine teeth, fine as those on a jeweler's saw, but with a much wider blade is required. Such a saw can be made of an old spring from an eight-day clock, says a correspondent of The American Machinist.

The sketch shows the gauge made of $\frac{1}{4}$x$\frac{1}{2}$-in. machinery steel. Grind one side of a 3-cornered file safe, cut a piece of steel the length of blade you require and clamp in the vise; file one space A the proper depth, take the gauge in the left hand and apply in space A and file the next space,



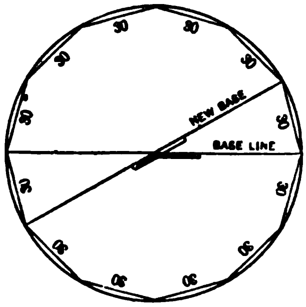
Making a Fine-Toothed Saw

holding the safe side against the gauge. Repeat this operation until the saw is complete. Regulate the depth by the number of strokes of the file. For thin brass or German silver tubing, one long stroke is enough; for flat stock, two; for hard rubber or fiber, three.

Punch holes in the ends to stretch in a frame, or for miter work make a back for the blade by slotting a piece of flat brass like B, or take a piece of soft brass and double over like C. If for any reason you should desire to draw the temper at each end, wrap the toothed part in a wet cloth, or, better still, stick through a raw potato and leave the end exposed and apply the heat. The temper is hard enough for gray iron and machinery steel. The blade can be made at the rate of 1 in. in 3$\frac{1}{2}$ minutes. No set is required. This saw makes a cut of .02 in.

DIVIDING CIRCLES BY THE STEEL SQUARE.

A circle may be divided into any number of equal parts by the use of the steel square, says the Metal Worker. To do this, divide 360 by the number of equal parts desired. This will give the angle of the parts in degrees.



Using Steel Square for Dividing Circles

Let us suppose that we wish to describe an octagon within a circle. Dividing 360 by 8 gives us 45 degrees as the angle of the parts. Set bevel square at this angle by aid of the protractor and from any diameter as the base line, secure a new base, using this from which to secure a second and so on until the circumference is completed. This proceeding is indicated in the diagram.

For a very large circumference, first make a small drawing, having a diameter which is a factor of the given circumference, keep in mind that dimensions of similar figures are in proportion and the sides may be secured by the rule of three.

BOILED OIL FOR ZINC PAINTING.

Mix 1 part of binoxide of manganese, in coarse powder, but not dusty, with 10 parts nut or linseed oil. Keep generally heated and stir frequently for 30 hours. The oil will then begin to turn a reddish brown and will answer for any paint.

FILLER FOR WALNUT.

To make a good walnut filler mix together equal parts of rye flour and china clay and a little burnt umber with two parts turpentine, one part boiled oil and two parts japan gold size. Apply with a rag.

If you have a good "kink" for this department, send it in. We can use rough sketches of any size.

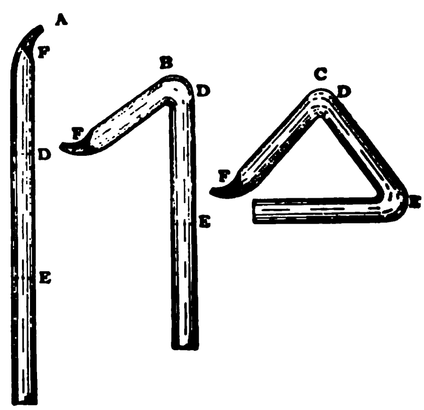
BLACK ENAMEL FOR WOOD.

Prime the wood with linseed oil, turpentine and while lead; give it two or three coats of black mixed with copal varnish and turpentine; rub it down dry with pumice stone and water, and then varnish with copal. Rub down again and polish with oil and rottenstone, which will give a perfect smoothness, says the Master Painter.

HOW TO MAKE A TRIANGLE.

A triangle which may be used by a lodge or other organization as a call instead of a bell or horn, is described in the American Blacksmith.

The triangle, which should be about 24 in. on each side, is made from a round bar of spring steel, ⅜ to ½ in. in diameter, and about 6 ft. long. Mark it off into three sections, as at A in the drawing, making the marks very light with a center punch, not a cold chisel. Heat one end of the bar and forge it as at F, then heat the bar at the mark D and bend the top over as at B. Now heat at the second mark E and bend the lower part toward the forged end F, but not touching it. True your triangle until the base is horizontal and the other two sides form equal angles at each end of the base. To see if the piece is straight, place it on a perfectly level surface, and if all sides touch equally your job is finished.



Making a Triangle

In working your steel bar be careful to overheat a... work too at one... the

MOVING HEAVY WEIGHTS IN THE MOUNTAINS.

When nothing else is available the windlass shown in the accompanying sketches is used in the mountains of Montana for moving heavy weights. If it is possible to obtain anything else for the purpose this windlass is not desirable, but it may prove very useful in an emergency.

At the top and base of the windlass are iron bands having rings from which pass strong guy ropes and chains to iron rods driven into the ground. The weight is attached by means of strong rope, which unwinds from the small drum and winds upon the larger, thus giving double or triple purchase according to the difference in size of the two drums (Fig. 1). When the weight has been pulled up as far as the windlass can pull it, the rope No. 2B (Fig. 2) is shortened and the windlass rope lengthened or unwound and a new start is taken, or the windlass is moved farther back. A, Fig. 2, indicates the guy stakes.—Contributed by Lee R. Clarke, Bozeman, Mont.

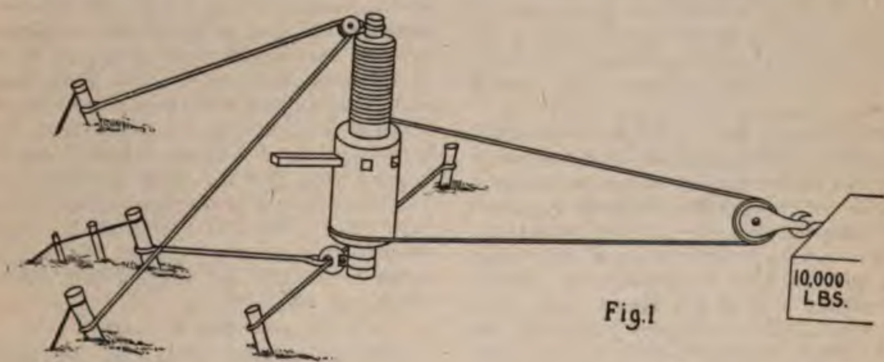


Fig.1

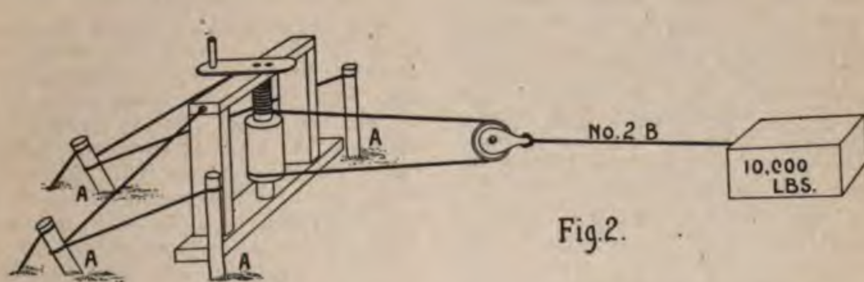


Fig.2.

For laying 100 cu. ft. of wall, a cord of stone, 3 bu. of lime and a cubic yard of sand should be allowed.

CEMENT FOR UNITING BRASS AND GLASS.

One part caustic soda, 3 parts rosin, 3 parts plaster, 5 parts water, boiled together. Hardens in one-half hour. To prevent hardening so rapidly substitute zinc white, white lead, or slaked lime for the plaster.

AUTOMATIC TIRE PUMP FOR AUTOS.

Automobile tires may be inflated while the machine is running. The device is specially recommended for use where a slight puncture is had and it is desirable not to repair before reaching home or some shop. The pump is carried in the tool box and fastens to the hub. An eccentric works the pump, the air steadily discharging into the tire. The pump will fit any make of wheel.

TO REMOVE FROST FROM WINDOWS.

One of the simplest and quickest methods of removing ice from windows is to place common coarse salt on a dry cloth and rub the frost. You will be surprised to see how rapidly the frost is removed, and the glass will not coat again for a day or two, even in very cold weather.

WHERE THE BEST BRISTLES ARE OBTAINED—RUSSIA THE SOURCE OF LARGEST SUPPLY.

Bristles are so extensively used for brushes of so many descriptions and for such widely varied purposes that one wonders where all the abundant supply comes from. Good bristles, however, are expensive and more than that, the American supply is of the lowest grade, short, crooked and fit only for the cheapest kinds of brushes.

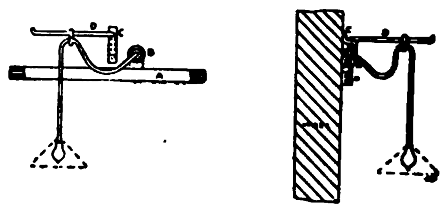
The reason for this is that in America hogs are grown for pork, and are killed young, the bristles being obtained at several of the large American packing plants, where men, hired for the purpose, grab what bristles they can as the hogs pass along in being cleaned, after killing. The bristles are gray and less sightly than the white ones obtained elsewhere. The hair from the ridge of the hog's back is the best and is saved for brushmakers' use; that from the sides is used in cheap grades of curled hair used by upholsterers, says the Master Painter.

Russia supplies the world with the highest grade of bristles, long, stiff and snow white, the latter quality being no inconsiderable factor, though for efficiency it makes them no better than the gray or black bristles. The reason Russia leads in this product is that the hogs from which the bristles are obtained live in the forest, half wild, and are not killed young for pork as in the United States. The better the hog for pork the poorer for bristles. Siberia also produces good bristles. The bristles are packed in casks weighing 250 and 300 pounds. They are assorted into the following grades: "Okataka," from 5 to 7 in. long and used by shoemakers, the coarsest and stiffest bristles grown. "Firsts," 4 to 6 in. long, stiff and elastic; "Suchoys," 4½ to 5 in. long, fine and soft; and "Seconds," 3½ to 6 in. long, also fine and soft. Each grade is furnished in the four colors, white, bronze, gray and black. The peasant women save the bristles and sell them to itinerant peddlars who in turn sell them to dealers. The best stock is gathered in the winter time and they range in price from 60 cents to $5.00 per pound. To be a good bristle buyer requires years of experience. The quality of bristles is determined by length, stiffness and color; cheap qualities are often made to appear far better than they really are.

Germany, France, China and India all furnish bristles in commercial quantities.

ADJUSTABLE LIGHT FOR FITTING BENCHES.

When fitting benches run along the wall they can be lighted up very nicely in the manner shown in the sketch. Lamps suspended from the roof are unhandy, as it is often difficult to fix them in just the right position.



Adjustable Light for the Fitting Bench

To arrange the light as shown run the wiring along the wall about 4 ft. above the benches, as at A, and take them up to the rose, B. A wrought-iron bracket, C, is fixed to the wall by two screws. This bracket is drilled to receive the swing arm, D, which is made out of a ⅛-in. round arm in the shape shown. A small S hook is hung loose on the arm and the wire passed over it. The loop in the lower part of the S hook, says the Electrical Magazine, London, should be just large enough for the wires to pass through and keep it the required height as adjusted.

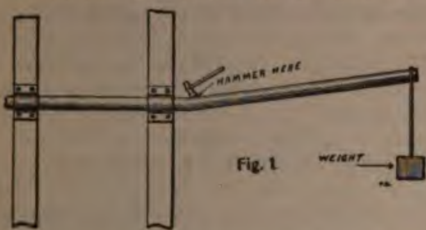
HOW TO BRAZE HOLLOW CASTINGS.

Take old wagon or buggy boxing and crack it. Drive a very thin wedge in the crack to keep it from closing tight when hot. Take the softest brass filings or spelter that can be got. Mix it with about one-eighth of its bulk of boric acid. Put the box in the fire and heat red. Dip a point of a lily in the mixture and spread it along the crack; blow up until the brass is melted. Take out and lay it away to cool. Be careful not to jar while hot. Take a sledge and mash up when cold and you will see that you have brazed the easiest thing possible, and for this reason the brass was clean and the work contracted and did not move while heating and cooling, as separate pieces would, which is the secret of the whole job, says a correspondent of the Blacks- Wheelwright. If your bras-
rusty, file, scrape
muriatic acid
ing acid

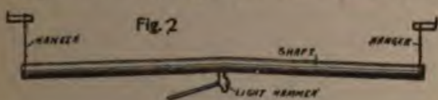
SHOP NOTES

HOW TO STRAIGHTEN SHAFTING.

If it is not convenient to remove the shaft to be straightened, it may be straightened while in place by the method shown in Fig. 1. Have enough weight on the end of the shaft to cause considerable strain, and pound lightly on the top of the shaft.



In Fig. 2 is shown another method. Hang the shaft to be straightened by the ends, the bow being up, and pound on the under side with a light hammer. The light taps swedge the iron, says the American Miller, and cause it to be straightened. Use a straight edge to true the shaft by.



LAYING A DRAIN ACROSS A MARSH.

In drain laying, when a soft place is reached in a marsh or in seepy land, if stone or gravel cannot be procured the place should be treated as shown in the sketch, says Brick. The place when dried out is liable to sink, but by bridging it as shown, by driving down short 6-in. boards about 2 feet apart until solid ground is reached, truing up the tops of these boards and nailing on a 6-in. board to grade on which to lay the tile, the difficulty may be overcome.

HOW TO SPLIT PAPER.

When drawings or engravings are printed on both sides of a sheet of paper and it is desired to file them separately, the paper may be split very satisfactorily and without injury to the drawings, says a correspondent of the American Machinist.

Have ready two pieces of cotton cloth, an inch or two larger than the paper to be split, some flour paste and some warm water. Cover the paper with a thin coating of the paste, dampen one piece of cloth and place on the paste side of the paper; smooth it out and so remove any air that may be under the cloth. Treat the other side of the paper in the same manner and allow the whole to become thoroughly dry.

Splitting Paper

When dry, separate two corresponding corners of the paper, as shown in the sketch, and gently pull apart. Paper will adhere to each cloth and they must then be allowed to soak in water in order to remove. Handle carefully till dry.

To make enough mortar to plaster 100 sq. yds. use 8 bu. of good lime, 16 bu. of sand and 1 bu. of hair.

Laying a Drain Through Marshy Land

THE MEASUREMENT OF VACUUM.

The importance of knowing just the pressure in the condenser has led to much discussion as to how it should be determined.

Fig. 1 shows one method, using the principle of the barometer, in which the mercury column is pushed up by atmospheric pressure until its weight, plus the pressure

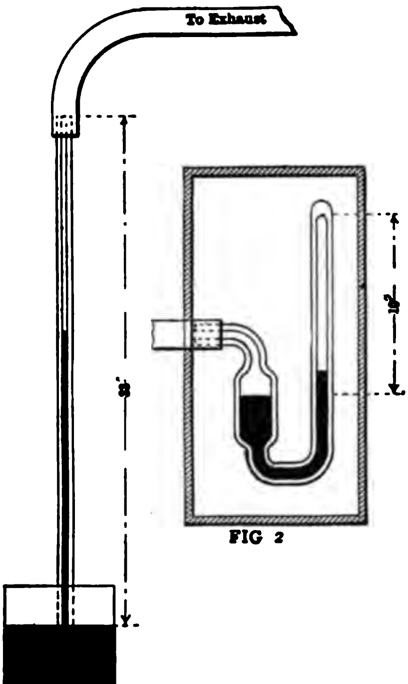


FIG 2

FIG. 1

The Measurement of Vacuum

in the condenser, equals the atmospheric pressure on the mercury in the dish. Suppose this column is 25 in. high and the barometer reads 30 in. The pressure in the condenser is equal to 5 in. of mercury. But two readings were necessary to get it. Besides this, a higher barometer reading; that is, greater atmospheric pressure, which would, of course, push the mercury up, would seem to show a better vacuum in the condenser, when in reality this vacuum was probably made less by the increased atmospheric pressure.

The best instrument is one that will: (1) show the actual pressure in the condenser, independent of the pressure of the atmosphere; (2) it must be accurate at all times.

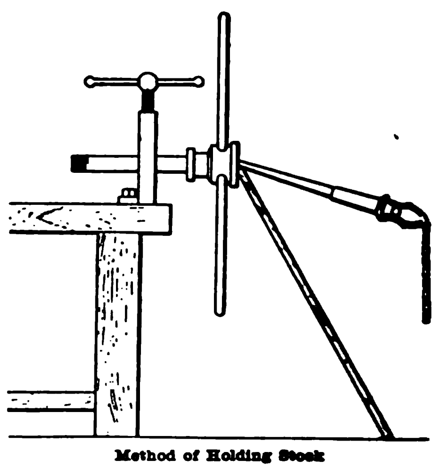
Take a glass tube, made and connected as in Fig. 2, with a vacuum above the mercury in the closed end. The difference in h of the mercury in the arms of the U tube will show quite well the actual pressure in the condenser. If the mercury rises 5 in. in the tube it means that the pressure on the exhaust side of the piston is the same in effect as if the piston were lifting a layer of mercury 5 inches thick. In a 10-inch piston this would mean a constant load of about 193 pounds at its back. This helps us to understand a 25-inch vacuum and now a still lower pressure cylinder can get work out of this exhaust steam.

The instrument in Fig. 2 is neat and cheap, and the arm at the right need be only 10 inches in length. By its use we may speak of 5 inches back pressure instead of a 25-inch vacuum.

HOW TO START A PIPE DIE.

It is possible to start the ordinary plain 2-in. pipe die on anything, save rotten pipe, by the following method, says a correspondent of the Engineer.

Take a board 6 or 8 in. longer than is necessary to reach the center of the pipe when standing on end, and with one end of



Method of Holding Stock

a bar or the handle of chain tongs in the pipe, incline the board so that the upper end comes about flush with the pipe, as shown in the sketch. Bear down on the bar, which will press the boards against the stock and so hold it firmly in position and squarely against the end of the pipe

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COLLECTING SPILLED MERCURY.

Mercury spilled on floor or table is hard to collect, as it separates into small globules which roll away at the slightest touch. A simple method of collecting it is to make a wet ring around it by means of a wash bottle or a glass, and then gather it up on a card scoop or in an envelope. The mercury cannot readily cross the wet ring.—Technics, London.

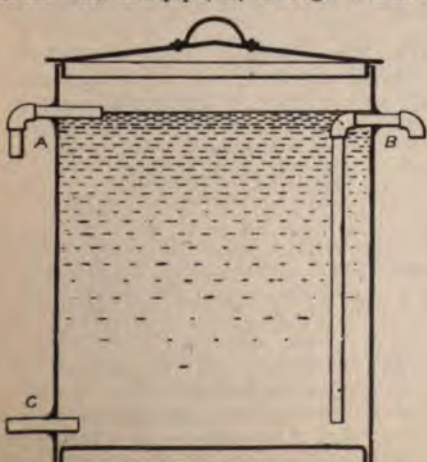
HOW TO RECUT OLD FILES AND RASPS.

Dissolve 4 oz. saleratus in 1 qt. water and boil the files in the solution for a half hour. Remove the files, wash and try them. Then to 1 qt. of water slowly add 4 oz. sulphuric acid. Immerse the files in this preparation and let stand from six to twelve hours, according to the fineness or coarseness of the files. Earthen vessels only should be used for the acid preparation. Bottle the liquid and it may be used again; but be careful in handling it, as it is poisonous.—Contributed by F. H. Olson, Loomis, Neb.

A SIMPLE OIL SEPARATOR.

For separating oil from water before filtering the oil, the apparatus shown in the accompanying sketch is efficient and can be made at home, says a correspondent of the Engineer.

A gallon oil can is used for the tank, and the pipe, C, is connected to the drip from the engine. Through this pipe, C, the oil and water enter until the liquid in the can is on a level with the pipe, A, through which the



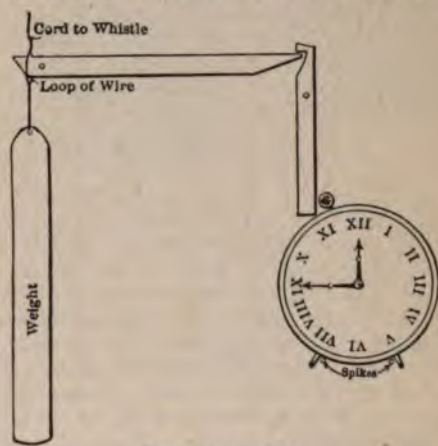
Sectional View of Oil Separator

light oil floats off, while the water runs out at B, which is ¼ in. lower than A, so that the water cannot reach A. In starting the separator, to prevent any water getting into pipe B, it is well to pour enough water into the can to cover the bottom of pipe B.

HOW TO MAKE A TIME ALARM.

A time alarm which will blow a whistle at the time it is set for is very easily rigged up as shown in the sketch.

A weight is attached to the whistle cord



A Simple Time Alarm

and hung up by a loop of wire on a trigger working loosely on a nail. The other end of this trigger is set under the hook of another loose trigger. An alarm clock having the bell removed is set against the wall by means of spikes on which the legs rest. The clock is near enough to the second trigger so that when the alarm rings the hammer will strike the trigger and release the weight, which falls with a jerk and so blows the whistle. A little slack in the cord running to the whistle will cause the weight to fall with a jerk.

HOW TO CLEAN PAINT KETTLES.

Add half a pound of caustic soda to two gallons of water, and boil the kettles in the solution. The caustic acid may again be used for the same purpose several times, or may be used for cleaning paint from woodwork, says the Master Painter.

A good furniture oil is composed of 1 pt. boiled linseed oil, 4 oz. yellow wax melted and colored with alkanet root.

SET SCREW POINTS.

In obtaining a point on set screws which are to be used on threaded collars, the method shown in the sketch is excellent, as it entirely stops annoyance with soft metal points.

To procure the points is a very simple matter. In Figs. 1 and 2 is shown part of

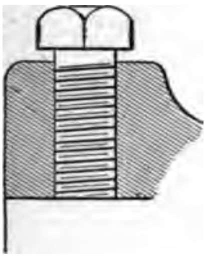


Fig. 1

Fig. 2

an adjusting ring for the blades of an adjustable reamer. Rough bore the hole, leaving enough stock so it can easily be rechucked and finished; drill and tap the hole for a set screw and screw a wrought-iron cap bolt in the tapped hole, as in Fig. 1. With a hand die cut the extreme end of the cap bolt small enough to be a "sloppy" fit in the tap hole, this being done to insure enough lateral play in the end to be used as the "point," so that the set screw will force it tightly upon the male thread which the adjusting ring is to fit. Rechuck the ring and bore and cut the thread in it in the usual way. This being done screw the cap bolt out of the hole, and cut off a piece, as shown at Fig. 2, with two or three threads of the original cap bolt on it and the same thread in the end as the adjusting ring. Caseharden the wrought-iron "point" so made and screw in to the adjusting ring (see Fig. 2) until it is in the same position it was in when the internal thread was cut in its end.

Points properly casehardened, says a correspondent of the American Machinist, will not expand under the ordinary pressure of the set screw and cannot mar the threads they grip.

DARK GREEN PAINT FOR VEHICLE GEAR.

When painting the gear of a vehicle dark green add a little chrome yellow, or chrome green, if preferred, to the black for the first coat, and for the second coat add the same to black rubbing varnish.—John L. Whiting Sons' Book, "What Else to Do."

BAND SAWS AND HOW THEY ARE MADE.

The very best steel obtainable, combining qualities of toughness, elasticity and edge-holding is used for band saws. The saws are rolled from large pieces of the steel until of the right thickness (the standard is 14-gage) and are then left for grinding and polishing.

Band saws are heated for tempering in large furnaces 75 to 100 ft. long. When at the right heat they are taken out and plunged into a long trough filled with whale oil, and when cold the teeth are punched by an automatic machine. If, when tested for its temper, it is either too soft or too hard, it must be retempered.

The blade usually comes out badly twisted after tempering, says the Wood-Worker. Some are long-face twists and some cross-face twists, then comes the cross-line twist, which runs the entire length of the saw. Sometimes part of the saw will have long-face twists and part cross-face twists. All twists are taken out of blade with the cross-pein hammer, and tension put in with the round-face hammer to the amount desired. Tension levels are used that are made on a circle, so as to have the tension even throughout the saw.

The blade is then ground between two large grindstones running opposite directions from one another. Great care is taken in grinding to keep the stones true so as to grind the saw alike on both sides. Should one stone become hollow-faced and the other remain square, you would find the saw blade to be ground level on one side and rounding on the other. It would be impossible to level such a saw alike on both sides.

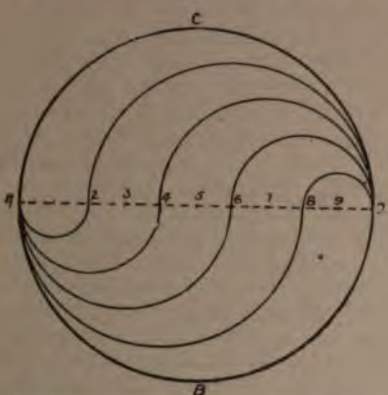
After being ground, saws are polished and brazed together, but are always hammered and tensioned before they are put together.

TO FINISH SPRUCE.

Wet the surface of the spruce with dilute sulphuric acid and allow it to dry. Hold over a heated stove until the whole surface is as black as charcoal, then with a stiff scrubbing brush, remove all the
that will come off. [illegible]
linseed oil and
brings out
gives th
is u

TO DIVIDE A CIRCLE INTO ANY NUMBER OF PARTS OF EQUAL AREA.

Let ABCD be the circle, to be divided into five parts of equal area. Divide the diameter, AD, into a number of equal parts twice as great as the number of parts desired in the circle—in this case, five. Number the points as shown. From 1 as a center, draw



Dividing a Circle into Parts of Equal Area

a half-circle through A and 2 on one side of AD, and from 6 as a center, strike a half-circle through 2 and D, on the opposite side of AD. In the same way, taking as centers 2 and 7, 3 and 8, and 4 and 9, the remaining half-circles are drawn, giving the required equal areas.

OIL THAT COLD WILL NOT AFFECT.

It is often difficult to keep machinery properly oiled in cold weather, as the oil freezes in the oil holes and the cups, and the oil upon the ways of the lathe and planer becomes stiff, causing the machines to work hard. A good oil for winter use is made by mixing graphite with cylinder oil until in a thick or pasty consistency, and then adding kerosene until it flows freely. This oil will not become stiff at 14 degrees below zero, and is valuable to those operating machinery outside or in cold shops.—Contributed by Paul S. Baker, Muscatine, Iowa.

Concrete which is well-proportioned will safely withstand a crushing strength of 50 tons per square foot, it is said. Most American cities limit it to 16 tons per square foot, however, in their building laws.

CEMENT FOR LEAKS IN IRON PIPE.

A cement for closing leaks in iron pipe consists of coarsely powdered iron borings, 5 lbs.; powdered sal ammoniac, 2 oz.; sulphur, 1 oz., and water sufficient to moisten it. This composition hardens rapidly; but if time can be allowed it sets more firmly without the sulphur. It must be used as soon as mixed, says the Mechanical Engineer.

TO MAKE GAS ENGINES NOISELESS.

To make a gas engine noiseless, the following simple device can be introduced by anyone at a small expense, says an English journal: A pipe split for a distance of about 80 inches is attached to the end of the exhaust, with the split end upward. Beginning at the lower end of the cut, which may best be made by a saw, dividing the pipe into two halves, the slotted opening is widened out toward the top until it has a width equal to the diameter of the pipe. The puff of the exhaust spreads out like a fan, and the discharge into the open air takes place gradually. The effect produced is said to be remarkable, but it depends somewhat on the flare of the tube.

SAFETY FIRE BUCKET TANK.

The fire bucket is a constant temptation to the workman who happens to need a pail and can't find one handy. The fire buckets to be of use when really needed must be in handy places. If they are set around on the floor they are either in the way or soon disappear. If hung up on nails or hooks or placed on shelves they dry out and are often found empty and ready to fall to pieces when the fire comes. An Eastern concern has conceived a practical solution of the fire pail problem by using a galvanized iron tank partly filled with water in which the pails are kept. A lid to the tank keeps out dirt and prevents evaporation.

FLANGED WHEELS.

Faulty Systems and How They Could Be Improved

The flanged wheel, undoubtedly, is very destructive in its effect upon a belt. Some manufacturers of belting state in their contracts that the radial flanges often used to keep belts on pulleys shall be dispensed with. The flanges are used oftentimes simply to overcome some imperfection in the alignment of the wheels or shafts. Again they are employed to guide the belt correctly on a wheel which is of too small diameter, too wide or too narrow, or in which the belt system itself is defective, and the belt cannot be kept in proper line.

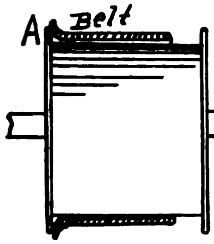


Fig. 1

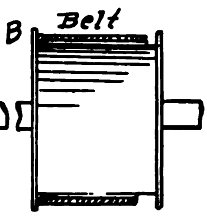


Fig. 2

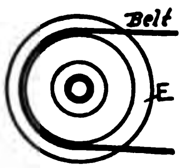


Fig. 3

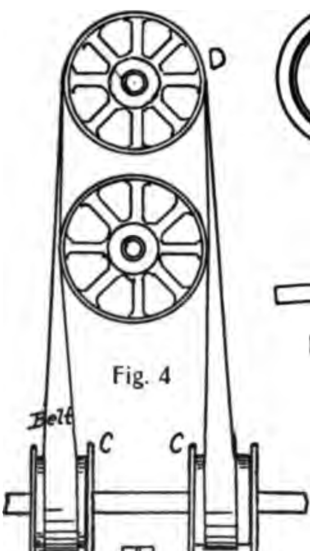


Fig. 4

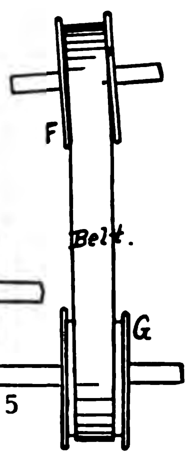


Fig. 5

There are several reasons why the shoulders or flanges of wheels are often seen in use, even in these days of apparently perfected power and transmission. Of course the effect upon the leather, rubber or canvas belt of the flanges is to tear and wear the edges in a short time—sometimes in a very few weeks after the belt is installed. In the cuts are shown some illustrations of defective systems of flanged wheels that came to notice recently.

The wheel system shown in Fig. 1 was found in use in a flour mill. There had been considerable trouble in keeping a certain belt in line on some overhead shaft wheels, and in order to overcome certain other defects a wheel was put on with the flanges as shown. The result was that the belt stayed on the wheels, but it constantly rubbed against the flange, as at A, resulting in ruining that edge of the belt in a short time. Some overhauling was done, and the belt was caused to run within the flanges, but still it rubbed against the side of the flange, as at B, Fig. 2. In course of time the edge of the belt was wrecked and a new belt had to be put on. The error in the flange system of deflecting the course of a belt is that the flange has to deflect the belt after the belt has already taken its grip on the wheel. The way to deflect a belt on a wheel is to exert the pressure upon it sidewise to the right or left, so that it will pass to the wheel spirally. This is done by applying the pressure before the belt gets hold on the wheel surface. The flange cannot do this. Fig. 3 shows the belt passing to the wheel, contacting with the flange E. There are occasions on which the flanges happen to come right, and the belt takes its course without danger of being worn by frictional contact with the wheel guides. But this is rare. Usually the flanges create trouble, more or less.

A system of right-angle drive was fitted up in a machine shop, as in Fig. 4, with the flanged wheels C, C. Many have used this form of drive, and usually made the belt stay on the wheels without the use of flanges on any of the pulleys. Sometimes when the system is installed and apparently complete, it is found necessary to turn the belt in the opposite direction, causing the belt to run off. Then the flanged wheels are clapped on. The driving puller system is marked D. The in opposite direr therefore need t with a col

This system is sometimes used instead of the half-cross method. The belt, however, has to be twice the length than for the direct driving. With proper setting the system can be run readily without flanged wheels.

In another establishment a belt was apparently laboring along between the flanges of a wheel, as at F, Fig. 5, and the floor and parts of machinery just below were liberally sprinkled with the grindings of the costly leather belt, chafed from the edges by the flanges. An inspection quickly determined the cause. The shaft carrying the wheel, F, was quite a distance out of line. The pulley, without its flanges, was unable to retain the belt on. Therefore, rather than re-adjust the shaft, a pulley was keyed on with flanges. The flanges kept the belt on, but the effect upon the belt was beginning to tell, and no doubt by this time the belt is upon the waste pile of the shop. A little re-adjusting of the shaft, making the parallel alignment true, would have overcome the defect at once and for good. The driving pulley of the system, G, was likewise flanged. The half-crossed belt running upon flanged wheels with disastrous results to the belting was found also in a number of cases. Some of the highest grades of belting were receiving unjust treatment from these flanges.

In the half-crossed system, heavy belts of narrow width are of course the best. Fortunately, the heavy, narrow belt is not so readily torn and worn by the flanges. Often the tough little double belt will run for a long time, grinding against the flanges, before signs of wear are observed. But even the double belts, tough raw-hide belts, and belts made specially to resist wear and tear, cannot stand the cutting, breaking, grinding, chafing flanges indefinitely. The cone pulley is, in one respect, a form of flanged wheel, for the reason that one side of the wheel in use must always be provided with a higher shoulder than the other side. Yet it is very seldom that the change or the cone pulleys destroy belting. As the flange or shoulder exists on one side only in each instance, it is possible to adjust the system so that the belt will always run so as to clear the shoulder. In the cone wheels the faces are made flat or parallel, as a rule. In special cases, however, convexing is advised. Such faces are also made with recesses, but so slight that the fact is scarcely felt by the belt. It is the abuse of the cone wheel that causes trouble with the belts. The one-cone wheel system, adjusted in the manner shown in Fig. 6, was found in a wood-working establishment. The outer pulley surfaces of each wheel at both sides were flanged at H and I. The shaft carrying the lower cone was out of true, and, to further add to the complications, a shifter was in use at J, manipulated by the lever and rod K. The belt was constantly abrading against the flange, and gave signs of

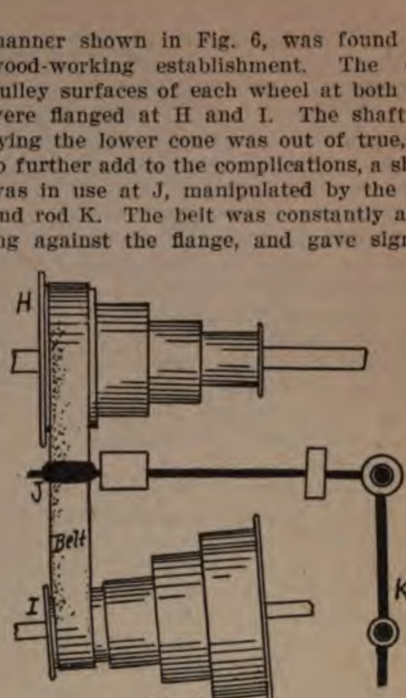


Fig. 6

Fig. 7

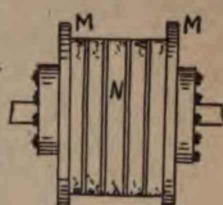


Fig. 8

Fig. 9

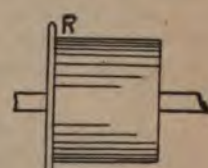


Fig. 10

breaking and tearing. The edges were scraped badly. When asked why the shafts were not properly lined so as to overcome the trouble, the response was that they did not have time to fix it. Belting is an expensive proposition. It will pay to take the time.

As to building up wheels with flanges, this ought not to be encouraged. Yet there are occasions in which it is perfectly proper to use the flanged wheel It is wrong only when some one claps on a flanged pulley to keep a belt in line when the belt runs untrue because of defective adjustments of the shafts or wheels, or the belt unions are unevenly closed and the belt wabbles as a result.

In Fig. 7 is a drawing of a home-made flange. The flange proper is L, and is part of the side which may be adjusted to the interior disks, so as to form the flanged wheel of the pattern shown in Fig. 8. The flanges are marked M, M. The disks are of wood, turned from hard stock, to right size at the nearest wood-working shop. The disks are bored through for the bolts of the flanges, and quite a substantial flanged wheel results.

Fig. 9 is a sample of what we often see. It is a piece broken out of the flange of a wheel. This fracture makes a rough place, and unless a remedy is sought the sharp, ragged edge will cut and ruin the belt. Broken pieces are sometimes riveted back in place. Fig. 10 is a sketch of the one-flange wheel. The flange is marked R. This type of wheel may be found in service in some places.—"Traveling Machinist."

RAISING A HEAVY TIMBER WITHOUT TACKLE.

A heavy stick of green timber 12 in. x 14 in. and 48 ft. long was raised to a height of 7 ft. 6 in. in fifteen minutes without the use of tackle by C. J. Case of Troy, Pa., and one assistant. The timber was raised as shown in the sketch, by see-sawing it and building up a crib of blocks beneath it. Each time one end of the timber went up a new block was placed, the work proceeding in this manner until the desired height was attained.

WEDGE FOR HAMMER AND TOOL HANDLES.

An English tool maker has put on the market a metal wedge for securing heads of hammers and other similar tools. A malleable iron wedge is provided with a short traverse slot at its thicker end. This wedge is driven into the shaft of the hammer, and a staple is then driven in astride the slot, its ends opening out as shown in the accompanying illustration, thus preventing the wedge from coming loose.

ROOFING PAINTS MADE OF GAS TAR.

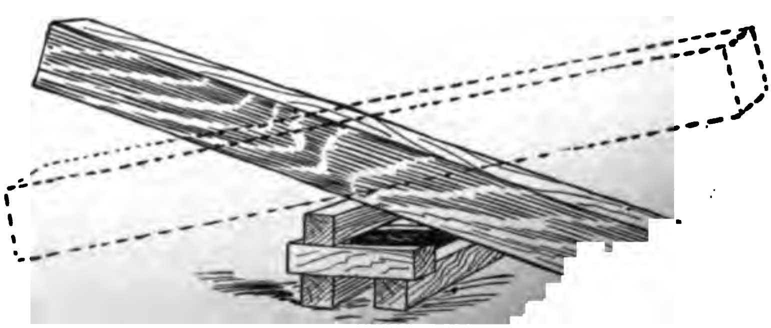
The following recipe is one of the very best for a roofing paint made of gas tar:

Take 30 lbs. each of coal tar pitch and cheap asphaltum; melt and boil slowly over a slow fire for five hours; add 8 gals. boiled linseed oil, and then add slowly 10 lbs. each of red lead and litharge. Boil three hours longer. Take from fire and thin, while still warm, with enough turpentine or benzine to make it work freely.

This is, however, a rather expensive paint and also considerable trouble to compound. A much simpler and at the same time reliable paint may be made as follows:

Take 3 gal. liquor coal tar and mix with it 1 gal. benzine asphaltum varnish, which may be thinned with either turpentine or benzine to working consistency.

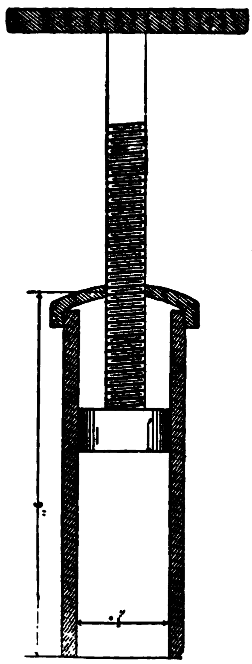
An excellent flux for copper, tin or arsenic is powdered flint glass.



Raising a Heavy Ti

COMPOUND FOR USE ON COMMUTATORS.

A good compound for use on commutators which will prevent them from sparking or cutting and will keep them in good shape, is made as follows:



Two parts of the best paraffine wax melted and allowed to come to a slow boil, into which is stirred one part of baking soda. Stir for two minutes and add one part of the best and finest graphite. Keep stirring and let remain over the fire for three minutes. Pour into mold.

Any sort of a mold may be used. The one shown in the sketch is used by a correspondent of Power, and molds a stick 9 in. long and 1 in. in diameter. Cut up into sticks 4½ in. long and wrap separately in tinfoil until needed. Treat commutator lightly once in awhile.

ANOTHER METHOD OF USING SAND-PAPER.

Fold the sandpaper three-ply. Face a piece of common rubber of suitable size and an inch in thickness. Place the sandpaper on the work, and upon this the rubber, and begin work.—Contributed by C. L. Truesdale, Sharpsville, Pa.

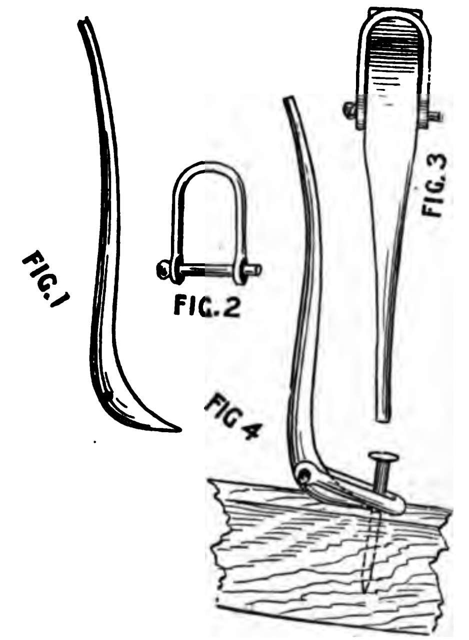
HARD SOLDER FOR SILVER.

Equal parts of silver and brass make a [illegible], which will fuse [illegible] the addition of [illegible] it is well [illegible] atten [illegible] soldered together with fine, soft wire. Have ready some finely powdered borax, well moistened with water, into which dip a camel's hair brush, and touch the joint to be soldered, placing a little solder on the joint. Apply a large piece of charcoal to the joint, and then with a blowpipe and lamp blow upon it through the flame until the solder melts.

To cleanse the article after the soldering has been done heat it red hot and let it cool. Then boil it in alum water contained in an earthen vessel. The cleansing will be perfect.

A GOOD SPIKE PULLER.

The spike puller here illustrated is made of a 2½-ft. steel bar in the form shown at Fig. 1, and has a clevis made as shown in Fig. 2, and measuring at the side 3 in., and at the ends 1¼ in. The method of attaching the clevis to the steel bar by means of a pin is shown at Fig. 3, while Fig. 4 shows the position of the tool in use. This is an



excellent tool for the purpose, and will pull rusty spikes as well as new ones.—Contributed by C. J. Case, Troy, Pa.

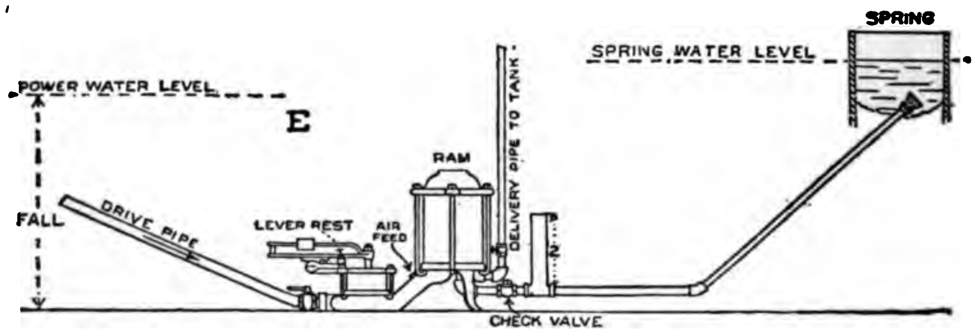
The best varnish for iron is a thin coat of red lead, laid on and allowed to dry, [illegible] one or two coats more added. Allow [illegible] at to dry before applying another.

HOW A HYDRAULIC RAM WORKS.

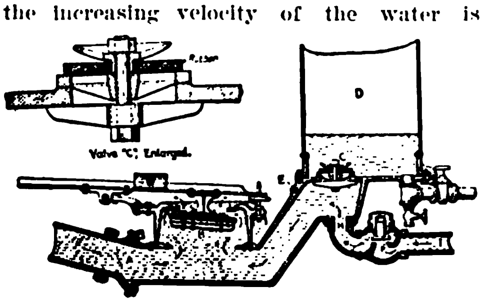
(Published in response to numerous requests.)

The invention of the hydraulic ram is credited to Michael de Montgolfier in 1796. The inevitable improvements since then include greater efficiency and the ability to pump a different water than that which furnishes the power; that is, impure and unusable water may be made to pump good water. Rams are now made to operate with a fall as small as 18 in., and up to 50 ft. Under certain conditions water can be raised 30 ft. for each foot of fall used. A first-class ram requires little attention and ought to run an entire season without repairs. They will not, of course, work when exposed to freezing conditions, but pipes can be buried and the ram housed to operate continuously.

The cut shows a view of the so-called double-acting ram, one which pumps pure water by using impure water for power. Considering it first without regard to the double-supply feature, suppose the opening at H to be closed. The valve at B being open, the water from the source of supply at more or less elevation above the machine flows down the drive-pipe A and escapes through the opening at B until the pressure due to the increasing velocity of the water is sufficient to close the valve B. At the moment when the flow through this valve ceases, the inertia of the moving column of water produces the so-called ramming stroke, which opens the valve at C, and compresses the air in the air chamber D until the pressure of the air plus the pressure due to the head of the water in the main, is sufficient to overcome the inertia of the moving column of water in the drive-pipe. This motion may be likened to the oscillations in a U-tube. At this instant the column of water in the drive-pipe has come to a rest, and the air pressure being greater than the static head alone, the direction of motion of the moving column is reversed and the valve C closed. The water in the drive-pipe is then moving backward, and with the closing of C a tendency to a vacuum is produced at the base of the drive-pipe; this negative pressure causes the valve B to open again, completing the circle of operations. At the moment of negative pressure the little shifting valve E, admits a small quantity of air, and the following stroke this passes into the air chamber, which would otherwise gradually fill with water, the air being taken up by water.



Double-Acting Ram--Pumping Pure Water with Impure Water for Power.



Details of the Ram.

The Mediterranean motor boat race from Algiers to Toulon ended disastrously. Seven craft were entered and were convoyed by a whole fleet of cruisers and destroyers. Every motor boat but one sank and the one spared was carried aboard its convoyer to Toulon, which place was decorated with triumphal arches to receive the winner. The affair turned out rather ridiculously considering that the English government lent its aid at a cost of $140,000.

INSULATING STEAM DOMES AND PIPING WITH HAIR FELT.

Where a high pressure is carried and there is considerable heat radiation it is economical to cover steam domes and piping with non-conducting insulating material. A correspondent of Power tells how he covered two steam domes and a large amount of 2-in. piping with hair felt. The domes in question were 4 ft. 6 in. high by 4 ft. wide, and to cover them one would proceed as follows:

Around each dome fit asbestos board ¼ in. thick and wire it on securely. Cut 16 pieces of wood 1¼ in. square, 4 ft. 6 in. long, and each having three slots cut in them (Fig. 2) 4 in. long and ⅝ in. deep. Set eight of these pieces at equal distances around each dome in a vertical position with slots toward the asbestos board (Fig. 1). Wire these in place also, and then put on another layer of ¼ in. asbestos board. Wrap this with strong twine, to hold it in place, and then wrap on hair felt, a layer 1½ in. thick. Wind on twine to hold this secure and, keeping the surface smooth, cover the hair felt with asbestos paper, and finally cover the whole with canvas properly sewed and painted. Treat the top of the dome in the same manner, except that the asbestos should be cut by a paper templet made to fit the safety valve, main stop and 2-in. connection, and radial strips of wood should be used instead of vertical pieces. Fasten these to the vertical strips with wire nails. Fig. 3 shows a sectional view of the covering. With this covering the hand can feel no heat when the boilers are under steam, the temperature of the boiler room will be reduced and made more comfortable, and fuel expense will be lessened.

Cover piping in the usual manner, except in applying the asbestos paper. Cut this into strips wide enough to go around the pipe, wet it and wrap around the pipes. It will not need twine to hold it if put on while wet. Cover the asbestos paper with hair felt and then another layer of asbestos paper to give a smooth surface, and finally the neat covering of canvas.

To remove ink stains from ivory use repeatedly a solution of quadroxalate of potash in water.

FIG. 1

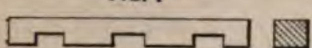


FIG. 2

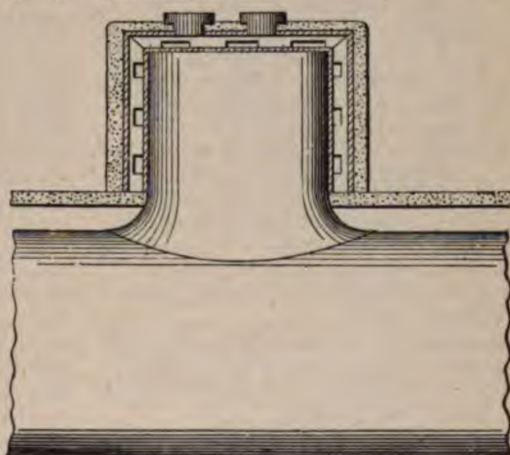


FIG. 3

Covering a Boiler Dome With Hair Felt

HOW TO FIND THE NORTH AND SOUTH POLES OF A DYNAMO.

While the dynamo is in service, bring the north-seeker end of a compass needle near each of the poles. Those that attract this end are north poles and those repelling it are south poles.

HOW TO TEMPER SPRING STEEL.

Heat to a cherry red and plunge into cold water. This will harden it; clean with emery cloth. To draw the temper, place in clean hot sand until the colors run to blue. Then place in cold water. Repeat the sand process if still too hard.

FIRST THINGS TO DO IN CASE OF BURNS, OR SCALDS.

Three classes are generally recognized:

1. Simple reddening of the skin.
2. Accompanied with the formation of blisters.
3. Charring of the skin and ulceration of all degrees up to complete destruction of the part.

Burns of the second and third degree, especially when covering large areas, require immediate medical attendance. In severe burns there is liability to shocks and prostration. The general directions for treatment of such a case would be to transport the patient to a place of safety, then remove clothing by cutting away with a knife or scissors. If the clothing sticks, do not pull it off, cut around it and wet it with water or oil, promptly exclude air by covering the wounded or injured surface.

As the pain attending a burn is very intense, care should be taken not to expose too large a portion of the surface to the air at any one time, and to cover as quickly as possible with something that will exclude the air. This should be done the moment the covering is removed. When the burn is extensive, expose and dress a small portion of the burn at a time.

Never hold the burn to the heat, but warm moist cloths are sometimes grateful, especially if wet with a warm solution of baking soda (bicarbonate).

When a person's clothing catches fire, make him lie down immediately or throw him down if necessary. Wrap him quickly in a blanket, cloak or shawl, preferably some woolen material, and smother the fire by pressing and patting upon the burning points from the outside. Have water ready, and in removing the wrapping pour the water over the burning point.

Serious degrees of shocks usually follow such burns. In cases of severe shock it is heroic treatment to lay the person on a sheet and lower him, clothes and all, into a bath tub full of water, moderately warm. This will relieve the pain and shock.

It is best in these cases not to attempt any dressing of the burns, simply to cover them with a layer of gauze, then a layer of lint, over this a layer of absorbent cotten, outside the whole a sheet or blanket, and await the arrival of the physician, or transport the patient to a hospital.

In slight burns or scalds, put a teaspoonful of baking soda in a pint of boiling water; stir well; in this dip a piece of lint and carefully cover the burns and scalded places; cover this with absorbent cotton, and finally wrap with the triangular or roller bandage.

In more severe cases, saturate lint with perfectly fresh salad oil, olive oil, sweet oil, vaseline or petrolatum. In the absence of these, the white of an egg may be used. A very common practice is to apply carron oil (equal parts of raw linseed oil and lime water). In absence of oils, dust the burned part with starch, flour or toilet powder or if nothing else is available use moist earth or clay. Cover the whole with a layer of lint, over this a layer of absorbent cotton, and finally wrap with a triangular bandage.

Burns from caustic lye, strong ammonia and similar substances, should be first thoroughly flooded with water and then with vinegar, and subsequently treated as if burned by fire. Burns from acid, vitriol, etc., should be first flooded with water and then washed with a solution of baking soda or lime water. If nothing else is available, take chalk, tooth powder or a portion of mortar from the wall, crush it and stir it up with water and apply on lint to counteract the acid. After washing, treat as a burn by fire.

Use a weak solution of washing or baking soda in the case of drinking an acid. For other burns of the inside of the mouth or throat caused by drinking hot fluids or swallowing chemicals, apply oil or the white of an egg, by drinking, or pouring from a spoon. In the case of caustic potash, ammonia and the like rinse the mouth and throat with weak vinegar. If a fragment of lime gets into the eye, don't try to take it out but flush with water and bathe it with diluted vinegar or with lemon juice, a teaspoonful of either to a cup of warm water.

In cases of frost-bite, carry the patient to a closed room without a fire, undress carefully, and rub the frozen parts, or the whole body with snow or bits of ice, otherwise put patient in cold bath, keeping up a vigorous rubbing of the surface affected; warm coffee or tea may be given as a stimulant. If the person has ceased breathing, use methods of artificial respiration. As the patient revives, carry him to a room slightly warmer, and cover loosely with a blanket. Afterward rub with a cloth wet with warm water, whiskey, or with diluted alcohol.

Treat cases of sunburn as mild scalds, covering with a weak solution of baking soda, oils, vaseline, or with white of an egg, then with lint and bandage.

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HOW TO SOFTEN IVORY.

Into 1 qt. of vinegar slice ½ lb. of mandrake. In this immerse the ivory and let it stand 48 hours in a warm place. At the end of that time it will be possible to bend the ivory into any form desired.

AN EASY RULE FOR CIRCUMFERENCES.

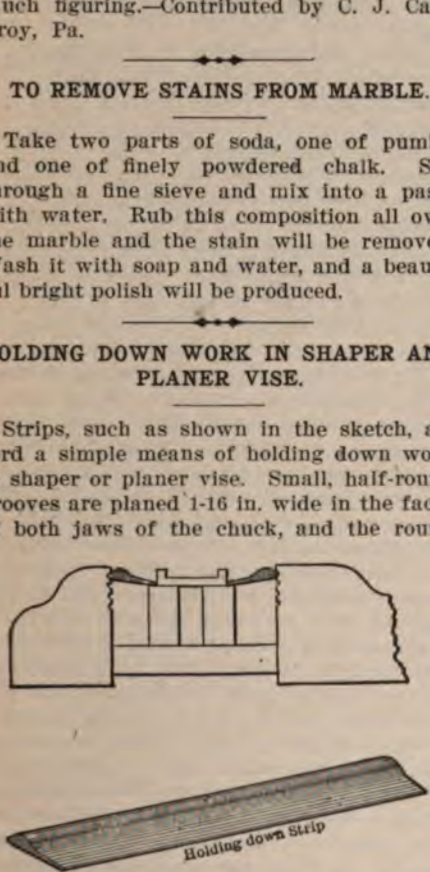
The rule that 11-14 of the diameter equal ¼ of the circumference is close enough for any business calculation, and will often save much figuring.—Contributed by C. J. Case. Troy, Pa.

TO REMOVE STAINS FROM MARBLE.

Take two parts of soda, one of pumice and one of finely powdered chalk. Sift through a fine sieve and mix into a paste with water. Rub this composition all over the marble and the stain will be removed. Wash it with soap and water, and a beautiful bright polish will be produced.

HOLDING DOWN WORK IN SHAPER AND PLANER VISE.

Strips, such as shown in the sketch, afford a simple means of holding down work in shaper or planer vise. Small, half-round grooves are planed 1-16 in. wide in the faces of both jaws of the chuck, and the round



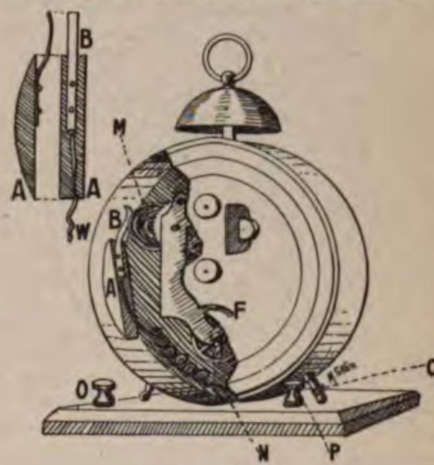
Holding Down Work in Shaper and Planer Vise

edges of the strips, if made to fit, will not kick up, says a correspondent of the American Machinist. The grooves are so small that they do not injure work held directly against the faces of the jaws. The strips can be placed so as to accommodate different heights of parallels and different thicknesses of work.

TO CONVERT AN ALARM CLOCK INTO AN ELECTRIC ALARM.

An ordinary alarm clock may be converted into a very satisfactory and efficient electric alarm by the method here illustrated:

The device consists of a segment of wood, A, having its radius equal to that of the



An Electric Alarm

interior of the clock, so as to fit snugly against it. To this segment the brass spring, B, is attached by two brads, and to this spring the insulated wire, W, is soldered. The segment of wood is then glued to the interior of the clock in such a position that when the alarm spring, M, unwinds it will press against the brass spring, B. A small hole, N, is made in the bottom of the clock, through which the wire, W, is passed. Care must be taken to insulate the brass spring, B, and the wire, W, from the rest of the clock. The clock is then mounted upon a suitable base, and the wire, W, is passed beneath this and attached to the binding post, O. A wire from the binding post, P, is passed through a hole in the base and wound about one leg of the clock at C. An electric bell and a dry cell are attached in series with the clock by the two binding posts, and the alarm is wound up. As the spring, B, and wire, W, are insulated from the rest of the clock no circuit is formed; but when the alarm goes off the spring, M, unwinds and forms a contact at B, thus completing the circuit.—Contributed by Milton F. Stein, Chicago.

Shellac may be bleached by exposing in thin threads to the atmosphere.

WITH PINS, STRING AND COMPASSES.

Take a string and make a loop one inch long. Stick pins at the points D and D', Fig. 1. Put the loop over the pins, and, with a sharp pencil catch the loop and run the

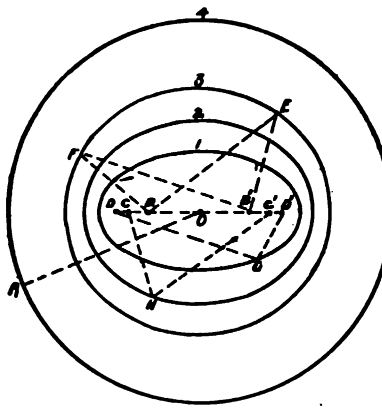


Fig. 1 With Pins, String and Compasses

pencil along it. Ellipse 1 is drawn. Use the same loop, putting pins at the points, C and C', and draw ellipse 2. With pins at B and B' curve 3 is made. Placing the string over a pin at the center, O, we get with radius OA, curve 4, a circle. The points B and B' and C and C', etc., are called foci of their respective ellipses. This work depends upon the law that the sum of the distances of any point on the curve from the foci is always the same; for example, taking curve 3, BF plus FB', is the same length as BE plus EB'.

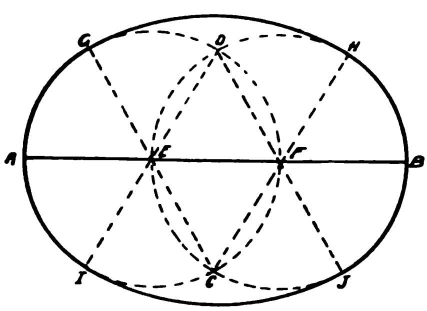


Fig. 2. With Pins, String and Compasses

To draw a curve (ellipse) like Fig. 2, when the length, AB, is known, proceed as follows: Divide the line (axis), AB, into three equal parts by points E and F. From E and F as centers, and a length equal to one-third the circles IFG and HJE. Through C and D, where the two circles intersect, draw CG, CH, DI and DJ. From C as a center, strike the curve GH, and from D as a center draw the curve IJ. AGH—BJI is the required curve or ellipse.—Contributed by C. L. Truesdale, Sharpsville, Pa.

HOW THE STEAM TURBINE OPERATES.

Usually the explanation of the operation of a steam turbine is "written so you can't understand it;" the following, condensed from the Engineer, London, is a clear and simple explanation of a complicated question:

We take the Laval turbine as the simplest type of the machine. In it steam, as is well known, is allowed to blow against vanes on the rim of a wheel. These vanes are cupped in order that the steam recoiling from the wheel may return, so to speak, on itself. Very little thought is required to show that if the curve of the cup is of the proper shape, and the tangential velocity of the cup—that is to say, the speed with which it moves away from the jet—is half that of the jet, the steam will leave it without any velocity whatever, and the whole of the energy in the jet will have been transferred to the wheel. Now, at this point the circumstance that steam is an elastic fluid comes in to cause mental confusion. It is hard to credit the statement that an elastic fluid can really leave anything with which it has been in contact without velocity. The fact which our readers must get into their heads is that in the Laval turbine the working steam is not an elastic fluid, and has no pressure. To make this clear, let us suppose a Laval wheel of 100 horsepower using 20 lbs. of steam per horse per hour, that is to say, 2,000 lbs.; and per minute, leaving out fractions which we do not want, 33 lbs.; and per second a little over half a pound of steam. Now, the steam issuing from the boiler has a pressure of, say, 150 lbs., but it is permitted to escape through a diverging nozzle, and the pressure is all expended in imparting velocity to the steam. Let us divest ourselves of all ordinary concepts about steam, and fancy that it ceases to be a fluid exerting pressure and becomes a torrent of very fine shot projected velocity of about 5,000
nearly twice that
vanes of the
elastic fluid
pound of
as solid
in

enormous velocity we have stated. The work done by the steam entering the nozzle is entirely expended in pushing the molecules away in front of it through the nozzle and out at the other end. Each group of molecules, in a sense, acts the part of the charge of powder in a rifle to make those in front of it fly faster. To put the facts in another way, the result is just the same as though a stream of fine sand fell into a steam jet. The jet would impart its energy to the sand, and if the sand were directed into the vanes of a Laval turbine it would cause its rotation. Instead of sand we utilize the molecules of the steam. With these facts before us, we see why the velocity of the rotating wheel of the Laval turbine must be so high. It has to attain a speed of about 2,500 ft. per second, or over 1,700 miles an hour, in order that the whole of the energy may be transferred to the wheel. It will be understood that, as far as the wheel is concerned, the steam has ceased to be an elastic fluid. It may be considered in the light of a shower of fine projectiles impinging on the vanes at an enormous velocity. Hence the revolutions of even as much as 30,000 per minute, in the smaller turbine.

The same effect takes place in the Parsons type of turbine, but the action is masked by the absence of the diverging nozzle. Divergence takes place inside the wheel casing, the steam expanding from step to step downwards. Quoting from Mr. W. F. Durand, an American engineer, we may say that, in turbines of the Parsons type, "the steam rushes from the steam supply to the condenser through the annular space between the wall of a long cylindrical casing and the contained rotor, increasing the cross-sectional area from the entering to the delivery end. This annular space thus constitutes in effect a gigantic nozzle within which the steam is continually undergoing transformation as it passes from one end to the other;" that is to say, it ceases by degrees to be an elastic fluid and becomes instead a furious torrent of molecules.

It is not necessary here to refer in any detail to the precise way in which the flying molecules of steam transfer their motion to the vanes. The major difficulty met with by those who want to understand the steam turbine is how a free elastic fluid can transfer its energy to a rotating wheel. The only way out of the difficulty is to say that the steam is not an elastic fluid, but a current of flying molecules—none the less molecules capable of mechanical action because they are small almost past the possibility of conception.

The initial perplexity in thinking about the steam turbine lies no doubt in clearly seeing how pressure—potential energy, to use what is little better than scientific jargon—can disappear and turn up in another form as kinetic energy. But when we dive a little below the surface it will be seen that, according to received theory, pressure itself is nothing more than the result of the impact of flying molecules—in fact, the whole energy stored in any volume of steam or other gas is always essentially kinetic. To pursue this branch of the subject would, however, lead us away from the purpose which we had in view in writing this article. Many more patents will no doubt be taken out, but in so far as these refer to principle, and not to detail, the inventor will do well to keep the facts constantly in mind. The steam must be worked in such a way that while its molecules will always tend to move in right lines, they will give up their energy in the form of centrifugal effort, or recoil, according to the type of turbine in which they act. The ruling principle is always that we have a molecule, or a pound, or a ton, of steam, moving like a bullet at a velocity of 5,000 ft. per second, and we want to take all that motion out of it, transferring it to the rotating wheel. It is not, perhaps, easy at first to master the idea that steam can ever cease to be an elastic fluid exerting pressure in all directions; but once the facts are grasped, the whole theory of the action of the steam turbine becomes intelligible.

REPAIRING THE LUBRICATOR.

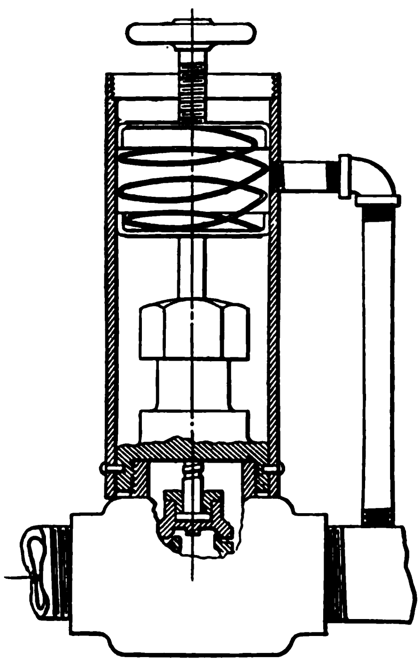
A lubricator which had frozen and cracked in two places and would not hold after having been fixed by the tinner a number of times was finally disposed of by a correspondent of the American Miller in the following manner:

A tin can, cut in half, just fitted the bulb or condenser. On top of this was poured babbitt. The arrangement, it is said, does not make a stylish appearance, but is O. K., and does not leak.

HOW TO MAKE A REDUCING VALVE.

To make the reducing valve shown here take a globe valve and file the stem so it will slide easily in the bonnet. File the base of the bonnet so a piece of brass pipe 6 in. long can be pinned on it. The body is thus formed, and it is now necessary for it to be steam-tight.

Fasten an iron washer on the valve stem-



Reducing Valve

top, and on top of the iron washer fasten a leather cup washer. Place a spring on top of this and on the spring place a piece of sheet metal for the adjusting screw to rest on. A valve wheel fastened on a piece of steel, as shown, will serve for this. Just above the cup-washer make a connection with the outlet of the valve and the body; this balances the pressure. A correspondent of Power says he has used such a valve on both steam and water with good results.

HOW TO MAKE BLUE OR ANTIQUE COPPER SCREWS.

Stand any bright screws on the heads on top of a stove; put a little oil on them; cover and heat until they are the color desired. The color will not rub off.—Contributed by C. J. Case, Troy, Pa.

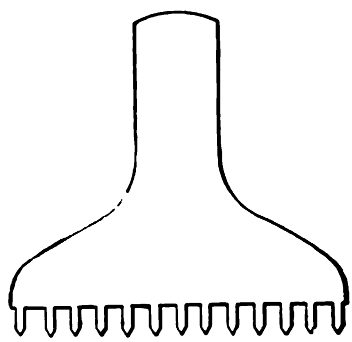
TO CLEAN MARBLE.

Mix up a quantity of the strongest soaplees and quicklime to the consistency of milk; lay it on the stone for 24 hours; clean it and it will appear as new. To further improve, rub with fine putty powder and olive oil.

HOW TO COVER A BUGGY DASH.

For this job a tool made of a piece of plow steel and like the one shown in the sketch will be necessary. Lay the frame of the dash on the leather and mark along it with a lead pencil the places where the stitching is to be done. Allow 3-16 in. on the inside of the stitching for drawing, but none on the outside of the frame, where the marking should be exactly at the edge of the frame.

When through marking remove the frame, place the points of the tool on the pencil mark, and strike the two with a hammer, making 10 or 12 perforations at a time. In this manner go over all the pencil marks, placing an outside tooth of the tool in the last hole made each time the tool is lifted, as a guide.



Tool For Covering Dashboard

If both sides are to be covered with leather, says the Blacksmith and Wheelwright, tack the two pieces together before starting and punch both at the same time. If one side is of duck make holes in the duck with needles while stitching, drawing tightly all the while, and your dash will look like machine work, if the job has been carefully done.

ETCHING ON STEEL.

For etching names, dates or designs on steel use iodine, 2 parts; potassi
5 parts; water, 40 parts.

SHOP NOTES

USING MOTORCYCLES FOR SHOP POWER.

A motorcycle may be rigged up to run shop machinery with excellent results. The motorcycle will provide as much power as a 3-hp. gasoline engine and is not at all injured for use on the road by putting it to this purpose in the shop, says a correspondent of the American Blacksmith.

The arrangement is very simple. Make a stand, as shown in the sketch, to raise the wheel from the floor. Block the front wheel with a block on each side of the wheel, one in front and one at the rear. For the rear axle make a stand, A, and screw it fast to the floor. Make a small shaft, B, and fasten in the end of it a 20-tooth, ¼-in. sprocket, C. Have it flush. Make journals or bearings, D, to hold the shaft and use collars, E, to keep it in place. Set this directly under the large sprocket of the rear wheel of the motorcycle, fasten it there and get a chain long enough to reach all the way around. Make the pulley, F, 6x3 or 4x3, of whatever speed desired, and put in place. Set the machine upstairs or down, as desired, and run the belt from the spark shaft to the line shaft. Fill the bicycle tank, which holds 1 gal. of gasoline, sufficient for 100 miles' run at a cost of about 14 cents. It is not necessary to keep gasoline in storage as when riding to and from the shop one may have the tank filled at a store. The bicycle can be taken from its stand for use on the road in five minutes.

Using a Motorcycle for Shop Power

This arrangement is suitable for running a drill press, horse clipper, grindstone, lathe or emery wheel.

Dwelling houses of hollow concrete blocks have been constructed by the San Pedro, Los Angeles & Salt Lake R. R. for some of its section foremen. Each house is provided with a concrete cistern.

REMOVING OLD GEAR WHEELS FROM SHAFTS.

Gear wheels which have been on the shaft a long while so that they are in a decaying condition may be removed by means of a ram rigged up as shown in the sketch.

Five-foot gear wheels with 9-in. hubs which had been on a 6-in. shaft for 12 years were removed in this way by C. J. Case of Troy, Pa. An old shaft, 4½ in. in diameter and 6 ft. long was hung from the ceiling by means of a rope. This served as the ram and was propelled by four men. The wheels came off readily.


Removing Old Gear Wheels

COMPASSES FOR METAL WORK.

The compass shown at Fig. 1 can be made by most any one out of sheet material. The compass has no locking device, as it depends on the tightness of the point to keep it in position when in use. Use thicker material than is used for calipers, says the Model Engineer, London, and harden and temper the points. Fig. 2 shows another useful form of compass which is not difficult to make.

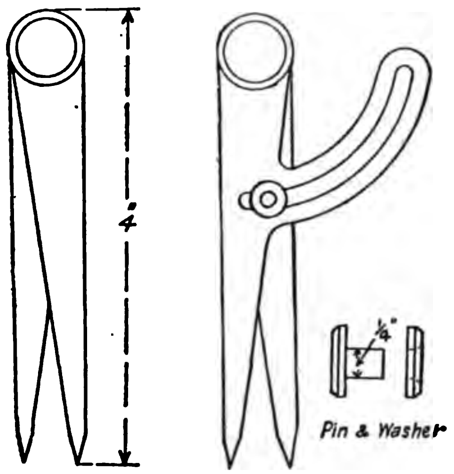
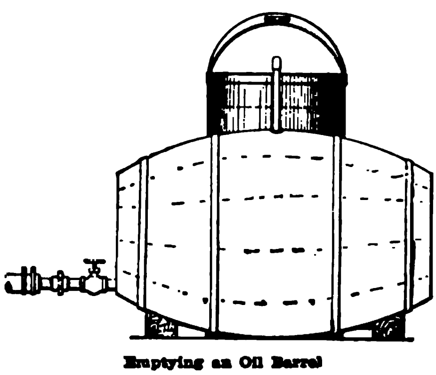


Fig. 1 Fig. 2

AN EASY WAY TO EMPTY AN OIL BARREL.

For emptying oil from the barrel into the oil tank, the arrangement shown in the sketch is highly recommended by a correspondent of the Engineers' Review. The device is operated by air pressure.

A short piece of 2-in. pipe is fitted to a valve, and a nipple having the female side of a coupling screwed to it, is fitted into the valve. A rubber hose is connected with a piece having the male part of the coupling screwed on it and this pipe is connected to the air line. In the bung hole on the side of the barrel a pipe, proportioned so that it reaches up above the top of the tank and extends over so as to empty in through the round hole that is in the top of most tanks, is fitted.



Emptying an Oil Barrel

When ready to empty a barrel of oil, it is rolled near the tank, stood on end and a hole to receive the 2-in pipe having the valve is bored in it, the pipe is screwed in and the valve closed tight. The barrel is then tipped down, the plug in the side removed, and the pipe which runs up the side of the tank is screwed in. This should fit tightly so there will be no leaking. The air is then turned on, the pressure forces the oil up into the tank and the barrel is emptied in a short time.

It might be possible to work this scheme with water pressure, but unless there were some efficient means of draining the bottom of the tank, the little water that would be apt to collect there would cause the tank to rust.

AGING OAK WITH AMMONIA FUMES.

Strong ammonia fumes may be used for aging oak says the Manual Training Magazine. Place the piece to be fumed, with an evaporating dish containing concentrated ammonia, in a box and close it airtight. Leave for 12 hours and finish with a wax polish, applying first a thin coat of paraffine oil and then rubbing with a pomade of prepared wax made as follows: Two ounces each of yellow and white beeswax heated over a slow fire in a clean vessel (agate ware is good) until melted. Add 4 oz. turpentine and stir till entirely cool. Keep the turpentine away from the fire. This will give the oak a lustrous brown color, and nicking will not expose a different surface, as the ammonia fumes penetrate to a considerable depth.

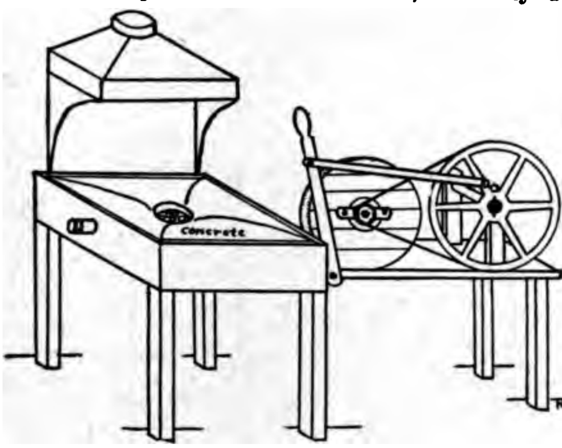
PREPARING BORAX FOR USE IN WELDING STEEL.

Put 1 lb. of borax in an old iron kettle and set it over the forge fire and cook it thoroughly. Keep stirring slowly after the borax is all melted and until it resembles popcorn. There will be about three times the original quantity, and it will go farther and do its work better.—Contributed by Wm. Raymond, New Sharon, Iowa.

HOW TO MAKE A SUBSTANTIAL FORGE.

The farmer or other person in a remote place who wishes to become his own blacksmith can make a cheap and substantial forge in one day, after the following method:

Make a square box of 8-in. board, 2 ft.



A Home-Made Forge

on the sides, and place legs of convenient length inside the corners. Nail a solid floor on the bottom of the box. In a 2-in. iron pipe, 30 in. long, drill about a dozen ¼-in. holes in a small circle near the center. Pass the pipe through snug holes cut in two opposite sides of the box, leaving it protrude 2 in. on either side. If one end of the pipe is threaded, screw it into fan before running through the box.

Make concrete of Portland cement, one part, sand three parts, and mix with enough water to make it of the right consistency. Tamp the concrete into the box above and below the pipe, leaving the top sloping toward the holes in the pipe. Put a heavy 4-in. ring around the holes and cement it in. A plug in the outer end of the pipe allows ashes to be blown out when necessary.

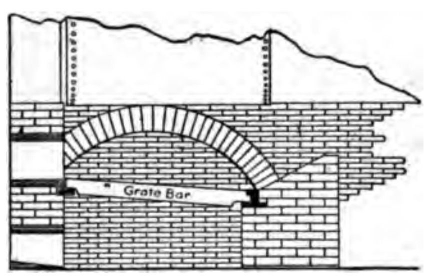
The fan should be about 6 in. wide and 18 in. in diameter, with iron or hard maple boxes and a 2-in. pulley. Mount the fan on the same board that forms the bottom of the forge box, for rigidity. A hood may be suspended over the hearth and connected to the forge back by a strip of sheet iron. When the cement has hardened, a durable fireproof forge is the result. A welding heat can be obtained in one minute with this outfit.—Contributed by Muron Streator, Ill.

A GERMAN METHOD OF CLEANING MACHINERY.

The use of blotting paper for cleaning machinery in many of the large shops in Germany has been found very effective and economical. The German workman formerly used on an average 250 grams of cotton waste, one new sponging cloth and one or two renovated ones per week; now he is supplied with 150 grams of cotton waste and eight to ten sheets of blotting paper, at a cost of two and a half cents, instead of six and a quarter cents, as formerly. The paper is, therefore, not only cheaper, but does not soil the engine with fiber and dust, like sponge cloth and woolen waste, which was used, besides being otherwise preferable even to cotton waste. It has the advantage of being less combustible than other cleaning materials, and safer in another way; by eliminating the chances of having the hand drawn into moving machinery while in process of cleaning.

ARCH IN SIDE WALLS OF FURNACE.

The constant repairing of side walls of the furnace of externally fired boilers is a big item of expense. An arch in the side wall, spanning the entire length of the grates, will save the cost of its installation many times in a year, says a correspondent

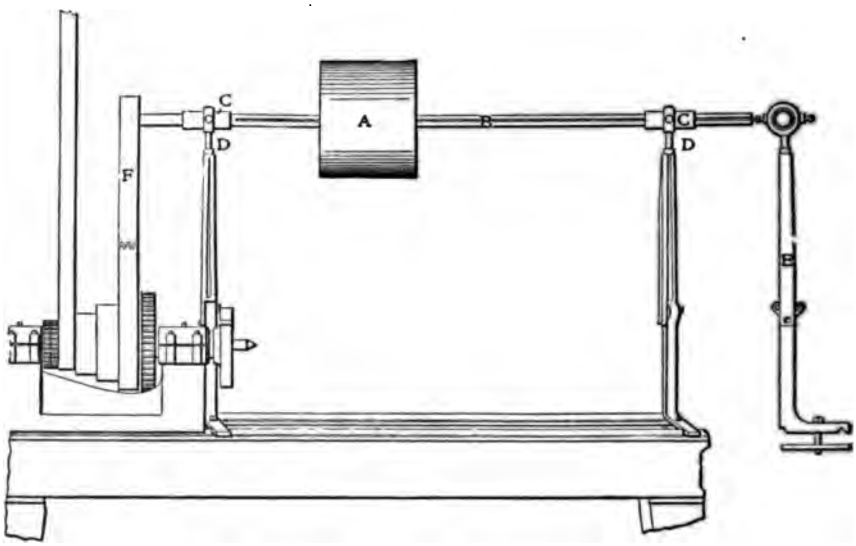


Arch in Side Walls of Furnace

of the National Engineer. When the fire brick are burnt out and must be replaced, only the brick beneath the arch need be removed, and the upper part need not be interfered with. Each engineer must determine the height of the arch required in his individual case.

GRINDING ATTACHMENT FOR A LATHE.

A grinding attachment, intended for short work and internal grinding, which does away with an overhead drum with belt and hangers and which can be put on and taken off a lathe in a few moments is described by a correspondent of the American Machinist.



Grinding Attachment for a Lathe

The shaft, B, has a spline, so that the drum, A, which is provided with set screws to fasten it, can be slid to any position over the lathe bed. The shaft boxes, C, are self-adjusting and can be raised to take up the slack of the belt, F, and then secured by the collars, D. The upper portion of the stanchion, E, is hinged so that the shaft and drum may be swung to conform to the different angles in which the grinder is used, and thereby causes a flat belt to run better on the driving pulley of the grinder. Silk ribbon is used for high-speed belts. Any simple form of grinder can be fastened to the tool block of the lathe and belted to the drum, A. The stanchions are fitted to the slides of the lathe and held by a bolt that screws into a flat piece placed under the inside projections of the lathe bed.

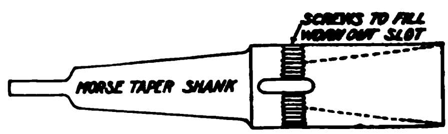
The belt, F, must be connected so it can be readily put together or taken apart. A steel belt hook fastened to one end of the belt may be used successfully with holes punched in the other end, so that the hooks ...n slightly bent will enter and stay as ... as when clinched.

HOW TO MAKE TRACING PAPER.

Tracing paper for use with either pen or ink may be made by brushing a solution, consisting of one part of castor oil in two parts of methylated spirits (poisonous), over one side of some good thin printing paper. Blot off and hang up to dry, after which it is ready for use.

REPAIRING A WORN-OUT DRILL SOCKET.

There is an old and easy method of repairing a worn-out drill socket which may not be known to some, and which will be found of particular benefit in repairing morse taper shanks, which in time become



Repair for Worn-Out Drill Socket

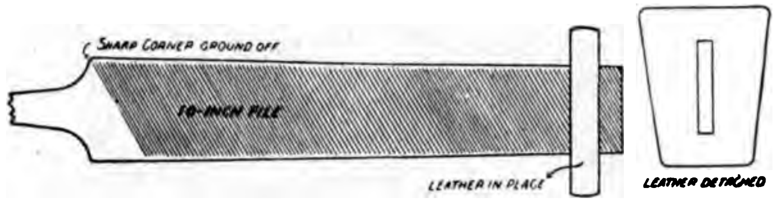
worn so that the tang will no longer hold. By drilling out and tapping at the bottom of the slot a piece may be screwed in and squared out again, thus making the socket as good as new. By drilling from each side and tapping, a plug may be made a very tight fit, thus avoiding any chance of working loose.—Contributed by A. C. Eggleston.

The 1905 edition of Shop No...
200 pages; 385 illustrations;

SUBSTITUTE FOR A SWAGE-SHAPER.

A filer who had some full-swage gang edger saws to fit, but had no swage-shaper, used a side file instead and put the same bevel on each tooth in a manner which was both ingenious and efficient.

In a small piece of leather belting, nearly ¼ in. thick, he cut a slot so that it could be slipped over the end of a 10-in. file. He held the file on an emery wheel and ground off the sharp corners so they would not scratch the saw. Then by resting the leather on the saw plate, it gave him a bevel back from the face of the tooth and also from the extreme cutting edge towards the eye of the saw. This gave a tooth with the cutting edge the widest. By the aid of a gage he filed until the swage just touched the gage and so made all teeth the same spread. The saws so made worked nicely and cut smoothly, says a correspondent of the Wood-Worker, but the method is recommended only for emergencies when a swage-shaper cannot be had.



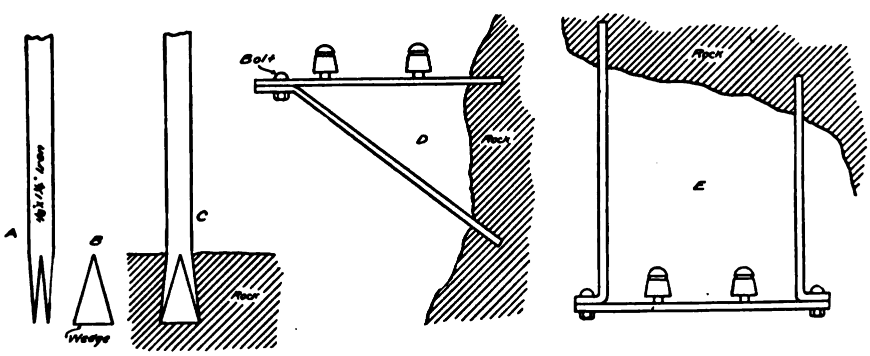
Swage-Shaper Substitute

In a new clock for a sick room, an electric lamp is arranged behind the dial, and when the invalid presses a button, the shadow of the hours and hands, greatly magnified, is thrown on the ceiling where he can see it without turning his head.

A GOOD METHOD FOR ATTACHING LINE WIRES TO ROCK.

Telephone lines must often pass in a circuitous and lengthy route in mountainous countries, because of no convenient means of attaching wires to rock. A correspondent of the American Telephone Journal describes a good rock fixture for this purpose.

A piece of strap iron, ⅛ in. by 1¼ in. and tapered slightly at one end is split in the center of the tapered end as shown at A in the drawing. A hole 4 in. deep is then drilled in the rock, and a wedge, like B in the sketch (previously made), is placed in the split end of the iron rod and the rod is then driven into the hole drilled in the rock, as at C. It is practically impossible to withdraw a rod put in in this way as the two fingers of the rod spread apart as it is driven against the wedge, and the effect of an expansion bolt is produced.



Fixture for Rock

The sketch shows this scheme applied to a vertical rock at D, the two rods or straps being bolted together, and applied to the under side of a rocky ledge at E. In each case, the insulators are screwed to steel pins, which are screwed to the iron straps.

A hot pin may be cooled by pouring a half teaspoonful of aqua ammonia in the oil cup with the oil.

HOW TO MAKE A FOUR-EYE MAST BAND.

On all ship yards and masts and on derricks, also, bands having a number of eyes are used, the number being determined by the circumference of the mast. The purpose of the band is to strengthen the mast

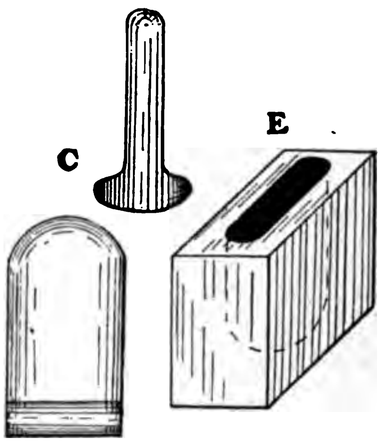


Fig. 1—Jump and Stamp Block

and to equalize the strain on it when lifting weights. On one eye (on a boat the eye pointing toward the bow) is hung the boom or spar for lifting the weights, and to each of the others is fastened a wire stay so that each pulls against the other and causes a down pressure instead of a side pressure, says the American Blacksmith.

To make such a band having four eyes, first determine what the circumference of the band should be. Suppose the mast is 16 in. diameter and the iron for the band 4 in. wide and 1½ in. thick. To the 16 in. (diameter) add 1½ in.' (thickness of iron) which gives 17½. Multiplying this by 3 1-7 gives 55 in. as the required circumference. This divided by the number of eyes to be used (4) gives 13¾ in. as the distance from center to center of jumps.

Mark the center in a bar of iron 60 in. long, as at H, Fig. 2, and measure half the distance there is to be between jumps, or 6⅞ in., at one side of the center, and upset well as at A, Fig. 2. Drive the fuller down into this upset portion well, and by splitting with a hot chisel and fullering with a sharp fuller, gradually shape as shown at B. Measure for each jump from the first one made and make the other three in the same way.

Have ready the four jumps as shown at C, Fig. 1. Heat one of the jumps and a portion of the bar into which it is to go to a good red heat, set the bar on its edge and drive the jump into place. Hammer and scarf down well as at D, Fig. 2. Place in the fire, put a thin shell over it, and slowly heat, being careful not to burn it. When it is hot, put it in the stamp block, E, Fig. 1, and drive down well. Knock the stamp block off, finish the edges and chamfer between Y and Z. Put a jump on at P, Z and X.

The band should be first bent at each jump, as at F, so the jump will not tear it when bending to a circle. Measure off the circumference as at G and I, Fig. 2, add the thickness of the iron for welding and bend and weld. To work the eyes in the

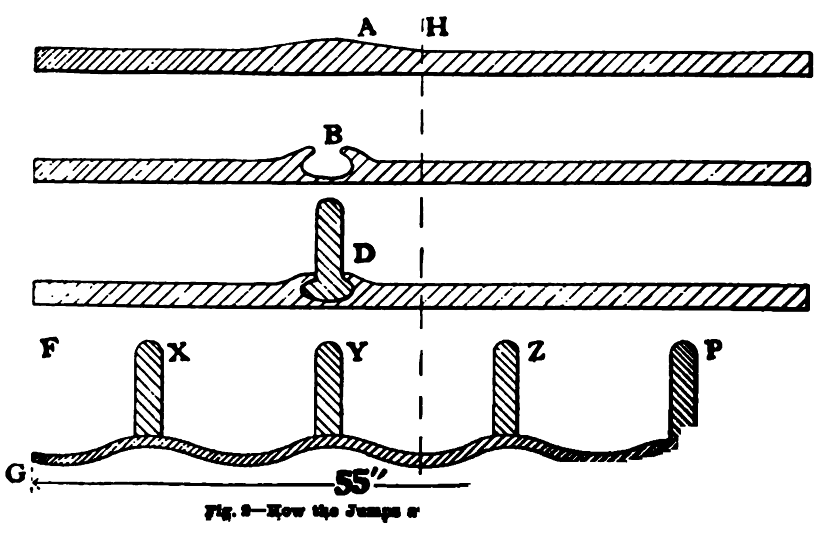
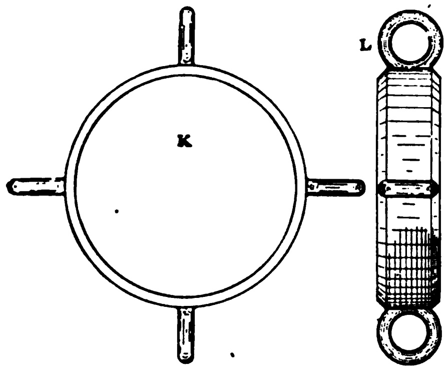


Fig. 2—How the Jumps a

jumps, use a round punch, flattened at the point, which will swell out in the iron when punching. Round the eyes with an eye-bolt fuller and swage. The finished band is shown at K and L, Fig. 3.



Top and Side Views of Finished Mast Band

This makes a neat solid job, with jumps that will not tear out or loosen either while bending the band or punching the eyes in them.

HOW TO LETTER ON TIN.

Draw the letters and ornaments upon a smooth, thin piece of light brown paper, one-half inch larger than the sign, using a lead pencil and making the characters neatly and precisely. Rub whiting over the back of the paper, a neat coating, and place the whiting side directly upon the face of the tin. Remove both to a drawing table and tack firmly in place through the margin of paper. Go over all the letters, etc., with a tracer, or other sharp point; this will leave a white line on the tin, so transferring the pattern, and it is then ready for laying gold size, or for finishing in any other way desired. When all is through, says the Master Painter, rub off accidental spots of tracing with a pad of cotton.

HOW TO REMOVE FILM FROM A SPOILED NEGATIVE.

Hold the plate over a pan of boiling water for a few seconds, being very careful not to melt the film, until the film slips by the pressure of the thumb. It if fails to come again over the steam. This is d. says the Photo-Beacon.

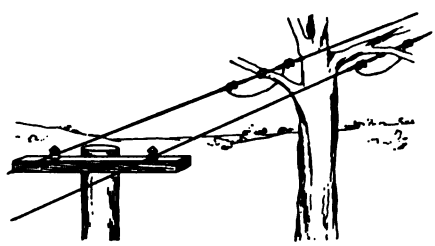
INSULATING WIRES FROM TREES.

The following method of insulating wires from trees comes highly recommended from one who has had considerable experience in line work.

To each end of a piece of No. 6 gauge, hard-drawn wire, 3 or 4 ft. long fasten a glass insulator, first knocking the end of the insulator out with a piece of iron so that there is a hole clear through. For a 1,000-volt-current use but one insulator on each end of this wire, but where for 2,000 volts use insulators on each end. Twist the wires on the insulators securely.

Fasten this wire to the limb or any part of the tree affected by the line wire by means of a loop of greasy leather nailed to the limb and large enough for the wire to pass through freely.

Put the line wire through the groove of the insulator on one end of the still wire, loop it loosely across under the limb so


Insulating Wires from Trees

that it touches no part of the tree, and fasten it at the other side to the insulator on the other end of the still wire.

This affords excellent insulation in wet weather and is just as safe then as any other part of a good line.—Contributed by W. J. Catlin, Glen Ellyn, Ill.

A GOOD BROWN FOR VEHICLES.

A good brown color for vehicles is obtained by using Indian red and black for the first coat, and black rubbing varnish charged with vermilion for the second. Burnt umber and burnt sienna in proportions to taste will give a warmer brown. Add a little white if too dark, or burnt and raw umber in equal parts. Make the first coat flat, and the second color-and-varnish. —From John L. Whiting & Son's book, "What Else to Do."

ABUSE OF TWIST DRILLS.

Before proceeding with this article I wish to state that I look at all things from a proprietor's point of view. Therefore, I want to tell just how our drill case appeared to me. I believe I am safe in saying that twist drills receive more abuse than any tool about the shop, and when a man is compelled to buy them he is interested in the care they receive. They are run at all speeds, and in case of a hurry-up job, I have seen the fire fly. The pressure applied to them varies according to the strength in the operator's arms, which covers a wide range, from 50 lbs. up to and including a ton, or whatever he is capable

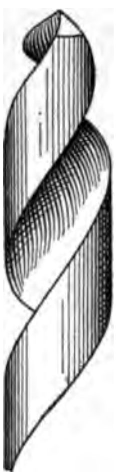


Fig. 1.

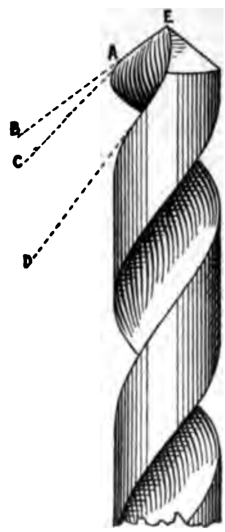


Fig. 2.

of pulling on a lever and twisting on a hand wheel.

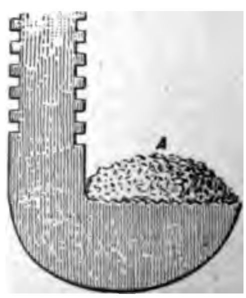
Judging from the looks of our drill case, they have been used as punches, but they did not give as good service as the boiler punches did. The point of the drill looked like Fig. 1. Worn off to about one-half size, the cause being too high speed. If one of the boys becomes a little excited, he immediately declares war against the small tools. The twist drill, of course, bears the brunt of the attack. The weapon used is an emery wheel, which is very destructive to the drill when the boys get excited. As I viewed our drill case I thought of the old story of John and the pants which he brought home on Saturday evening to wear the following Sunday morning. Findin[illegible] [illegible] too long, he instructed mother to cut off 2 in. Fearing she would forget, he instructed his sister, also fearing that she, too, might forget, he instructed his grandmother likewise. It so happened that the mother, sister and grandmother had good memories. And they each cut off 2 in. John's pants reached the high water mark the following Sunday morning. So it is with the twist drill. Frank uses a drill and wears the outer points of the cutting edge off in a rounding shape (A, Fig. 2); Bill grinds the rounding points off without grinding the point (E, Fig. 2); making the angle that of B; Bill also wears the outer points off; Frank again grinds after Bill without grinding the point, E, making the angle that of C. This is repeated, each grinding after the other the dull outer edge without grinding the point, until the angle, D, is reached. At this stage the honor of being a first-class countersink is bestowed upon the drill. The angle, like John's pants, has reached high water mark.—Paul S. Baker, Muscatine, Iowa.

WINE COLOR FOR VEHICLES.

A good "wine color" paint for vehicles is made by adding a little vermilion to carriage part lake. Use a standard grade, and one coat of this and a coat of color-and-varnish will cover without any ground.—John L. Whiting & Sons' Book, "What Else to Do."

HOW TO HARDEN A STILLSON WRENCH.

The easiest method of hardening a Stillson wrench is to take the jaws out, anneal them and file them sharp. Then heat the



jaws red and lay some nitrate of potash on the jaws and teeth as at A in the sketch and [illegible]

TO PROTECT A MOTOR FROM DUST.

To protect a motor from dust, which is sure to be present even where a fan system is used for carrying it away, a galvanized iron cover, A, Fig. 1, made to fit the

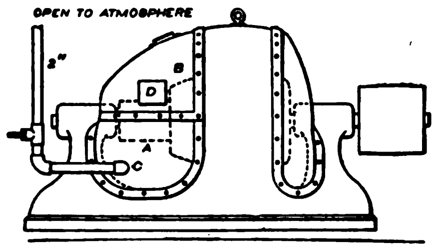


Fig. 1

motor frame snugly and fastened rigidly to the frame, is satisfactory, says a correspondent of the Engineer. Access to the commutator and brushes is afforded by a hinged cover, B, and sparking may be detected, without opening the casing, through a peek-hole, D, about 4 in. square and covered with mica.

A jet of air, supplied by the siphon or jet blower shown in Fig. 2, and which is operated by compressed air, is kept blow-

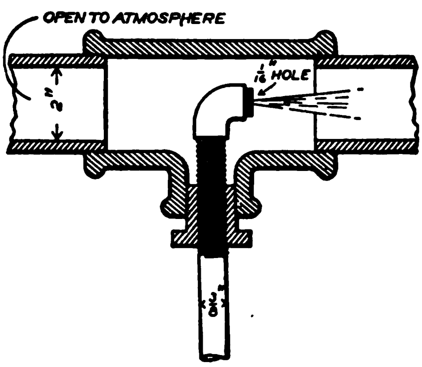


Fig. 2

ing in at C, and the air forces its way out through the openings and cracks at the top and sides of the machine. This jet of air allows no dust or grit to settle upon the motor and keeps the machine cool, also.

The color of common mahogany may be [illegible]d by applying a solution of potassium lye. to the surface. To deter- [illegible] strength of the solution [illegible] stock of the same [illegible] with a dark paste [illegible] with shellac.

READY REFERENCE METRIC CONVERSION TABLE.

C. H. Nicolet, of La Salle, Ill., sends to Engineering News the table which we print below, and regarding which he says:

I send herewith an excellent little conversion table which has had a place in my pocket note-book for many years, and has proven very useful. It is sent to you with the belief that it may be appreciated by other engineers. The arrangement of the

Millimeters	×	.03937		Inches.
"	=	25.400	×	"
Meters	×	3.2809	=	Feet.
"	=	.3048	×	"
Kilometers	×	.621377	=	Miles.
"	=	1.6093	×	"
Square centimeters	×	.15500		Square inches.
" "	=	6.4515	×	" "
Square meters	×	10.76410	=	Square feet.
" "	=	.09290	×	" "
Square kilometers	×	247.1098	=	Acres.
" "	=	.00405	×	"
Hectares	×	2.471		"
"	=	.4047	×	"
Cubic centimeters	×	.061025	=	Cubic inches.
" "	=	16.3866	×	" "
Cubic meters	×	35.3156	=	Cubic feet.
" "	=	.02832	×	" "
" "	×	1.308	=	Cubic yards.
" "	=	.765	×	" "
Liters	×	61.023	=	Cubic inches.
"	=	.01639	×	" "
"	×	.26418	=	U. S. gallons.
"	=	3.7854	×	" "
Grams	×	15.4324	=	Grains.
"	=	.0648	×	"
"	×	.03527	=	Ounces, av'dupois.
"	=	28.3495	×	" "
Kilograms	×	2.2046	=	Pounds.
"	=	.4536	×	"
Kilog's per sq. centimeter	×	14.2231	=	Lbs. per sq. inch
" " "	×	.0703	×	" " "
Kilogram per cubic meter	×	.06243	=	Lbs. per cubic foot
" " "	=	16.01890	×	" " "
Metric tons (1,000 kilog's)	×	1.1023	=	Tons (2,000 lbs.)
" "	=	.9072	×	" "
Kilowatts	×	1.3405	=	Horse-powers.
"	=	.746	×	"
Calories	×	3.9683	=	B. T. units.
"	=	.2520	×	"
Francs	×	.193	=	Dollars.
"	=	5.18	×	"

table is especially commendable, as the entire conversion process is at once apparent, thus:

M = (millimeters) × .03937 = I (inches) or, reversing,

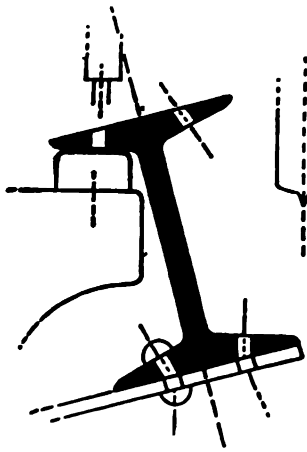
I (inches) × 25.4 = M (millimeters).

TO PROTECT LABELS ON BOTTLES.

To protect labels on bottles so that they will adhere for years and not be affected by acids or dampness first give them a coating of size, and then a coating of gelatine, prepared by swelling a little cooking gelatine in cold water and making it fluid by placing the vessel containing it in a dish of nearly boiling water. Allow the gelatine coating to dry and then apply a single coat of "church" or "oak" varnish which will dry in a few hours, and affords better protection to the labels than other quick-drying varnishes. The Photo-Beacon says that the labels on bottles in chemical laboratories are protected in this way.

PUNCHING STRUCTURAL STEEL FOR LOCOMOTIVE TENDERS.

Structural steel shapes, chiefly channels and I-beams, are used in the construction of locomotive tenders, and many methods are used in the various shops for punching these rolled shapes, says Railway and Locomotive Engineering. Most of these



Punching I-Beams

methods are very difficult of execution as an attempt is made to do the punching so that the axes of the holes shall be parallel with the web of the rolled sections.

In one railway shop a much simpler method of punching without reference to the parallel idea, so far as the axes of the holes is concerned, is used. The bevel side of the flange is laid flat on the die and the descending punch encounters the upper surface of the flange at an angle. This method of punching causes the holes to be as they appear in the illustration. A reamer, when run through before rivets are applied, somewhat modifies the angle at which the hole is punched, but the rivets when driven are not straight; the important point, however, is that the holes of the I-beam and the plate are absolutely in register, and as the rivet is made to fill both holes, and as there is no vestige of a shoulder at the point of union, the bending of the axis of the rivet is not thought important. In fact, a certain advantage is claimed for it, and that is that the bent rivet lessens the strain on the rivet heads, and the punching can be done without any specially constructed supports or apparatus for holding the steel I-beam or channel in place. A shearing punch is not necessary, but the face of the punch should be flat or slightly hollow, and not rounded.

TO MAKE CASEIN COLD WATER PAINT.

Either of the following formulae for making casein cold water paint is recommended by the Master Painter:

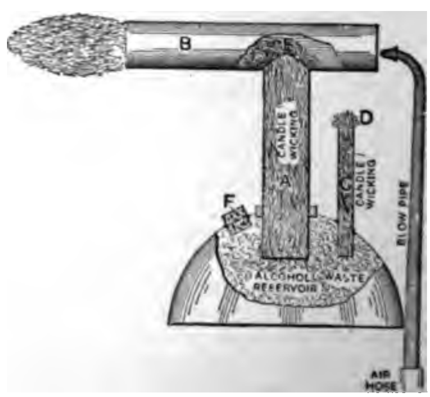
For interior use—10 lb. pure casein, 1½ lb. soda ash, 58 per cent; 88½ lb. plaster of paris or whiting.

For exterior use—9 lb. pure casein, 4 lb. pulverized air-slaked line, ¾ lb. silica, 86¼ lb. plaster paris or whiting.

HOW TO MAKE AN ALCOHOL BURNER.

An alcohol burner which is much safer than a gasoline torch for soldering and other purposes may be made at home. The one shown here was devised by a correspondent of Machinery, who says, that while the flame cannot be focused to a small point the burner is very handy for drawing the temper in broken taps.

To make the burner take the bottom of an oil can, stuff it full of waste, and solder in the brass tubes, A and C. Draw candlewicking through these tubes, as shown. At the top end of tube, A, fit another tube, B, and drive A into an opening at E. Have a hole at F, plugged with a cork, for refilling. Solder a blowpipe into permanent position, the small end being nearly central to the open end to tube, B, serves also as a handle to hold the burner.



Home-Made Alcohol Burner

To start this torch, light the wicking in tube C, which will heat tube B. The hol gathered ...

from the opposite end of the blowpipe. The flame is very green in color and somewhat better than the flame from a gasoline torch.

THREADING AN ELL.

In removing an old hot water tank having $1\frac{1}{2}$-in. connections and replacing it with a larger tank having 2-in. connections, a correspondent of the Metal Worker, who had no fittings of any kind larger than $1\frac{1}{2}$-in. on hand, but had a 2-in. die and stock and vise made good connection by threading an

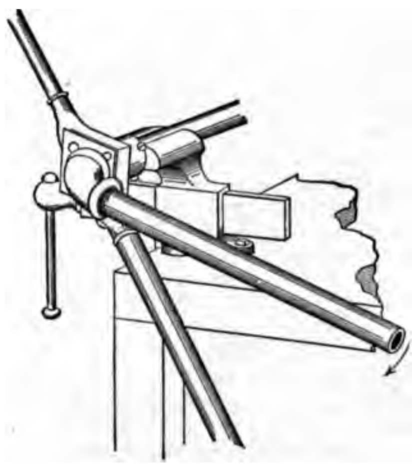


Fig. 1. Method of Threading An Ell

ell. To apply this kink under similar conditions, proceed as follows:

Start a $1\frac{1}{2}$-in. beaded malleable iron ell on one end of a piece of pipe about two or three threads. Take the faceplate out of the stock and put in the 2-in. die, reversed from the ordinary position. Slip the pipe through the dies and guide until the ell strikes the die. Then grip the pipe tightly in the vise, close to the guide; put a piece of pipe over the handle of the stock, so as to reach to the floor and prevent the stock from turning. Into the other end of the beaded ell screw a piece of $1\frac{1}{2}$-in. pipe 2 or 3 ft. long. Then everything is ready to start the work and in a very few minutes a 2 x $1\frac{1}{2}$ in. street ell can be produced, as the operation will thread the bead on the outside of the ell.

Fig. 1 shows the method of working. The screwing up of the ell on the threaded pipe
it into the 2-in. die and re-
-ing cut on the outside
can be screwed into
advantage that
in it is com-

pleted is that it is threaded on the inside so as to receive the delivery tube or pipe, as shown in Fig. 2, to conduct the cold water to the bottom of the boiler.

The table below shows what sizes of pipe

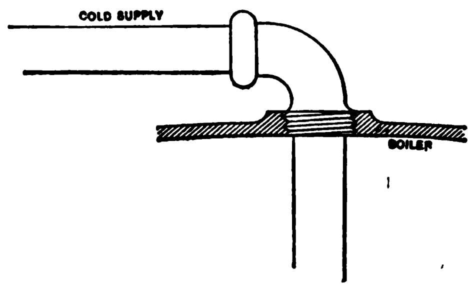


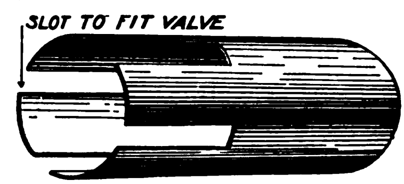
Fig. 2. Ell Threaded on Outside

for different fittings now on the market can be threaded:

$1\frac{1}{2}$-inch beaded fitting can be threaded to fit 2-inch pipe.
$1\frac{1}{4}$-inch not adapted for any standard size.
1-inch plain fitting can be threaded to fit $1\frac{1}{4}$-inch pipe.
$\frac{3}{4}$-inch plain fitting can be threaded to fit 1-inch pipe.
$\frac{1}{2}$-inch plain fitting can be threaded to fit $\frac{3}{4}$-inch pipe.
$\frac{3}{8}$-inch plain fitting can be threaded to fit $\frac{1}{2}$-inch pipe.
$\frac{1}{4}$-inch plain fitting can be threaded to fit $\frac{3}{8}$-inch pipe.

WRENCH FOR REMOVING VALVES FROM PUMPS.

Any size pipe can be used as a wrench for this purpose by taking a hack saw and sawing slots in it to fit the bridging on the pump valve. Such a wrench is easily made



Novel Wrench

with but few tools. Valves that have been in pumps for years I have removed in this way with a 3-in. pipe.—Contributed by W. J. Catlin, Superintendent Electric Light and Water Works, Glen Ellyn, Ill.

For lubricating journals, a compound consisting of one part fine plumbago and eight parts Albany grease is good.

All the articles appearing in this department are reprinted in book form at the end of the year. Price 50 cents postpaid.

TABLE OF KILOWATT-HOUR COSTS.

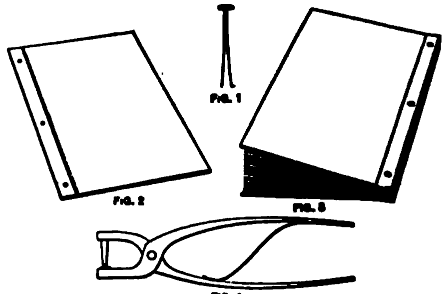
It is frequently necessary to reduce kilowatt costs per year to kilowatt-hour costs, or vice versa, and to do so entails calculations that though simple are irksome, says a correspondent in Journal of Electricity, Power and Gas. Such costs, of course, depend upon the hours of daily service rendered, and in ascertaining them it has been found convenient to reduce them to a tabulated form for ready reference, when they appear as follows for daily services amounting to ten, twenty-one and twenty-four hours respectively:

Cost Per Kilowatt-Hour	Cost Per Kilowatt-Year—Hours Per Day.		
	10	21	24
$0.015	$54.75	$114.97	$131.40
0.0145	52.92	111.14	127.02
0.014	51.10	107.31	122.64
0.0135	49.28	103.48	118.26
0.013	47.45	99.64	113.88
0.0125	45.62	95.81	109.05
0.012	43.80	91.98	105.12
0.0115	41.98	84.15	100.74
0.011	40.15	81.13	96.36
0.0105	38.33	80.48	91.78
0.010	36.50	76.65	87.40
0.0095	34.68	72.82	83.22
0.009	32.85	68.98	78.84
0.0085	31.02	65.15	74.46
0.008	28.20	61.32	70.08
0.0075	27.37	57.49	65.70
0.007	25.55	53.65	61.32
0.0065	23.72	49.82	56.49
0.006	21.90	45.99	52.94
0.0055	20.07	42.16	48.18
0.005	18.25	38.32	43.80
0.0045	16.42	34.47	39.42
0.004	14.60	30.66	35.04
0.0035	12.77	26.83	30.66
0.003	10.95	22.99	26.28
0.0025	9.12	19.16	21.90
0.002	7.30	15.33	17.52
0.0015	5.47	11.50	13.14
0.001	3.65	7.66	8.76
0.0005	1.82	3.82	4.38

SIMPLE METHOD OF PRESERVING ARTICLES FOR REFERENCE.

Articles, pamphlets and old catalogs which one may desire to keep for reference may be preserved in convenient form in the following manner:

Select an old out-of-date catalog of good size and having board covers. Strip the covers from the contents and cut off the flexible back up to the point where the stiff boards are glued to it. About ¾ in. from the back edge of the cover and from the inside cut the board cover nearly through lengthwise, as in Fig. 2, so that the back may be broken. This cut line may be made to act as a hinge by bending the cover over a straight table edge, the flexible binding holding the parts of broken board together. For [illegible] papers as it is desired to preserve, with brass pamphlet pins (Fig. 1), running the pins through the loose pages and the hinge pieces, Fig. 3. The pamphlet pins



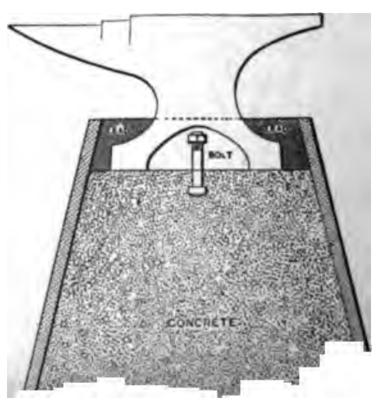
Preserving Articles for Reference

cost about 20 cents per 100. Smooth holes may be made through the pamphlet and binder by the use of a belt punch like the one shown at Fig. 4, says the Metal Worker; this tool costs about 20 cents. If wished an index sheet may be bound in with papers, and the covers of the book may be labeled.

CONCRETE ANVIL BLOCKS.

The difficulty of holding the anvil secure on the block is solved by the use of a concrete block, such as that shown in the illustration.

To make such a block, encase concrete, made of crushed stone and cement, in a rectangular box made of ⅜-in. cast iron, 18 in. high and having a base 14x18 in. tapering to 8x10 in. at the top. The inside measurement at the top should be just 1 in. larger than the base of the anvil, which rests on the concrete 2 in. below the top



of the casting. On each side of the anvil (front and back) embed a bolt and nut in the concrete to a depth of 3 in., allowing the nut to project upward nearly to the top of the casting and about 1 in. above the concrete. Pour melted lead on top of the concrete, until the space (2 in. deep) between the base of the anvil and the top of the casting is filled. The nut of the bolt and the taper of the casting will hold the lead to the cement.

The cost of mounting anvils in this way is very little, says a correspondent of Machinery, and the noise and vibrations when the anvil is struck are done away with. It takes the poetry out of the ringing blows of the blacksmith's hammer, but will be found a most convenient arrangement, especially for colleges.

HOW TO MAKE A SMALL STORAGE BATTERY.

Procure an old battery jar about 6 in. high by 4 in. in diameter, and a piece of sheet lead 3 ft. long and 7 in. wide. The lead may be obtained at any hardware store or plumber's. Cut the lead exactly in half, making two pieces 18 in. long and 7 in. wide. Remove a strip 1 in. wide and 17 in. long from each of the plates, leaving them 6 in. wide, with a lug at one end for connections. Cut an old piece of cord or rope ¼ in. in diameter, into four pieces, each 18 in. long. This is for insulating the plates from each other when ready to charge.

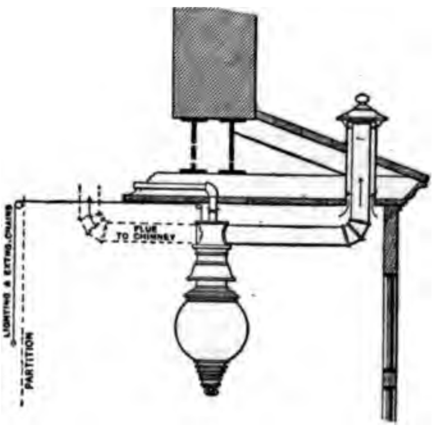
Lay two lengths of the rope across one of the plates, about 4 in. apart, and place the other plate upon the two cords, with the two remaining cords laid upon the second plate. Be careful to have the two lugs on the same side and at opposite ends.

Get a piece of an old broomstick, and carefully wind the whole on the stick, making sure that at no point the lead plates come in contact with each other; otherwise, the battery will be short-circuited and will not receive a charge. It will be found that the coil fits into the jar neatly. The next step is to prepare the acidulated water, which can be easily done by mixing 1 oz. of sulphuric acid with about 10 oz. of water. This is the right proportion, but about
amount must be used to fill the
l plates in it.
ready to charge. Either
but they must
y have once been
charged. The first time the battery will lose its charge rapidly, but the second or third time it is charged it will retain a current for quite a long time. Two or three of these batteries will light a small 2-candlepower electric lamp, or will run a large motor.—Contributed by E. H. Klipstein, East Orange, New Jersey.

HOW TO PREVENT MOISTURE IN SHOW WINDOWS.

The device shown in the illustration is for securing ventilation in windows lighted by gas in a way that prevents moisture in the windows, says the Acetylene Journal.

A simple 6-in. galvanized iron conductor pipe is fitted tightly over the top of the



For Preventing Moisture in Show Windows

lamp and extends upward and outward into the open air, and carries off the products of combustion. If more convenient, the pipe may connect with a chimney instead of passing through the roof. The lamp is turned off and on by means of chains extending over pulleys to any convenient point. The lamp may be placed close to the ceiling so that it will not hang down in an unsightly position, and it is said that trouble from either frost or moisture is entirely obviated by this means.

Holes as smooth as glass may be obtained in long cast-iron tubes of large diameter, as 15-in. for instance, if kerosene is used as a lubricant and, for boring, a "packed bit," such as is used for gun-boring.

Only lead lined tanks with seams burned together instead of soldered should be used for pickling cast iron in vitriol. The acid ruins zinc and solder in a short time.

HEAT RESISTING PAINTS.

For painting exhaust pipes or mufflers, the Pacific Coast Gas Association recommends the following paints as being able to withstand anything up to a red heat:

Lampblack, 3 lbs.; graphite, 3 lbs.; black oxide of manganese, 1 lb.; japan gold size, 1 pint; turpentine, 1.5 pints; and boiled linseed oil, 1 pint. Powder the graphite and mix all the ingredients to a uniform consistency. Give two coats.

Or, black oxide of manganese, 2 lbs.; graphite, 3 lbs.; and terra alba, 9 lbs. Mix and pass through a fine sieve, then mix to required consistency with the following compound: Sodium silicate, 10 parts; glucose, 1 part; and water, 4 parts.

HOW TO SUSTAIN A POLE ON ROCK.

In line-building in mountainous sections, it is often necessary to sustain telephone poles on rock, says the American Telephone Journal, and instead of the ordinary method of making a hole in the rock by blasting, which takes a great deal of time, is very dangerous and expensive, the method illustrated in the accompanying diagram is used.

All that is necessary is to drill five 1¼ or 1½-in. holes in the rock and set an iron pin in each. A hole is bored in the butt of the pole and it is set on the central pin. Guy wires are run from the top of the pole to the other pins. The iron pins are secured in the rock by pouring sulphur or lead around them. An iron ferrule around the butt of the pole keeps it from splitting while being raised.

This is a great improvement on blasting, as it is almost impossible to blast a round hole of small diameter. A blasted hole of sufficient depth is funnel shaped, probably 3 or 4 ft. in diameter at the top and tapering toward the bottom.

DEVICE FOR SMOOTHING COMMUTATORS.

A simple device such as shown in the sketch, is very convenient in smoothing commutators. It consists of a block, Fig. 1,

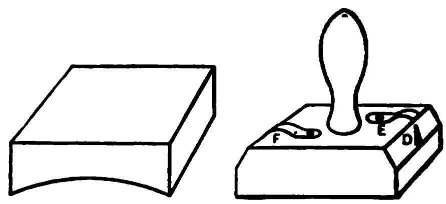
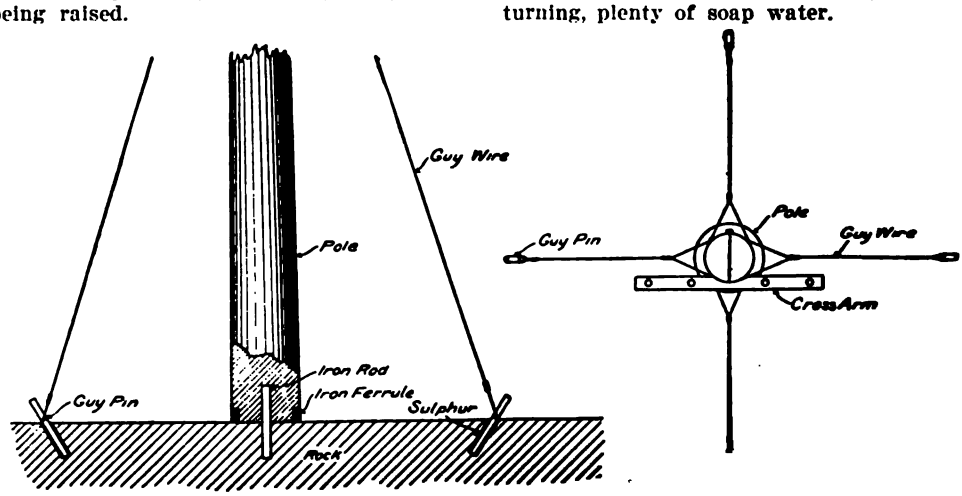


Fig. 1 Fig. 2

of hardwood made to fit the circle of the commutator and just as wide, and having No. 00 sandpaper tacked to it. The sandpaper is put on with pointed pins at D, Fig. 2, and has little flat springs, E and F, to hold it down on the pins. These pins have an advantage over tacks, says a correspondent of the Engineers' Review, in that old paper may be removed and replaced with new more easily. A handle on the block keeps the fingers from getting caught in the dynamos.

In working with aluminum the best lubricant for the machine operation of milling is crude oil; for drilling, kerosene, and for turning, plenty of soap water.



Sustaining a Pole on

SIMPLE ANTI-HUM DEVICE.

Persons annoyed by the humming of telephone wires may prevent the humming by using a piece of No. 14 insulated weatherproof wire, either iron or copper, from the pole to the house.—Contributed by E. H. Umdenstork, Osage City, Kan.

A SIMPLE RIG FOR WINDING COIL SPRINGS.

In the rig for winding coil springs shown here, the hooked or bent end of the spring is made first, as in Fig. 1. Fig. 2 shows the front elevation of the coiling block, and Fig. 3 the end elevation, the portion at A being rounded off to the same radius as the hooked end of the spring. A plan of the coiling clamp is shown at Fig. 4 and an elevation of it at Fig. 5.

To wind a spring with this apparatus, cut off the required length of wire, grip the coiling block in the vise and insert the wire in the block at the hole, B, and bend over the radius, A. Put the slot in the coiling clamp over the coiling pin, C, of the coiling block and, by means of the winged nut on top, grip the loose end of the wire, in the groove, D, cut in the bolt head.

Wind the coiling clamp around the pin, C, the requisite number of times, keeping the wire tight and even. Then slacken the wing nut and the spring will ease enough to allow the end to be pulled out of the hole. Take off the spring and make the eye in the opposite end by means of the two pegs shown at top of C. Fig. 6 shows the manner of making the eye. Use pliers to finish the end.

A correspondent of the American Machinist who describes this rig, says he uses 16-gage wire, 20 in. in each spring of 8 coils, and that a boy can make 25 springs per hour in this way.

LUBRICANTS FOR GASOLINE PUMPS.

Nearly all oils are absorbed by gasoline and for that reason the hemp or string used in the stuffing box of gasoline pumps must be kept moist with some liquid or semi-liquid substance which gasoline does not act upon.

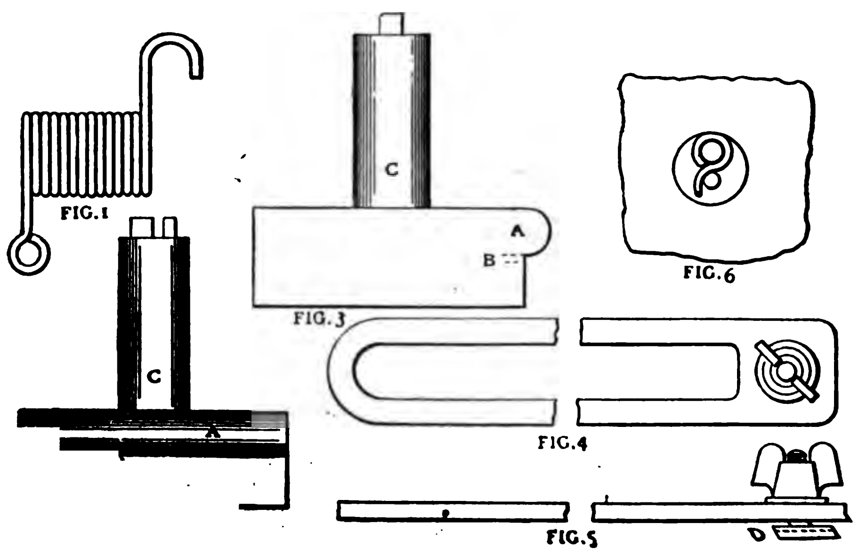
"There are two such substances," says Gas Power; "one is common soap and the other glycerine." First soak the string or packing with glycerine, then screw it down in the stuffing box and the joint will keep moist for a long while. If castile or laundry soap is handier than the glycerine, wax the string thoroughly and the results will be almost as good as with glycerine.

LIQUID FOR ETCHING ON STEEL.

Either for biting deeply into the metal or for producing a beautiful frosted appearance on the surface, the following liquid for etching on steel may be used:

Sulphuric acid, 1 oz.; alum, ¼ oz.; salt, ½ teaspoonful; vinegar, 1 gill; nitric acid, 20 drops.

The effect produced depends upon the time the liquid is allowed to act.



Coiling Springs

MARQUETRY WOOD STAINS.

Wood stains are now used largely in marquetry work instead of, as of old, inlaying the article of furniture to be ornamented with thousands of small pieces of veneer of various colors and sizes. The old process was slow and tedious, the new requires about one-fourth the time. The Decorators' Gasette gives some reliable formulae for these stains, which have hitherto been known only to manufacturers. They are as follows:

EBONY.

6 gals. water.
6 lbs. ground garnet shellac.
3 lbs. ground borax.
1 lb. water ebony A.

WALNUT.

5 gals. water.
5 lbs. ground garnet shellac.
2½ lbs. ground borax.
2½ lbs. Scotch soda.
15 ozs. water walnut A.

OAK.

6 gals. water.
6 lbs. ground orange shellac.
3 lbs. ground borax.
16½ oz. water oak.

PINE.

8 gals. water.
8 lbs. ground bleached shellac.
4 lbs. ground borax.
12 oz. water pine.

SATINWOOD.

5 gals. water.
5 lbs. ground bleached shellac.
2½ lbs. ground borax.
15 ozs. water satinwood.

MAHOGANY.

6 gals. water.
6 lbs. ground orange shellac.
3 lbs. ground borax.
18 ozs. water mahogany 10,522.

GREEN.

6 gals. water.
6 lbs. ground garnet shellac.
3 lbs. ground borax.
12 ozs. pure green P. G. M.

ROSEWOOD.

5 gals. water.
5 lbs. ground garnet shellac.
2½ lbs. ground borax.
1¼ lbs. water rosewood.

Directions for Mixing.—Put shellac and borax into the water, and boil until dissolved, and while still very hot, pour this over the staining color, but never boil up the colors to dissolve them, or they may be destroyed by the heat. Stir up well, and strain carefully when cold. Then bottle for use.

These directions apply to all the formulae, unless specified otherwise.

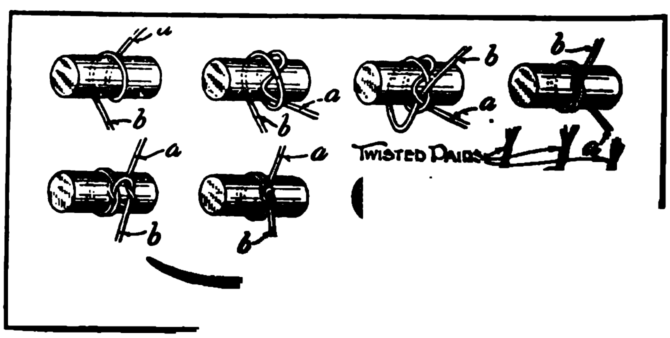
HOW TO MAKE LIME WHITEWASH.

Slack stone lime, not air-slacked, in hot water, keep stirring and use sufficient water to make a mass like mush when slacked. Thin with sweet skim milk, says the Master Painter, and you will have a whitewash which will not rub off if used inside, or wash off if used outside.

Another good method for ceilings is to slack, as in the first instance, and thin with a solution made of 1 lb. powdered alum dissolved in the least possible quantity of hot water and having sufficient lime added to make 10 qts. of whitewash. This will prevent suction and make a wash that will not work up under the brush when putting on a second coat. A little ultramarine blue, first wet up in water, added to the wash, will improve the tone and make a clearer job. For kalsomining, glutol is an excellent substitute for glue.

CABLE SEWING KNOTS.

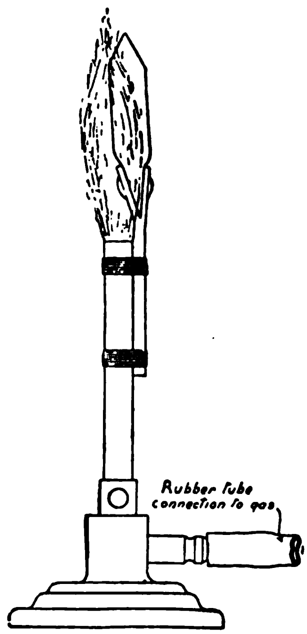
The illustration shows a number of knots used in sewing cables. In each instance A is the needle end of the cord and B is the short end. The "sewing" of the "form," says the American Telephone Journal, is done with a needle. Every lineman should know how to sew these



SHOP NOTES

HOW TO MAKE A SELF-HEATING SOLDERING IRON.

A useful and simple self-heating soldering iron made like the one shown in the illustration will be found a great convenience to its owner.



An ordinary burner, having an end off, has a soldering iron fastened to the end by means of copper wire bound around it. To use, the gas is turned on full and the iron allowed to get well heated. The gas is then turned half off or until the flame just fills the surface of the iron and comes quite to the point. The iron will keep hot quite a while, says the Model Engineer, London, and when cool, is quickly heated again by turning the gas up. This is a cleaner method than using the fire, and after a little practice the iron is not at all awkward to hold.

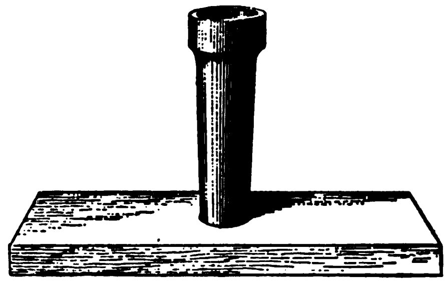
MAKING A SOLDERING IRON OUT OF SCRAP SHEET COPPER.

For material the copper bottom of an old wash boiler will suffice. Cut the copper into
1 in. square and put them in
Place the pot in a large
with wet coal, as the
ckly if the pot
ondent of the

wheel
In a

piece of board bore a hole ½ or ¾ in. deep so the small end of the box will fit in as shown in the illustration. Pour the melted copper into this box, taking care to keep the face well away, as the molten metal may spatter.

If the copper cannot be punched out of

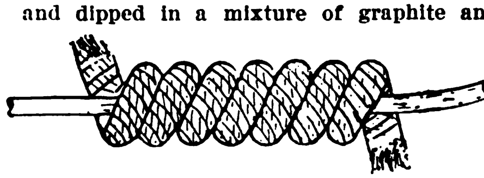


Mould for The Melted Copper

the box, break the box with a hammer. Good copper can be forged at a dull red heat, but if it will not hammer, rasp the end to the desired point. Cut off the right length, drill a hole in the blunt end, tap it out and screw in a ⅜-in. piece for a handle.

HOME-MADE METALLIC PACKING.

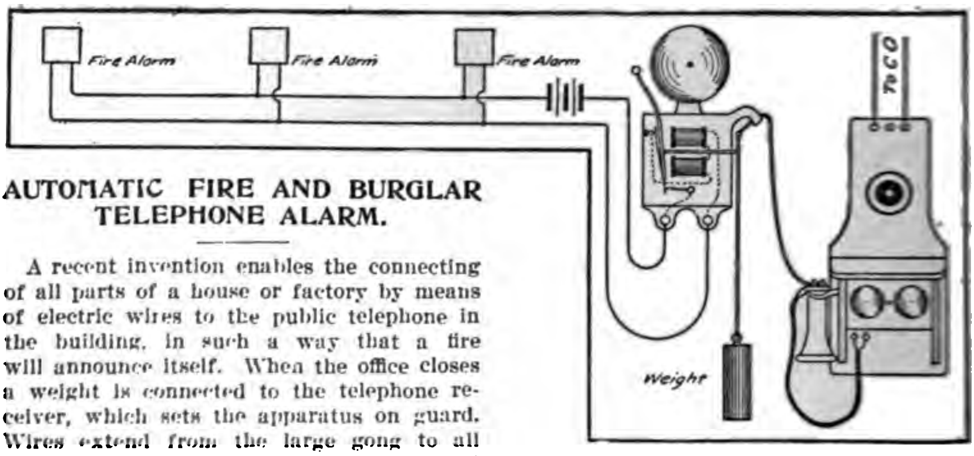
Where the size of the pump stuffing-box is wholly inadequate a home-made metallic packing, consisting of a combination of soft wire solder wound with asbestos wicking and dipped in a mixture of graphite and



Home-Made Metallic Packing

cylinder oil, may be used to advantage, says a correspondent of the Engineer's Review.

The packing will leak at first, but as it becomes fitted to the rod will gradually stop. The packing has not been tried on hot water, but being metallic would probably work alright.



AUTOMATIC FIRE AND BURGLAR TELEPHONE ALARM.

A recent invention enables the connecting of all parts of a house or factory by means of electric wires to the public telephone in the building, in such a way that a fire will announce itself. When the office closes a weight is connected to the telephone receiver, which sets the apparatus on guard. Wires extend from the large gong to all parts of the building, being connected at frequent intervals to thermostats. When a fire starts in any room the ceiling becomes hot, the mercury in the thermostat rises, thus closing the circuit, causing the gong to sound and lifting the receiver from its fork. This calls "central," who hears the gong striking and reports the fact to the fire department. By attaching ordinary electric burglar alarms to doors and windows a burglar alarm service is secured. If a burglar alarm system is already installed connection can easily be made in a few minutes by any electrician. It is suggested as an excellent means of safeguarding a house while the occupants are absent for the summer. Our illustration is by courtesy of the American Telephone Journal.

PERFORATED NIGHT SIGNS.

The latest destination signs which are carried on street cars are now made of perforated sheet metal, says the Street Railway

Perforated Sheet Metal Signs

Journal. One electric light is placed behind the sign which is a great improvement over the glass painted signs which are easily broken and when dirty are indistinct. The light shines brightly through the holes spelling out the letters which can be seen a long distance. Merchants can easily em- same means for special annou ments in night advertisements and any mechanic can readily fill an order for perforated signs on short notice and at trifling expense. The sign should serve as the front of a box inclosing the light which can be connected to any convenient socket with a flexible wire cord.

COMPRESSED AIR AT ALTITUDES.

With increase in altitude the barometric or atmospheric pressure falls from 14.7 pounds per square inch at sea-level to about 10 pounds at 10,000 feet above sea-level. Since the density of the air decreases with its pressure it is obvious that at such an altitude the total weight of air handled by a given displacement is considerably less than at sea-level; and that to fill any volume—a rock-drill cylinder, for instance—with air compressed to 90 pounds, a greater free-air displacement will be necessary than would be required at sea-level. The relative capacities of a given displacement to do work—as in rock drills or pumps—at varying altitudes are indicated in the following table:

Feet above Sea-Level	Barometer Inches	Relative Capacities	Feet above Sea-Level	Barometer Inches	Relative Capacities
0	30	1.000	4500	[illegible]	[illegible]
500	29.43	[illegible]	5000	24.73	[illegible]
1000	26.87	.967	[illegible]	[illegible]	[illegible]
1500	26.33	.954	7000	[illegible]	
2000	27.79	[illegible]	[illegible]	[illegible]	
2500	27.27	.924		[illegible]	
3000	26.76	[illegible]			
3500	[illegible]				
4000					

A HANDY LAMP PENDULUM.

A lamp pendulum which is adaptable for flexible cords is used in England, says the Electrical Review, London.

Lamp Pendulum

The sketch shows the arrangement. The cradle is attached to the flexible cord by cord grips, and inside the cradle rests a heavy ball through which the flexible cord passes, and to which the lamp and shade are attached. The ball is of sufficient weight to rest firmly on its seating and so holds the shade at any desired angle and keeps the cradle perpendicular at the same time the lamp is tilted.

TO USE OLD DRY ELECTRIC CELLS.

The cells of exhausted dry batteries will make good Grenet cells, if the bottoms are cut off and the filling and paper lining, if any, are removed. Be careful not to break off the carbon rod.

After the filling has been removed, if there is a paper lining, it may be removed as follows: Drill an exhaust hole through the cement in the top of the cell, then stand the cell in a watertight receptacle and fill the receptacle with water to within ¼ in. of the top edge of the cylinder. Let it stand until the paper lining is loosened and may be entirely removed.

The electrolyte to be used is 7 oz. of bichromate of sodium dissolved in 1 qt. of water. Add, very slowly, ⅓ pt. strong sulphuric acid, stirring the mixture slowly with a glass rod all the while. When the mix-
t into a glass battery jar
of mercury, which
malgamated the
ld be suf-
he zinc
sht,

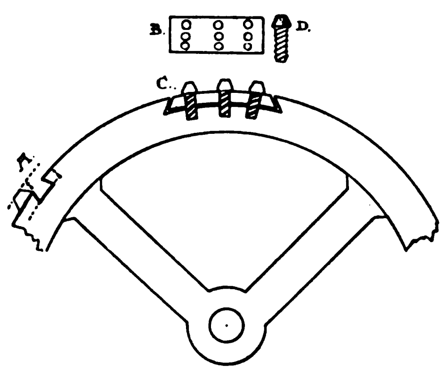
If while working with the batteries any of the acid or the solution should get on the hands or clothes, rinse off immediately with clean water. This experiment was sent us by a correspondent who has used it successfully.

HOW TO REMOVE PUTTY FROM OLD SASHES.

Cutting the putty with a knife and hammer is very apt to damage the woodwork. Instead, give the putty three coats of ordinary paraffin oil, allowing a half hour between coats. The petroleum will penetrate into the pores of the putty and dissolve the hardened linseed oil, making the putty plastic in a short time and in two or three hours it can be readily removed.

HOW TO REPLACE BROKEN TEETH IN GEARS.

To properly dovetail a tooth in a gear, requires a slot as deep as the tooth is high (A in sketch). If the gear is subject to hard work this will not hold, but will surely work loose. There seldom is metal enough to dovetail the proper depth without weakening the



Replacing Broken Teeth in Gears

rim of the gear. A method for light rim gears, that holds where all others fail, is as follows:

Bend a piece of boiler plate to the proper circle, as at B; dovetail it in the gear, as at C; make it a driving fit. Then drill through the plate and rim of the gear; tap out and screw in steel studs, as at D.

This will certainly hold because the studs are all solid in the boiler plate and cannot tear loose.—Contributed by Paul S. Baker, Muscatine, Iowa.

GETTING A BLOCK AND TACKLE TO THE TOP OF A STEEL STACK.

An engineer who had experienced some difficulty in getting a block and tackle to the top of a steel stack 38 in. in diameter

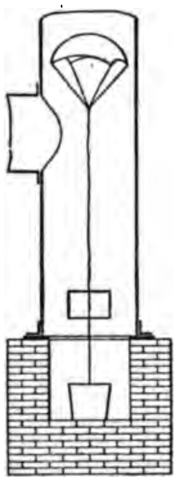


Fig. 1

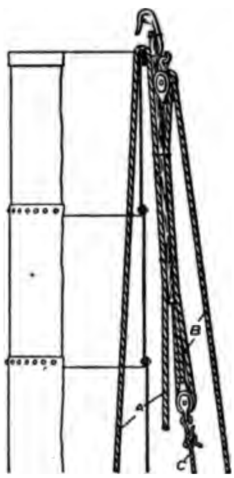


Fig. 2

and 80 ft. high, tells, in the Engineer, how at last he was successful. The stack had previously had a rope running through a pulley at the top for raising a block, but the rope had parted and come out of the pulley.

The materials the engineer collected to work with were a double and single block, 320 ft. of ½-in. rope, 200 ft. of chalk line, 200 ft. of common fish line, ½ yd. of cheesecloth, a stick 1x1x8 in., a pine board 1x12x16 in. with cleats on one side, 90 ft. of ⅝-in. rope, a pail and some wrapping twine.

The first thing to do was to get a line to the top of the stack. Four pieces of line, each 2 ft. long, were tied to the corners of the cheesecloth and the loose ends were tied to one end of the fish line. This formed a parachute. The other end of the fish line was tied to the handle of the pail, the loose length of the line having been run into the pail so that it might be rapidly paid out when required. The pail was then placed in the bottom of the stack and by means of a stick the parachute was pushed past the tee with which the boilers were connected (See Fig. 1). The air or gases soon lifted the parachute through the stack and out at the top, where it was possible to get hold of it. Then by means of the chalk line the ½-in. rope was drawn up the inside and down the outside of the stack. The hook on the double block was replaced by one made of ⅝-in. steel and of suitable size to hook over the band at the top of the stack. The blocks were then threaded up with the other end of the ½-in. rope and pulled about 12 ft. apart.

The ½-in. rope, A, Fig. 2, was now hanging on the outside and to this was attached the stick to which the tackle had previously been bound. The old ⅝-in. rope, C, was tied into the hook of the single block and the tackle hoisted by pulling the rope, A, down and out through the manhole in the stack. Getting the hook over the stack band required some patience, but was finally accomplished. When secured, a few hard pulls on the various ropes broke the wrapping twine by which the tackle was bound, and the rope, A, fell down on the inside of the stack, and the stick fell on the outside. The single block was then pulled down by means of the rope, C, and a swing, Fig. 3, made of the 12-in. board attached. The engineer then collected his painting materials and with the aid of an assistant pulling on the rope started up. It was only necessary to make three trips to the top, as a white-wash brush attached to a broom-

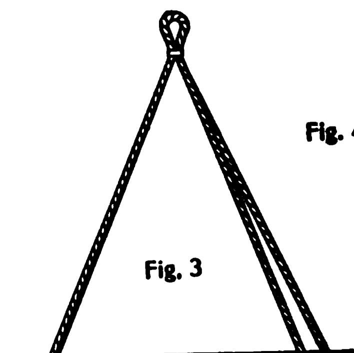


Fig. 3

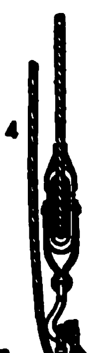


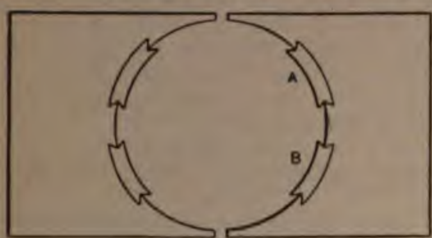
Fig. 4

stick enabled him to reach one-half the circumference of the stack. Fig. 4 shows a safe hitch which is quickly made and by means of which the man fastened himself at whatever point he wished to stop.

ANOTHER METHOD OF BABBITTING CRANKPIN BRASSES.

Old worn-out crankpin brasses may be babbitted in the following manner and made as good as new, says a correspondent of the Engineer's Review:

Dovetail places into the brasses on the quarters as shown in the sketch, leaving a space of about ¼ in. on a 2½ in. pin. The dovetailed part need be only 1-16 in. deep to hold the babbitt in place and from ½ in. to ¾ in. is quite wide enough for the babbitt. A pin fixed in this way does not



Babbitted Crankpin Brasses

wear quite so flat and makes a smooth running box; it wears better than brass and requires less lubrication.

GRINDING CAR WHEELS AT SLOW SPEED.

In some St. Louis street car shops it has been discovered that better results are obtained by removing car wheels from the trucks and grinding them at a slow speed than by the old method in which the wheels, run at a high speed by the motors under the car, were ground under the car.

The wheels removed are run at 6 r. p. m. This speed is regulated by means of a countershaft fixed above the wheel grinder, says the Street Railway Journal, from which a belt is run to a split pulley which is placed on the car axle. The excellent results obtained make the means worth while.

REPAIRING A THERMOMETER.

For a thermometer in which the mercury has separated try the following remedy:

Place the thermometer in a long stocking, having the bulb toward the toe and then grip the stocking tightly at the top and whirl rapidly. The centrifugal action will drive the mercury to the bulb, and the thermometer will be as good as new.—Contributed by Raymond J. Edwards, Shullsburg, Wis.

WHY WAGON WHEELS ARE DISHED.

The reason for dishing wagon wheels can very easily be demonstrated by making a couple of tin wheels for one axle of a child's toy wagon, says a correspondent of the Blacksmith and Wheelwright. If the wheels are made straight, as shown at A,

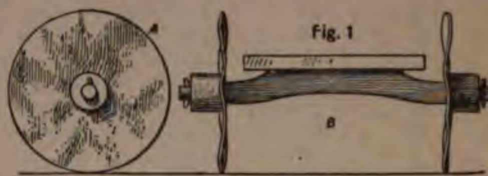
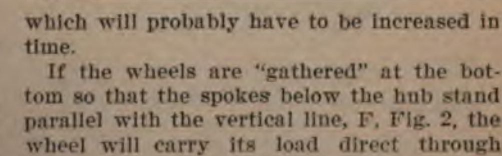


Fig. 1, they will take the shape shown at B, Fig. 1, a very short time after being in use, especially is this true when the wagon is loaded. The hubs of these wheels are made of a bit of wood nailed to the tin.

The superiority of the dished wheels is shown in Fig. 2. The tin wheel is cut into at C, lapped over to the dotted line and riveted or soldered into a flat cone. This wheel put on the axle at the proper angle will stand a great deal of hard usage. The difference is in the degree of stiffness obtained in the two forms of wheels. The dished wheel is stiffer than the flat one and so will not easily bend and wobble. Put on as shown at E, Fig. 2, however, the dished wheel will not stand constant usage and loading. The spokes in the hub will become loose and the only remedy is to cut out a piece of the rim and reset the tire causing a greater and rather unsightly dish,

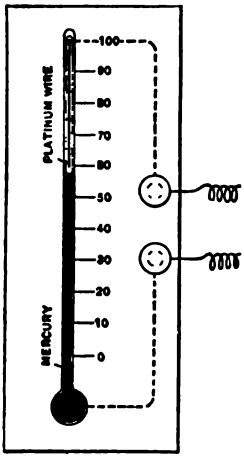


which will probably have to be increased in time.

If the wheels are "gathered" at the bottom so that the spokes below the hub stand parallel with the vertical line, F, Fig. 2, the wheel will carry its load direct through spokes, rim and hub and there is no undue strain on the spokes. The gathered wheel throws mud in the direction of line G, away from the wagon instead of into it and is preferable for this reason also.

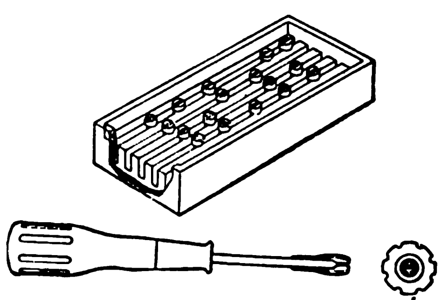
A TEMPERATURE ALARM.

Temperature alarms are of great service in greenhouses where a drop of a few degrees may mean a loss of a goodly sum to the florist. There is a thermometer on the market, having a platinum wire in the bore and suitable connections to electrical terminal posts on the thermometer board, says a correspondent of the Metal Worker. The platinum wire can be adjusted to any desired temperature and to effect the alarm, the wire is connected up so that a metallic circuit is broken whenever the temperature drops below the set point and the alarm bell rings. The apparatus connected up with suitable bells and batteries and installed so that the alarm can be heard in any part of the greenhouse costs less than $10.



TRAY FOR HOLDING SCREWS.

If a box of screws be poured into the tray, constructed as shown in the illustration, and it is then shaken two or three times, every screw will fall into the grooves head upward, says the American Electrician.



Screw Tray

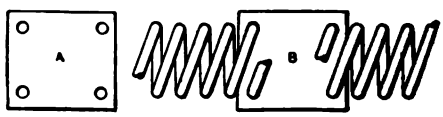
If small brads are driven in the tops of the ribs (not shown in cut) the screws will fall into the grooves more readily. The screw-driver is then pressed over a screw, the spring sides of the tray being stiff enough to hold the screw so it can be entered and screwed until pressure comes on. Then the driver revolves part of a half turn, until the positive drive blade slips into the slot of the screw head and a firm pressure can be applied and the screw picked out.

GOOD PACKING FOR A STEAM CHEST.

One-sixteenth inch asbestos sheeting makes a good packing for a steam chest. This material costs about 45 cents per yard and if put on wet will bear 150 pounds steam pressure. In tests with this packing a joint was broken six times and tightened up satisfactorily with the wet asbestos. It is just as tight as the best rainbow packing can ever be made.—Contributed by T. H. Konrad, Burlingame, Cal.

HOW TO REPAIR A SPIRAL SPRING.

A spiral spring, 1 in. in diameter, which was used in an engine governor and which parted in the middle one morning just before starting up, was repaired by a correspondent of the Engineer's Review in the following manner:



Spiral Spring Repaired

Four holes were drilled in a piece of steel as at A, and the broken ends of the spring were forced through the holes into position as at B. The spring was then replaced and the engine started. The job took about 30 minutes.

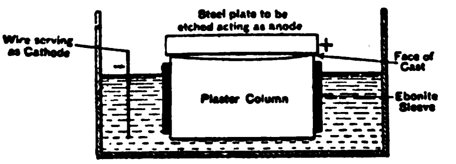
HOW TO THAW DYNAMITE.

A safe and sure way of thawing out dynamite is as follows:

Procure a small box or a nail keg just large enough to hold a lantern, and knock the bottom out of it, to admit air so the lantern will burn. Tack a piece of burlap over the top, on which to lay the dynamite, and set the apparatus a safe distance from all buildings. Throw an old coat or a sack over the dynamite. The heat can be regulated by turning the lantern up or
"I have used this meth-
mite for f
Parker
h

ELECTROLYTIC PROCESS FOR ETCHING STEEL.

A process of electrolytic etching, invented and patented by a German, makes it possible to obtain exact reproductions of articles in low relief, such as medals and coins, in hard steel. The principle of the process is quite simple. Plaster of paris is poured upon the



Arrangement for Electrolytic Etching

article, let us say a coin, sufficient to form a column several inches high and a cast is taken. The plaster of paris is then removed from the coin and fitted with an ebonite sleeve, leaving exposed only the face and the corresponding blank at the opposite end of the short column of plaster.

A vessel containing an electrolyte, such as ammonium chloride, is prepared and the cast placed face upward in it, so that the face projects above the level of the liquid, and the liquid can only reach the face by absorption through the column of plaster. The piece of steel on which the reproduction of the coin is to be etched is placed on the face of the cast and is made the anode of the cell. A wire spiral placed in the liquid in the vessel is the cathode. Thus the steel plate rests on the high parts of the cast and at those points flows a current which dissolves the steel and the liquid steel flows into the cast. This process is kept up until the whole surface of the steel is in contact with the surface of the cast. Of course the process involves a number of details.

The best electrolyte is made by electrolytically dissolving an iron anode in a solution of ammonium chloride. Every five or ten seconds the steel must be cleansed of its constituents, notably carbon, which are left as it is dissolved. A reproduction of a coin can be etched on a steel blank in about three hours. A high voltage—10 to 15 volts—is efficient.

ISH FOR BALLOONS.

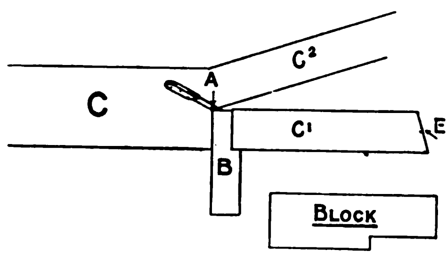
ndia rubber
a, using

CEMENT FOR BELTS.

Cook thoroughly 6 oz. of Peter Cooper's white or cream glue and when it is well done add 2 oz. of powdered white lead. Mix well. Use same proportions for larger quantities. For use for any length of time in summer leave thick and thin down with alcohol. When thoroughly cooked turn out into something to cool. Cut off a piece as wanted. In applying, make the splice the same length the belt is wide, hammer it well together and the belt can be used in one hour. A correspondent of Power says he has used this cement for six years and has never had a splice come apart.

HOW TO CUT BELT LACING.

In the diagram the various parts are as follows: A, sharp pocket knife; B, block; C, belt lacing, C^1, size of strip to be cut; C^2, other part of C; E, end of lacing. Place the left hand on B, holding it firmly and with the right hand take hold of E and draw it



Cutting a Belt Lace

towards you. The knife, A, will cut C in two equal parts, providing C has a straight outer edge. In this way C can be cut straighter than a string. The cut in block, B, may be any breadth or depth. The pocket knife should be driven into the bench or other base and must be very sharp.—Contributed by R. V. Archambault, Norris, Mont.

PAINT FOR SHIPS' BOTTOMS.

The following recipe is recommended by the Master Painter as a good paint for painting the bottoms of ships:

Eight lb. of rosin; 1½ lb. of Cologne brown dry color; 15 oz. of shellac; 25 gills of alcohol; 6 gills of benzine; ¼ gill of toluene and 10 drops of pyridine. Finish with a coat of paraffin wax and white lead boiled together and applied hot.

HOW TO MAKE GLASS SLEEVES FOR MACHINE BOXES

Their Use Makes Lubrication Unnecessary—Many Persons Experimenting with Them.

A very fair bearing for a common box can be made from broken bits of bottle or plate glass. Many machinists and power transmission people who desire glass journals for

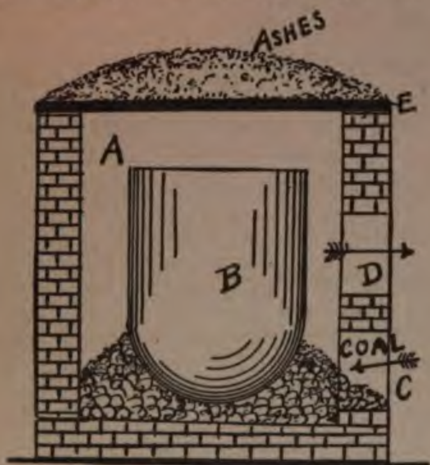


Fig. 1

special purposes give their orders to the glass works where any required pattern of sleeves can be manufactured. The glass manufacturers have every facility for making glass journals, but, as a rule, they are obliged to make excessive charges for special work of this kind; and besides, they cannot very well make just what one wants from drawings. Therefore, many people who are interested in the use of glass sleeves in journals for machinery, shafts for power transmission, engine bearings, etc., undertake to make the bearings themselves. There are many experiments in progress in the glass bearing line at the present time, and several different processes for making glass sleeves are in use at various important machinery centers. In some shops quite elaborate apparatus for the melting of the glass and


Fig. 2

casting the same has been installed; in others, the workman may be seen melting some broken pieces of glass over a fire with a ladle, he then pours the melted substance into the sand mold. Before we undertake to make any glass bearings, either in a crude way or in a mechanical way, let us observe the grades of glass used.

The Japanese use glass bearings for the purpose of saving oil. In fact they do not apply any oil at all to lubricate the journals fitted with glass sleeves. They take ginger ale bottles and break the pieces fine with a hammer and melt them. Flint glass is used by some of the American makers. The grades of glass in which silicate of potash and oxide of lead are prominent are considered the best grades. These are flint, crystal and strass. The coarse green bottle glass, which is so often used and which is so readily obtained, includes in its physical make-up silicate of soda, alumina, lime, and oxide of iron. The chief reason why one sees this grade of glass used frequently is because it is always convenient. Some of the glass bearing makers and users evidently consider all species of glass alike. The English crown glass is sometimes used, also the refractory Bohemian types. There are two ways: One is to select the glass from bottles or broken window panes; the other is to go direct to a glass works and purchase the kind of glass desired. Common white is a good sort to buy. If one uses bottles, he may as well use whatever is handy, and mix

Fig. 3

and grind all together, as an assortment, except by an expert is not possible. But even when the glass is ready, and the pieces all broken up, so they have a degree of uniformity, the work is only begun.

For melting, an apparatus like the one shown in Fig. 1 is recommended as good, but such an apparatus involves both labor and expense. As a substitute one might melt the glass in an ordinary melting ladle. (Fig. 2) In a shop, where it is intended to fill orders for glass bearings, it is a good plan to erect the bri[illegible] enclosure as shown in Fig. 1. T[illegible] of proper dimensions to [illegible] inside [illegible] high and 20 in.

in diameter. Such a crucible can be purchased at a foundry. The melting of the glass is best done if the crucible is enclosed. Therefore build up the walls to make the chamber A. Have the inlet for the coal at C and the outlet for the draft and smoke at D. Cover the top with sheet metal, C, and to keep the heat in cover the sheet metal with ashes. Pack the crucible, B, with the broken glass and cover it. Put the crucible in through the top of the chamber. Cover the chamber, make a coal or coke fire and keep it up until the glass is melted. Then remove the covers and ladle out the melted glass. This is a first-class method, but as before stated, the glass can be melted in a common open ladle (Fig. 2) over a hot coal fire.

The next part of the process is the pouring and moulding. It is a good plan to make some sand moulds precisely like those used in the foundry for casting metals. Fig. 3 is a plan of one of the sand moulds. Use moulding sand and shape the form of the article to be cast in the sand as at F. Pour the glass direct, or use the usual gate and runners of the standard flask. Fig. 3 is a sectional view.

First cast very plain sleeves in open flasks and finish the exposed side by grinding on an emery wheel. After a while, almost perfect sleeves may be cast ready for use, by employing the facilities of the finished flask. Some of the sleeves are cast round complete as in Fig. 4. Fig. 5 is a view lengthwise of this design of glass bearing. The glass bearing is often supported in a cushion of rubber or a padding of felt. Sometimes, if thick, it rests directly upon the metal. Fig. 6 shows the arrangement frequently used when the sleeves bear in metal boxes. The shaft, G, contacts direct with the glass facing of the sleeve. The sleeve is supported in the metal frame of the box, H. This part of the box fits into the journal of the hanger or machine frame. Some of the boxes are put up as illustrated in Fig. 7. This involves either a tight fit of the glass sleeve or ridges provided on the sleeve to fit into corresponding grooves in the metal cap or seat of box. The adjustment of the ridges and the grooves prevents the sleeve from working out of its position. Some of the glass sleeves are made up in sections as illustrated in Fig. 8. Sometimes the sleeve is in one complete part, again in two halves and then again in four parts, as in this case; sometimes the sleeves are capped at the ends with metal enclosures and these caps protect the edges of the glass.

After the casting of the sleeves comes the smoothing and finishing. Some of the sleeves will be warped and crooked and have to be

Fig. 4

Fig. 5

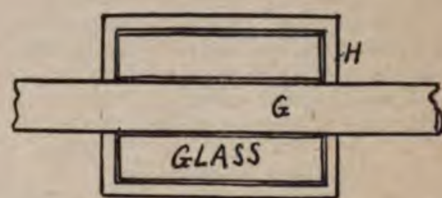


Fig. 6

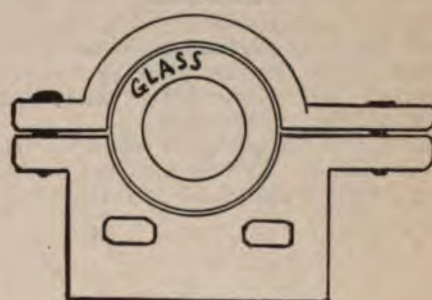


Fig. 7

Fig. 8

remelted; others are cracked too badly for use; some are very rough and the roughness must be ground off on the emery wheel. This is quite fine work. In fact, all of the glass sleeves must be subjected to more or less grinding to get them into the proper order for use. After the final grinding, rub the parts with an oily cloth, and then the sleeves are ready for work.

The object of the glass bearing is to do away with lubrication. Glass sleeves are used on water wheels, where the water constantly moistens the bearings, and no oiling is necessary; but in nearly every other instance of the use of the glass sleeve, it will be found that a drop of oil is slyly deposited in the glass bearing. Almost all makers of glass sleeves, however, declare that no oil is needed. The .glass sleeves are hard and smooth, and for sewing machine bearings, etc., may run without oiling, or at least with little oil. In the large shafts, however, although practically no lubrication is made, daubs of grease plastered against the sides, "just to help out," may be observed. No oil holes are bored through the glass sleeves.

Despite these contradictory facts, the indications are that there is a future for glass bearings and many intelligent men are experimenting with them in spare hours.

"Traveller."

ANOTHER METHOD OF CUTTING A FINE-TOOTHED SAW.

The following method of cutting a fine-toothed saw is recommended as a better way than the one described on page 347 of the March Popular Mechanics.

Clamp a clock spring or corset steel in the vice firmly. To cut the teeth hold a sharp and hard cold chisel so that its front

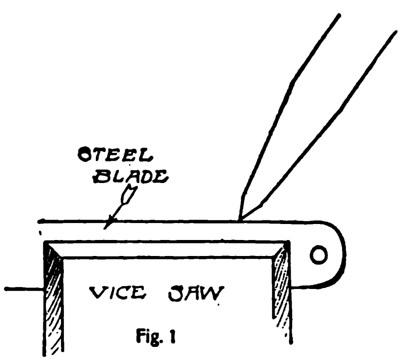


Fig. 1

cutting edge stands nearly plumb (see cut), then with a light hammer strike a blow of sufficient power to cut to the depth required. Now place the chisel on the steel and draw it toward the tooth just cut. When it strikes against the burr thrown up by the first cut, strike again with the hammer, being careful to strike with the same power as in making the first cut. Repeat this until all the teeth are made.

By using a fine chisel and light hammer, saws may be cut as fine as 30 to 40 teeth to the inch, and with heavier tools, as coarse

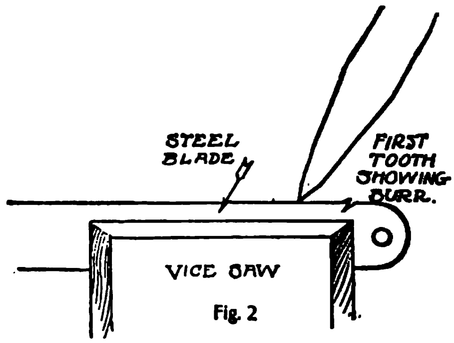


Fig. 2

as 12 to 16 teeth to the inch. After a little practice anyone can cut these teeth as fast as he can strike the blows.—Contributed by C. G. Evans, 380 Bowen Ave., Chicago, Ill.

THE DANGERS OF A SCRATCH

Scarcely a day passes that many workmen do not, in some way or other, get a scratch, a small cut, or a bruise that may break the skin. In most instances not the slightest attention is paid to this beyond the temporary annoyance of the pain and the possible irritation when the hands are put into water, or some subsequent blow in the same spot brings an exclamation on account of the hurt.

This, while a common practice, is by no means a wise one. The air is full of floating disease germs, especially the air of cities and towns, and an injury of this sort, be it ever so slight, might furnish excellent breeding ground for some deadly bacteria. It is a good plan always to keep a bottle of prepared carbolic acid and glycerine, and frequently touch all bruises or sore spots with it. This is one of the most convenient and effective germicides imaginable. It is believed that many cases of fever and other serious ailments can be contracted by a floating germ coming in contact with the abraded skin. Once snugly lod
most congenial dwellin
multiplies with ama
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HOW TO MAKE A CLOTHES LINE TIGHTENER.

To keep clothes line wires from sagging when hung full of heavy damp clothing, the following contrivance will be found efficient and can be made by anyone.

Procure a strong, straight-grained fence post, 9 ft. long, and saw a section about 8 or 10 in. from the top, as at K, Fig. 4. Bore a ¼-in. hole through the post as at F, Fig. 2. Set the post in the ground to a depth of 3 ft., tamping the earth around it firmly. The post must be well set, as there will be considerable strain.

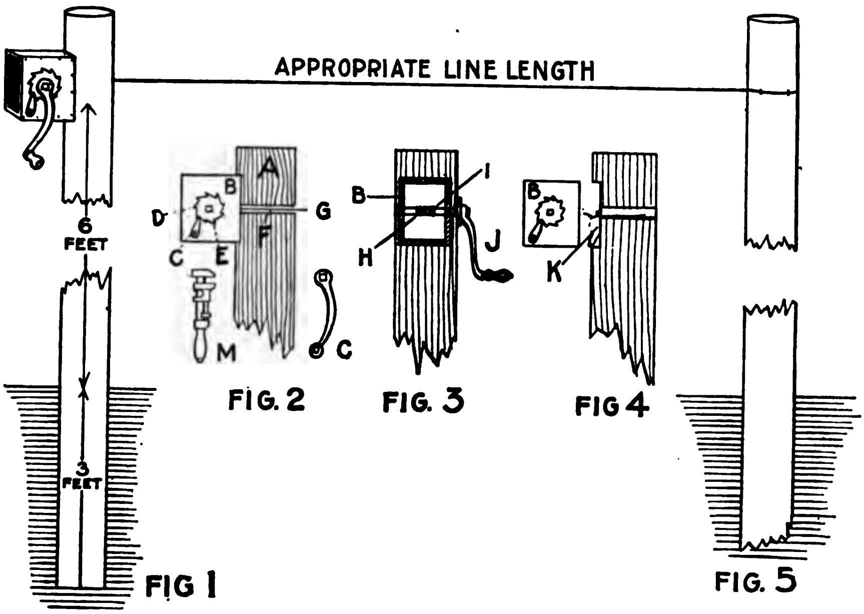


FIG 1 FIG. 2 FIG. 3 FIG 4 FIG. 5

Construct a boxed enclosure with a ratchet wheel and ratchet as at B, Fig. 4. Nail this box in the post at K, Fig. 4, run the wire through the hole in the post on to the ratchet shaft, H, Fig. 3, and then run the wire from this post to another post or to a building. Attach a crank, as at C, Fig. 2. If there is no crank to be found use a monkey wrench. The apparatus is now in working order. All that is necessary is to turn the crank on ... stretched as ...

...eroy L.

TO GIVE WOOD AN EGGSHELL POLISH.

Make a polish of 3 parts shellac, 1 part mastic resin, and 1 part sandrac resin, dissolved in 40 parts methlyated spirits. Apply with a rag.

RECIPE FOR FRENCH POLISH.

Dissolve thoroughly ¾ oz. gum benzoin, 3 oz. gum juniper, 14 oz. orange shellac, ¼ oz. dragon's blood powder and ½ oz. powdered borax in ½ gal. methylated spirits of wine contained in a bottle. Strain through thin muslin.

HOW TO SOFTEN CAST IRON.

Put a cap or plug in one end of a piece of gas pipe larger and longer than the work to be annealed. Put a layer of equal parts of sand and powdered charcoal mixed together into the pipe, put in the work, and then fill the pipe with the sand and charcoal mixture, tamping down lightly. At night, heat to a red heat, cover well with hot coals and then with green coal and leave until morning. Remove from the forge in the morning and set aside to cool. A correspondent of the American Black-...h says finished work can be annealed in

JACKS FOR HOLDING AND LIFTING PUMP PIPES.

In Fig. 1 is shown a jack and its parts in detail for holding pipe. The jack may be made of either 1¾ in. by ½ in. steel very good iron tire or of 1⅛ in. square axle stubs taken from an old carriage axle, says a correspondent of the American Blacksmith.

The hook or claw which holds the pipe is shown at A, and a side view of it, showing the manner of forging so as to strengthen it at H, where a hole is drilled to receive a ⅝ or ¾ in. rivet, is shown at C. This claw is made for 1¼-in. pump pipe, the size most commonly used. The lever and rest is shown at B. It should be curved in the arm so that when in use the hook cannot touch the platform to loosen the hold on the pipe. D shows a top view of B. The hole I, in the lever, B, is for receiving a chain or rope when using the tool over an old-fashioned well or cistern, and prevents the tool from falling in and being lost. The rivet holding the parts together should be strong and fit like that in a pair of tongs. The tool opens and closes by lifting away from G.

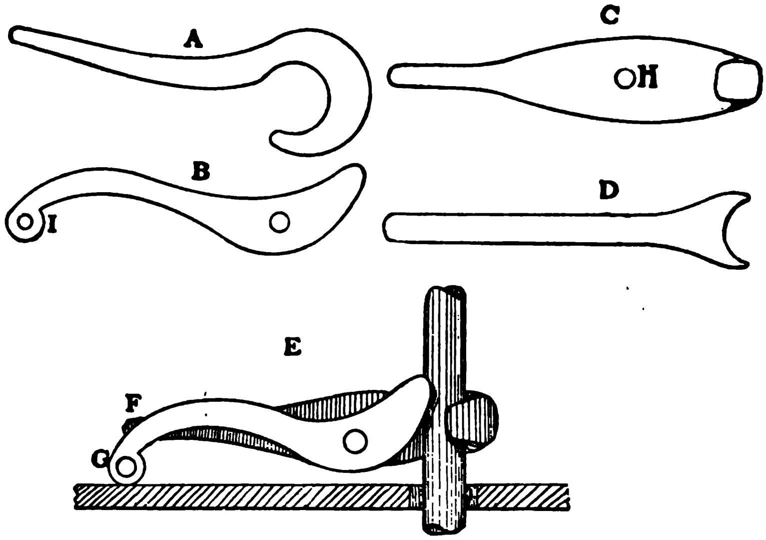


Fig. 1—Pipe-Holding Jack

For lifting and lowering pump pipes a tool like the one shown at X is satisfactory. It may be used either with a rope or by passing a bar or hand spike through the ring, so that two men can lift on it. It is made of 1⅛-in. axle stub of square stock, the opening being just large enough to let the pipe into the hole of the tool which should be but ⅛ in. larger than the pipe. This tool is shown in use at Z.

A tool for hand use is shown at Y, and it may be used singly or in pairs. The ring at the end provides hand-hold and it is turned out of the handle solid, just like a poker hand-hold. The light part should be ¾ or ⅞ in. round and the rest 1⅛ in. square. A set of these tools should comprise a jack as at E, rope and a lift like X, or a jack and two hand lifts like Y.

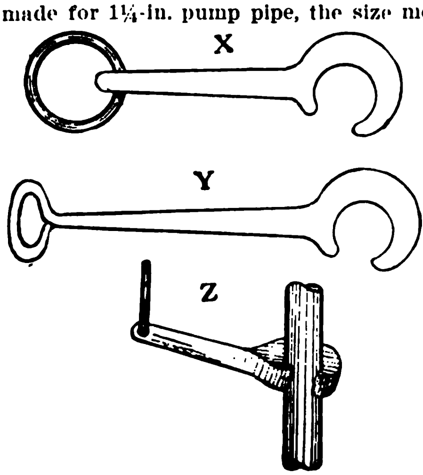
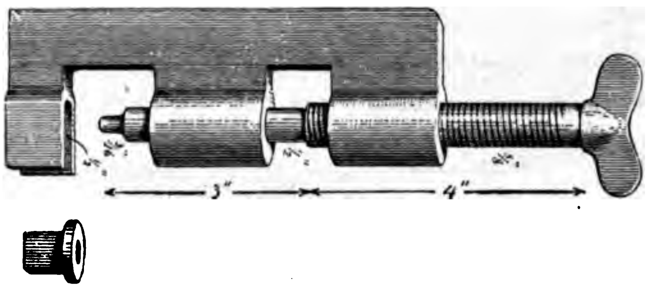


Fig. 2—Pipe-Lifting Jack

DEVICE FOR REMOVING BROKEN RIVETS

For removing broken rivets in buggy bow sockets the device shown in the sketch is guaranteed by a correspondent of the Blacksmith and Wheelwright to be all right. The sketch is self-explanatory. For the inside end of a rivet, place a washer large enough to go over the head of the rivet to hold it firm in its place. There is no danger of breaking the socket in using this device, and one man can do the work more easily and quickly than by the old method.



For Removing Rivets

HOW HORSEPOWER COMPARES WITH MANPOWER.

The measurement of a horse's power of work, first ascertained by Watt, the inventor of the steam engine, was founded upon the basis that the average brewery horse was capable of doing work equal to that required to raise 330 lb. of weight 100 ft. in one minute, or 33,000 lb. one foot in one minute. This estimate, however, was for one minute; it would not be possible for a horse to perform this amount of work continuously for eight consecutive hours. One horse could exhaust 12 men in a single day, for where a strong man could perhaps pull half of 330 lb. to a height of 100 ft. in two minutes, he probably could not repeat the operation more than a few times. A man's power is about one-tenth of a horse's power. That is, where a horse could pull 330 lb. to a height of 100 ft., one minute, and then slack up and repeat the operation, for eight hours, thus pulling four hours, and slacking up four hours, it would require ten strong men to perform the same amount in that length of time. When man put horses to work the gain in labor for the world was thus tenfold. Multiply this by steam power, water power, air power, and above all, electric power, and one has a problem in mechanical progression.

RULE FOR CONSTRUCTION OF ELLIPSE

The following on the construction of ellipses may be of interest to many mechanics, as this subject is not taught in public school text books. I had occasion to use this rule but recently in certain designs, and noting certain comments on ellipses in April Popular Mechanics, offer this for the benefit of those who are interested. The difference between the squares of the axis of any ellipse is equal to the square of the difference between the foci.

To reduce this rule to a formula, let

L = Long axis.
S = Short axis.
D = Distance between foci.

Then

$L^2 - S^2 = D^2$.

To construct an ellipse of any given dimensions, say, with long axis 5 in., short axis 3 in., substituting in formula—

$L^2 = 5^2 = 25$
$S^2 = 3^2 = 9$
$25 - 9 = 16$
$\sqrt{16} = 4$ = Distance between foci.

To construct ellipse, insert pins in line of long axis 4 in. apart, or ½ in. from each end of ellipse to be constructed. Then with a loop 4½ in. long draw ellipse.

In addition to the remark in April Popular Mechanics that the curve of the distances of any point on the curve from the foci is always the same, it may be added that this distance is always equal to the longer axis.—Contributed by W. G. Frisbie, Athens, Pa.

A CORRECTION.

The article entitled "Using Motorcycles for Shop Power," which appeared in our May issue was by mistake credited to the American Blacksmith instead of to the Blacksmith and Wheelwright in which paper this interesting kink first appeared.

A LESSON IN FRESCO PAINTING.

The materials required by the beginner in fresco painting are a perfectly straight piece of wood, 3 ft. long, 2 in. wide and of about the thickness of a lath, and a brush, called a "fresco liner," made of white bristles, and varying in size from 1/4 in. upwards. The smallest size is best for the beginner, says

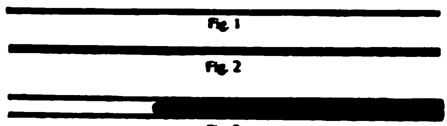


Fig 1 Fig 2 Fig 3

a correspondent of the Western Painter. It is not only cheaper, but if mastered first, it will not be hard to learn to handle the larger sizes. To practice with use black marking ink, which flows evenly and is easy to use.

Good lining is the first thing for the amateur to master. If he practices until he can make perfectly straight lines of uniform thickness and having neatly joined corners he has gone a long way toward becoming an expert fresco painter.

To begin work select a smooth board surface or wall space and hold the straight

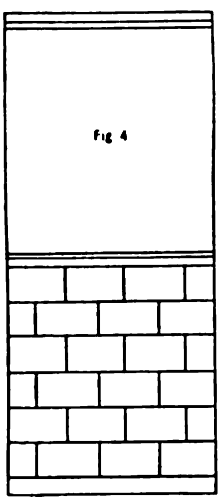


Fig 4

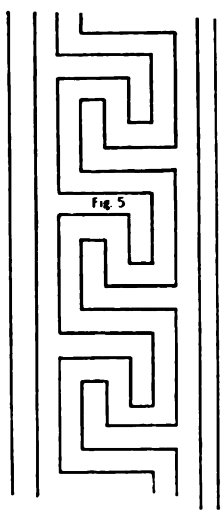


Fig 5

edge against the wall, using the left hand and grasping it at the extreme left end, the back of the hand being against the wall and the thumb facing the body. The right end of the straight edge should touch the ing wall; the straight edge does not on its surface. Take the brush in the right hand, holding it at the extreme end of the 10-in. wooden handle between the thumb and first finger. Dip the brush in the fluid, touch it lightly against the side of the pot to remove all excess ink and, starting at the left, run the line lightly to the right. Do not hesitate or the line will waver, due to varying pressure.

When able to make such lines perfectly, try making lines several times as long. Make first a guide line by fastening one end of a 6 ft. line to the wall with a tack, drawing it taut and running a piece of char-

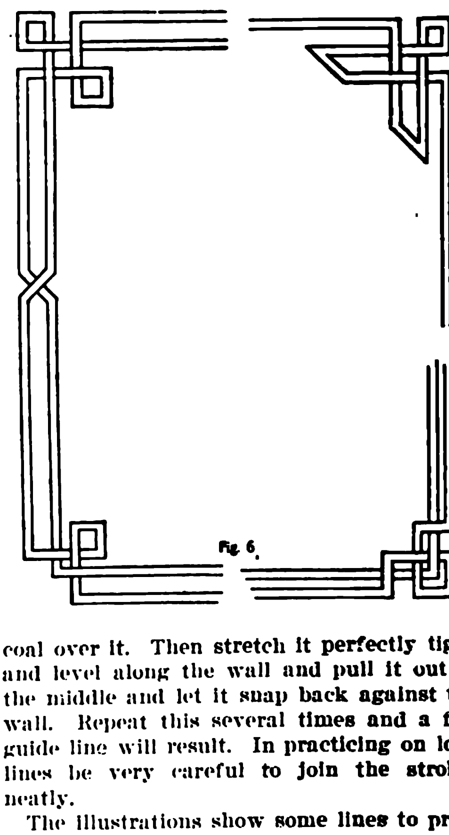


Fig 6

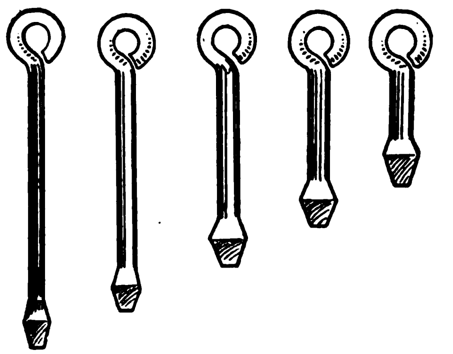
coal over it. Then stretch it perfectly tight and level along the wall and pull it out at the middle and let it snap back against the wall. Repeat this several times and a fine guide line will result. In practicing on long lines be very careful to join the strokes neatly.

The illustrations show some lines to practice on. Fig. 1 represents a fine line made with a light, quick stroke; Fig. 2 requires a heavier brush; Fig. 3 is made by filling in between two fine lines, using another brush, and Figs. 4, 5 and 6 show various decorations which may be executed by the amateur.

On an average from 10 to 12 lb. of hard coal, or 18 to 20 lb. soft coal can be burned on one square foot of grate. Nearly double this amount can be burned with fan draft.

HOW TO MAKE A GOOD SCREW DRIVER.

Take ⅜-in. round spring steel and forge the end to the proper shape. Bend an eye in the other end. For hard work place a bar through the eye. There is no handle

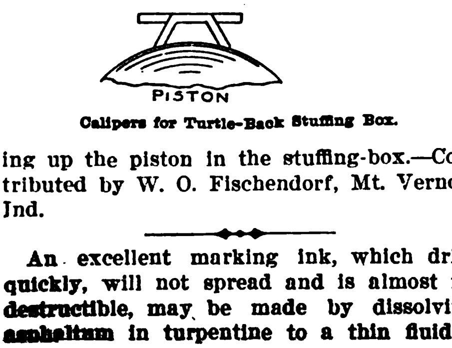


Set of Screw Drivers.

to come off, and if the point breaks it can be forged again. The long one, or lazy man's driver, should be about 30 in. long; the short one about 8 in. long.—Contributed by Paul S. Baker, Muscatine, Iowa.

HOME-MADE TURTLE-BACK STUFFING-BOX CALIPERS.

The illustration shows top, side and end views of some turtle-back stuffing-box calipers which any engineer can make and will find them a valuable addition to his kit of tools. The calipers are used for tru-



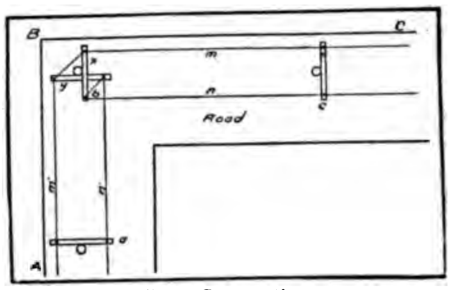
Calipers for Turtle-Back Stuffing Box.

ing up the piston in the stuffing-box.—Contributed by W. O. Fischendorf, Mt. Vernon, Ind.

An excellent marking ink, which dries quickly, will not spread and is almost indestructible, may be made by dissolving asphaltum in turpentine to a thin fluid.

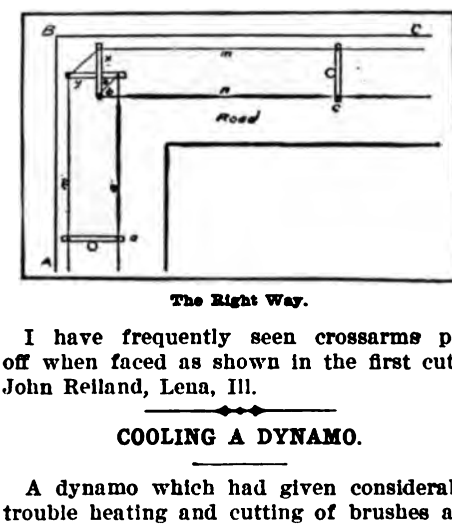
TURNING CORNERS WITH TELEPHONE WIRES.

Editor Popular Mechanics: On Page 444, of your April issue, I notice an article on telephone line construction. The description is right, but the artist got the pole on the wrong side of the crossarm. The cut shows as follows:



Wrong Construction.

As shown above the pull comes so that the strain is on the bolt or lag screws instead of on the pole. The proper way is to place the crossarms as shown in the cut below, viz.:



The Right Way.

I have frequently seen crossarms pull off when faced as shown in the first cut.—John Reiland, Lena, Ill.

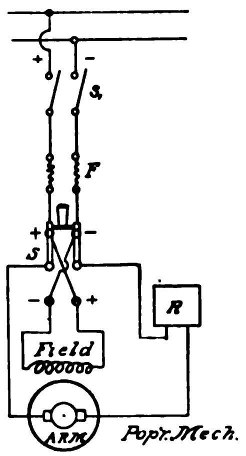
COOLING A DYNAMO.

A dynamo which had given considerable trouble heating and cutting of brushes and commutators was arranged by a correspondent so that it was kept cool by its own power. An electric fan was placed on a stand just high enough so the current of air would be thrown on the armature. The fan was then connected with the wires from the generator and there has been no trouble from heating since.

Shop Notes for 1905 is a book for ev craft. Send for a copy. Price 50 cents

SIMPLE WAY OF REVERSING A MOTOR.

The diagram shows a simple way of reversing the direction of a motor with a double pole double throw switch. The fields are in circuit as soon as the main switch is closed and by using the double pole double



Plan of Wiring

throw switch on one side the motor runs one way, and by changing the switch the motor runs in the opposite direction. An ordinary rheostat is used for controlling the armature. —Conducted by G. H. A., Chicago.

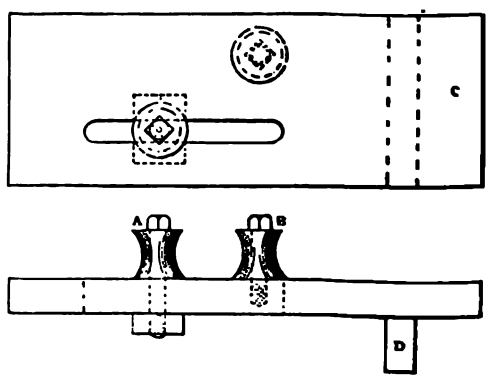
DRIVING AND HOLDING POWER OF CUT AND WIRE NAILS.

Prof. Carpenter of Cornell has made some experiments in nail driving. These experiments would seem to establish: First, very much more force is required to drive a cut nail a given distance than a wire nail. Second, more force is required to start a cut nail generally than to drive it, and that it invariably starts much harder than a wire nail. Third, the work in inch-pounds per nail required in driving cut nails is much more than that in driving wire nails. Fourth, the work in inch-pounds in pulling cut nails is about equal, sometimes less and sometimes greater, per nail, than that for pulling wire nails. Fifth, the maximum force per pound in driving or starting wire nails is more nearly equal to that of the cut nails than when estimated on the basis of that of a single nail, but it is still less. Sixth, the work, in foot-pounds, per pound of wire nails required for driving is less than that required for the cut nail, and that for pulling is considerably more. Seventh, the relative efficiency which is here considered as the ratio of the work of pulling to that of driving is much higher for the wire nail than for the cut nail. In making experiments it was noticed that the cut nail bruised and broke the fibers of the wood, principally at the end of the nail, whereas the wire nail simply crowded them apart, and probably did not move them much beyond the point from which they would return by elastic force, and hence the nail would be grasped much stronger per unit of area of surface by the wood. Presenting less surface, there would be, however, less resistance to starting. To see what the effect of change of form would be, a number of ten penny cut nails were sharpened on the point by grinding to an angle of about 30 deg., so that the fibers in advance of the nail would be thrust aside and not bruised and broken. This served to increase the holding power over the cut nail of ordinary shape about 50 per cent, in starting force, and about 30 per cent in work of resistance to pulling.

AN ADJUSTABLE PIPE-BENDING DEVICE.

The pipe-bending apparatus shown in the illustration, which can be adjusted to vary the radius of the curve to be bent, is so simple that any workman could make one like it, says a correspondent of the Engineer's Review.

To the plate, C, is fastened a stud, B,



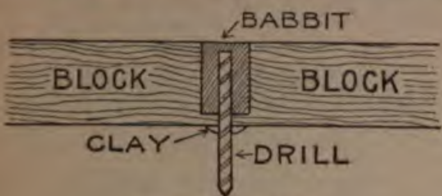
Adjustable Pipe Bending Device

while the stud, A, moves in a slot in the plate. The pipe is bent between these two studs, by prying in the direction in which the pipe is to be bent. The movable stud regulates the radius of the curve. The D, is for holding the plate in the vi bending pipe.

SHOP NOTES

HOW TO REPAIR A BROKEN DRILL

Procure a block of wood a little thicker than the length of the shank of the drill and bore a hole of the same size as the shank nearly through it. Bore through the rest of the way with a bit the size of the drill. Insert the drill in the hole as shown



Repairing the Drill

in the illustration and press clay or putty around it in the small hole from the underside. Run babbit in the chamber made in the block, allow it to cool, and then burst the block apart and the repaired drill is ready for use. It will bear much longer service than may be imagined and the repair will be found useful when the supply of drills fails unexpectedly.—Contributed by Eli Tolliver, Louisville, Ill.

THE STEAM BLAST AS A PROTECTION FOR THE BRIDGE WALL?

A steam blast introduced under a grate would do more harm than good, says a correspondent of Power, and where it is desirable to increase the draft, a blower set is the proper innovation.

The illustration shows the probable effect, if a steam pipe were placed below the grate

Fig. 1

Fig. 2

as in Fig. 1. The shaded portion represents clinkers adhering to the bridge wall In dislodging the clinkers, the steam would take with it a small part of the wall until an effect as in Fig. 2 *would* gradually result.

HOW TO MAKE AN AIR-HAMMER

An air-hammer, such as shown in the illustration, will be found handy for straightening round and flat iron at the scrap pile and may be home-made, says the American Blacksmith.

The anvil of the hammer is a cast iron block and the hammer is made of an 8-in.

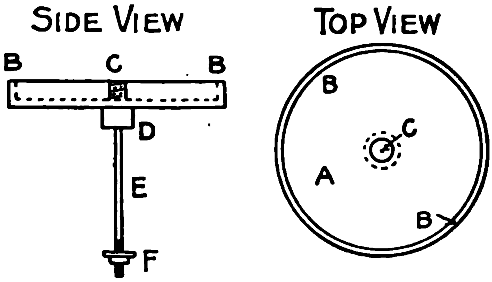
Air-Hammer for Straightening Scrap Iron.

railroad air brake cylinder. In the one shown, an old mortising machine was used for the frame, but it could be made of old channel irons, or a wooden post could be used. A foot treadle connected to the valve on the top of the cylinder by a rod operates the hammer and both hands of the operator are left free to handle the rods to be straightened. All round stuff up to 1¼-in. diameter may be straightened by this device. Of course the machine is usable only in shops having compressed air.

Contributions to this department are invited. Have you a practical idea for us?

FIXTURE FOR A DRILL PRESS

A simple, cheap and efficient fixture for a drill press is shown in the accompanying illustrations. It consists of a casting, A, with a flange, BB, a lug, D, to fit the center hole of the drill press table and a stud, C, the same size as the lathe spindle nose.



Fixture for the Drill Press.

In using, the fixture is placed on the drill press table with the boss, D, in the central hole. The fixture is then securely fastened by means of the washer and nut, F, on the rod, E. An universal or scroll chuck from a lathe is then screwed on the stud, C. This chuck is supported by the flange, BB.

The idea may not be new but it is a good one. By the use of the fixture much work can be done on the drill press by a cheap man that would ordinarily require a good man on the more expensive lathe.—Contributed by E. M. Davids, 958 Grand View St., Los Angeles, Cal.

HOW TO BRAZE A BROKEN GLAND

A gland which suffered injuries that broke off about two-fifths of the flange and took out one of the three stud holes in the gland, was repaired by a correspondent of the Engineer's Review in the following manner:

A piece of ⅛-in. sheet iron, the size of the gland and having a hole for the rod to fit, was cut out as in Fig. 1. In both flange and sheet-iron piece five small holes, less than ¼ in. were drilled to correspond, and the plate was riveted to the gland. A charcoal fire was then built in the forge, and the gland, flange downward, slowly heated till red hot, when borax was poured over the fracture until sufficient to flow into all the crevices. Bits of brass were then placed along the line of fracture, enough to fill all space between the plate and the gland, Fig. 2, and in the crack in the flange, also. The part was then heated until the brass flowed freely into the joint when it was removed from the fire and allowed to cool. The stud holes were then bored and the piece dressed off. This repair was made in 1882 and two years ago was still in good order.

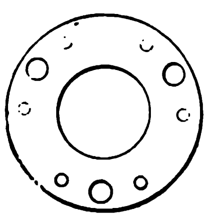


Fig. 1

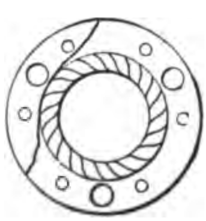


Fig. 2

COLORING CONCRETE

[Excerpts from paper by J. P. Sherer read before the convention of the National Association of Cement Users.]

All coloring compounds containing acids or greases (including lamp blacks and graphites), are detrimental to concrete. For this purpose ground colored natural stone and mineral iron oxide are most desirable, in that they do not weaken or damage the setting qualities of the stone, but add materially to the strength of the finished product.

It is more satisfactory and cheaper to color the entire block than to use the facing plan. The color of the mixture wet must be many shades darker than the shade it is desired to obtain. For a strong deep cherry red from five to seven pounds of pure mineral oxide per cubic foot of concrete should be used.

TEMPERING STOUT SPRINGS

The following method may be used on springs for almost any purpose with excellent results:

Smear the spring with oil or tallow and hold it over a clear fire, or in a hollow fire, or place in a large iron pipe and put in the midst of the fuel of an open fire. Heat the spring until the grease burns off with a blaze. Probably the ends of the spring will heat first and the grease begin to burn there. If so, remove from the fire the moment this happens and immerse in oil, but do not quench entirely. Remove from oil and reheat, and if the ends again heat first, immerse in oil again. Repeat this operation until the oil burns uniformly on all parts of the spring. Cool by whirling around in the air.

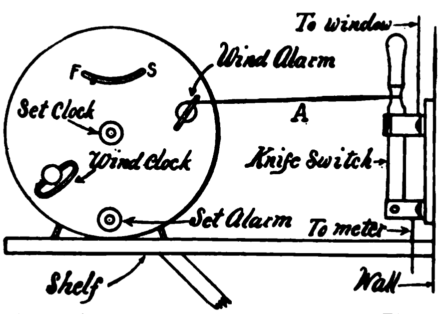
INSPECT THE SHAFTING AND SAVE POWER

Shafting which is out of alignment, belts which are too tight and bearings which are improperly fitted or insecurely supported are all excellent means of wasting power, says the Practical Engineer. Regular inspections of couplings and shaftings will pay for themselves in the power saved and the reduced expense in generating power. Pulleys placed too far from the shaft hangers spring the shaft, thus wasting power and perhaps heating the journals. Small pulleys waste power also, as they necessitate straining the belt too tightly.

AUTOMATIC DEVICE FOR TURNING OUT ELECTRIC LIGHTS

Merchants will find convenient a device which will automatically turn out the electric lights in their show windows some hours after they have left their places of business.

Such a device is shown in the sketch and may be rigged up accordingly. An alarm clock and a knife switch are the essential parts required. A in the diagram is a string having one end tied around the switch and the other end tied to the alarm winding key on the clock which has the bell removed. When the alarm rings, the string winds up, thus pulling out the switch and



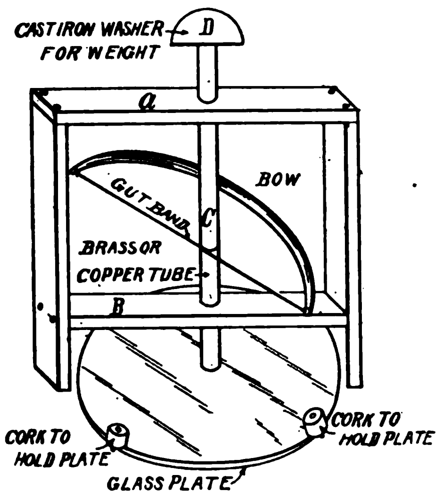
Turns Out Electric Lights at Specified Time

so breaking the circuit. If a merchant leaves his store at eight o'clock and wishes the lights turned off at twelve, he just sets the alarm for twelve o'clock and winds it up, closes the knife switch and may go home assured that exactly on the hour the lights will be turned off.—Contributed by G. Russell Noble, South Haven, Mich.

METHOD OF DRILLING HOLES IN GLASS PLATES

The apparatus shown in the illustration is used for drilling holes in glass plates such as are used in static machines. The frame is very easily made and the sketch explains its construction.

Procure a copper or brass tube the size of the hole it is desired to drill in the glass,



Drilling Holes in Glass Plates

and bore holes in the crosspieces, A and B, just large enough for the metal tube to pass through and have room to turn freely. If these holes are too large, the hole drilled in the glass will not be round, nor of the size desired; if too small, the tube will not turn freely.

Make a bow, such as a boy uses for shooting arrows. Pass the tube through the hole in the upper crosspiece of the frame and make one turn around the tube with the string of the bow, as at C. Then pass the tube on through the hole in the other crosspiece. Fasten a weight on the top of the tube as at D, and the apparatus is ready for use.

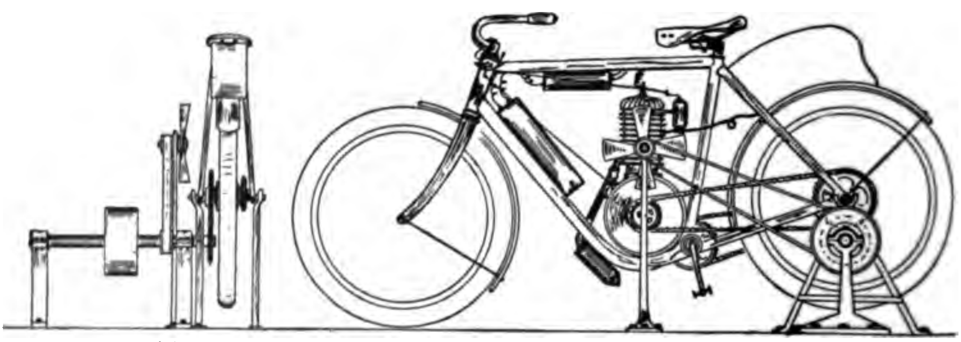
Fasten the frame on a perfectly flat table, put the glass plate under the framework and fasten it down with nails driven through corks. Put a small quantity of emery dust moistened well with turpentine into the tube and, grasping the bow, saw back and forth, so causing the tube to revolve alternately toward the right and left. In a short time a clean round hole in the glass plate will result.—Contributed by W. J. Slattery, Emsworth, Pa.

CEMENT FOR SLICKING LEATHER FILLET ON BRASS PATTERNS

Melt together 2 parts rosin and 8 parts pure beeswax, let cool, cut into strips, and apply with a slicking tool of the proper radius. The best tool for the purpose is made by setting a piece of wire into a steel ball and heating over a Bunsen burner. In applying, warm the pattern slightly so the cement will flow between the leather and brass. When cold any excess cement may be removed with a piece of waste soaked in spirits of turpentine.

MOTORCYCLE FOR SHOP POWER

In one of your "shop notes" in the May number I notice the article of using a motorcycle for shop labor by placing it on a stand and connecting the drive wheel to a shaft. I do not wish to criticise this article, as I think it very good, but merely offer a suggestion and enclose a drawing. It is a well known fact that a gas-engine heats up very rapidly to its own destruction unless cooled either by water or air cooling fins on the cylinder. For motorcycle use, the air-cooled is generally adopted because its rapid passage through the air causes the air

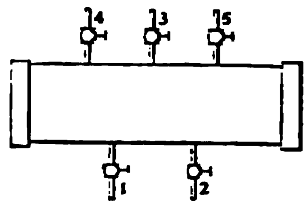


End View. *Side View.*

to circulate freely around and through the fins, cooling the cylinder perfectly. Now, if the same machine is installed in a building on a stand where there is little or no moving air, it is clearly seen that the cylinder can not be cooled unless some device is used to produce an air current, such as a fan, as shown by my drawing. If this plan is used also, I see no reason why the use of a motorcycle for shop work should not be a ccess.—Contributed by Prentice P. Avery, ewood, N. J.

DEVICE FOR TESTING VACUUM GAUGES

The illustration shows a device designed by a correspondent of Power for testing vacuum gauges. It consists of a piece of 4-in. pipe, capped at each end and tapped for five ¼-in. nipples as follows: No. 1, live steam inlet; No. 2, for the condensed drip; No. 3, high pressure gauge connection from which the high pressures may be tested;



Nos. 4 and 5, connections to the two vacuum gauges, one of which is a standard. In operation, steam is admitted through the live steam inlet till the high-pressure gauge registers 100 lbs. pressure, when the steam is turned off and cold water applied to the outside of the pipe. This condenses the steam and forms various amounts of vacuum. The gauge under test can be compared with the standard gauge, and corrections noted.

MAKING BLUEPRINTS FROM PENCILED DRAWINGS

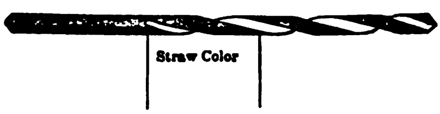
Blueprints can be made from pencil drawings by using rapid blueprint paper, a pencil tracing and good sunlight, an exposure of one minute only being necessary, says a correspondent of the American Machinist, who recommends the method highly as simple and wholly efficient. The 2-H. grade of pencils is stated as the best for t

HOW TO BLUE GUN BARRELS

The gun barrel should first be cleaned free from grease, oil or varnish. Dissolve 4½ oz. hyosulphite of soda in 1 qt. water and make another solution by dissolving ¼ oz. acetate of lead in 1 qt. water. Mix the two solutions and heat to the boiling point in a porcelain dish or stone pot. Warm the cleaned gun barrel and, using a piece of sponge tied to a stick, smear it with the hot solution. When the color has developed, wash the gun barrel, wipe it dry, and finish with boiled linseed oil.

HOW TO KEEP SMALL DRILLS FROM BREAKING EASILY

Small drills will not break so easily, says a correspondent of Machinery, if at the section indicated in the illustration they are drawn to a straw color. This treatment re-



To Keep Small Drills From Breaking

duces the brittleness of the drill at that point and makes it less liable to snap off in the hands of the men and boys, who are not always so particular about handling tools.

TO MAKE DASH-POTS NOISELESS

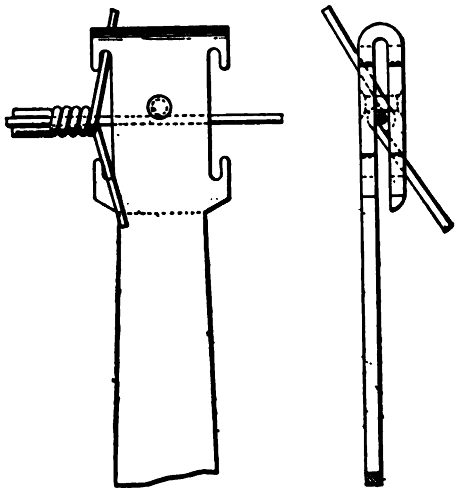
Engineers troubled with noisy dash-pots may profit by a kink practiced by a correspondent of Power, who says the dash-pots on an engine he was operating always slammed when brought home.

To prevent this he put a valve on the end of each of the pipes which are about 2 ft. long. He now leaves the regulating valves on the dash-pots open, and regulates by means of the valves in the pipes. The plungers are brought home as quickly as before and there is more air to act as a cushion and prevent the sound.

The same writer says that when an engine that is equipped with dash-pots of the leather-packed type is running and a dash-pot gets to bucking and water will not help it, it can be temporarily repaired by putting a check valve on the end of the pipe; this can be done without shutting down.

A HANDY WIRE-SPLICING TOOL

The illustration shows a wire splicing tool which will be found useful. The de-



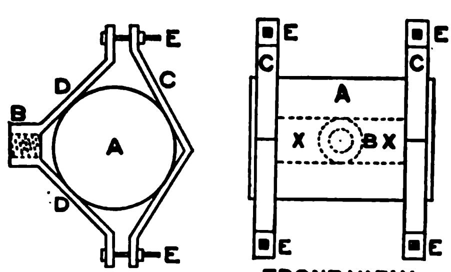
Three-Wire Splice

vice is used in making a three-wire connection.—Contributed by W. H. Cunard, Everett, Pa.

JIG FOR BORING WRIST-PIN HOLE IN GASOLINE PISTON

The parts of this jig or fixture are as follows: B is a boss threaded to fit the lathe nose; DD are cast on to the ends of X; CC are clamps secured by bolts EE.

In using, the fixture is screwed on the lathe spindle, when the trunk piston, A, may be very easily set in position for bor-



ing the wrist-pin hole. Many sizes of pistons may be machined by the use of one of these jigs, and when well made, they produce very accurate work.—Contributed E. M. Davids, Los Angeles, Cal.

USEFUL ARTICLES MADE OF WROUGHT-IRON PIPE

Pipe and fittings can often be used to advantage by the tradesman in constructing articles needed about his work which must be both light and strong, says the Metal Worker. Nearly every workman can construct these various articles according to his individual requirements and perhaps improve upon them. Those shown here are in the nature of suggestions of the adaptability of the material.

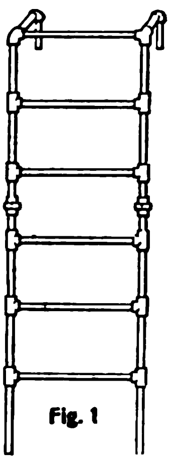


Fig. 1

A short ladder made of ¾-in. iron pipe, connected by T's, elbows and unions is shown in Fig. 1. The ladder is so constructed that it can readily be taken through small places, as to inspect tanks in attics, or conveying in a vehicle, such as an open buggy, the unions being placed in the middle. It has hooks on the top so that it may be hooked over the side of a tank.

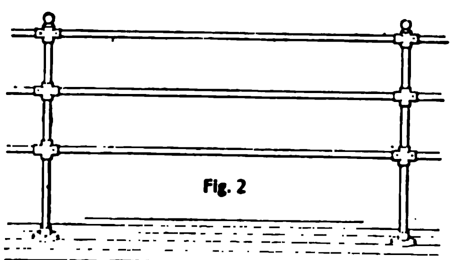


Fig. 2

The railing shown in Fig. 2 is made of 1¼-in. pipe. Special railing fittings are used in screwing up the vertical posts with threads and the side rods are connected by *rivets. A post* is held to the floor by one-*half of a flange* union and an ornamental cap surmounts the top of each post. The railing is both substantial and neat and may be changed and adapted to almost any requirement.

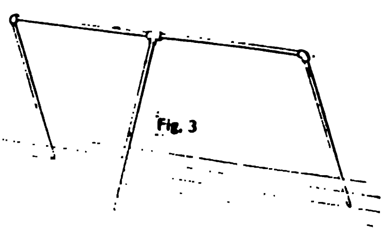


Fig. 3

Five pieces of ½-in. pipe, two elbows and a T were used to make the horse for a drafting table shown at Fig. 3. The device is light and adjustment is made by moving the middle leg backward or forward. It may be taken apart and set up at another point, if desired at any time.

HOW TO TELL STEEL PIPE FROM IRON PIPE

It is so often difficult for users of pipe to distinguish iron pipe from steel that a few hints on the subject may be found helpful. The scale on steel pipe is very light and has the appearance of small blisters or bubbles; the surface underneath being smooth and rather white; on iron pipe the scale is heavy and rough. Steel pipe seldom breaks when flattened, but when it does break the grain is very fine; whereas the fiber of iron is long and when the pipe breaks, as it readily does in the flattening test, the fracture is rough. Steel pipe is soft and tough, says Domestic Engineering, and when it is threaded, the threads do not break, but tear off. It requires very sharp dies to cut the threads on steel pipe successfully, and a blunt die which might be used with satisfactory results on iron pipe, will tear the threads on steel pipe, because of the softness of the metal.

DETERIORATION IN GRATES

The principal cause which contributes to the rapid burning out of the grate bars in a boiler is the action of the furnace heat, which will in time destroy any set of grates, but the want of a proper flow of air through the grates will cause overheating whether it occurs through too little air-space in the grates themselves, or by these spaces becoming obstructed through any cause, thus preventing the cooling effect of the air on its passage to the fire. Another reason is found in the impurities of the coal, and especially in the chemical combinations of sulphur and iron, which impurities are found in more or less quantity in all coals. The Practical Engineer says any coal which forms an easily fused clinker will fatally affect the grates.

HOW TO REMOVE GALVANIZED COATING

The coating should be burned off, and if the galvanized parts are to be welded, the heat for welding can be obtained at the same time. Heat the pipe or iron to a white heat and use only plain, clean sand. After preparing one end for welding, says a correspondent of the American Blacksmith, plug the opposite end so as not to burn the pipe.

HOW TO MAKE A PORTABLE SCAFFOLD BRACKET

A pair of portable scaffold brackets which can easily be stored out of the way will be found a great convenience by the tradesman who only needs them occasionally and usually borrows them at such times of a carpenter. The bracket shown

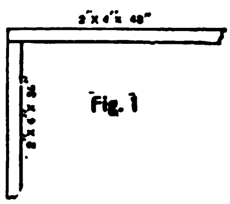


Fig. 1

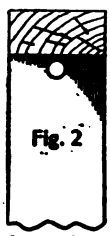


Fig. 2

in the sketches takes but a few hours' work to construct and may be readily set up on the work, says the Metal Worker.

To make the bracket use a 2x4 stick 36 in. long for the upright, and for the bracket a 2x4 stick 48 in. long. Place the longer piece on top of the shorter, as in Fig. 1, and spike them together with two 20-penny nails, driving the nails in as near

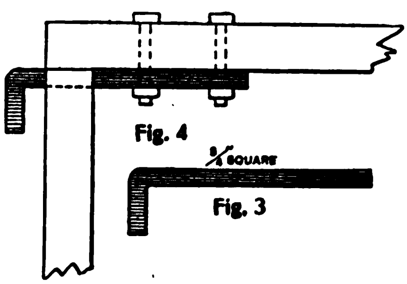


Fig. 4

Fig. 3

the outside as possible. Bore a ⅞-in. hole in the short piece, directly under the top piece, as in Fig. 2, and pass an iron hook, Fig. 3, through the hole. The hook should be made of ¾-in.. bar iron, 9 in. long and drilled for two ⅜-in. bolts. Make the hook part 2 in. long and bolt it directly to the top bracket, as shown in Fig. 4, allowing the hook part to extend about an inch from the back. With 10-penny nails attach 1x6-in. diagonal pieces near both ends of the

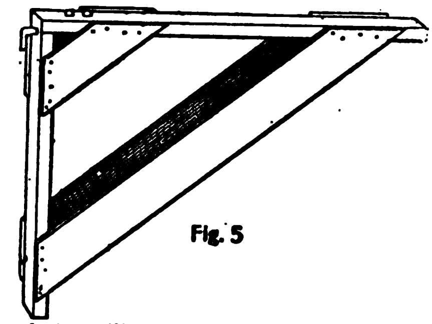


Fig. 5

bracket, nailing securely, and the device is then complete, as in Fig. 5.

In fastening the bracket on a building, cut a hole 1 in. wide and 3 in. high into the sheathing close to the stud. The bracket can be unhooked easily from this position. The device will be found both cheap and light and also a time-saver.

KEEP OIL OUT OF BOILERS AND FEED WATER HEATERS

Many boiler experts insist that oil or grease inside a boiler or heating surface is far worse than the ordinary scale deposited from the water, in cutting off heat from the water and overheating the boiler plate.

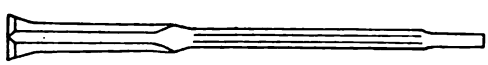
Tests have been made to show this, says a writer in Page's Weekly. When the temperature of the water was made to rise rapidly in a clean boiler, the difference in temperature between the boiler plate and the water did not increase at the same rate, showing that the heat passed through the water nearly as fast as received. With a very high evaporation of steam per hour in a clean boiler there was little danger of overheating the metal. But covering the inner surface of the metal with a thin layer of heavy mineral oil and evaporating about as much steam as in the first place, the fire side of the boiler plate was 392° hotter than the water side. The plate itself must have stood a temperature of about 630° F., at which iron and mild steel weaken and are easily broken. Any flaw in the plate would of course add to the danger.

Hence for safety and economy, when exhaust steam is mixed with the feed water, use feed water heaters in which the steam is on one side of the tubes and the water to be heated on the other, if possible.

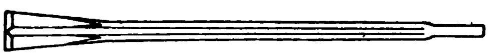
DRILLS SHARPENED BY POWER MACHINES

Cost of Sharpening Greatly Reduced- No Longer Necessary to Upset a Half-Foot of Stock.

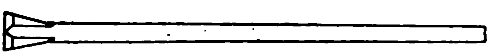
The sharpening of drills by machine is rapidly superseding the old practice of sharpening by hand, not merely because it is easier, but because of the great economy thereby effected. Various methods of sharpening were formerly in use in mines, says T. H. Proske, in the Mining and Scientific Press, and all were laborious and expensive. Usually the cross bit, which took the place of the single bit in the modern air drill from the first, was upset to twice its normal size for from 6 to 8 in. at one end in order to have a long stock to use in redressing the bit. When this upset portion was worked down, the bar was again upset.



Type of drill used in Rocky mountain mining districts. Cross-formed bar welded onto octagon bar; shank forged to small bushing.



Type of drill used in Michigan copper and iron mines. Long cross upset in bolt upsetting machine from octagon bar.



Type of drill as made with a Power Drill Sharpener. Cross upset 3 inches long from round bar; no forging down of shank, as chuck bushing is large enough to take the full size of bar; the most economical drill that can be made.

In some Michigan mines a bolt-upsetting machine was installed to do this upsetting, but the expense was prohibitive of this practice becoming general. Then steel-makers began to manufacture cross-formed bars of steel which were cut into the required lengths to be welded in the bars. This practice is general in Rocky mountain mining districts, and while somewhat cheaper, is still expensive.

Until the advent of power drill sharpening machines it is said that no two mines used the same kind of drill. There was no economy in the gauge used. Often the starter drill would be 3½ in. wide and drop ¼ in. in gauge for each successive length. Out of this chaos the machine method brought system. It was determined that for 1¼ in. powder, a 1 7-16 in. hole at the bottom is sufficiently large; that the strength of the powder can be increased more cheaply than the size of the hole, and that the gauge should not vary more than ⅛ in. Supposing a 9-ft. hole were to be put down with four lengths of drills, the sizes would be as follows: Starter, 1¾ in. wide; successive lengths, 1⅝ in., 1½ in., and 1⅜ in. wide, respectively.

A 3-in. cross is sufficient where the machine is used and the sharpener will forge the cross and bit on the end of the bar without hand labor. One man using such a machine can sharpen from 200 to 300 per cent more drills than he can sharpen by hand.

SOME GOOD RECIPES FOR CEMENT FOR LEATHER BELTS

(1) Soften equal parts of good hide glue and American isinglass in water for 10 hours. Then boil it with pure tannin until the mass is sticky. Roughen the surface of the belt joints and apply the cement hot.

(2) Digest 1 kg. of finely shredded gutta percha over a water bath with 10 kg. benzol until thoroughly dissolved, then stir in 2 kg. of linseed oil varnish.

(3) Dissolve completely 1½ kg. finely shredded india rubber in 10 kg. of carbon bisulphide by heating and while still hot add 1 kg. shellac and 1 kg. turpentine. Heat again until the last two ingredients are dissolved.

(4) Dissolve at a moderate heat 1 kg. best glue in 1½ kg. of water and thicken to the consistency of syrup. While this mass is hot stir in 100 gm. of thick turpentine and 5 gr. carbolic acid. Pour the mixture into flat tin pans to cool; cut it into pieces and dry it in the air. To use, make the cement liquid with a little vinegar, apply to the joint with a brush; place the two ends of the joint together and press between two iron plates heated to a temperature of 86° F.

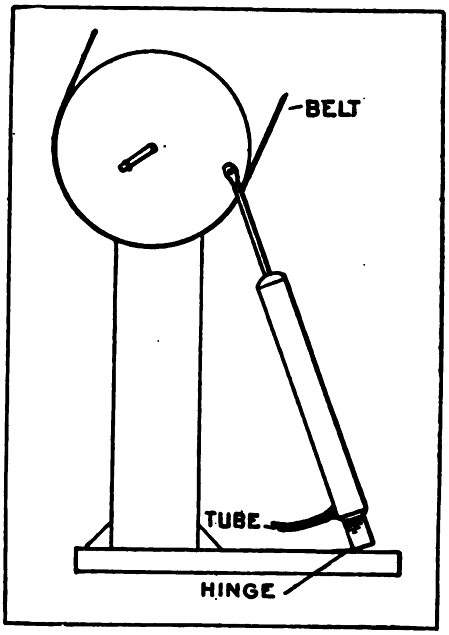
PAINTED PAPER FOR STEEL

Steel surfaces may be protected with excellent results by covering them with painted paper. The method employed is to first clean the steel in the ordinary way and then put on a single coat of a very sticky substance, upon which paraffined paper is next laid. Any color paint desired may be used for painting over the paper. Holes cut in the paper allow the rivet heads to pass through and the heads are then covered with caps of the paper and painted.

HOW TO MAKE A SMALL AIR COMPRESSOR

Anyone possessing, or able to obtain an old bicycle pump can, without much difficulty, make a small air compressor which will pump a bicycle tire or run a toy steam engine. The next thing necessary is a pulley about 8 or 9 in. in diameter and 2 in. thick.

Mount this pulley on a piece of ¼- or ½-in. steel rod for a shaft. Bend about 2 in. of one end of the shaft at a right angle and force the rod through a hole in the center



Air Compressor Made of a Bicycle Pump.

of the pulley, hammer it into the wood and fasten it with a staple.

Remove the handle from the bicycle pump, heat the end of the piston rod to a bright glow and hammer it flat. Drill a hole in the flat part large enough for a nail to pass through easily. To the foot-piece on the bottom of the pump solder a hinge and then screw the loose part of the hinge to the baseboard which is constructed as shown in the illustration.

In putting the compressor together mount the shaft of the pulley on pieces of sheet brass having holes drilled to make an easy fit. These pieces of sheet brass should be screwed fast in a hole in one end of a 2 x 4 in. timber 2 ft. long. Nail the end of the piston rod, through the hole drilled, to the pulley and belt whatever means of generating power you may have to the air compressor which is now complete. A small electric motor will work the apparatus nicely for pumping bicycle tires or other work of that nature.—Contributed by E. H. Klipstein, East Orange, New Jersey.

CASTING ALUMINUM FOR PATTERN WORK

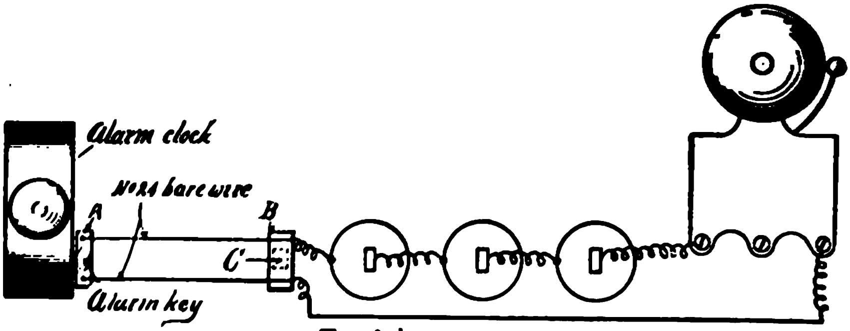
Casting aluminum for pattern work is a matter that is constantly assuming greater importance, says the Mechanical World, and there is a demand for general information on the subject. It is important to make the mould suited to the casting. For instance, a plain bar can be molded up as hard as may be, and if well vented, will come out perfect. On the other hand, a thin ring, unless molded up soft enough to allow the metal to compress it, will be sure to tear apart. Hence, wherever the metal is to inclose the sand, this must be left as soft as possible, to allow for compression during the cooling of the casting. Ram the sand as little as possible, use as dry as possible, vent freely, and you are pretty safe. Aluminum is quite brittle at the critical temperature, hence the least strain at that time injures it. Cores should be soft, and coated with graphite. The sand should be new, and while no facing is necessary, a good dusting with soapstone can be recommended. The slicking tool should never be used on a mold.

Melt the aluminum in a plumbago crucible, previously rubbed up with graphite. When the metal is melted, it should be poured at once. Gates should be wide, and of a generous area. Big feeder heads are not advisable, as they do not feed, but rather draw away the metal from the casting. The metal should not be too hot, a good claret color is sufficient, when observed by putting aside the skin with a stick. Fluxes are unnecessary; occasionally, however, cryolite may be used to advantage. All sodium salts should be kept away. Zinc can be added, though the metal should not be sold as an aluminum casting. Up to 15 per cent can be used safely. Tin also should not be added to the aluminum.

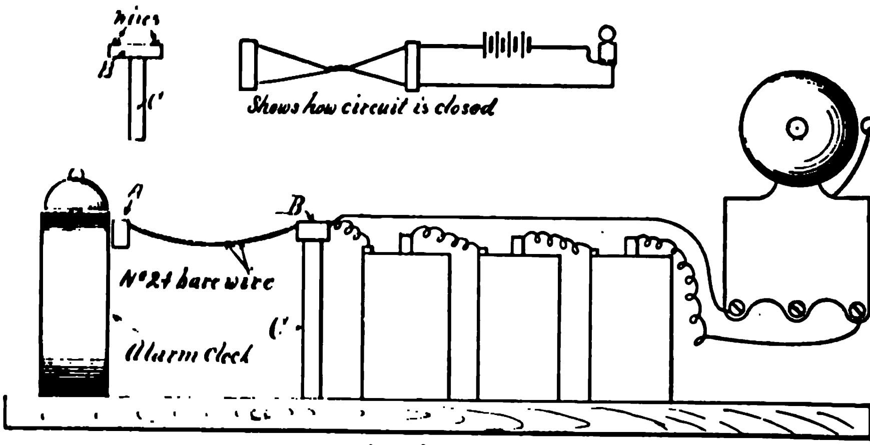
Bristles may be stiffened by immersing them in cold alum water for a short time.

HOW TO MAKE AN ELECTRIC ALARM ATTACHMENT FOR AN ALARM CLOCK

Make a baseboard for this device about 10 in. long by 6 in. wide at the center, with an upright C extending upward to about the height of the alarm key of the clock. the two bare wires together forming a circuit which will set the electric bell ringing. The wires will untwist when the alarm is again wound up, and the electric bell will



Top View



Side View

On top of the upright fasten a small piece of wood to form a T, and fasten a similar piece on the alarm key, as at A in the sketch. Connect these two pieces A and B with two pieces of No. 24 bare copper wire and carry the wires on to form connections, one going through the batteries to one terminal of the bell and the other passing directly to the other terminal.

The apparatus will then be in working order. Set the alarm in the usual way. When it goes off, the turning key will twist ring until this operation is performed.—Contributed by W. J. Slattery, Emsworth Pa.

CEMENT FOR STEAM PIPES

Rub as fine as possible, litharge, 2 parts, powdered slaked lime, 2 parts; sand, 1 part. Mix the mass with a sufficient quantity of hot linseed-oil varnish to form a stiff paste. Use the cement while fresh and warm.—Contributed by R. Lindemann. [illegible]

HOW TO FILTER WATER FROM GASOLINE

Fine wire gauze will not remove water, but if a chamois skin pocket be carried by a gauze on either side and placed between the gasoline tank and the carburetter, all dirt and water will be removed, says the Motor

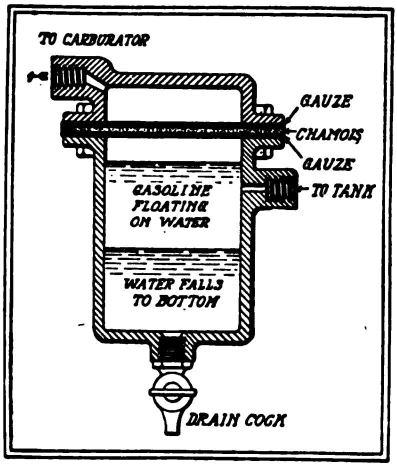


Fig. 1.

Age. The arrangement should be on the order of the device shown in Fig. 1, so that the water may settle into a separator, and be drained off. The separator should be about 4 in. long and 2 in. in diameter. If this is drained each day no water will reach the carburetter unless the chamber becomes filled, which could only be occasioned by rain entering the fuel tank as the gasoline itself of a day's usage would not

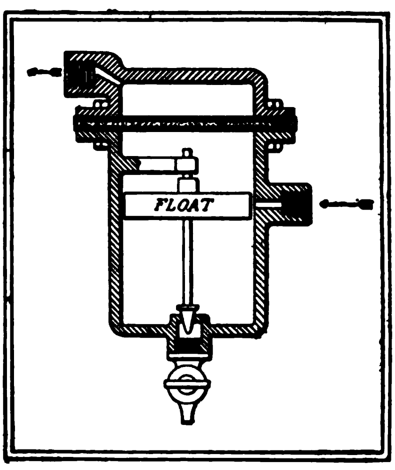
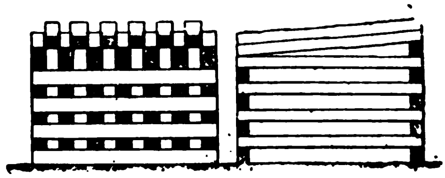


Fig. 2.

contain that quantity. The strainer placed between the tank and the carburetter is better than one placed at the tank, for the reason that in the latter dirt and water would be forced through the tank strainers by the impact and weight of the fuel entering, while in a strainer placed between the tank and the carburetter the fuel is strained slowly, in fact as slowly as it is used. A first-class water separating strainer is shown in Fig. 2. At the bottom of the separating chamber is a needle valve. On this valve is a metallic float of such a weight as to sink in gasoline and just float in water. When the chamber is filled with gasoline the valve is seated, but as soon as water collects the float is lifted, opening the valve and letting the water flow out until the gasoline comes to such a level that the valve seats. The device has the gauze and chamois strainer.

HOW TO PILE RAILROAD TIES

The proper method of piling railroad ties is shown in the accompanying illustration. Each pile contains either 25 or 50 ties built up in alternate courses of two and seven.



The Way to Pile Railroad Ties

Two ties are first laid on the ground some distance apart, then seven others are placed across these and so on to the top, where the last course is laid to form a watershed.

HEAT-RESISTING CEMENTS

1. For cementing joints. Make into a thick paste, asbestos powder and liquid silicate of soda. This cement will withstand a very high temperature.

2. For stoves and ranges. Use fire clay and a solution of silicate of soda.

3. The following cement will resist white heat: Pulverized clay, 4 parts; plumbago, 2 parts; iron filings, free from oxide, 2 parts; peroxide of manganese, 1 part; borax, ½ part; sea-salt, ½ part; mix with water to a thick paste and use immediately. Heat gradually till it comes nearly to a white heat. This cement is recommended by Monumental News.

HOW TO PAINT CEMENT FLOORS

In order to roughen the surface of the floor so that the paint will hold on well and also to change any caustic lime contained in the cement into harmless sulphate of lime, the floor should first be treated with a wash. If it is only a few months old, a wash consisting of 12 fluid ounces of vitriol and one gallon of water mixed in an earthen or glass vessel, allowed to cool, and then applied with a large fiber brush or a swab made of cotton waste, will produce the desired results.

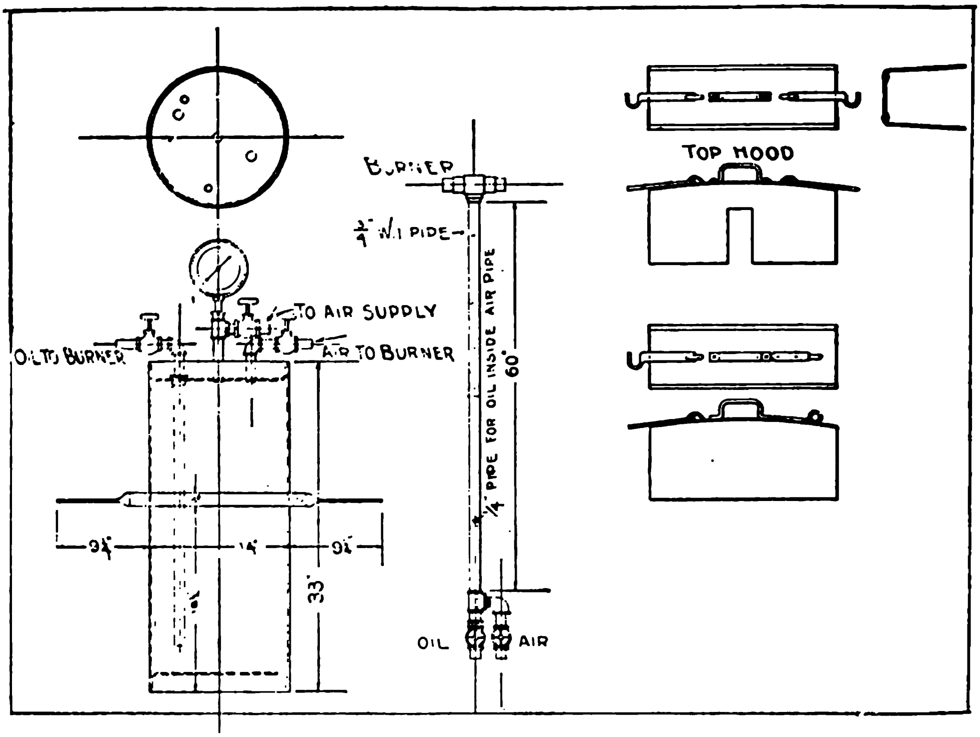
After the wash has been on 24 hours apply a priming of well-settled and well-aged raw linseed oil and let stand for a week. Then apply a coat of good linseed oil paint, preferably with a pure lead and zinc base. Rub in well and finish with a hard drying floor paint of the grade used on ferry boats, says the Painters' Magazine, and adds:

"If such a floor paint is to be of lead color or spruce color, it is best made on a base of equal parts of lead and zinc in oil, thinned with equal parts of turpentine and Japan to brushing consistency, tinted to suit requirements, and then mixed equal parts by measure with hard drying floor varnish of approved quality."

On cement floors thus treated the paint will wear well even in engine rooms and machine shops where oil is apt to be spilled over it.

HEATING TIRES WITH CRUDE OIL

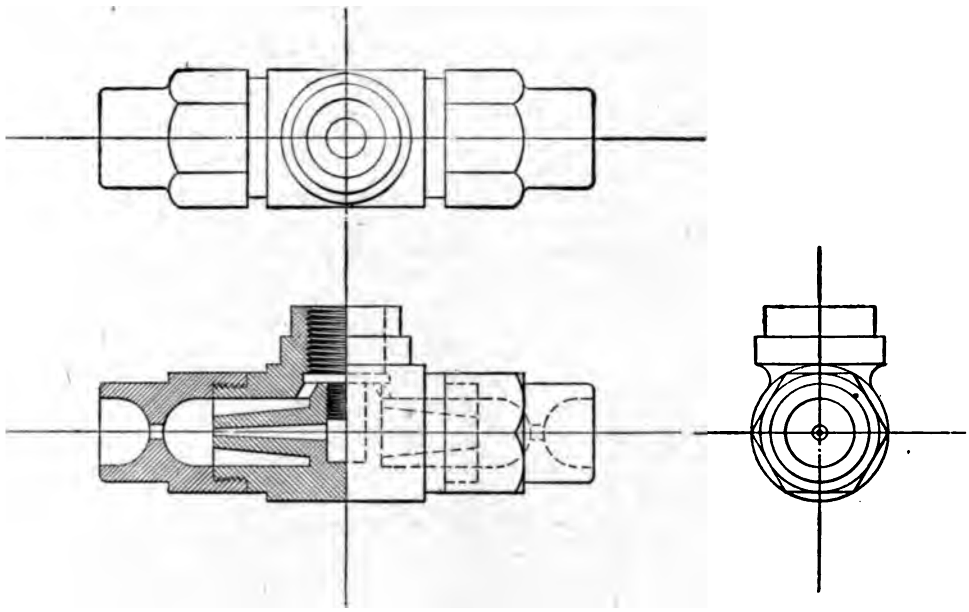
The illustration shows an apparatus used for heating locomotive tires with crude oil as a fuel. With this process it takes only about six minutes to heat one tire, about two gallons of oil being used.



Heating Locomotive Tires With Crude Oil

The method of using the apparatus is very simple. If a tire is to be heated, the wheel is jacked up for several inches off the ground, then the sheet metal hoods are placed all the way around the tire, leaving but a small space at the bottom for the burner to be inserted. A piece of lighted waste is then placed directly in front of the burner and the oil and air turned on, the amount of each being determined by the operator.

The construction of this device is both cheap and simple. For the oil tank air-drum off a locomotive was



Detail of Oil Burner for Heating Tires

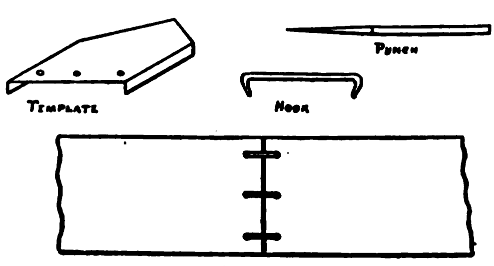
The burner is connected to the tank by two hose pipes each about 30 ft. long. Only about 60 to 80 lb. air pressure is required to operate the burner.

This tire heater is in use in several railroad shops about the country and has proved very satisfactory as a quick and cheap method of removing and setting tires. —Contributed by G. E. Baldwin, 634 D St., San Bernardino, Cal.

HOW TO MAKE A CANVAS BELT JOINT

In rooms where there is so much dampness and steam that rubber belts are affected thereby and come off, canvas belts can be substituted and will be found to work very well, says the Practical Engineer.

These belts may be mended in the following manner: Place a tin template, having holes the right distance from the sides and ends, on the end of the belt, square it off, mark the holes and punch them with a long pin having a tapered point. This pin is better than a belt punch, as the punch cuts away and weakens the belt and the hook will pull out. Use a hook with a good, and quick point. It is a good idea to keep templates for different-sized belts on hand. The wide ones should have more holes.



Making a Canvas Belt Joint

SUBSTITUTE FOR PURPLE LAKE

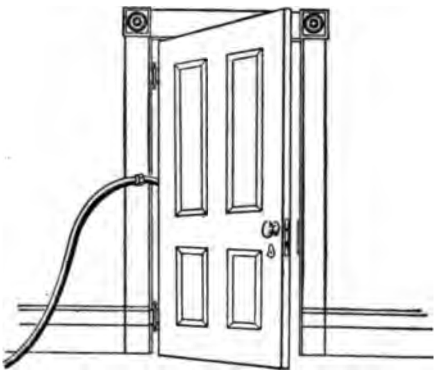
Purple paint is so rarely used that it does not pay the average painter to buy a can of purple lake when he needs but a little. If he will add just a touch of ultramarine or cobalt to his carmine and glaze as for carmine, or, add a touch of Prussian blue to the ground and glaze with clear carmine, the results will be satisfactory.—From John L. Whiting & Son's Book, "What Else to Do."

The amount of Portland cement used in this country doubles about once in four years. Last year it amounted to more than 23,000,000 bbls.

MADE A VISE OF A DOOR

When a vise is not handy, and one is not strong enough to hold the work with his hands, the following kink may be found useful:

A gardener who was repairing a lot of old hose and whose only suitable tool was a



Utilizing the Door as a Vise

wrench, could not get the old couplings apart. He asked me to hold it for him, but I could not. Instead, I opened the barn door and through the crack between the door and the side of the casement on which it was hung pushed a piece of hose up to the coupling. Then pushed the door to, and while the gardener held it, I unscrewed the nut by means of the wrench. There are many articles that could be held in this manner.—Contributed by Thiede of Colorado.

HOME-MADE CROSSHEAD PIN OILER

A very satisfactory crosshead pin oiler may be made like the one shown in the illustration. A correspondent of the National Engineer says he applied such an one to a vertical engine several years ago and it is still doing good work.

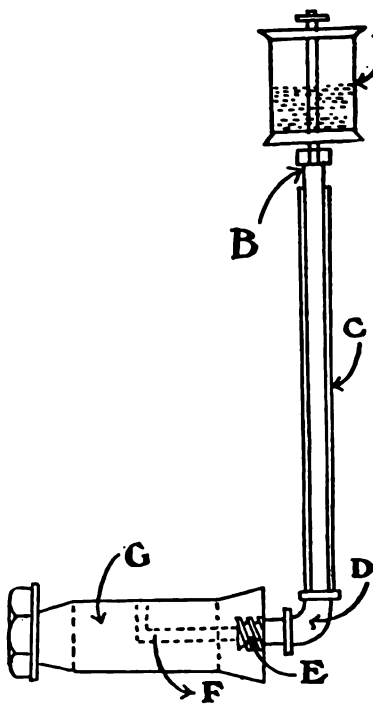
The device consists of an oil cup, A; a piece of ⅛-in. pipe, B; a piece of ⅜-in. pipe, C; and a ⅜-in. elbow and nipple D. The outer end (E) of the pin is tapped with a ⅜-in. pipe thread, and the oil duct is drilled as shown at F.

The cup is stationary and is fastened to the front of the cylinder or engine frame by a bracket over the center of the elbow D. The shank of the cup is drilled and *tapped for ⅛-in. pipe*, into which is screwed the pipe B, which telescopes the ⅜-in. pipe C.

To determine the height at which to place the cup, place the engine on upper center (vertical engine) and place the end of shank of cup the length of the engine stroke, plus at least 2 in. above the face of elbow D.

To determine the length of the ⅛-in. pipe, place engine on upper center and cut pipe long enough to reach within ½-in. of shank of cup, when screwed into elbow D. The center of the elbow D must be plumb under the center of the cup A, thereby allowing pipe C to travel up and down outside of pipe B without touching it at any point.

Only one oilway should be cut in the top



Home-Made Crosshead Pin Oiler

crosshead pin brass and it should extend lengthwise to within an eighth of an inch of each end. Always have the oil duct at the top of the pin, and always be careful not to turn the pin while tightening the nut, if there is no means provided for holding it in position.

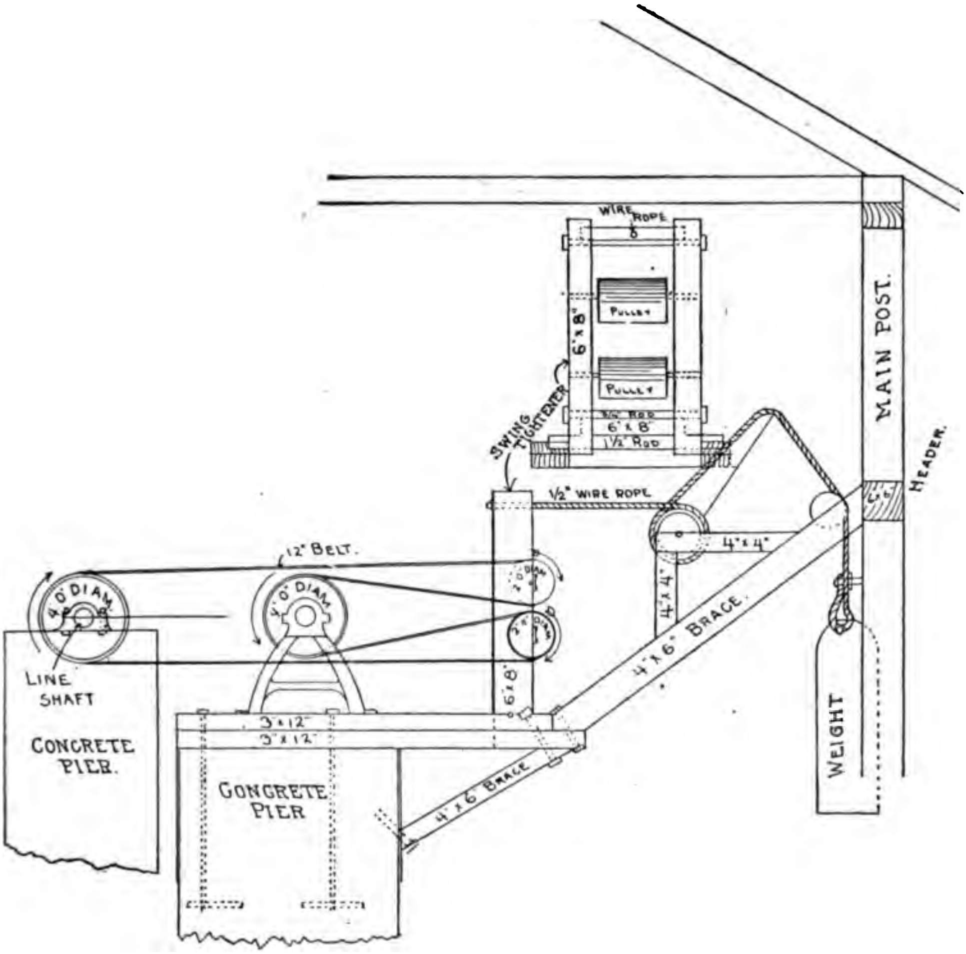
Castor oil is an excellent preservative for leather belts and rats will never touch belts treated with it. Apply the oil warm.

A POWER TRANSMISSION KINK

The accompanying diagram is a plan submitted by C. J. Case, of Johnsonburg, Pa., showing how he succeeded in running a machine requiring 40 hp. in the opposite direction from the line shaft, without crossing the belting. The back of the belt runs on the driven pulley. The speed maintained was 193 r. p. m. The direction in which each pulley revolved is indicated by arrows.

WRITING DETAILS ON BLUEPRINTS

A solution of 75 gr. of potassium oxalate dissolved in one ounce of water is excellent for writing details on blueprints. The fluid should be applied with a pen or fine brush, and may be thickened with gum, if necessary. It removes the blue ground of the drawing very rapidly, but the paper should be washed well afterwards or the blue will reappear, and the writing become obscured.



Running a Machine the Opposite from Line Shaft Without Crossing the Belt

TO EMPTY GASOLINE FROM BARRELS

The best method is to syphon the gasoline out with a rubber hose, says a correspondent of the Engineers' Review. To start the flow of the gasoline, pass a string a few inches longer than the hose through the hose by means of a plumnet tied to one end. To the other end tie a bunch of rags. Push these into the end of the hose, poke the hose rag end first into the barrel to its lowest point, hold the hose in place with one hand and pull on the string with the other. When the rags come out, the gasoline will follow.

How to Make a Portable Electric Heater

By Harry H. Townsend.

Anyone can make the portable electric heater described below, without the use of an ohmmeter or the necessary apparatus for finding the resistance of wire. The construction is very simple and the materials required few and inexpensive.

Select two boards 17¾ in. long by 6¾ in. wide by ⅝ in. thick; dress and sandpaper one side of the best of the two boards. These are for the top and bottom, and must be nice and smooth.

Select four pieces 9½ in. long, ⅝ in. thick and 1½ in. wide; these pieces are for the standards that hold the top and bottom boards together. They must be set or screwed to the top and bottom boards, as indicated in Fig. 1.

A, B, C and D are the four pieces for the uprights; these must be set perpendicular to the bottom board and must fit the top the same as the bottom. These pieces had best be put on with screws, so they will fit tightly. In Fig. 2 is shown their dimensions. These pieces must be placed so as

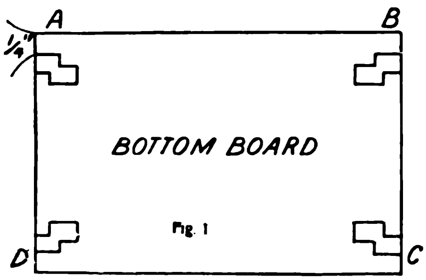


Fig. 1

to leave a margin of ¼ in. on the sides and no margin on the ends, as per Fig. 1. When this is done we have a frame which has neither sides nor ends excepting the four uprights.

We can now wind our coils for the heater. Cut 28 pieces 16 ft. long from a coil of broom wire; this wire is used in broom factories, and it is also used by tinners. It can be bought for 8 or 10 cents a pound, and 2½ lbs. will be enough. The gauge is No. 19 B and S.

Wind each one of these 16-ft. wires upon a ½-in. iron rod; be sure and wind it close and tight, so that when you take it off the rod it will present a closed spring.

After they are all wound (14 to each set), they must be joined together, as in Fig. 3. Fourteen of these coils must be made as if ... were one coil, as per sketch, and 14 to make the other coil. We will then have two coils in the heater, and either or both of them can be turned on or off at once.

These coils must now be put in the frame so that they will not touch any of the coils in either set. They can be fastened to the top and bottom boards with double-pointed tacks. Care should be taken about driving

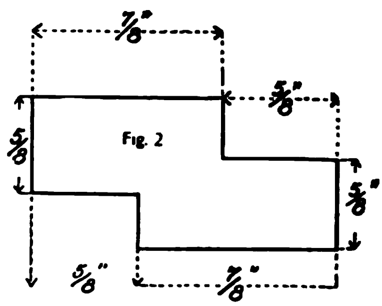


Fig. 2

the tacks in far enough, because if they are not they will break loose and make the sides of the coil springs touch each other. The free ends of each set of coils will be used for connecting up to the circuit, so that they will not be cut off.

Cut two pieces of sheet iron 15⅞ in. long, 9½ in. wide; also two pieces 5⅝ in. long by 9½ in. wide for the ends. These pieces should be perforated with a ½-in. punch. The maker can select some pretty design, so that the punchings will not look rough when done.

Fig. 4 is a home-made fuse block, ½ in. x 2⅞ in. x 6 in. Binding posts, 1 and 1′, are 1 in. high and are larger than the other ones. The current comes in at 1 and 1′ and passes by wires to 2 and 2′, thence by fuse wire to 4 and 4′, and then by wire to 3 and

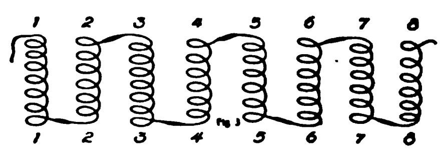


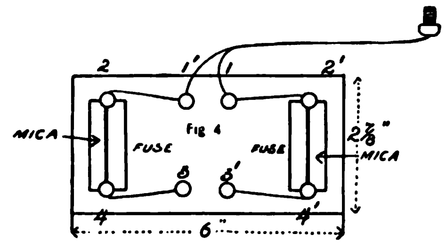
Fig. 3

3′. The only binding posts that we will use for the stove will be 4 and 4′, 3 and 3′, and for the current intake 1 and 1′.

This block is made of poplar or any other kind of lumber, as it is thoroughly protected by the mica. It can be placed about 1½ in. from one end of the heater and fastened there. After being fastened bore four ... holes exactly beneath posts 4 and 4′ a...

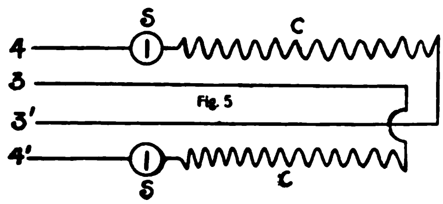
and 3' and then make connections, as in Fig. 5.

The switches can be placed on the top of the heater, opposite the fuse block, and in



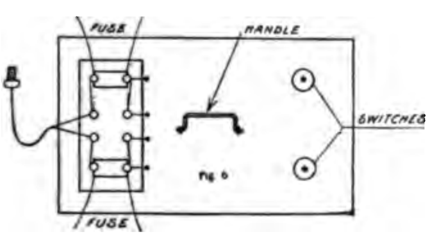
the middle can be fastened a convenient handle. The top view will be like Fig. 6 when completed.

Before the sheet-iron pieces are put in, the four standards should have some small strips put in between them at both top and bottom, so that the strips will not fall through, and also 16 holes should be bored in the bottom board in the center with a ¾-in. bit. The bottom boards should have a small leg, diameter, ½ in. x 1 in. long,



so the cold air can circulate to the heating apartment. Then place the sheet-iron strips in and fasten them with little strips.

The coils are made for 104 volts, but if the wood gets too hot, paint it with fire-proof paint and it will be all right for 110 volts. The cost of such a machine should not exceed 75 cents.



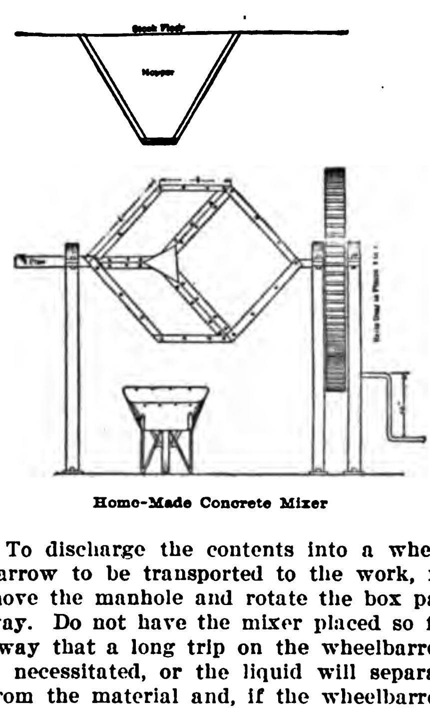
The sheet-iron pieces should be made with as many holes in them as possible.

When through using a square wipe all perspiration marks from it, and occasionally put on a few drops of oil. Never use emery or sandpaper on nickel or black finished

HOW TO BUILD A CONCRETE-MIXER.

To build the concrete-mixer shown in the illustration line a cubical wooden box with No. 10 sheet steel and arrange an iron manhole at one corner. Mount the box on two corners or trunnions, one of which is a piece of 3-inch pipe, through which water is introduced and the other of which is connected to a hand-crank by means of a gear-wheel and pinion.

Turn the manhole up to receive the charge from the hopper and then fasten it down. Revolve the box a few times to dry mix the ingredients, then introduce the proper quantity of water by hose and nozzle through the hollow trunnion, and revolve the box as long as necessary.



Home-Made Concrete Mixer

To discharge the contents into a wheelbarrow to be transported to the work, remove the manhole and rotate the box part way. Do not have the mixer placed so far away that a long trip on the wheelbarrow is necessitated, or the liquid will separate from the material and, if the wheelbarrow leaks, will run out and reworking the concrete will be necessary.

This apparatus was highly recommended by Henry W. Edwards of Grand Junction, Colo., in a paper read before the Atlantic City meeting of the American Institute of Mining Engineers.

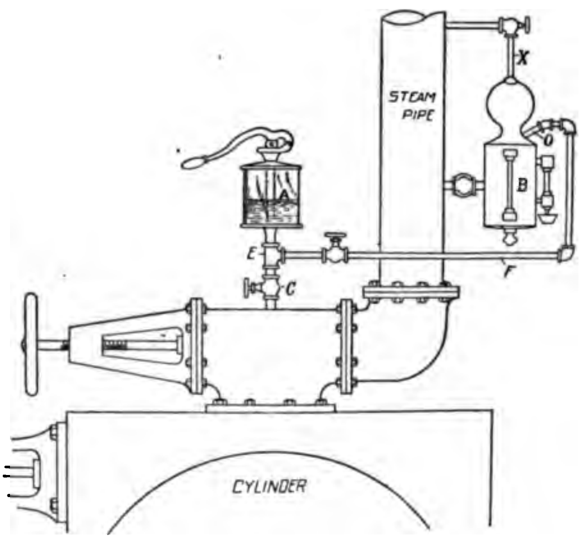
The following paste is good for keeping wood light: One-fourth pound beeswax scraped into one-half pint of turpentine. If it is wished to darken the wood add linseed oil.

A KINK FOR THE LUBRICATOR

The following kink may be old to some, but those having never tried it may use it with benefit.

Between the pump cup, A, and the throttle or steam-chest insert the valve C, and the tee E. In the ¼-in. pipe, F, insert valve, D. Pipe, F, taps the "fill-up" of lubricator B at O. Close valve C, open D and pump oil from A into lubricator. The condensed water is displaced by the incoming oil and rises through pipe X and is carried off into the steam pipe. Thus the draining of the lubricator is avoided.

In case of the failure of the lubricator and it is desired to oil cylinder by hand, close valve D, open C and pump oil direct to cylinder.—Contributed by Lee Boyer, Okmulgee, I. T.



Lubricator Kink

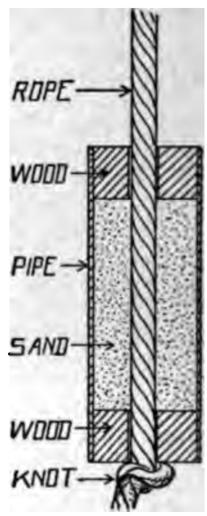
SIMPLE WAY TO FASTEN A ROPE TO A RING

Make an ample-sized loop by braiding the end of the rope into the rope. This may be done by passing the end of the rope, which should be untwisted, under every second strand, cutting a little out each time to make it taper. Then roll it on the floor with the foot and a neat job will result.

To attach to the ring simply pass the loop through the ring and slip the loose end of the rope through the loop. This gives two thicknesses of rope on the ring, is easy to put on and remove and as there is no knot, there is no loose end of rope to bother with.—Contributed by Paul McMichael, Hartstown, Pa.

COUNTERWEIGHT FOR DROP OR SLIDING DOORS

A cheap and good counterweight for drop or sliding doors or for tightener pulleys, may be made of a piece of 3-in., 4-in. or 5-in. gas pipe of any convenient length. Put a common cast-iron washer at one end, or a block of wood will do. Bore a hole through the wood and pass a rope through. Tie a knot in the end of the rope and put a block of wood corresponding to the first block at the other end of the pipe to hold the rope in the center of the pipe. If the weight is not heavy enough, fill the pipe with anything convenient, sand will do.—Contributed by F. A. Sustins, Stevens Point, Wis.



Counterweight

It is stated that an alloy consisting of 90 per cent copper, 6 per cent tin, and 4 per cent phosphor tin—containing 5 per cent phosphorus—has been found the best for castings for hydraulic purposes. The addition of two parts of lead makes the metal cut easier, but the castings are sounder and more uniform without it.

CHINESE METHOD OF MAKING OIL SKINS OR SLICKERS

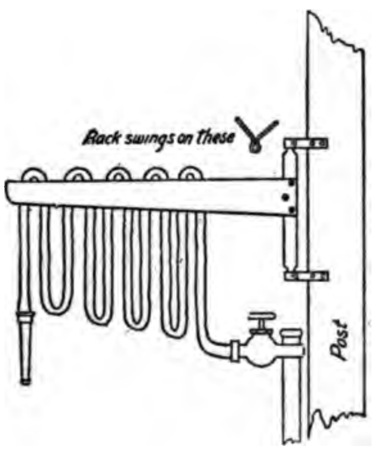
What is called oil skins and souwesters is called slickers in civil life, and have a disagreeable habit of sticking together when put away in dry, warm weather, which spoils them and makes them less waterproof.

The following simple formula makes them waterproof and when thoroughly dry, you can roll them up and put weights on them and they will come apart without sticking:

To one quart of pure raw linseed oil add two fresh eggs, well beaten, and mix. Apply with a rag or brush, let dry and give a second coat.—Contributed by John Rhodes of the U. S. S. Denver.

SWINGING RACK FOR HOSE

A hose rack that will swing in any direction the hose is pulled and may be placed near the ceiling and out of the way, provided the nozzle hangs within easy reach, is

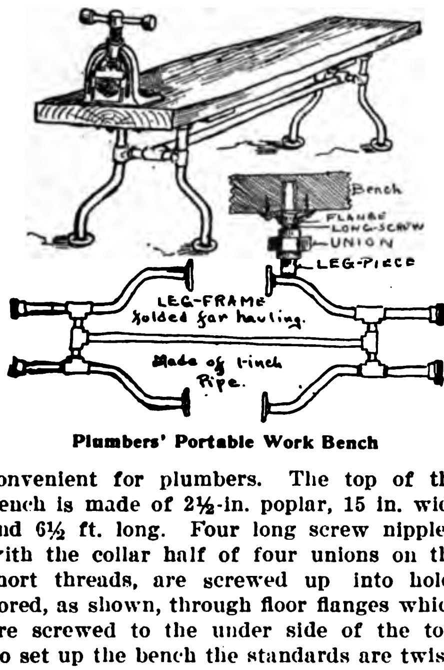


Hose Rack

shown in the illustration. This rack can be made by anyone, declares the Woodworker, and at trifling cost. It consists of a swinging double bracket 3 ft. long and with the sides far enough apart to allow the hose to pass freely between. It is provided with arms of 7x¾-in. half-round sticks, smooth on top, over which the hose is looped. When the hose is wanted, merely grasp the nozzle and walk away and it will come off readily.

PORTABLE WORK BENCH FOR PLUMBERS

The portable work bench shown in the illustration is described by a correspondent of the Metal Worker as being especially



Plumbers' Portable Work Bench

convenient for plumbers. The top of the bench is made of 2½-in. poplar, 15 in. wide and 6½ ft. long. Four long screw nipples, with the collar half of four unions on the short threads, are screwed up into holes bored, as shown, through floor flanges which are screwed to the under side of the top. To set up the bench the standards are twisted upright and the top placed and the collars of the unions screwed down with the hand. No braces of any type are necessary in general work up to 1¼-in. pipe. For benches to be used regularly on 1½ and 2-in. pipe some form of brace easily applied and leaving the bench still of the quick knockdown type would be an improvement. For starting occasional threads on large pipe the thrust strain can be taken care of with a piece of plank in the frame.

HOW TO MAKE A SLED BRAKE

A sled brake like that shown in the sketch was used by a correspondent of the Blacksmith and Wheelwright to hold loads of 12,000 lb. in the mountains. To make it, proceed as follows:

Sled Brake Attached

Make a roller, R, the same as a double cam roller for a wagon brake, only heavier, 1½-in. round iron. Leave the end square for lever L to be held on with key. Make rods same as for a wagon brake, only make eye to connect with dogs A and B. To make the dogs take a piece of iron ⅝x3 in. and the length must depend on the width of the runner, but make the dog B on the inside of the runner about 12 in. long. Make a square turn at the middle. Draw the end down 3 in. from that turn and let it come at 45 degrees. Split the end and weld in a piece of steel. Sharpen so that it will be 1½ or 2 in. wide where it comes to the bottom of the shoe. The other dog, A, is made the same way, only it is long enough to turn over the runner at the top and meet the eye bar, E. They are connected to the runner with a ⅝ bolt, which must be put in so the snow will turn the nut on instead of off.

CAT HELPS ELECTRICIAN

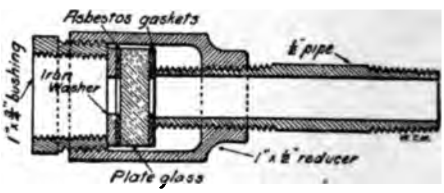
Last spring, when wiring a house for electric gas lighting, I had occasion to run a wire between a chamber floor and the ceiling to light the chandeliers in the rooms below. The gas fitters had taken up flooring in two places about 15 ft. apart, a greater distance than I could work the wire through. An interested spectator was a big yellow tom-cat, "Foxie" by name, and I concluded to impress him into the service, so I tied a chalk line around his body and pointed his nose down into the hole with directions to "scat," and he "scatted," being attracted by the light at the distant opening, where he brought the line out all right. I have since repeated the performance, and it will work every time, provided you can find the helper. If the cat is inclined to waste time under the floor, blow a little tobacco smoke into the opening where he started and he will hasten.—Contributed by Andrew Whiton, Hartford, Conn.

COMBUSTION SIGHT HOLE FOR TESTING A GAS ENGINE

A valuable device for testing engines is called a combustion sight hole and is adapted for use with make-and-break igniters. The Gas Engine tells how to make this device.

Screw a pipe nipple, ½-in. iron pipe size with a long thread on one end, into the cylinder head. On the thread of the nipple screw a 1x1½-in. reducer into the outer end of which screw a 1x¾-in. bushing, to be used as a stuffing box nut in holding a piece of thick plate glass in position at the end of a ½-in. nipple. Use asbestos gaskets to separate the glass from the nipple and the iron stuffing box washer. The distance of the glass from the inner side of the cylinder head should be several inches to prevent its becoming overheated and breaking, and its diameter should be so small that it does not touch the inside of the reducer.

This apparatus enables one to view the interior of a gas engine while the engine is in motion. For safety, do not put the eyes too close to the glass, but stand several feet away, though it is hardly probable that the glass will break. The cost of the device is under a dollar.



Combustion Sight Hole

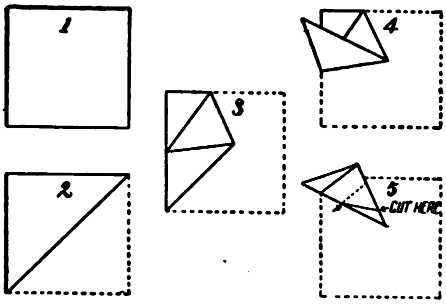
MIXING CEMENT

To make a cement block as hard as a rock and with no limit as to its lasting qualities, writes J. H. Johnston of Albion, Ind., proceed as follows:

Mix the cement in the usual manner and leave stand 12 hours; then break it up and mix again. Let stand for another 12 h- and remix and use.

TO CUT A FIVE-POINTED STAR

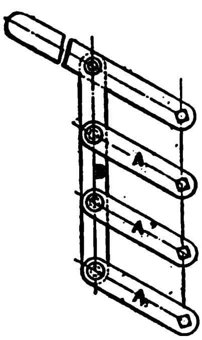
The accompanying diagrams show how a square of paper can be folded so that a five-pointed star can be cut with one clip. The



kink is old, but oftentimes useful.—Contributed by J. B. Dean, Reading, Mich.

LEVERS FOR TIGHTENING GIB-SCREWS ON MILLER KNEE

For tightening at once all the gib-screws locking the milling machine knee to the column the arangement of levers shown in the illustration works like a charm, says a correspondent of the American Machinist. The short levers, A, are all of the same length, have the same distance between holes and



the position of the square holes with relation to the center line of lever is the same. Holes B are spaced to correspond with the spacing of the gib-screws.

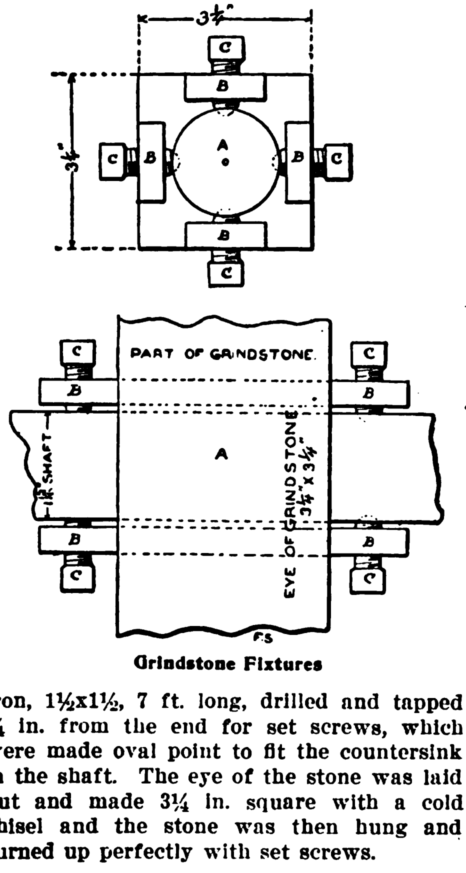
The gib-screws were all ground off at the ends when necessary, before assembling, so that when they were tight each would allow its lever, A, to stand at the angle shown. A movement downward from the position shown, and through an angle of about 60 degrees, is sufficient to loosen the knee.

There are two kinds of sizes, oil and water. Oil size makes an adhesive surface upon which the gold leaf must be laid immediately. Water size dries hard and when the gold is to be laid must first be brushed over with water. Oil sizes are used in decorating furniture. Water sizes are used for burnished gilding. Oil sizes do not harden sufficiently for this *purpose.*

GRINDSTONE FIXTURES

A set of grindstone fixtures like those shown in the illustration were made by a correspondent of the American Miller ten years ago and used for hanging a 600-lb. stone. The stone hangs as true today as when first hung.

The shaft, A, is a piece of 1$\frac{15}{16}$ about 3 ft. long and the hangers are four pieces of tire



Grindstone Fixtures

iron, 1½x1½, 7 ft. long, drilled and tapped ¾ in. from the end for set screws, which were made oval point to fit the countersink in the shaft. The eye of the stone was laid out and made 3¼ in. square with a cold chisel and the stone was then hung and turned up perfectly with set screws.

REGLUING BRIDGE OF A GUITAR

Having occasion some time ago to reglue the bridge of a fine guitar and not having suitable clamps, I removed the pegs from the guitar and replaced them with six binding screws, taken from the carbons of discarded dry batteries and left the instrument alone till the glue had had time to dry. This also allowed of immediate use of the guitar when necessary.—Contributed by Wallace S. Allen, Denver, Colo.

PATTERN SHOP CONVENIENCES

For transferring lines to irregular surfaces the vertical plumb or box square will be found convenient. This device is shown at Fig. 1 and is made of wood. The marker shown at the upper part of Fig. 1 and in dotted lines at the right-hand side consists of a straight piece of hardwood with a brad driven in the end and filed to a point, as at the sole of the plane at I, so that it comes opposite the cutting edge of the bit. The wing is gouged out opposite the throat J of the plane to allow the shavings to clear themselves.

A pair of calipers for large work is shown at Fig. 5. They have a light wooden frame made of strips screwed together and are furnished with adjustable pins, K, made from ordinary dowel-pin stock.

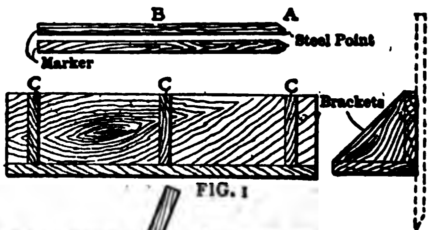


FIG. 1

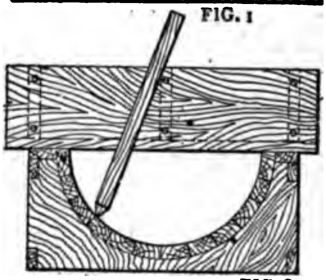


FIG. 2

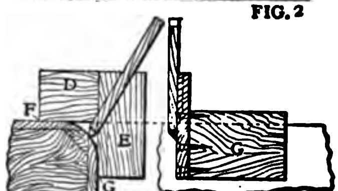
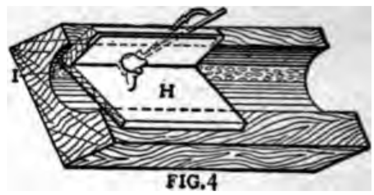


FIG. 3



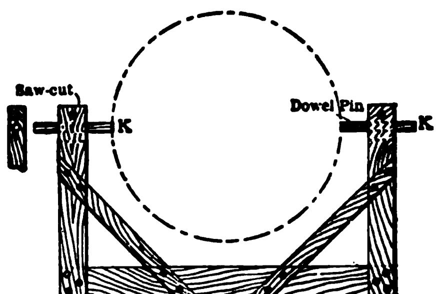


FIG. 5

A, or a metal plate let in flush with the face of the marker and filed to a point. The point should be in exact line with the face, B, says a correspondent of the American Machinist. Figure 2 shows how the device is used for drawing a line across a core box. It is also convenient for pipe connections, stove work, etc.

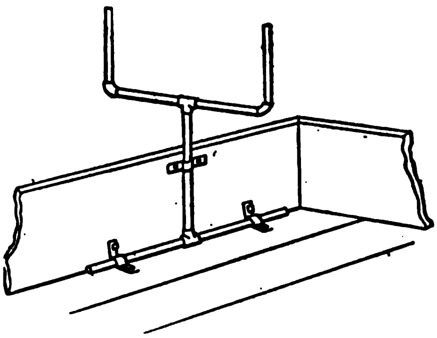
Another form of the device is shown at Fig. 3. The brackets on the device as shown at Fig. 1 exclude it from this class of work, but Fig. 3 receives its stiffening from the faces D and E. These are halved together and attached to face F and G as shown.

A method of converting a rabbet plane into a core-box plane is shown at Fig. 4. Wing H, which should be twice as wide as the body of the plane, is attached to the body by screws at a right angle to it, the face of the wing projecting slightly beyond

TO CARRY LONG PIPE ON A DELIVERY WAGON

The job of carrying pieces of pipe 16 and 20 ft. long on a 10-ft. delivery wagon is one that often confronts the plumber or steamfitter. To make the pipe less unwieldy to transport a device like the one illustrated is recommended by a correspondent of the Metal Worker. It consists of a forked support to hold the pipe so that it can extend out over the horses' backs instead of trailing out at the rear.

A support is placed at the front and another at the rear of the wagon, the front one being a trifle higher than the other. Each is supported by a standard which is prevented from revolving by a piece of pipe extending lengthwise in the corner of wagon. Three straps or pipe carefully bolted to the wagon box, fasten the upright in place, in each case. If the supports are fastened to the stanadrds by a



Device for Carrying Long Pipe on Delivery Cart

union, they will be detachable in case bulky supplies are to be carried.

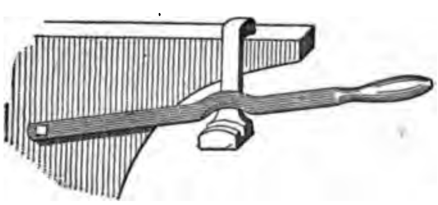
WAX VARNISH FOR MARBLE

Marble or statues exposed to the air may be preserved by applying a varnish made of 2 parts of wax in 8 parts of pure essence of turpentine. Apply the varnish hot, a thin, even coat, so that the lines of the figures will not be destroyed.

HOW TO MAKE RINGS AND PULLEY BLOCKS

Rings and pulley blocks were once called thimbles, and only a few smiths knew how to make them. The process is described by a correspondent of the Blacksmith and Wheelwright.

"Drill a ½-in. hole in your anvil and cut a thread in it for a set screw. Then make a hand lever and fasten it to the anvil with the set screw. Make a piece to fit in the



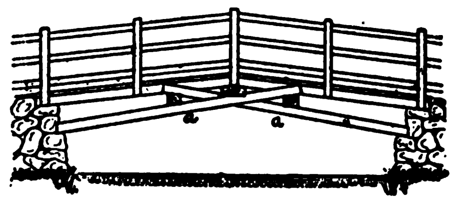
Making Rings and Pulley Blocks

anvil hole one inch square, and let it project over the anvil toward you. Fuller the end of it like a bottom swage. Make a loop the size you wish, get it hot, put it in the piece that is in the anvil, and bring your lever down on to it. Keep turning the hoop as it rounds it up, and you have a complete thimble in less time than it takes to tell you about it.

"For making open thimbles, we used to hammer our iron to a feather edge on both sides. We had a hardy made so that it would cut the ends the right shape. Then we put in a bottom swage and hollowed the thimble with the pein of the hammer. Then, holding it with a pair of narrow-bitted tongs, we turned the thimble over the anvil horn with the pein of the hammer."

BRIDGE FOR FARM USE

On a farm crossed by small streams which it is necessary to bridge, the form of bridge shown in the illustration will be found adaptable to almost any condition; and when it is built of good timber, says the Epitomist, forms a lasting and serviceable



Farm Bridge

structure. This bridge is especially valuable where a single log cannot be used as a stringer. Good timber of a size sufficient to sustain the weight the bridge must bear should be used for the stringers, a.

HOW TO SQUARE WINDOW SHADES

Window shades that are imperfectly squared will not roll up straight, and this is almost certainly the result where a square, of wood or metal, is used for the purpose.

The proper way to square a shade, directs Hartshorn's Roller, is to cut the cloth off the roll the right length, allowing for the bottom hem and for several turns around the roller when the shade is pulled all the way down. Then fold over the cloth, and bring the two outer edges together (Fig. 1). If the finished shade is to be narrower than the cloth, measure off one-half the width, top and bottom, using a rule, and put an awl through both thicknesses of cloth as close to the top and bottom as possible. If necessary make a slight short crease at the top and bottom of the shade. It is a good plan to use two awls. Then spread the cloth out flat, carefully place a straight edge on prick marks A and B, Fig. 2, and with an ordinary shoe knife, very sharp, cut out the cloth. Cut also lines C to D, A to C, and B to D. Every corner will be

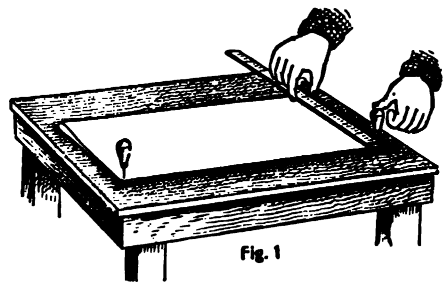


Fig. 1

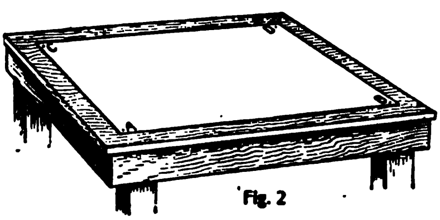


Fig. 2

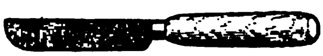


Fig. 3

a perfect right angle. Fig. 3 shows how the edge of the knife should be ground, round and sharp. If the cloth is the right width for the curtain without cutting, only the top and the bottom need be squared. A number of shades may be cut down at one time.

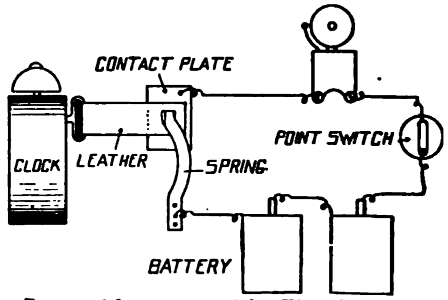
Never use shears for cutting shades, as they cut jagged edges and cause the cloth to ravel.

TO BROWN GUN BARRELS

Mix chloride of antimony to thin creamy consistence with olive oil. Heat the iron slightly, dress evenly upon its surface with the mixture and leave until the degree of browning desired is produced.

IMPROVED ELECTRIC ALARM

An improvement in the electric alarm attachment for an alarm clock described in our July number is suggested by Claude E. Harrison, of Clinton, Iowa, who says the



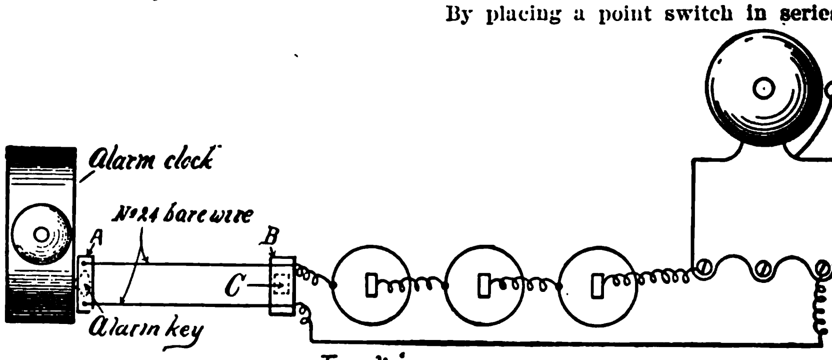
Proposed Improvement for Electric Alarm

No. 24 wires which twist together to close the circuit soon play out.

Instead of the No. 24 wires use a piece of leather ½ in. by 3 in. On one terminal of the circuit place a contact plate made of copper and on the other terminal put a piece of clock spring.

To set the alarm, place the leather between the plate and the spring. When the alarm rings the leather will be twisted from its position, thus closing the circuit and ringing the bell.

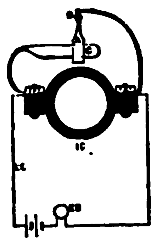
By placing a point switch in series with the circuit, the bell can be stopped without any trouble. During the day the clock can be used in any place desired.



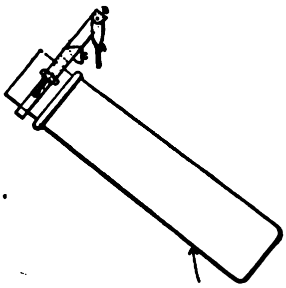
Old Method, Using Wires

CIRCUIT-BREAKER ALARM

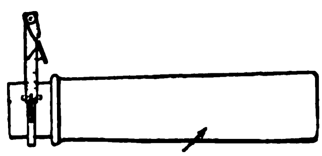
This is an English idea and can be constructed by any electrician at practically no expense. When the breaker opens from a short-circuit or overload the attendant may be engaged elsewhere and not hear the report. The plan was sent the London Electrical Review by R. N. Tweedy, who says:



c, Insulating clamp; l. c, Local circuit; e b, Electric bell.
Fig. 1.



Circuit breaker handle, closed position.
Fig. 2.



Circuit breaker handle, open position.
Fig. 3.

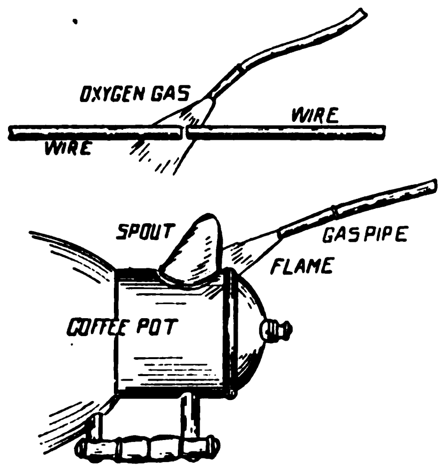
"It is hardly an exaggeration to say that no tools are required to manufacture the device. Certainly it can be made and fixed by the aid of a knife, a pair of pliers and a screw driver, and the cost per breaker is minute, especially if the switchboard attendants do the work, as they well may, while on duty. There can be no uncertainty about the action of the contact maker, for it depends on gravity alone; and the contact faces are always vertical, so that dust cannot cling sufficiently to insulate A from C when the breaker opens. As the current passing through the local circuit is infinitesimal, the pivoted joint, B, which is the only moving part, can be made so loose as to preclude the possibility of sticking, but to provide a still higher factor of certainty the contact maker, A, may be weighted.

It will be seen that the circuit-breaker must be kept in the closed position even when the feeder or generator is out of service, unless a switch is inserted in the local circuit of each breaker; but there is no practical objection to that, as there is always a switch in series with the breaker, and, so long as that is open, the feeder or generator will remain isolated. The interposition of a tumbler-switch to cut any breaker off the alarm bus-bars is to be deprecated, inasmuch as there is always a possibility of the attendant forgetting to close it when putting the circuit-breaker into service."

SOLDERING ALUMINUM

A reader who was at one time employed with a reduction company manufacturing aluminum wire, describes the soldering process used by the company.

The two ends of the wire were first heated by oxygen gas and then pressed together, as shown in Fig. 1. When cooled the wire would be smooth at the joint and appear as



Method of Soldering Aluminum

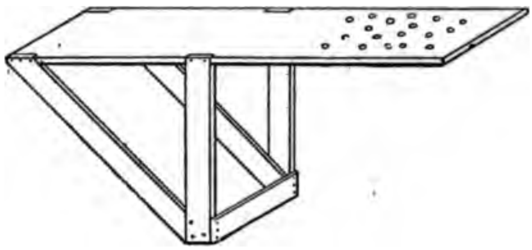
one piece. The same process was used in soldering the spouts on tea and coffee pots (Fig. 2)

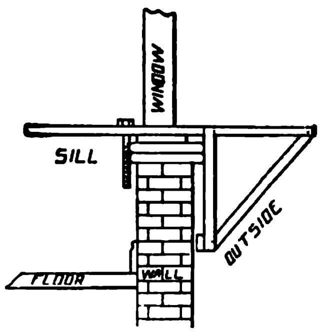
TO CLEAN SLATE SWITCHBOARDS WHEN BURNED

First clean off with sand-paper; then give one coat of any good filler that will not carry current. When dry, putty up all uneven surfaces, using good, hard drying putty. Rub down with rock pumice stone, clean off and give one or two coats of color, give two coats of japan, varnish, after thoroughly dry, polish in the usual way. A good polish can be made from butter of antimony and raw oil.

Varnished paint may be cleaned by washing with a mixture of a pound of wheat bran boiled in a gallon of water.

HOW TO MAKE A WINDOW JACK





Window Jack for Painters

A window jack for painters' and window washers' use may be made of a plank 5 or 6 ft. long and 12 or 14 in. wide. The part which extends outside has legs or braces to brace against the wall. The inside part has holes drilled through at different intervals, say three rows and about 1 in. apart, to allow for different width sills.

To place, open the window and put the jack on the outside and put a bolt in the hole that comes nearest the sill on the inside. This makes a strong jack and one that a man can work on and feel safe. The bolt used should be about ⅝ in. and need only be slipped into the hole, as the weight on the outside causes the bolt to bear against the sill on the inside and holds the jack secure.—Contributed by Thiede.

HOW TO MAKE A CHEAP DIE AND STOCK

Make the die (Fig. 1) of tool steel 1½ in. wide, ⅜ in. thick and 4 in. long. Drill a ⅝-in. tap hole in the center of the plate, then tap it with a ⅝-20 thread tap. Drill a row of holes and saw them out to make a slot for adjusting the die which is done by means of a stave bolt (A), which passes through both sides of the slot. File three slots to form the cutting edges of the die and back off the starting side of the die by filing. Make three small holes (B B B) in the die for fastening it in the holders or stock.

The stock is shown in Fig. 2. Make it of a piece of tire iron 12 in. long, 1½ in. wide

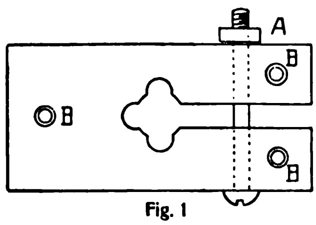


Fig. 1

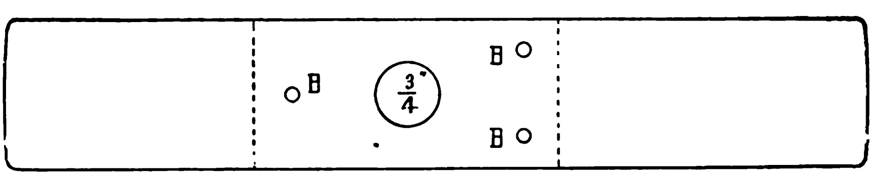


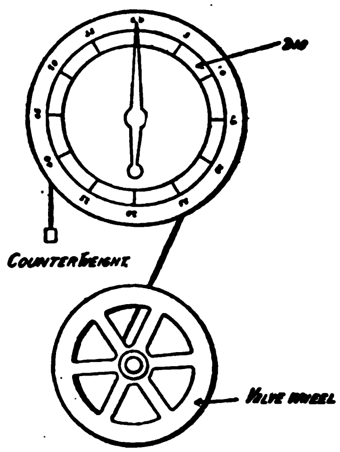
Fig. 2

and ¼ in. thick. Put a ¾-in. hole in the center, as indicated, and tap three holes (B B B) for the stove bolts, which hold the die to the stock. Harden the die and draw its temper to a straw color and it will cut as clean a thread as one can wish.—Contributed by F. G. Emmelmann, Indianapolis, Ind.

TO FIND THE NUMBER OF TURNS A VALVE IS OPENED

A device for indicating the number of turns a valve is opened was described at the annual meeting of the Western Gas Association in Chicago recently. This device is shown in the sketch.

A cord is attached to the stem of the valve and thence runs over a small drum, around which it is wound several times. A small counterweight is hung on the free end of the cord. The drum communicates with an indicating hand, which registers on a dial



the number of turns that the valve is opened. When the valve is opened the stem turns and winds up the cord, turning the drum and moving the indicating hand.

CEMENT FOR TIGHT PIPE JOINTS

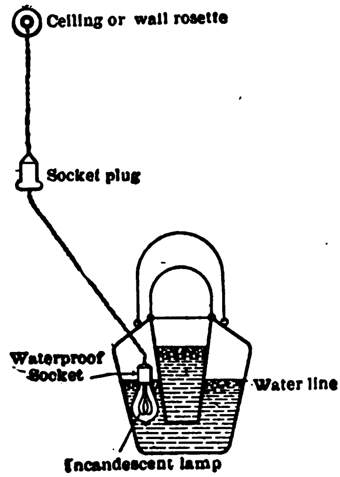
Powder and mix together 15 parts slaked lime, 30 parts graphite and 40 parts barium sulphate. To make a stiffer preparation, omit the lime.

CEMENT FOR WOOD VESSELS

Calcine and reduce to a fine powder, separately, lime-clay and oxide of iron. Mix them thoroughly and place in a closed vessel until ready to use. Before using mix with the *necessary quantity of water.*

HOW TO MAKE AN ELECTRIC GLUE HEATER

In the shop where electricity is used the electric glue heater is the simplest device of its kind. The illustration shows how it



Electric Glue Heater

is arranged. An incandescent lamp with a waterproof socket is suspended in the water in the kettle, and the joints between the glue pot and the kettle are made perfectly tight. A 32-candlepower lamp will boil the water in from two to four minutes, says a correspondent of Wood Craft, while six or eight candlepower will keep the kettle warm enough for constant use.

WAX FINISH FOR FLOORS

Slice 2 lb. of white wax thin and boil it with 2 oz. of pearlash in 2 qt. of water. Stir until the wax is melted and unites with the water. Apply with a brush and polish with old plush. Good for light service only.

TO SOFTEN OLD WHITEWASH

Wet the whitewash thoroughly with a wash made of 1 lb. of potash, dissolved in 10 qt. of water.

To clean tarnished zinc apply with a rag a mixture of 1 part sulphuric acid with 12 parts of water. Rinse the zinc with clear water.

FUEL ECONOMIZER FOR SAWMILL PLANT

In a small sawmill plant, consisting of a 25-hp. engine and boiler, where it was difficult to keep the steam up to the required pressure, a correspondent of Power fitted up and installed a fuel economizer and water heater that was a great improvement.

The fuel used was green slabs. The boiler was of the firebox type. The exhaust of the

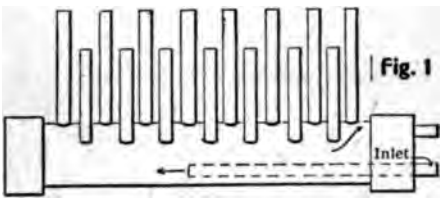


Fig. 1

engine was turned up the smokestack and the heavy draft kept the flues scoured out by means of pieces of bark it drew out through them.

It thus not being necessary to scrape the flues from the firebox end, the heater could be placed directly in front of the flues.

Fig. 1. shows a diagram of the heater. A piece of 6-in. pipe threaded at both ends was covered with two caps. Into this 6-in. pipe a number of ¾-in. pipes plugged at one end were screwed. These water tubes or quills were made short enough to lie below the water line when in position in the smoke-box of the boiler, as shown in Fig. 2. The quills were put in only on the top

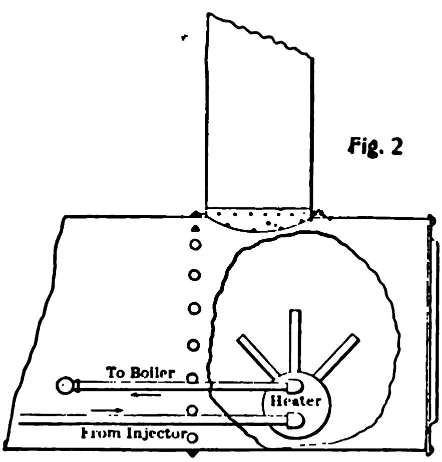


Fig. 2

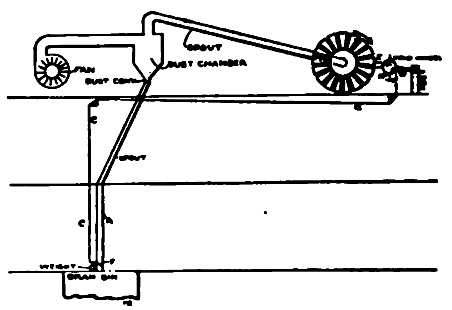
and sides, as shown, so that any sediment which might be in the water would not lodge in and scale them and cause them to burn out.

The heater absorbs a great deal of heat and the feed water is fed through it as it goes to the boiler. Ample water connections were used between the boiler and heater. The lower connection (delivery from the pump or injector) extends in about half way to insure circulation (see dotted lines in Fig. 1). The check and stop valve are on the delivery to the heater, but between the heater and the boiler no check valve was used, so that the heater has always a sufficient supply of water.

When after three years continuous service the heater was taken out of the boiler for inspection the quills were not scaled at all.

DUST COLLECTOR KINK

In a mill where the fan from the scourers blows into the dust chamber spout from chamber to bran bin, a great deal of dust was raised because there was so little stock



Kink for Dust Collector

running down the spout and so much air that it blew up through all other spouts leading to the bran bin. A correspondent of the American Miller tells how he remedied matters, as shown in the accompanying diagram.

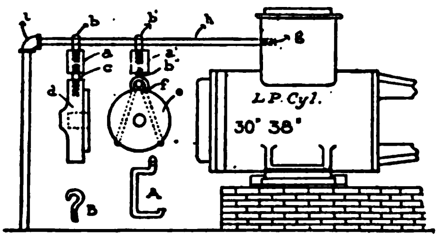
F is a valve in the spout, closed by means of a weight on the lever from F; C is a wire running to trip lever B; H is a small pin in trip wheel to raise lever B; E is a pin attached to the dust collector, which makes one revolution every five minutes. Four pins in the trip wheel, A, cause it to trip every 20 minutes, when valve F closes immediately, shuting off all air. Lever B is bolted loosely to the post or the wall and is just long enough to rise high enough to allow pin H to pass and levèr B to drop back in place. It is checked from dropping too low by a small block fastened to the post and just below the lever.

The intervals between the action of the valve can be varied in duration by adding more pins to trip wheel A, or by using fewer pins.

INEXPENSIVE RIG FOR REMOVING CYLINDER HEAD AND PISTON

A simple and inexpensive rig for removing cylinder heads and pistons is shown in the sketch and may be made as follows:

At g there is a 1½-in. pipe plug put in the steam chest to allow for the removal of the L. P. valve stem for repairs. Remove this plug and into the hole screw a piece of 1½-in. extra heavy pipe about 4 ft. long.



To Remove Cylinder Heads

Put an ell on at i and screw a piece of common black pipe long enough to reach to the floor into the ell. Cut two pieces a and a' each 4 in. long from a piece of 1½-in. shafting and drill a hole for a ⅞-in. standard machine thread through the center of each piece. Tap each of these pieces half way through with a left-hand thread tap and through the other half with a right-hand thread tap. Make the threaded hook, B, of ⅞-in. round iron, bent to fit the outside diameter of the pipe. Cut the hook with left-hand dies. Make hooks b, b', b" in the same way, except to thread b" right hand. Make the bracket, f, supporting the piston head, e, of ⅞-in. round iron. A side view of the bracket is shown at A. Make the stud at c with a right-hand thread on either end; the blank space at c is for the grip of a pipe wrench. This device is recommended by a correspondent of the National Engineer.

HOW TO MEASURE CORN IN CRIB

This rule will apply to a crib of any kind. Two cubic feet of sound, dry corn in the ear will make a bushel shelled, says Grain Man's Guide. To get the quantity of shelled corn in a crib in the ear, measure the length, breadth and height of the crib, inside of the rail; multiply the length by the breadth and the product by the height; then divide the product by two, and you have the number of bushels in the crib.

FORGING GRAB HOOKS OR TWITCHING DOGS

In Fig. 1 is shown a grab hook made of a 1-in. bar of round iron. To make such a hook upset a lump 2 in. from the end of the bar, draw toward a point and bend square across the swell. Leave the front thick, but thin the outside of the point at the back. Cut off 10 in. inside the hook and punch a hole for the chain. This hook will not draw

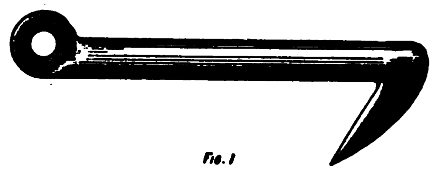


Fig. 1

Fig. 2.

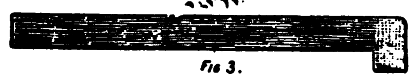


Fig. 3.

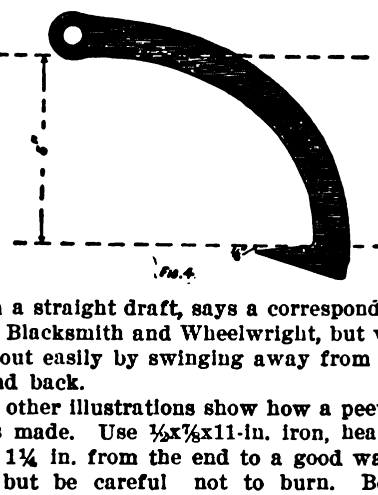


Fig. 4.

out on a straight draft, says a correspondent of the Blacksmith and Wheelwright, but will come out easily by swinging away from the log and back.

The other illustrations show how a peevey dog is made. Use ½x⅞x11-in. iron, heat it about 1¼ in. from the end to a good warm heat, but be careful not to burn. Bend slightly over the horn of the anvil, Fig. 2, then stand it on its hot end and hammer to the shape of Fig. 3. Draw to a point and in the other end punch the eye. Bend to the shape of Fig. 4, so the point will set ⅛ in. out from one of two parallel lines 5 in. apart when placed as shown in sketch. Use an anvil with a 5-in. face and in either of the dogs described do not allow a square corner to form in the throat, or the heads will break off.

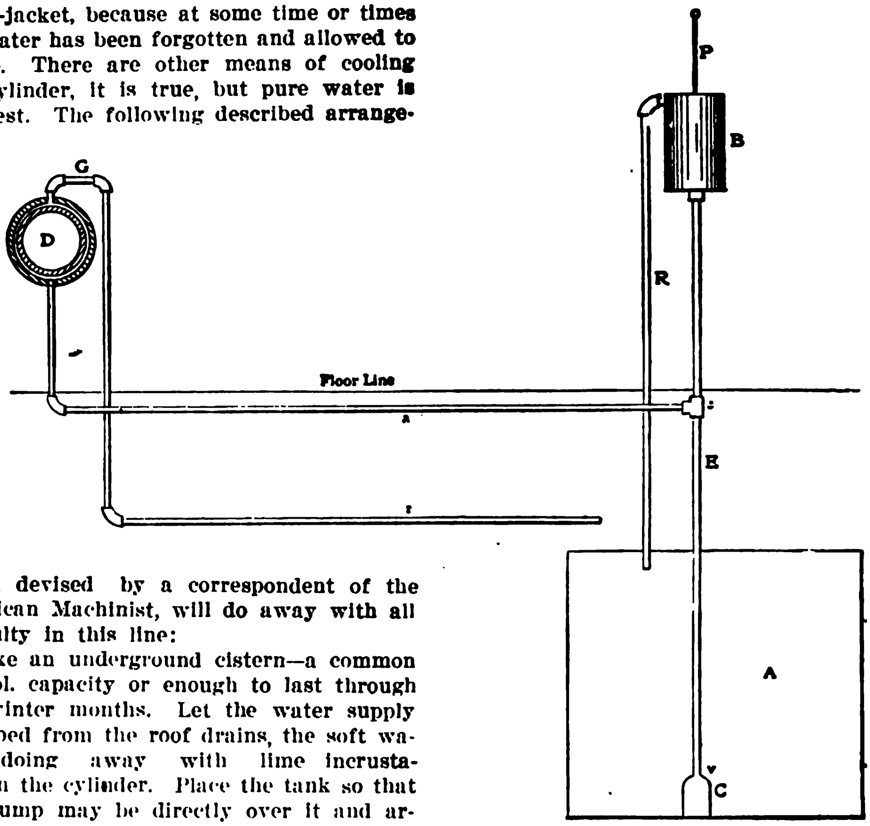
Do not neglect to send for the second volume of Shop Notes. Price, 50 cents.

NON-FREEZABLE COOLING WATER ARRANGEMENT FOR GAS-OLINE ENGINES

The water-cooled gasoline engine in use in a cold climate usually has a cracked water-jacket, because at some time or times the water has been forgotten and allowed to freeze. There are other means of cooling the cylinder, it is true, but pure water is the best. The following described arrangement, devised by a correspondent of the American Machinist, will do away with all difficulty in this line:

Make an underground cistern—a common 30 bbl. capacity or enough to last through the winter months. Let the water supply be piped from the roof drains, the soft water doing away with lime incrustation in the cylinder. Place the tank so that the pump may be directly over it and arrange with whatever modifications are required, as shown in the diagram. Place a common deep-well pump cylinder, C, at the bottom of the tank A, and carry a pipe up into the bottom of a reservoir, B, which should be placed about 2 ft. above the level of the top of the engine cylinder. Any kind of vessel that will hold 3 gallons or more will do for the reservoir. Run the pump rod, P, up through pipe E, and reservoir B, and attach it to any convenient mechanism for giving it the necessary reciprocating motion. At a point e in pipe E, preferably below the floor, insert a T and from it run pipe a to the bottom of the cylinder water-jacket. Carry the overflow taken from the top of the cylinder back to the tank by pipe r. At point v in pipe E drill a $\frac{1}{16}$-in. hole and leave it open at all times, so that when the pump stops the water will drain back.

The pump should in all cases be of ample capacity and should have a stop-cock at G, for gauging the flow, the surplus being returned to the tank by the overflow pipe R attached to B near the top. A cooling water temperature of 150 degrees as it leaves the



Cooling-Water Arrangement for Gasoline Engine

cylinder indicates the highest degree of heat permissible in running gas or gasoline engines.

INK FOR LABELING

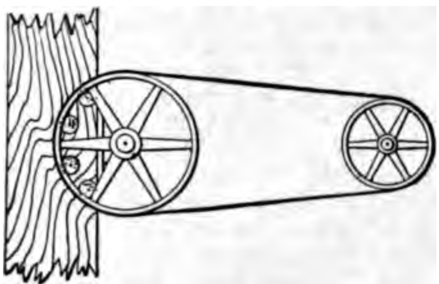
An ink that nothing will bleach is made by mixing pyrogallic acid and sulphate of iron in equal parts. Particularly useful for marking labels on bottles containing acids. Varnish the label after the ink is dry so that moisture will not affect it.

New oak may be made to look old by sponging with a strong hot solution of common soda in water. This will raise the grain which must be cut down with sandpaper

LOOSE PULLEY SUBSTITUTE

For a belt that is not much used the appliance shown in the illustration will take the place of a loose pulley, says a correspondent of the Engineers' Review.

Small rollers are located near the flange



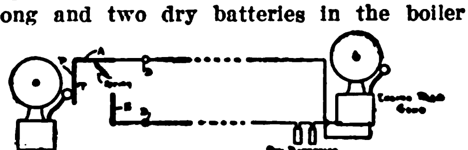
Substitute for a Loose Pulley

of the driving pulley. The top roller is even with the face of the pulley or nearly so, the other three are a little nearer the shaft and the lower one is still nearer the shaft. The belt may be handled by hand with this device, though for a large belt it is better to use a stick for removing it. The rollers may be fastened to a joist by log or wood screws on which they turn. The belt will not wear by friction when standing as in the case of a loose pulley.

GONG CONNECTIONS FOR TELEPHONES

For the noisy plant where the telephone bell cannot always be heard a simple gong signal will prove a great convenience.

Put the telephone in a quiet room adjoining the boiler room and connect it with the gong and two dry batteries in the boiler



Connecting a Telephone with a Gong

room, as indicated in the illustration. The dry batteries and the gong are connected in series to binding posts, B, B, says the Practical Engineer. T is a trigger pivoted at P, A is a piece of steel pivoted so that the spring can draw it down to touch the contact S. When the telephone bell rings, the clapper releases arm A, which contacts at S completing the circuit and causing the gong in the boiler room to ring. The trip must be reset after every call.

IMPROVED METHOD OF FASTENING A ROPE TO A RING

In regard to the method of fastening a rope to a ring, given in our September number, Harry de Joannis, of Chicago, says:

"The method illustrated in your article does not present, as stated, two thicknesses of rope to wear through, for, when the first thickness is worn through, it is worn through in such a way that the half-hitch holding it is insufficient to stand the strain. Not only this, but the seizing shown in the illustration should have two or three cross tightening strands, as shown in the sketch submitted herewith, to prevent the inevitable play of one rope upon the other.

"By the method I show, the rope takes a round turn through the ring and then is given a half hitch over the main rope and

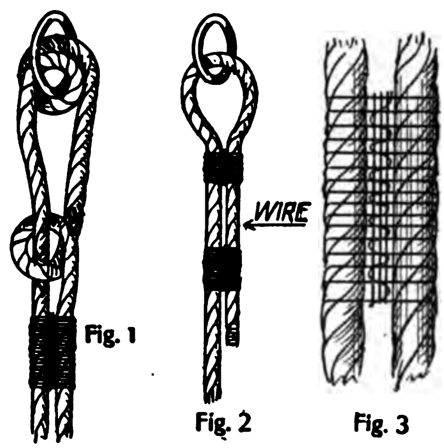


Fig. 1 Fig. 2 Fig. 3

the end is fastened to the rope (Fig. 1), as in your illustration, with the addition of the strands above mentioned. The advantage I claim for this method of fastening is that the half-hitch takes a considerable portion of the strain and the round turn gives two wearing surfaces in the ring which can easily be examined at any time by pushing the half-hitch towards the ring and enlarging the round turn so that the inside surfaces of the rope are seen easily. If wire is used (Fig. 2), it should not be hammered flat nor is a round turn needed in the ring whatever. It should be laid around a split thimble and two seizings should be applied to it instead of one.

"In tightening seizings, the strands are woven in and out and then pulled tight and cut off short (Fig. 3)."

WATER SUPPLY SYSTEM FOR THE KITCHEN

In country towns where there is no water system a simple supply system for the kitchen will be found a great convenience.

Procure three barrels, one a very large

Hot and Cold Water Supply System

pork barrel. Mount the large barrel on a strong bracket outside the kitchen, in a shed if there be one, and make an inlet by which the soft water from the roof will flow into it. With a ½-in. pipe, an elbow and a bib for connections, run the water from this barrel to the kitchen sink and arrange for the overflow from the barrel to be run in another direction. Pipe the discharge from the sink to another barrel placed just below the supply barrel, but on the shed floor. The barrel can be wheeled away on a barrow or cart to empty in some suitable place.

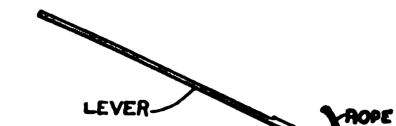
If the pump be one of the ordinary kind and out of doors, replace it with a force pump in the house at the sink and arrange it to connect with the supply barrel so that when there is no soft water the tank may be filled from the pump.

Place the third barrel on a strong bench back of the stove and lead a pipe from the supply tank to the barrel, connecting it at the bottom of the barrel. This pipe should be provided with a stop-cock to shut off the supply when the hot water barrel is full.

Make the water heater of 1¼-in. pipe and install it in the stove. From the bottom of the hot water tank run a pipe to the heater. The return pipe from the heater connect into the side of the hot water tank about 10 in. above the bottom of the barrel. Make the connections by means of iron pipe with long threads cut on it and use jam nuts on both sides against asbestos washers *soaked in red lead*. Put the hot water service cock a few inches above the side connection so that the barrel can never be quite emptied. Make a cover of sheet metal in the form of a cone for the top of the barrel and lead a small pipe from the cone to the chimney to carry off any condensed steam. This system is recommended by a correspondent of the Metal Worker, who installed one that worked admirably.

PUTTING ON BELTS WHEN PLANT IS IDLE

Starting the mill up in order to put on belts is a source of extra expense which may be avoided by the means illustrated herewith. Place the belt on the driver pulley and run it as far as possible, says a correspondent of the American Miller. Then tie a rope around the belt and pulley behind the arm of the pulley. Put a lever in under

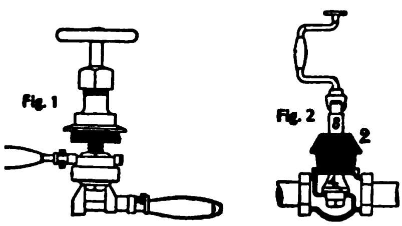


To Attach a Belt when Plant is Idle

the rope and on top of the belt and press down. With a long lever a greater weight can be exerted on the belt. The driver pulley will then turn the belt on readily.

ꝛEPAIRING A DISK VALVE

: following method of repairing a Jen-
lisk valve is recommended by a corre-
ent of the Practical Engineer.
h a large monkey wrench unscrew the
t, giving it a quick, sharp pull to
ı the thread. A large wrench will not
; easily and round off the corners of
onnet. If a valve has been in use



steam pressure a long while, it may
ecessary to apply a Stillson wrench.
ve marks made by the teeth of the
h by filing carefully. Hold the disk-
: with one wrench and unscrew the
ith another, as shown in Fig. 1. If the
and nut do not come out together
ı the nut by holding it in a gas flame,
which it may be cut or pried out easily
. new one put in. Put a prick punch
in the edge of the threads to prevent
it from working off easily.
repairing the seat of a Jenkins valve
shows a good plan. Remove the bon-
ıd screw in the bushing (2) to form a
for the stem (3), on the lower end of
ı is a circular file (4). When this is
l by means of the brace it files the
until all irregularities are removed,
ıg it as good as new.

ΓO SOLDER AGATE WARE

orrespondent in the Metal Worker says
in agate ware can be soldered, not-
tanding the general belief to the con-
He says, take a chisel out of your
ocket, as I suppose you carry all your
tools with you, and give the old agate
a crack or two and see what it does.
take your file and rasp and give it a
trokes to brighten the metal, after
. some cut acid should be put on and
hole can be readily soldered. The
' will say that you have botched his
gate ware, but this is the best way to
› work.

BLUEPRINT CHEMICALS

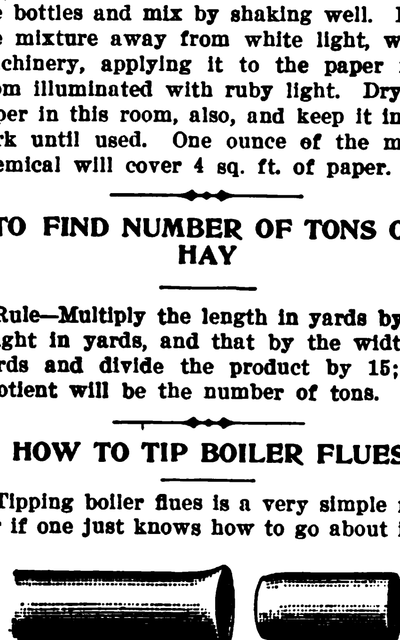
For making blueprint paper prepare the following solutions: Citrate of iron and ammonia, 1⅞ oz., dissolved in 8 oz. of water and red prussiate of potash 1¼ oz. dissolved in 8 oz. of water. Keep the solutions in separate bottles until ready to use them. To use, measure equal quantities from each of the bottles and mix by shaking well. Keep the mixture away from white light, warns Machinery, applying it to the paper in a room illuminated with ruby light. Dry the paper in this room, also, and keep it in the dark until used. One ounce of the mixed chemical will cover 4 sq. ft. of paper.

TO FIND NUMBER OF TONS OF HAY

Rule—Multiply the length in yards by the height in yards, and that by the width in yards and divide the product by 15; the quotient will be the number of tons.

HOW TO TIP BOILER FLUES

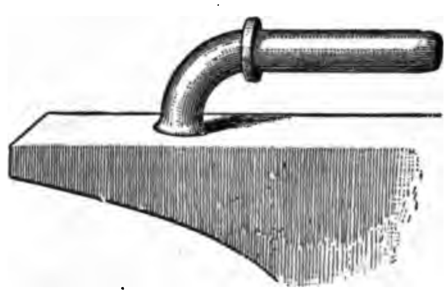
Tipping boiler flues is a very simple matter if one just knows how to go about it. A



Tipping Boiler Flues

correspondent of the Blacksmith and Wheelwright recommends the following method:

Lap the flues one-half inch and take one heat and weld in the fire. Then straighten them up on the horn. Second heat in the



Straightening Boiler Flue on the Anvil

fire and weld on the horn. It will be hard to tell where the weld is and the flues will be as good as new.

MAKING FORCED FITS

To bore out a wheel and turn a shaft or other part to be driven or forced into the wheel by means of heavy blows or hydraulic pressure, is an operation of the most frequent occurrence in every machine shop and is of such utility as to be indispensable. The grip and solidity of a driven fit is something remarkable. Bolts and nuts will loosen, but no amount of vibration will affect the integrity of a well-made press fit. Systematic experimenters and mechanical writers have been somewhat neglectful of this subject, and considering its importance, the matter would seem to merit more attention. The data contained in this article came to the author by frequent experience in the every-day work of a machine shop, rather than from deliberate experiment. These conditions do not afford the same opportunity for accurate observation as would a carefully conducted test, but the figures obtained are sufficiently close to give satisfactory results.

The part to be driven must of course be slightly larger than the hole which receives it, but the difference is exceedingly small, and the first step is evidently to determine this amount correctly. The common practice is to gauge the oversize solely by the feel of the calipers, but the element of uncertainty in this method is very large.

In figuring the necessary allowance for any given case, the principal factor is the size of the job. To make a press fit of the greatest possible strength, there should be a difference in size of from two to three-thousandths of an inch for each inch of diameter. The required pressure in tons will be the allowance in thousandths multiplied by the diameter in inches and by one and a half. For example, a wheel is to be forced upon a 5-in. shaft, $5 \times .002 = .010$, which is the required allowance, and the required pressure will be $10 \times 5 \times 1\frac{1}{2} = 75$ (tons). On smaller pieces when the fit is required to be very heavy, the larger figure or .003 per inch of diameter may be used. Say the shaft is 2 in.: $2 \times .003 = .006$; .006 will be the allowance and the pressure will be $6 \times 2 \times 1\frac{1}{2} = 18$ (tons).

It will be apparent, however, upon a little reflection, that with pieces of very large size the necessary pressure would be very great indeed. For instance, a 15-in. crank-pin is to be pressed into its disk. By the rule, $.002 \times 15 = .030$; and $30 \times 15 \times 1\frac{1}{2} = 675$ (tons), the pressure. Very few shops, not even the largest establishments, are equipped with the means of obtaining such ernormous pressures; and moreover, it is rarely necessary in large work to fit two parts together with such extreme tightness. An allowance of about .010 on the above pin would be sufficient and would bring the required pressure within more convenient limits.

It is also true that the driving allowance must in many cases be limited by the strain which the job will safely stand. The material and thickness of the metal which surrounds the hole, the length of the forced shaft, etc., these points are in some cases governing considerations. As a general thing, however, in ordinary cases when it is not necessary to go to extremes, the given rule of .002 per inch of diameter may be used on all work up to about 4 in. For larger pieces a total allowance of .008 to .010 is about right, regardless of size. About .007 will make a 40-ton fit on a 4-in. axle. When the required pressure is specified the necessary allowance may be found as follows: Divide the pressure in tons by one and a half times the diameter in inches. The quotient will be the required allowance in thousandths. Thus, a wheel is to be pressed upon a 4-in. shaft at 30 tons: $4 \times 1\frac{1}{2} = 6$ and $30 \div 6 = 5$; .005 is therefore the allowance.

For driving fits, a total allowance of .003 without regard to size is good practice with pieces larger than $1\frac{1}{2}$ in. For smaller pieces apply the first rule given for pressure fits.

A shrink fit is usually made in cases which require the greatest possible binding effect. The allowance may be somewhat greater than for a press fit. Some railway companies shrink their locomotive tires on at 1/64 in. per foot of diameter. Others use double this amount or 1/32 in. per foot. It is probable that about .003 in. per inch of diameter will secure the maximum effect in any case.

In making a press fit with an old wheel which has been previously pressed on and off, the foregoing rules do not apply. In this case the metal forming the circumference of the bore has been surface-hardened by the pressure to which it has been already submitted, and the force required to press the wheel on will be about double that required for new work, or, the forcing allowance may be reduced to one-half regular amount.—Contributed by S. M. Howell, Steubenville, Ohio.

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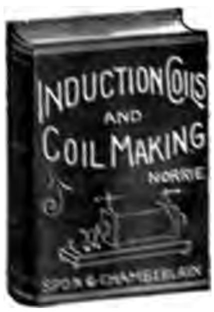

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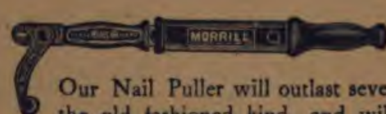

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As Published Monthly During 1906

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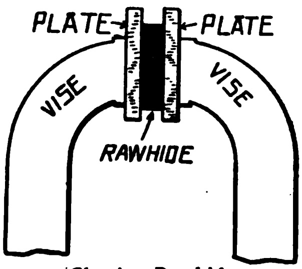
SHOP NOTES

TO FLATTEN AND SHAPE RAWHIDE

Warm two metal plates a little warmer than is comfortable to hold; put the rawhide between them and press solid in a



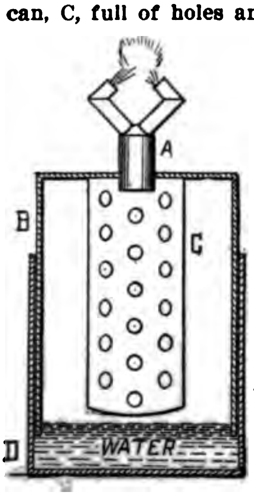
Shaping Rawhide

vise, leaving all there till the plates are cool. Be careful not to heat the plates hot enough to burn the hide.—Contributed by J. H. Jerome, Brighton, Mass.

HOW TO MAKE A SMALL ACETYLENE GAS GENERATOR

To make this machine the materials required are two tin cans, one of a size to fit into the other, a smaller can and an acetylene gas burner.

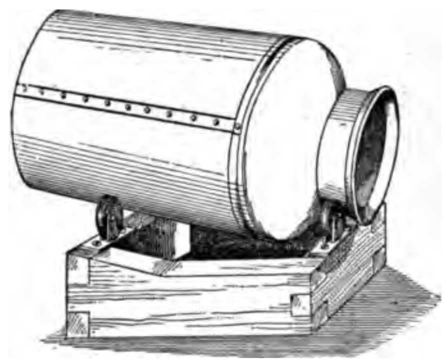
Solder the gas burner, A, to the smaller of the two large cans, B. Punch the smallest can, C, full of holes and fill it with carbide and fasten it to the under side of can B. Partially fill can D with water and place can B with its attached apparatus in can D, as shown in the illustration.



Wait a moment, then touch a lighted match to the burner. If too much gas is generated the carbide is automatically lifted out of the water, as shown, and the generation of gas ceases until more is needed.—Contributed by Fred Crawford Curry, Brockville, Ontario, Canada.

FRAME FOR HOLDING MILK CANS WHILE SOLDERING

In a shop where soldering milk cans forms an important item of repair work the frame shown in the illustration will be found convenient. Placed on this frame a 40-qt. milk can can be rotated freely so that the seams in the breast of the can may be



Frame for Holding Milk Cans While Soldering

quickly and easily soldered. The frame may be held in the lap of the operator, if it is more convenient. To solder the bottom seam, an arm is fastened to the frame, so as to support the bottom of the can when inclined for this soldering, says the Metal Worker, and the frame is then taken in the lap of the operator, who turns the can and at the same time solders the seam. The construction of the frame is shown in the illustration.

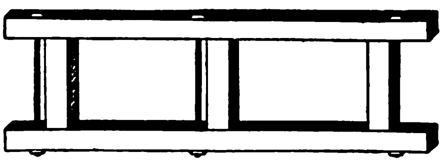
To renovate varnished work make a polish of 1 qt. good vinegar, 2 oz. butter of antimony, 2 oz. alcohol and 1 qt. oil. Shake well before using.

For oil gilding make an oil size of calcined red ocher ground with the best and oldest oil. Add oil of turpentine to make it work freely when ready to use.

QUICK BOILER MOVING

An engineer was given from Sunday morning until the following Wednesday at 2 p. m. to connect up some new boilers that had just been installed, and break the connections of the old boilers and move them from the plant to the cars on which they were to be shipped. He tells in the Engineer's Review how he did it with the help of but two white men and a gang of southern negroes. He says:

When the order came, I completed my measurements for connecting the new boilers to the engine and piping system and starting up the shop, cut and fitted the two 6-in. and one 4-in. connections that were necessary. Getting in some more men these



Skid for Moving Boilers

were erected in place that night and the old boiler connections broken and plugged.

The next morning the fronts and stays were taken off and the boilers stripped. A crib work of blocks was then placed under each end of the boilers, and with jacks they were raised clear of the settings and securely blocked. A gang of men then pulled down the brick setting. Meanwhile I had the carpenter get out some skids of 6 by 8-in. timber, as shown in the sketch. As soon as one of the boilers was clear enough to work on, it was lowered down onto a skid. While this work was going on, I had a hole made in the boiler room wall large enough for the boiler to pass out, and by the time I had the track ready the first boiler was on the rolls. Hitching the blocks to the skid we soon had the boiler walking out in great shape. Tuesday morning at 10 o'clock this boiler was on a car, with all the fittings, securely braced and ready for moving.

In the meantime the other setting had been removed and the rubbish cleared away so we had a clean sweep at the other boiler, and Wednesday morning at 7:40 o'clock everything was ready for the freight. This job might have been accomplished more quickly if we had had better facilities and competent help.

BEST ANTI-FREEZING SOLUTION

The best anti-freezing solution for the use of motorists is prepared by the following recipe:

Mix and filter 4½ lb. pure calcium chloride and a gallon of warm water and put the solution in the radiator or tank. Replace evaporation with clean water, says the Motor Age, and leakage with solution. Pure calcium chloride retails at about 8 cents per pound, or can be procured from any wholesale drug store at 5 cents.

A ROPE PIPE WRENCH

A rope pipe wrench which may be operated by one man is shown in Fig. 1. The rope is wrapped on the pipe and toggle as shown, then, holding the ends of the rope in one hand, the operator pulls the toggle with the other. In operating the device shown in Fig. 2, which is used for heavier work, one man is required to hold the rope ends and another to handle the toggle. This device, says American Machinist, is called a Spanish windlass, and is used by seafaring folk.

A method of grinding a pulley on a shaft, or grinding a shaft in the boxes, is shown in Fig. 3. The ends of the rope are pulled alternately. The hand-rails of marine engines are polished by wrapping them with emery cloth which is worked by a piece of spun yarn instead of rope, as in Fig. 2.

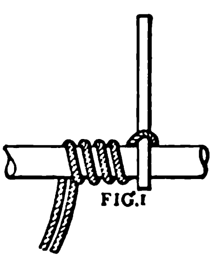


FIG.1

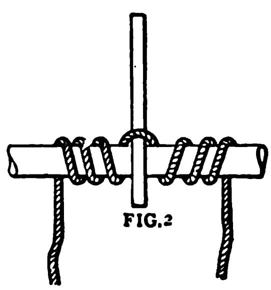


FIG.2

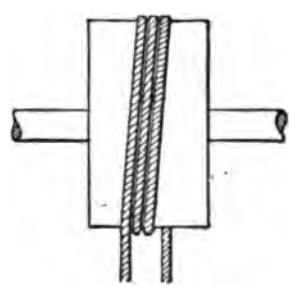


FIG.3

NEGATIVE NUMBERING DEVICE

The negative-numbering or marking device shown in the illustration is very simple in construction and will save time for the photographer using it.

To make the device prepare a brass strip by cutting into its face the inverted numbers 0 to 9 and screw the strip to the edge of a printing frame. Then construct a small pantograph of light ash strips and brass screw eyes.

To number a negative put the plate, with its dull side out, into the frame and pick out the correct figures on the brass strip and transfer them neatly to the negative by holding the wooden block to which the pantograph is attached lightly against the

Tool for Numbering Negatives

frame with the right hand and tracing the figures with the left. Slip the wooden block backward or forward to get the right spacing.

Keep the tool with the printing frame in a drawer of its own, says a correspondent of the American Machinist, so that no time is lost in preparing or assembling the parts.

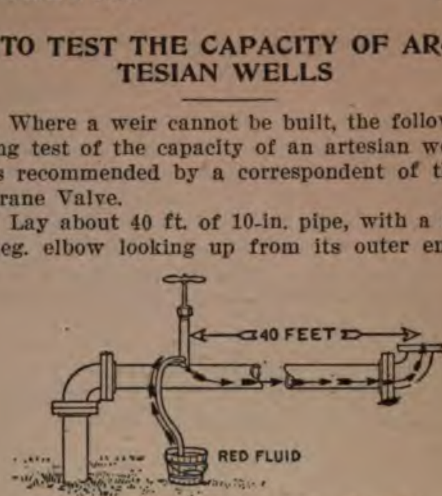
WATERPROOF POLISH FOR WOOD

Put into a stopped bottle 1 pt. alcohol, 2 oz. gum benzoin, 1/4 oz. gum sandarac and 1/4 oz. gum anime. Put the bottle in a sand-bath or in hot water till the solids are dissolved, then strain the solution and add 1/4 gill best clear poppy oil. Shake well and the polish is ready for use.

TO TEST THE CAPACITY OF ARTESIAN WELLS

Where a weir cannot be built, the following test of the capacity of an artesian well is recommended by a correspondent of the Crane Valve.

Lay about 40 ft. of 10-in. pipe, with a 90 deg. elbow looking up from its outer end,

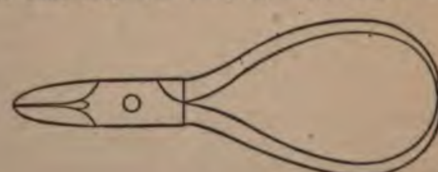


Testing the Capacity of an Artesian Well

horizontally from the well. Tap the pipe near the well and attach a small force pump. Let this pump draw from a bucket a solution of red aniline dye. One stroke of the pump will force about 4 oz. of the red dye into the water passing through the pipe. When this stroke of the pump strikes, start a stop watch, and when the colored water shows at the elbow, stop the watch. Thus the exact time taken to travel the length of the pipe may be ascertained, and with this time and the capacity of the given size of pipe the amount of water passing per minute may be figured. This test will come within three-fourths of one per cent of being absolutely correct.

CALIPERS MADE OF PINCERS

To make a pair of calipers of a pair of pincers, heat both handles of the pincers so that they will bend to meet at the ends



Handy Calipers

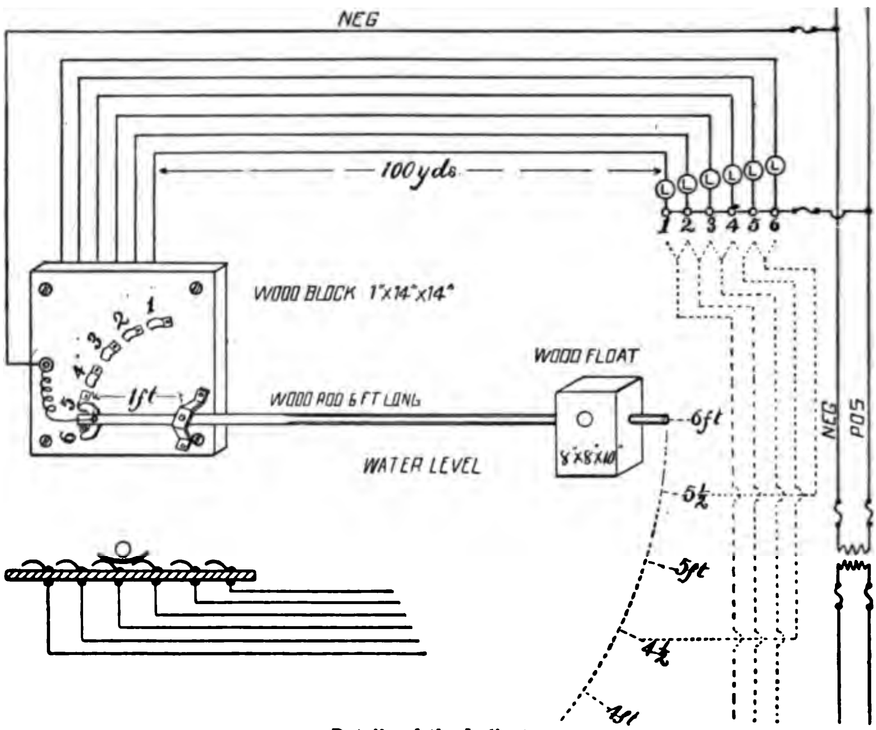
easily. Then file the tips of the bent handles to a point. This makes a very handy tool.—Contributed by Jack Wener, 2247 F St., Los Angeles, Cal.

AUTOMATIC ELECTRIC INDICATOR OF WATER LEVEL IN DISTANT DITCH

I am in charge of an electric generating plant which ordinarily operates with water-power. The water is brought in an open ditch to within 300 ft. of the station, where a waste gate is placed. From there the water is carried in a pipe. In order to carry the proper load without using too much water, it is necessary for me to know the depth of water in the ditch at all times. I am running a 90 kw. alternator in multiple with another set of alternators 10 miles away. Both plants are short of water at times and then it is necessary to use steam when the load is at the maximum. I can usually hold the load during the day. My plant has a 6-mile ditch and the other a 1-mile ditch. Both ditches cause a great deal of trouble in stormy weather.

The 100-yd. trip in the dark to get the water level was a great annoyance; even in the day time it took time, so I studied out the following plan to indicate the water. It is so simple any electrician can install one, and it has worked to my entire satisfaction My indicator uses six lamps, as the ditch is 6 ft. deep. The diagram will make the construction readily understood. There should always be one of the six lights burning, and when two burn it indicates a 6-in. level. For example, when lamps 5 and 6 are burning there would be 5½ ft. of water in the ditch. If No. 6 goes out there is only 5 ft. of water; if No. 4 and No. 5 light there is 4½ ft. of water, and so on.

The contact points, 1, 2, 3, 4, 5 and 6, are placed on a wood block 14 in. x 14 in. x 1 in. The wooden lever is 6 ft. long, with the negative wire connected to the contact point on the lever with a flexible wire long enough to allow for travel over the six contacts. At the other end of the lever is a float which I made of a block of wood 8 in. x 8 in. x 10 in. At the station a positive bus bar connects to the six lamps, from each of which leads a wire to the contact block, where connection is made to its corresponding contact number. I used No. 16 wire for the outdoor lines, about 2,000 ft. was required. For the las

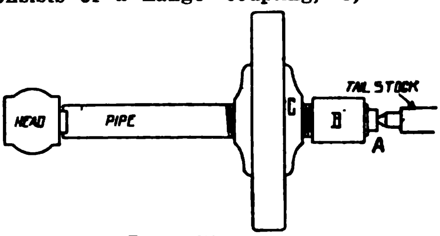


Details of the Indicator

signals I used 8-cp. 110-v. lamps. By placing the contact points at nearer or farther intervals the device may be made to indicate changes in 3-in. levels, or 1 ft., but for my purpose the 6-in. change in level is sufficiently exact.—Contributed by Lee R. Clarke, R. R. No. 2, Bozeman, Mont.

EMERY WHEEL ARBOR

An emery wheel arbor to rig on a lathe is shown in the sketch and is the device of M. C. Warnock, of Farmington, Ill. It consists of a flange coupling, C, in this



Emery Wheel Arbor

case $3\frac{1}{2}$ in. in diameter, and a length of piping. A coupling, B, is put on the tail stock end, into which is screwed a plug, A, for the center to hold. If the plug were inserted in the pipe without a coupling the threads would cut through, being threaded both inside and outside. A solid bar of iron may be substituted for the pipe. The flange may be trued in the lathe.

If you want anything and don't know where to get it, write Popular Mechanics. Information free.

AIR DRILLS FOR DRILLING MARBLE

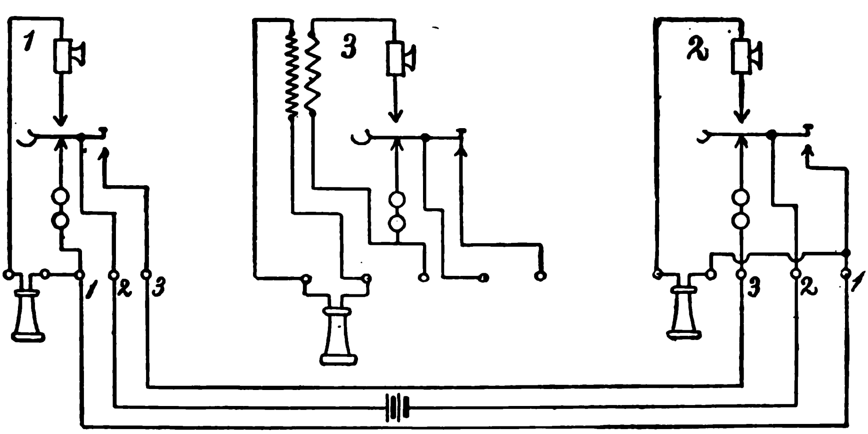
To successfully drill marble with a pneumatic drill, an ordinary twist drill is prepared as shown in the illustration. The twist is removed for a distance of about ½-in. from the point and the face of the


"The Drill is Ground Square"

drill is ground square, which gives it the appearance of an ordinary screwdriver. When running light with this drill the speed should not exceed 70 revolutions per minute, and when pressure is placed on the machine and the drill begins to cut, reduce it to 30 revolutions. In this way marble can be rapidly and economically drilled.

METHOD OF TELEPHONE WIRING

A method of wiring and connecting two short line battery call telephones is shown in the illustration. The chief feature of this method is that it permits the use of the ordinary two-contact push in place of the unreliable three-contact push generally made use of in this type of 'phone. Figures 1 and 2 show the transmitters and receivers in series with the battery when conversation is going on. Figure 3 shows induction coil in series with transmitter and having a closed secondary through receiver. This kink is contributed by a reader.



Plan of Wiring and Connecting Two 'Phones

HOW TO MAKE A PARALLEL RULE FOR THE DRAWING BOARD

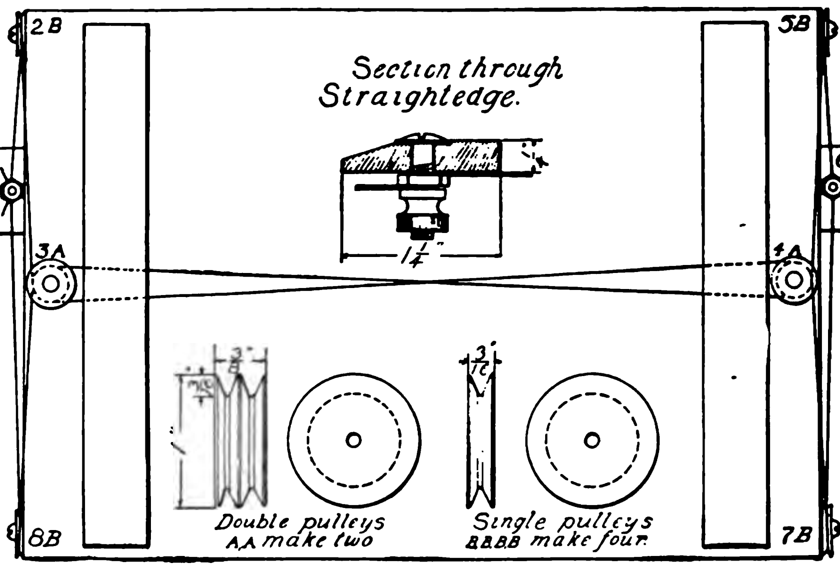
A very useful drawing device, which saves time and does better work than the T-square, as by its use it is impossible to get a line out of parallel through carelessness, was constructed by C. D. Gilbert, St. Johnsburg, Vt., who tells how to make the instrument:

Unless one has a lathe the machine shop must be called upon to make six brass pulleys, four single and two double as shown in the drawing. This is the only expense, assuming, of course, that the device is to be used on a drawing board one already has. The holes in the pulleys are drilled to fit easily a 1-in. round head screw. Other materials needed are a piece of hard wood, about 1½ in. longer than the board, and suitable for making the straight edge, as shown in illustration, two brass binding posts from the carbons of some discarded dry batteries, and a few feet of good fish-line.

To make, put one of the posts through the end of the straight edge, about ½ in. from one end, countersinking it slightly, and screw the check nut up snug, and with one side of the hexagon nut square with the end of the ruler, so that it will slide easily along the board.

Then lay the ruler on the board and put the other post so that the ruler will slide up and down the board freely, but leaving very little end play. Screw the pulleys on the board, as shown by the drawing, and if there are cleats on the board remove them and proceed to connect up.

Beginning at Post 1 fasten the end of the line under the hexagon nut and bring it over the under side of Pulley 2 (the board being in the position shown in the drawing, face down), then to the lower groove of Double Pulley 3, to Double Pulley 4, then over the upper side of Pulley 7 and to Post 6. There it is given one turn around the post between the two nuts and starts back to Pulley 5, then to the upper groove in 4, crosses the other part of the string to 3, next passes to 8, and back under the milled nut on Post 1. Now if drawn snug all is ready for business unless the ruler has been pulled out of square; if so, loosen the milled nut at Post 6 and slide the ruler along the string till correct. The line will stretch at first and have to be taken up, but will soon work all right.



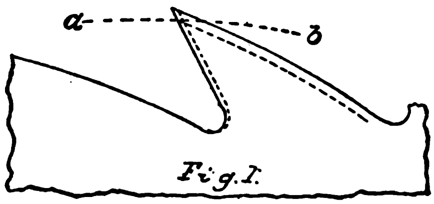
Parallel Rule for the Drawing Board

The cleats which were removed from the board must now be notched to allow the strings to pass and replaced, when all is complete. If one has several boards, a frame may be made which will hold the largest one, and the device attached to that, when one can readily change from one piece of work to another by simply changing boards—often an advantage to a busy draughtsman.

IDEAL TOOTH OUTLINE FOR CIRCULAR SAW

A saw expert in the Woodworker gives a sketch of what he considers an ideal tootn outline for a circular saw. He says:

Let us consider such a saw at work. Suppose the saw to be 24 in. diameter, with



Where a Saw is Dull

48 teeth, which makes the teeth practically ½-in. space. Supposing this saw is making a 3-in. cut—that is, 3 in. of feed for one revolution. It is obvious that each tooth cuts a shaving 1/16 in. in thickness. If we could draw a circle 1/16-in. smaller than that of the saw, we should find that the saw is dull only outside of the line where the said circle crosses the face of the tooth (Fig. 1, a b).

How shall we sharpen? This dull point is but a trifle over 1/16-in. long, but is probably less than 1/124-in. deep. Consequently, if we sharpen on the back, we must grind or file 1/16 off all along the periphery

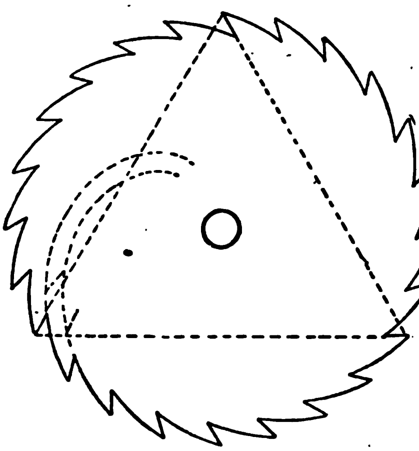
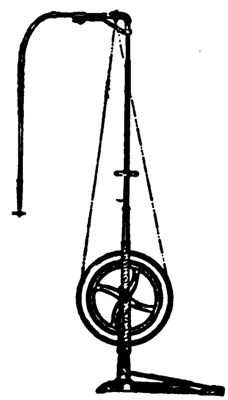


Fig. 2

line, and as stated by another, the saw is ⅛-in. smaller when we are done. On the other hand, if we grind or file on the face of the tooth, we will have less than 1/124-in. to grind to obtain a sharp point, but we sha'n't lose anything like ⅛-in. in diameter. Considering the size of said saw, and the gauge as well, I think it obvious that such a saw will stand up and rip for a long time; and I may safely contend that every semblance of a corner will be gone when it comes up to the file room. These conditions are true in conjunction with the upset swage, only to a greater extent.

ERASING MACHINE FOR DRAFTING ROOMS

Frequently in drafting rooms, such records as street records, plat books, main records, etc., are kept which have to be changed from time to time to show new pipe lines, etc., and thus a great deal of erasing is occasioned. To do this work quickly and neatly the erasing machine may be employed.



To make this machine, procure an ordinary dental engine or machine, such as is used for drilling teeth, and, instead of the drill used by the dentist, set a circular ink eraser in the mandrel by means of a small screw. An electric motor may be attached to the machine, or it may be run by foot power. In operating it, merely guide the eraser by means of the handle.

A few points, however, should be kept in mind, says the Progressive Age: The eraser must not be pressed too hard on the paper, and the machine must be kept at a good speed.

With a good paper the erased spot will have a hard surface, and the erasing will be hardly noticeable. The time required is very short, and the operator quickly becomes an expert at erasing by machine.

NATURALIST'S PASTE

For mounting specimens make a paste of thick mucilage of gum arabic and powdered starch. Suitable for artificial flower makers' use, also, and for sticking wafers, paper ornaments, etc., to candles and cakes. For the last mentioned purpose, add a little ler juice.

HOW TO LAY GALVANIZED IRON ROOFING

The use of galvanized iron for general roofing work has increased greatly during the past few years. It has many features which commend it as a roofing material, but difficulties have been experienced by beginners as to the proper method of applying it to the roof. The weight of material used is rather heavy to permit of

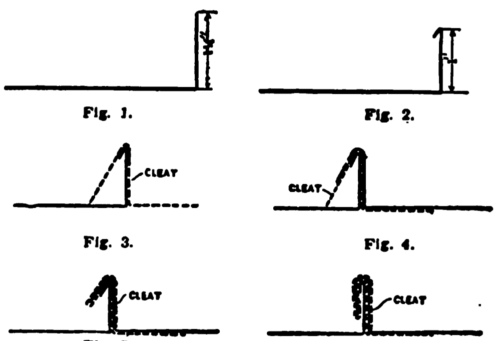


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6.

double seaming, but a method that has been evolved by a correspondent of the Metal Worker is found very satisfactory. By this he says that galvanized iron roofing can be put on at low cost, that it is water tight and is subject to no buckling in the joints, does away with double seaming and is considered more suitable than the latter for roofing purposes wherever it can be laid on a roof steeper than 1 to 12.

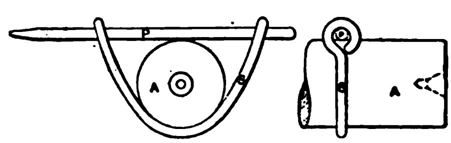
Galvanized iron of No. 28 and heavier gauges is used, the sheets being lap-seamed and soldered together in strips in the shop the proper length to apply to the roof. After the sheets are fastened together a 1¼-in. edge is turned up the entire length of one side of the sheet, as indicated in Fig. 1. This operation is done with tongs having gauge pins set at the proper point. The second operation consists in turning a strip ¼ in. wide toward the sheet, as shown in Fig. 2. This sheet is then laid on the roof, and a cleat about 8 in. long and 1 in. wide made of galvanized iron is nailed to the roof close to the sheet and bent over it, as shown in Fig. 3.

A second sheet having 1½ in. turned up is now brought against the first sheet and bent over both sheet and cleat, as shown in Fig. 4. The cleat is then bent backward over the second sheet and cut off close to the roof, as in Fig. 5, after which the seams are drawn together by double seaming tools, as the occasion demands, and slightly hammered with a wooden mallet. The finished seam is shown in Fig. 6. It will be seen that the second sheet of galvanized iron, cut ¼ in. longer than the first, laps over the former, making a sort of bead which prevents water from driving in. Cleats hold both sheets firmly to the roof and are nailed about 12 in. apart. Roofs of this character, when laid with No. 28 gauge iron, cost, he says, very little more than the cheaper grades of tin and do not have to be painted. Some of them have been in satisfactory use for eight and twelve years. A name applied to this seam which, though somewhat long, describes it well, is half double standing seam.

TO MAKE A SPRING FASTENER FOR A LATHE POINTER

A feeler or pointer, used for setting up work on the lathe where the work has a hole through it by which it is to be trued up, is shown in the illustration. The spring S is made of a straight piece of wire with an eye turned on each end. This spring is sprung around an arbor, A, and a pointer, P, is passed through the eyes of the spring and over the arbor. The tension is sufficient to hold the pointer in place.

When the arbor is rotated by hand, it carries the pointer around with it to test the accuracy of the setting. This device, says a correspondent of Machinery, is of the most service for heavy and awkward



Spring Fastener for a Lathe Pointer

shaped pieces, as they can be set and fastened without starting the lathe. For setting on the lathe carriage cylinders, bushings, etc., that are to be bored with a boring bar, it is handy also. For small holes in work, use a very light arbor, with a short spring and pointer. For setting to the outside of a hub, bend the end of the pointer hoop-shaped.

PLUMBERS' CEMENT

A good plumbers' cement consists of 1 part black rosin, melted, and 2 parts of brickdust, thoroughly powdered and [illegible]

MYSTERY OF BOILER EXPLOSIONS EXPLAINED

The "Lap-Joint Crack" is the Greatly Dreaded and Unseen Danger

A locomotive standing idly on the track or hauling a train, in apparently a perfectly normal condition, explodes without warning; a great factory is busy with hundreds of operatives at work, when suddenly the structure is torn asunder and the air is filled with the cries of the injured and groans of the dying. Both disasters were wholly unexpected. Usually the engineer and fireman are among the dead, and too often blamed by an unthinking public for carelessness, when in fact they were wholly innocent.

Brockton Lap-Joint Explosion--Boiler Was Hurled 215 Ft. and Moved House 16 In.

The explanation of a very large proportion of these accidents lies in the "Lap-Joint Crack"—an insidious, unseen danger, which cannot be found save by tearing a boiler to pieces, and which may exist for years without giving the slightest warning.

The expert of a well-known boiler inspection company, in the Locomotive, goes into details of this danger, from which the following is condensed or quoted:

A "lap-joint crack," as the name implies, is a crack in a boiler plate, which follows the general course of the longitudinal lap-riveted joints by which the plates of the boiler are held together. Any kind of a crack possessing this peculiarity of position would, strictly speaking, be a "lap-joint crack;" but the name is usually applied to one particular kind of defect, which is illustrated in Figs. 1 and 2. The main thing to observe in connection with Figs. 1 and 2 is that the crack, although it may occur in either the inner or the outer plate of the boiler, always starts from the face of the affected plate which is in contact with the overlapping plate, progressing into the metal more and more deeply until the boiler is weakened perhaps to the point of explosion; and being itself so situated that it cannot be seen from either the inside or the outside of the boiler. It is this peculiarity of position which makes the defect so dangerous, the strength of the plate being sometimes greatly reduced before there is any external, visible evidence that the crack exists at all.

One of the most unfortunate things about these hidden cracks is that they show a marked tendency to extend nearly through the affected plate for a considerable distance along the joint, without actually perforating it anywhere. Fig. 3 illustrates a well-marked case of this sort. The piece of plate which it represents was cut out of a boiler that was affected by a lap-joint crack. The crack, in this instance, did not actually perforate the plate at any point, but it extended so nearly through it that the specimen here shown was bent over by hand. The position of the edge of the overlapping plate is indicated, in this engraving, by the dotted line.

The two main causes of lap-joint cracks are the treatment the plates receive during manufacture, and the action to which the boiler is subject on account of steam pressure.

First, as to the processes of manufacture and their effects. In rolling plates into the cylindrical form, preparatory to riveting them up into shells, the rolls do not "grip" the plate as effectively near the end of the operation as they do in the middle of it; for the last end has a tendency to slip off the first roll, and spring back so as to be flatter than the desired radius would require. If the plate were solid, and had no rivet holes in it, the resulting cylinder would look something like Fig. 4, one end of the shell "standing off" from the general curve, as represented. If, on the other hand, there are one or more rows of rivet holes along the edges of the plate that is being rolled, it may easily happen that the plate takes a sharper bend along one or more of these rows of holes, owing to the weakening of the plate at these points.

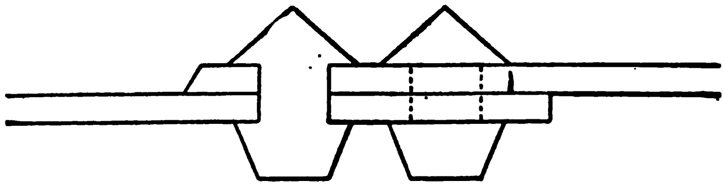


FIG. 1.—A LAP-JOINT CRACK UNDER THE OUTER EDGE OF THE RIVET HEADS.

FIG. 2.—SECTION OF A BOILER PLATE WITH A LAP-JOINT CRACK.

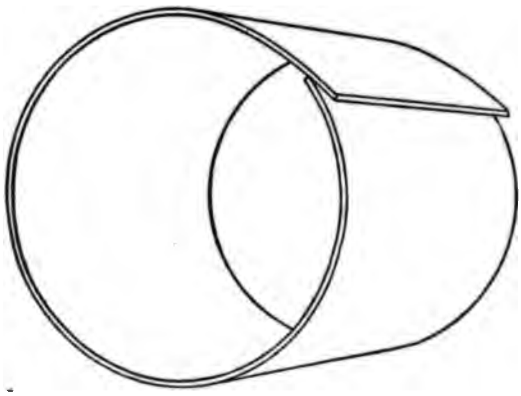


FIG. 4.—ILLUSTRATING THE "OFF-SET" OF THE LAP.

FIG. 3.—A PLATE ALMOST PERFORATED BY A LAP-JOINT CRACK.

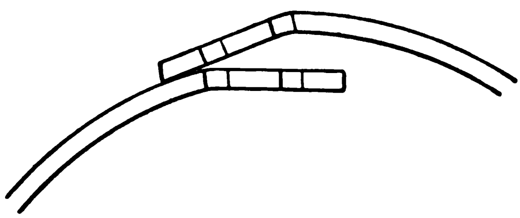
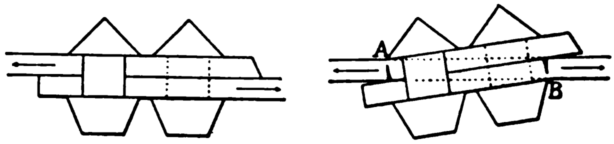


FIG. 5.—SHOWING THE ACTION OF THE ROLLS. (EXAGGERATED.)



FIGS. 6 AND 7.—BEHAVIOR OF A LAP-RIVETED JOINT UNDER PRESSURE.

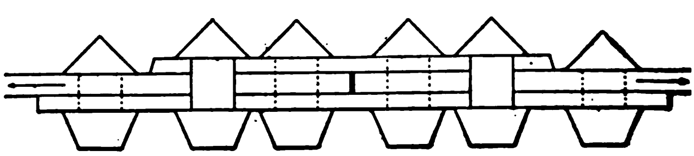


FIG. 8.—DOUBLE-STRAP BUTT JOINT.

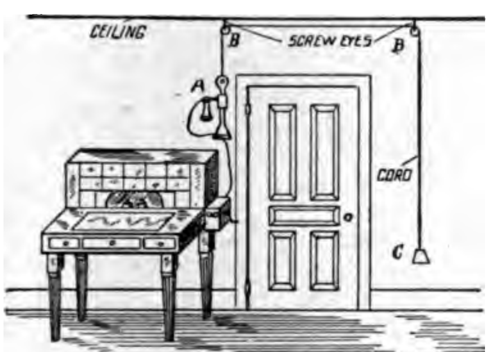
from the removal of the material in forming the holes. The ends of the plate, where they come together, may then present the aspect represented on a greatly exaggerated scale, in Fig. 5. Careless sledging produces stresses, often of considerable magnitude.

The steam stresses are shown in Figs. 6 and 7. Fig. 6 represents an ordinary double-riveted lap-joint, and it is to be observed that when the boiler is under steam, the tensions on the respective plates which are united by the rivets cannot possibly act in one and the same straight line. The plates do not abut against each other at the edges, but are laid one over the other, and the tensions to which the plates are subjected must be related to each other somewhat as indicafed by arrows. It is evident, therefore, that there will be a tendency, in such a joint, for the rivets to "cock up" somewhat after the fashion shown in Fig. 7. The action will not be as violent as here represented, but the tendency will be for the joint to be deformed towards a position in which the two overlapping plates would come into one and the same straight line, as suggested by the dotted lines in Fig. 7. The parts of the plates which lie between the rivet shanks and under the rivet heads will be held firmly together by the rivets; and the bending action to which the plates are subjected will therefore be most severe immediately under the edges of the rivet heads, where it first becomes possible for the plates to bend to any perceptible extent. As the steam pressure in the boiler varies, the bending action upon the plates will also vary, and hence there will be a tendency, sooner or later, to form a crack in the plate, either at A in Fig. 7, or at B.

Inasmuch as the lap-joint crack appears only in lap joints, the use of butt joints, as shown in Fig. 8, is recommended as preventing the trouble. The use of the butt joint is increasing, but probably 85 per cent of all the boilers in use today in the United States still have lap joints and their manufacture continues.

IMPROVED DESK 'PHONE

The desk 'phone is often in a busy man's way and takes up too much space, also it is frequently knocked off with injurious effects to the instrument. An apprentice in our machine shop contrived the method



To Keep the Desk 'Phone Out of the Way

shown in the illustration for overcoming this difficulty. The device requires two pulleys, a cord, weight and two eye screws. The weight can be a shot bag of sand or shot of the same weight as the 'phone stand, A. The device has proved a great improvement over the old arrangement and is recommended to others.—Contributed by F. A. Grier, Jr., Salisbury, Md.

COMPOSITION OF BABBITT METAL FOR STREET CAR MOTOR BEARINGS

The following compositions are recommended by the Mechanical and Electrical Association:

The following babbitt metal composition makes a long-lived and tough metal, that will not pound out nor be too severe on the armature shaft: 100 lb. tin, 10 lb. copper, 10 lb. antimony.

We are using the following composition with good results: 83⅓ lb. tin, 8⅓ lb. antimony, 8⅓ lb. copper.

Our motor bearings have without rebabbitting an average mileage of 52,100, with an oil consumption costing $0.089 per 1,000 car-miles, the cars being equipped with two 125-h. p. motors.

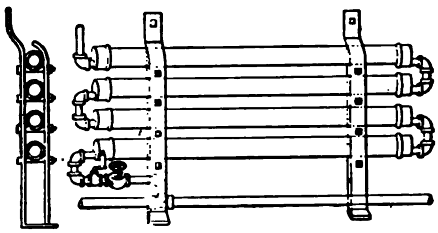
A good composition of bearing metal for motor bearings is: 105 lb. copper, 60 or 55 lb. phosphor-bronze, 9¾ lb. tin, 25 lb. lead. Phosphor-bronze is composed of copper, 79.7, tin 10, lead 9.5 and phosphorus, 0.8 per cent.

10 parts tin to 1 part antimony.

COIL HEATER MADE OF OLD CAR HEATERS

Old discarded street car heaters may be used to make a coil heater suitable for heating large barnlike structures, where doors are opened often and heating is ordinarily a problem. The kind of heater referred to is those made under Gold's patent of 1884.

Each section of the coil heater should consist of a length of 4-in. pipe capped at each end, and with a 1-in. opening tapped near the edge of each cap. Lay the section across a bench made of two barrels and some planks and assemble and connect them. Use short nipples and elbows for connections. Thread the middle nipple at each end, right and left-handed, and have left-handed threads in one of the elbows. Paint all outlets well with litharge. Fix the pitch by putting on wrought iron clamps, as shown in the illustration, when the parts are on the bench.



Heater for Large Building

Make these clamps, says a correspondent of Power, of heavy ⅜-in. iron, with the back bar 1 ft. longer than the heater, and in a manner to serve as a foot and also to keep the heater free from the wall. Have the front bar shorter than the back one, and curve it at the top to hold the upper length of pipe in place. Offset the back bar at the top and bend it at the bottom as shown. Insert ½-in. bolts through the bars between each section of pipe and bolt the back bar to the wall.

Let the steam feed from overhead and put an air valve on the return line to insure circulation.

METAL FOR GONGS AND CYMBALS

A sonorous metal for cymbals, gongs and tam-tams consists of 100 parts copper with 25 parts tin. Ignite the piece after it is cast and plunge it into cold water immediately.

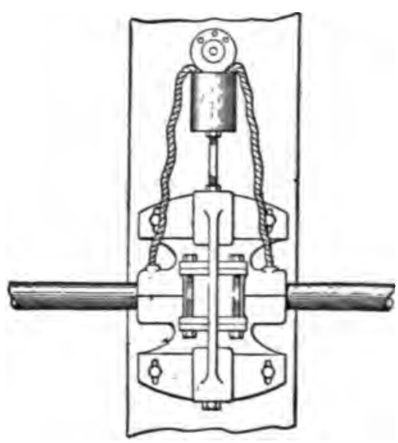
TO DO AWAY WITH SHIMS IN ENGINE BRASSES

In taking up the wear of engine brasses on wrist pin or crosshead pin when the key is driven clear down, back out the key and instead of putting in sheet-iron shims put in a small piece of pine wood of just the right thickness to allow the key to come even with the under side of the strap, then pour in melted babbitt. A hole must be drilled through the flange of the brasses to allow for pouring the babbitt.

Every engineer knows the trouble it is to put several shims between the brass box and the end of the strap, especially if the box is a round-end one, as many are. By using the method described, brasses may be worn up much closer, even if worn through; the babbitt will form part of the bearing. This kink is the idea of W. H. Nostrant, engineer, and will be found worth trying.—Contributed by F. A. Sustins, Stevens Point, Wis.

A CAN SHAFT OILER

To make a good shaft oiler, take a can that is opened at the top, turn the lid back and nail it to the beam. Stretch lengths of hemp packing from the can to each oil hole in the box and fill the can half full of oil. The can must be filled every two weeks.



Shaft Oiler Made of a Can

This method is used by a correspondent of the Engineers' Review for oiling a line shaft 150 ft. long and a countershaft. It works successfully, and he goes over the shafting every two weeks, only; thus saving an hour's work every day.

Original Frieze, "Night"--By Percy Lancaster, London

SMOOTHING TABLE LEGS IN A TUMBLER

A good method of smoothing table legs in a tumbler is described by a correspondent of the Wood-Worker as follows:

I have a tumbler about 6 ft. long and 3 ft. in diameter, with a shaft 11/16 in. extending the entire length of it. On each end and bolted to the head is a cast iron flange 12 in. in diameter, with 3½-in. set screws in the hub of each to hold the tumbler to the shafts; bearings are close to the ends of tumbler. On one end and attached to the head is secured a rim of the necessary size to secure the proper speed, which is 36 revolutions per minute. The tumbler is filled about half full of legs, and a lot of scrap sandpaper is put in with the legs, and the whole falling about together allows the sandpaper to assist in cleaning the legs. Our legs are turned from reasonably good air-dried stock, and after turning are placed in the dry-kiln and allowed to stay two nights and a day before going to the tumbler. In this way the legs become good and dry on the outside, which aids in getting them clean in the tumbler. They are run about two and one-half hours, which in our case cleans the legs well. In this way about 1,000 center table legs may be smoothed per day.

HOW TO ESTIMATE CONTENTS OF CIRCULAR TANK

The capacity of a circular tank may be determined by multiplying the diameter in inches by itself and by .7854 and by the length (or depth) in inches, which gives the capacity of the tank in inches, and then dividing by 231, the number of cubic inches in a U. S. gallon.

Old coins may be cleansed by first immersing them in strong nitric acid and then washing them in clean water. Wipe them dry before putting away.

Original Frieze, "The Storm"--Decorator's Magazine, London

HOW TO TURN A HOLLOW BALL

As most machinists are familiar with the turning of a sphere by means of the compound rest, it will not be necessary to go into details. Assuming we have a ball 1 in. in diameter, and wish to bore out the inside so as to leave a shell 1-16 in. in thickness: A piece of hardwood is clamped in the chuck and the end turned out cup-shaped (Fig. 2, first cut) so it will extend a trifle over the center line of the ball. A little chalk rubbed into the wood will help to hold the ball firmly in position. Now the tool rest (Fig. 1) is clamped in the tool post by an L-shaped piece of stock (L), riveted to the bottom, just high enough to allow the tool, when resting on the support, to come to the center line of the ball. The tool rest is made of two pieces of sheet metal, A and B, which are hinged together on the line CD, allowing A, which is only used as a gauge for setting the tool to be folded down. E, F, and G are guides for the tool holder, the former two also serving as stops. The tool holder, H, is made of ⅜ in. square stock, having a ¼ in. hole in the end to insert the tools, which are held by means of a set-screw, I. Back of this is the guide screw, J, a piece of 3-16 in. stock is fastened to the end just long enough to reach down into the semi-circular aperture cut into B. K is a crosspiece fastened to the bottom of H to insure a wide bearing on the tool rest. To adjust the tool rest in position we measure the distance between the aperture cut in A and the line C-D, say ¼ in. in this case. Now the gauge A is folded down and the carriage moved towards the ball until the line C-D is ¼ in. away from the nearest point of the ball and locked there, then the cross slide is moved to bring the center line of H in line with the lathe centers. If there is any difference between the diameter of the ball and the hole in the gauge plate A, allowance for such difference must be made in adjusting the tool rest. Now the carriage is backed, the gauge is raised on a level with B and the first tool in the shape of a flat drill inserted in the tool-holder in such manner that when the tool-holder is up against the stops E-F-G the point of the drill will be 1-16 in. away from the edge of the hole (Fig. 1). Turning the gauge plate down the carriage is again moved up to the stop and locked there, the ball having been previously centered, we now take the first cut with the tool up to the stop. The chips may be removed by blowing into the hole with a blowpipe. Back up the carriage again and turn up the gauge plate and insert the second tool and turn the guide screw J to such position that both cutting edges of the tool will be 1-16 in. away from the edge of the hole in the gauge at either end. Once more the gauge is folded down, the carriage moved up to the stop and we take the second cut. In each of the subsequent cuts another tool must be inserted, shaped to fit that part of the circle to be cut away, and the guide screw J must be adjusted to the length of the cut.—Contributed by Wm. Lachmich, Chicago.

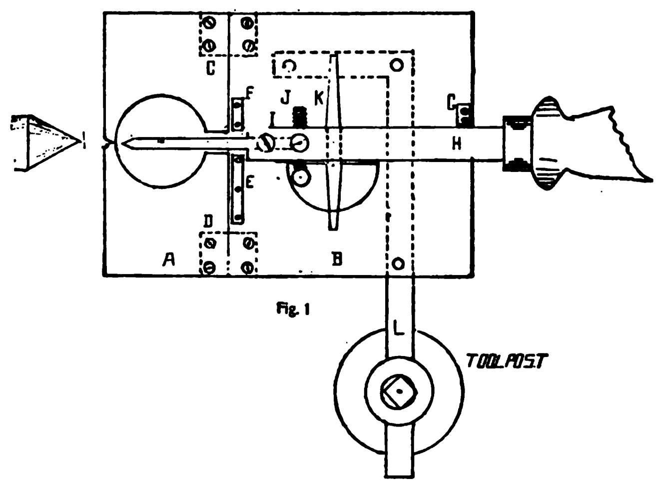


Fig. 1

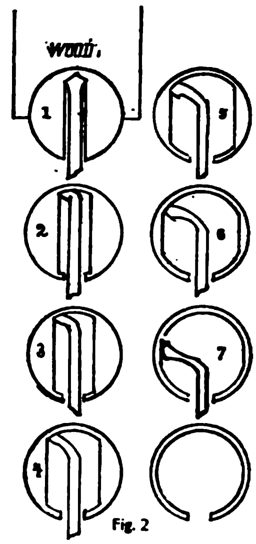


Fig. 2

MUFFIN PANS FOR SCREW CABINETS

Tinned muffin pans make satisfactory drawers for cabinets to hold screws, brads, staples, etc. Procure the required number of pans (they cost about 10 cents each), nail a couple of strips on each side of them, provide the cabinet frame with suitable ways and the arrangement is complete and ideal. This is an idea of a correspondent of Wood Craft.

DEVICE FOR LINING SHAFTING

A convenient instrument for lining shafting, described by a correspondent of the American Machinist, operates as follows:

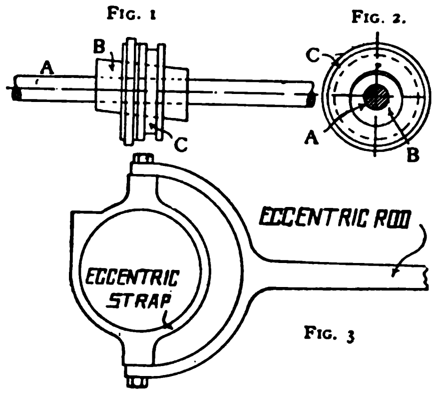
Referring to the sketch, a b is the line to which the shaft ought to be parallel horizontally; a square, c, slides in the slit of the head d, and may be clamped by the screw e to this head; a level, f, is put at a convenient place on the longer edge of the square.

After first securing the line a b so that its two ends are at the same horizontal distance from the ends of the shaft to be lined, put the head d on one end of the shaft and slide the square in the slit of the head until its vertical edge is about 1/16 in. or so from the line a b, while by the level f keeping the longer edge of the square horizontal. Then by the screw, e, clamp the square to the head and proceed along the shaft, putting the head d on the shaft and leveling the square to see whether the line a b be just at the same distance from the vertical edge of the square as when the latter was adjusted at the end of the shaft.

SINGLE ECCENTRIC REVERSING GEAR

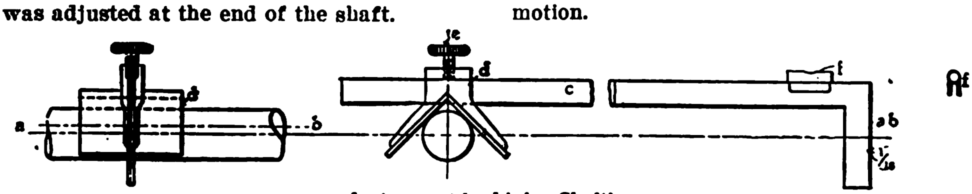
A single eccentric reversing gear, simple in action and efficient, is described in the Model Engineer, London.

Figure 1 is a front elevation of sheave and crankshaft; B is a disc, or cam, bored and turned diagonally as shown, and is



Simple Reversing Gear

keyed on shaft A, the throw at either end being equal to the travel of valve. C is a loose sheave and lever-clutch, which works on a feather-key let in B, and is operated by a forked lever, which is fitted with a pawl, and works in a quadrant placed horizontally, so that when moving the lever from right to left, or vice versa, it would operate the sheave and clutch, and thus reverse the valve from full forward to full backward or cut-off at any point of the stroke by simply notching up, as in link-motion.



Instrument for Lining Shafting

By this method it is not necessary to know the varying diameter of the shaft, and no scale or graduation is wanted.

SEALING WAX RECIPES

To make black sealing wax use 5 parts shellac, 9 turpentine, 6½ pine resin, 4 chalk and 1¼ soot. For blue, use 7 parts shellac, 6 turpentine, 3½ pine resin, 1 magnesia, 2 chalk, 2 blue coloring matter.

Figure 2 is an end view of shaft and sheave, and Fig. 3 shows the eccentric strap with forked rod, in order to accommodate itself when thrown out of center line with valve spindle.

This attachment was fitted to a portable engine used for winding purposes at a small colliery.

HOW TO MAKE A DOG OR GRAB

A dog or grab, easily made and without a weld, requires a piece of iron 4 in. wide, ½ in. thick and 7 in. long which is enough for one pair. Split the iron with a hot chisel, as indicated in Fig. 1. Sharpen the bit, place the dog, back down, on the anvil and beat down until it is in the shape

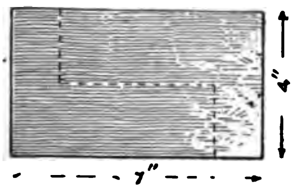


Fig. 1

shown in Fig. 2. Punch a hole at A, Fig. 2, and round up the eye on the anvil horn so it will work easily in the link. The finished dog will look like Fig. 3. The point

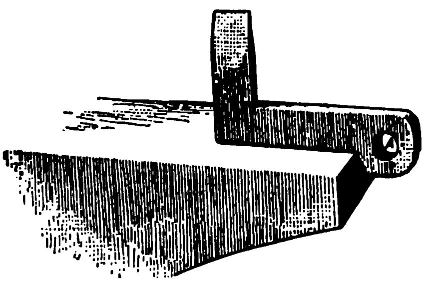


Fig. 2

should set in toward the eye ¾ in., so it will draw when driven into the log, says a correspondent of the Blacksmith and Wheel-

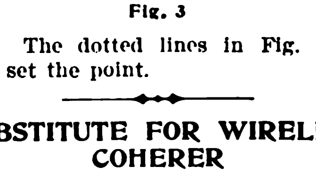


Fig. 3

wright. The dotted lines in Fig. 3 show how to set the point.

SUBSTITUTE FOR WIRELESS COHERER

In experimenting with wireless telegraphy, writes Everett R. Hough of Johnstown, N. Y., I have found that an ordinary telephone transmitter will answer in place of the coherer, if one of the latter is not at hand. The decoherer hammer can be arranged to strike the transmitter and so jar the carbon particles apart after they have once cohered. It works very well, and is much better for a beginner to use than are many of the home-made coherers I have seen.

CEMENTS FOR IRON

To make a good cement for iron on iron make a thick paste, with water, of powdered iron, 60 parts; sal-ammoniac, 2 parts, and sulphur flowers, 1 part. Use while fresh.

Another consists of sulphur flowers, 6 parts; dry white lead, 6 parts, and powdered borax, 1 part. Mix by sifting and keep as a dry powder in a closed tin box. To use, make into a thin paste with strong sulphuric acid and press together immediately. This cement will harden in five days. Recommended by the American Machinist.

REMOVING STRAINS IN METAL BY HEATING

In making springs of piano wire, or, in fact any wire, if the metal is heated to a moderate degree the spring will be improved. Piano or any steel wire should be heated to a blue, brass wire to a degree sufficient to cause tallow to smoke. Heating makes the metal homogeneous; before heating it is full of strains.

If a piece of metal of any kind is straightened cold and then put into a lathe and a chip turned off, it will be far from true. Before turning it was held true by the strain of the particles on the outside, they having changed position, while the particles near the axis are only sprung. The outside particles being removed by the lathe tool, the sprung particles at the center, return to their old positions. If, after straightening, the metal is heated to a temperature of 400 deg. the particles settle together and strains are removed.

This is the case in the manufacture of saws. The saw is first hardened and tempered and then straightened on an anvil by means of a hammer. After it is hammered true, it is ground and polished a little, then blued to stiffen it and then is subjected to the grinding process. Before bluing the metal is full of strains; these are entirely removed by the heat required to produce the blue color.

Often a piano wire spring will not stand if used without heating, while if heated it will last for years.—Contributed by J. H. Beebee, Rochester, N. Y.

SHOP NOTES

HAMMER MADE OF PIPE

A very handy hammer can be made for little or nothing, provided one has a few old materials on hand.

Into a ½-in. tee (B) screw a piece of ½-in. pipe (A) about 8 in. long with threads on one end and two pieces of ½-in. pipe (CC) 2½-in. long with threads on both ends. On the ends DD put ½-in. caps.

A larger hammer can be made by using pipe of larger dimensions, and the hammer can be made heavier by stopping up the tee and filling the head with lead.—Contributed by H. G. Stiebel, Jr., 3207A Olive street, St. Louis, Mo.

A HOME-MADE TRIP-HAMMER

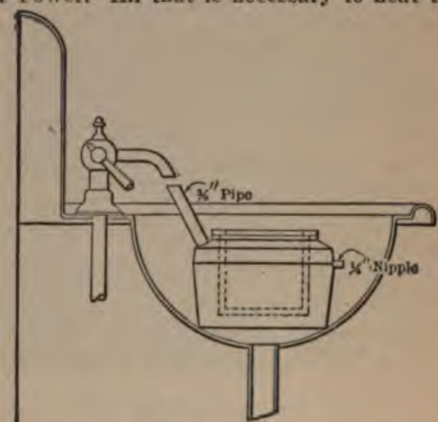
A trip-hammer like the one shown in the illustration was used for eleven years, turning horseshoes, laying plowshares and other work without a break, says a correspondent of the Blacksmith and Wheelwright. A good sapling with considerable spring in it is secured in the wall to make the spring and the striking hammer is of 16 or 18 lb. It is operated by foot-power. One man and his helper can rig the device up in one day.

Foot-Power Trip-Hammer

GLUE-MELTING DEVICE

A handy device for melting glue is made as follows:

Tap a hole at one side in the top of an ordinary glue pot and put in a piece of ⅜-in. pipe about 4 in. long. At the opposite side drill a hole and tap it out for a ¼-in. nipple. In case it be desired to use the pot in any other way, a plug may be substituted for this nipple, says a correspondent of Power. All that is necessary to heat the



For Melting Glue

glue is to set the pot in the wash basin and turn the hot water into the ⅜-in. pipe. The hot water supply in many plants comes from the feed-water heater, which is an excellent arrangement. This is a neat and speedy method of getting hot glue.

TO REMOVE CAN COVERS

To remove a tight fitting screw cover to a can rub a little chalk on the top and wrap a piece of sandpaper around the cover with the sand side next the can. The top can then be removed without trouble.—Contributed by J. C. Fox, Sabetha, Kan.

Linseed oil and benzine, half and half, with burnt umber or Vandyke brown incorporated with the mixture, makes a good brown stain for oak or ash. Apply in the usual manner and finish as desired.

AIR SUPPLY FOR PYROGRAPHIC OUTFITS

Some time ago I purchased a wood-burning outfit such as are on the market for scorching fancy designs on wood. The outfit consists of a small bottle for benzine, a squeezing bulb for supplying air at a low pressure and a needle with a hollow platinum point, this needle is kept red hot by means of the mixture of air and the fumes from the benzine.

After using the outfit for a short time I hit upon the following arrangement for giving a steady supply of air and at a higher pressure, and so doing away with the hand bulb, leaving both hands free to hold the work and apply the needle.

The engraving shows two 30 gallon tanks,

Tank Arrangement for Air Supply

the kind ordinarily used for hot water heating. They need not be new as they are costly. They can usually be had at any plumbing shop second-hand. I paid 50 cents apiece for mine and had any leaks soldered tight.

These tanks, as will be seen by the illustration, are connected across the top by ¼-in. pipe with ¼-in. globe valves on each one and the pressure gauge placed in the middle, thus making one gauge show the pressure on either tank, independently, or on both of them.

At the rear of the right hand tank a connection is made by means of a piece of hose to the city water supply, being controlled by a ¾-in. globe valve; at the front end will be seen a ½-in. check valve, while above it is a bushing and plug to stop up the opening as this hole is not required. At the bottom of the tank is placed a ¾-in. lobe valve to drain off the water.

At the rear end of the left hand tank will be seen a length of ¼-in. pipe which is carried around on to the front porch where it terminates with a ⅛-in. globe valve and a short nipple for attaching the rubber tube and needle, the benzine bottle, of course, being connected in between the valve and needle.

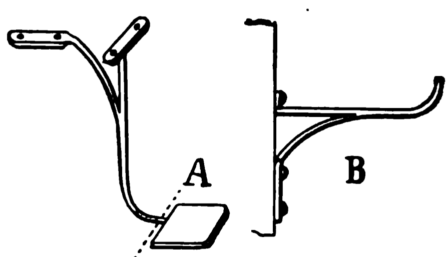
The method of obtaining a supply of air is to allow the water to run into the right hand tank, the valve at the left of the gauge being closed. The water is allowed to run in until the gauge shows the pressure of the water main, in this case about 55 lbs. The resulting supply of compressed air is then admitted to the other tank, the water supply is cut off and the water drained away, being assisted by a slight pressure of air still left in the tank and then by means of the check valve which opens up, admitting air to the tank.

It will of course be understood that only enough air will pass over to the air tank to make the pressure equal in both of them. In this case, the first charge nets me a supply at 10 lbs. pressure; by repeating the process five times more I get a supply at about 40 lbs. which is the limit with the pressure available.

The waste water I use to irrigate the flower beds; the tank when charged at 40 lbs. will last for three or four days, as the supply required in burning is very small.—Contributed by Everett E. Pomeroy, Los Gatos, Cal.

HARNESS HOOKS OF OLD BUGGY STEPS

Old buggy steps make good harness hooks, much stronger than the harness hooks one gets at the stores, writes Henry J. Heaton,

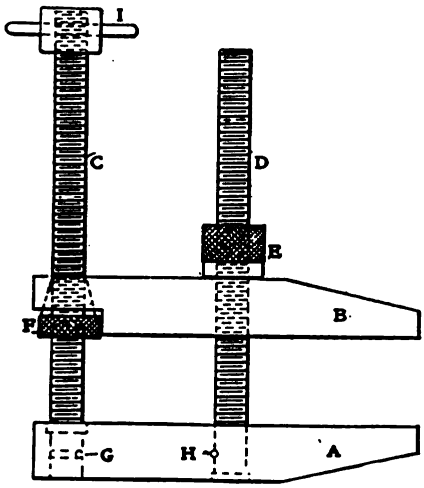


Strong Harness Hooks

of Sidney, Iowa. Cut off the step at the dotted line, A, and nail the hooked part up as shown at B.

HOW TO MAKE A PARALLEL CLAMP

A handy tool-maker's clamp which is self-contained and does not need a wrench is described by a correspondent of the American Machinist. The jaw A is counterbored for screws C and D—the latter a running fit, the former a driving—secured by the steady pins, G and H. The jaw B is recessed, bored and counterbored for the tapered nut F and a rather loose fit for the screw, D.

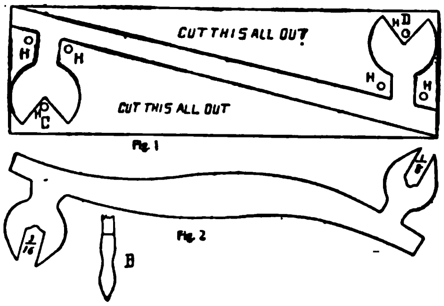


Tool-Maker's Parallel Clamp

In operation, adjust both the knurled nuts to your work and tighten up by the handle, I, and the screw, C. The tapered nut, F, grips the jaw, B, firmly without further aid while tightening by the handle. Both knurled nuts are slightly smaller than the jaws of the clamp, which lies flat with the work. All parts are drawn to scale.

MAKING A WRENCH

It is just as important that a wrench should be balanced as that a hammer should be. In making an S-wrench, do not give it too much hook, as you can not handle it so fast. The illustrations show how to make a tire-bolt wrench, called a side wrench. It is made of a piece of spring plate 1¾ in. by 6 in. Parts C and D are worked over the hardy, having care not to punch the holes at these points too far back. H indicates holes punched in material to be cut away. Part A, Fig. 1, should be beveled from the center and made as wide as the material will allow. B, Fig. 2, shows the pointed jaw and how it is beveled on the handle. This wrench will work in places that other

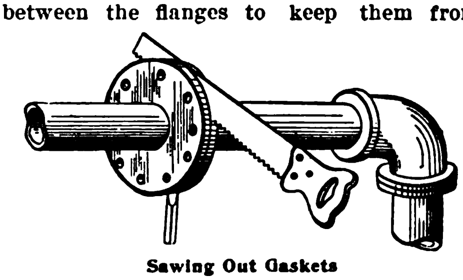


Home-Made Wrench

wrenches will not.—Contributed by James N. Keach, 803 Clay street, Bloomington, Ill.

TO REMOVE PACKING FROM A FLANGE JOINT

When the pipe can be sprung apart far enough to allow a scraper to work between the two flange faces, it is easy enough to remove old packing from flange joints, but often this is impossible. A correspondent of the Engineers' Review had a pipe running from a head which was anchored solid across the room and running down along the wall as shown in the illustration. When the flange connection in this pipe began to leak, he drove a cold chisel in at the bottom between the flanges to keep them from



Sawing Out Gaskets

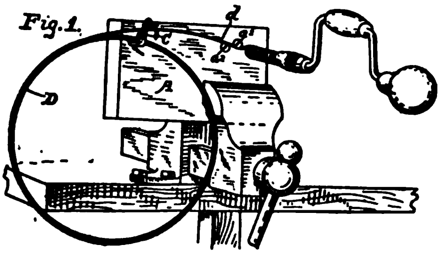
springing together, then sawed out the packing with an old hand saw. When he had sawed half way through, a chisel was driven in from the top and the rest of the gasket cleaned out. A new gasket was then inserted and the flange bolted together.

Red lead and glycerin, equal parts, kneaded to the consistency of putty is said to make an excellent cement for iron on iron. Mix fresh as needed and use quickly.

Index to Vol. VII, January to December, inclusive, 1905, is ready for distribution and will be sent free upon request.

TOOL FOR MAKING WIRE SPRINGS WITH A BRACE

Get a hardwood board (A) about 12 in. long, 6 in. wide and ⅞ in thick. At one corner bore a hole (a, Fig. 2) of the size that the inside diameter of the spring is to be. Set two flathead screws (a^1 and a^2) in the board in the positions in relation to the hole indicated in Fig. 2. At the opposite end of the board, near the upper cor-



Making Wire Springs

ner, place a hook (C, Fig. 1) to receive the reel of wire (D) of which the springs are to be made. Then fasten the board in a vise or other convenient place.

Secure a rod (B) the size of the hole and 12 to 18 in. long (sufficiently long to make the length of spring desired, or several springs may be made in one coil and then cut to length). Fasten one end of the rod and one end of the wire (d) in the chuck of the brace (see Fig. 3), hooking the wire under screw head a^1 and over a^2 and hanging reel D on hook C. Proceed to turn the brace handle the same as in boring a hole, slightly pressing against board A and backing the brace out as the wire is wound on rod B. Continue this operation until the desired amount of spring is wound on the rod.—Contributed by Chas. N. Leonard, 1319 'rth avenue, Indianapolis, Ind.

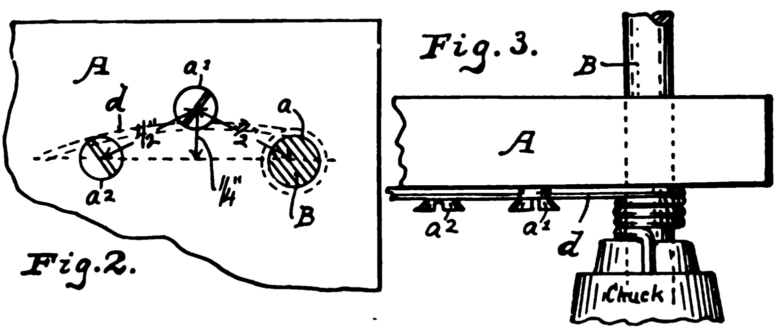
HOW TO ATTACH ENAMEL LETTERS TO GLASS

Not all sign painters know how to attach enamel letters, though it is a simple matter when once learned. Clean the glass and draw the lines of the lettering with chalk. If it is to be a curve use a string in the usual way. Space the lines off and you are ready for the lettering.

For this purpose a reliable cement will be required. Plaster the cement on the letters with a knife, being careful to have the part around the edge full, then place each letter in turn on the glass and press it up and down gently and firmly to get all the air out, then push to place. Be very careful not to bend the letters, says the Master Painter. Give large letters a second coat before putting them in place. It is only necessary to fill the edges of concave letters with cement; the flat letters must be pasted all over the back. Hold large letters in place, until the cement has time to set, by a bit of wax. When the cement has set remove any that may be around the edges of the letters and clean up the glass.

White lead in oil, thickened with dry lead, thinned properly with copal varnish and worked well on the stone with a spatula or elastic blade putty knife, makes a good cement.

A pocket knife and wood alcohol will remove old letters. They nearly always break, and the enterprising painter will always have a number on hand for supplying the need, at a neat profit to himself.



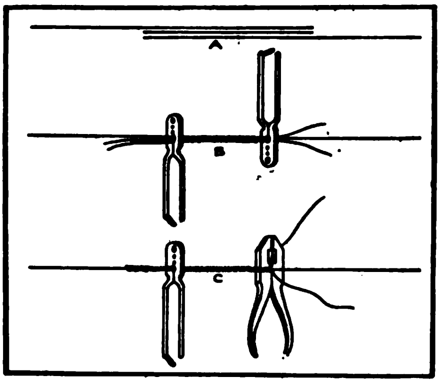
Details of the Spring-Making Device

REPAIRING A LEAKY GUTTER

To repair a leaky gutter, put putty in the hole, smooth it off with a putty knife and paint over the spot with a mineral or an oil paint.—Contributed by Gordon M. Backus, 32 Euclid avenue, Hackensack, N.

HOW A THREE-WIRE SPLICE IS MADE

Two pairs of connectors are required to properly make a three-wire splice in order to have the joints long in the "neck" and



Making a Three-Wire Splice

not mar the galvanizing at that part of the joint. In iron line construction the skilfully made three-wire splice will eliminate the necessity for soldering, says the American Telephone Journal, and insure freedom from high resistance joints. The superior conductivity of these joints consists not in the cross turns at the ends, but in the spiral twist at the neck. To make the splice proceed as follows:

Overlap the ends to be spliced about 18 in. and cut a third wire 18 in. long of same gauge and lay it with the ends to be spliced (Fig. a). Clamp two pairs of connectors over all towards the center and about 5 in. apart and revolve connectors in opposite directions, slowly, so as not to "burn" the wire (Fig. b). Care should be taken to revolve connectors evenly and at the same speed. Turning one pair faster than the other will result in a "humped" joint. When the wires have been twisted to a tight lay, remove the connectors and clamping one pair on the neck to hold the work, use pliers and finish the end with six or seven cross turns the same as in an ordinary W. U. splice (Fig. c).

CLEANING WINDOW GLASS

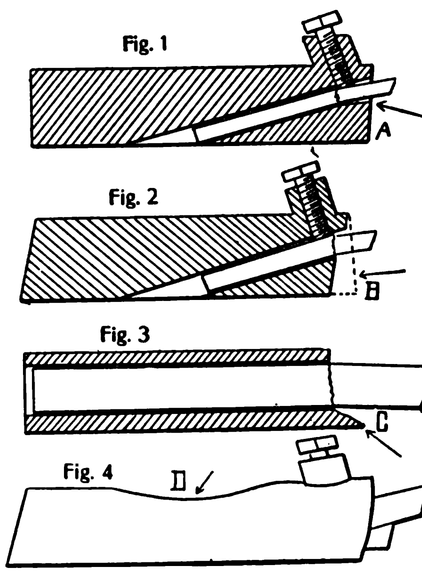
To thoroughly clean window glass pass diluted sulphuric acid, about as strong as vinegar, over it, and let it act a moment; then throw on just enough pulverized whiting to give off a hissing sound, directs the Master Painter. Rub both over the pane —ith the hand and polish with a dry rag. Rinse with clean water and a little alcohol, polish dry and clean. Treat both sides of the glass in the same way.

THE READY-MADE LATHE TOOL

Old mechanics looking back over their history as such can remember the days before the patent lathe tools. In those days they were obliged to forge their own tools into the desired shape. Modern improved tools can be ground to any desired shape and used in most any position, their use, however, requires a certain amount of judgment.

Figure 1 shows the effects on a small tool used for too heavy duty. This tool was made for a 12- or 15-in. lathe, but was used in a 30-in. lathe. The bottom at A is worn away until the pressure of the screw breaks the steel.

Figure 2 shows the effect of grinding without removing the steel. The under support is completely ground away at B. Figure 3 shows a cutting-off tool allowed to hog in and break, battering down the support, C. Figure 4 shows the effect on a small tool which was used in a large lathe. The powerful screw mashed the tool at D.



I recently looked over a number of patent tools of different makes. They had been used about one year and were a sad looking pile of junk. A lack of good judgment had sent them to the scrap he—— —Contributed by Paul S. Baker, ——tine, Ia.

CONTINUOUS MIXING OF CONCRETE

[Extract from a paper by E. N. Trump, read before the American Society of Mechanical Engineers.]

Of the methods mentioned the revolving table, with a stationary spout above its center, has been considered the most accurate, and is much used in cement manufacture for feeding mills, etc. Its defect is the change in the natural slope of the material, which varies the amount cut off by the diverting blade as indicated by dotted lines in Fig. 1.

If we make the table of relatively large size and distribute the material in a uniform layer upon it, as shown in Fig. 2, the stationary knife, or diverting blade, may be pivoted so as to take off a predetermined quantity in one revolution, and if the layer is thin, variations in the natural slope on the edge will affect the accuracy very little. As the table revolves the stationary knife will divert the material in front of it over the edge of the table and it will fall in a continuous stream into the chute. If the material is replenished on the table so that the layer taken off by the knife is restored to exactly the same shape as before, and is continuously removed by the knife, an accurately measured quantity will be iverted.

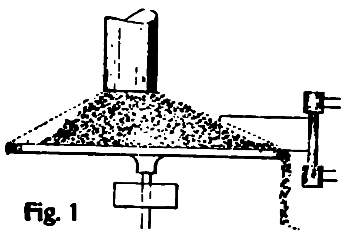


Fig. 1

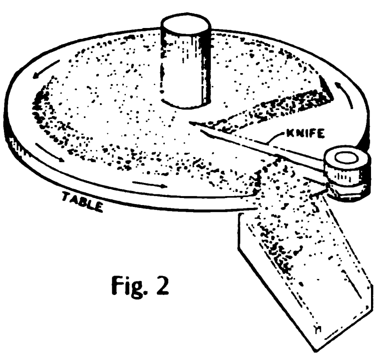


Fig. 2

By adding to the table a bottomless storage cylinder, somewhat smaller in diameter, with its lower edge spaced a distance above the table sufficient to clear the knife and yet near enough to the table so that the material flows out from under the edge of the cylinder and takes its natural slope, we shall have the condition represented by Fig. 3.

The cylinder being supported by arms from the central spindle may be filled to the top by means of the chute, and as the knife removes the section represented by its path over the table, the material from the cylinder above will take the place left vacant, and will come out under the edge of the cylinder to the extent of its natural slope. While this slope may vary a little this variation is a very small part of the amount diverted by the knife, and as the material composing nearly the whole base of the cylinder is cut away the space behind the knife is filled from above with nearly uniform pressure, and in practice the natural slope angle is almost exactly the same, in spite of considerable differences in height and material within the cylinder.

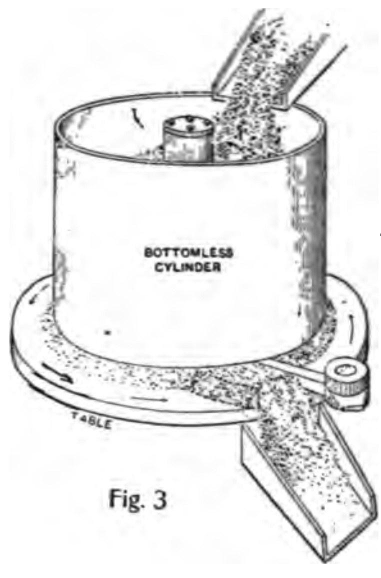


Fig. 3

After deciding on the distance between the bottom of the cylinder and the table, and the width of the knife, the other factors, which determine the amount of material measured off in a given time, are the speed and rotation and the depth of the cut of the knife, and these are both adju

The depth of cut of the knife is adjusted by swinging the knife around on its pivot so that it extends a greater or less

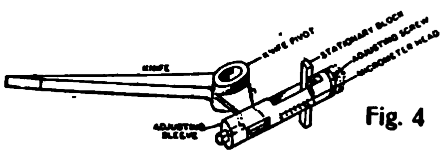


Fig. 4

distance into the material. This swing is controlled by a screw attached to an arm, cast as part of the knife, and a micrometer scale with pointer shows the amount of movement. This is shown in Fig. 4.

The mechanism described above may be employed for the feeding of a great variety of materials, varying considerably in size and consistency, and if the size of the table, the shape of the cylinder and the size of the knife and space between the cylinder and the table are properly adjusted, almost any kind of crushed material may be fed.

The variations in size may extend from fine powders, like cement, to rocks of 6 in. cube. In the case of the larger sizes the

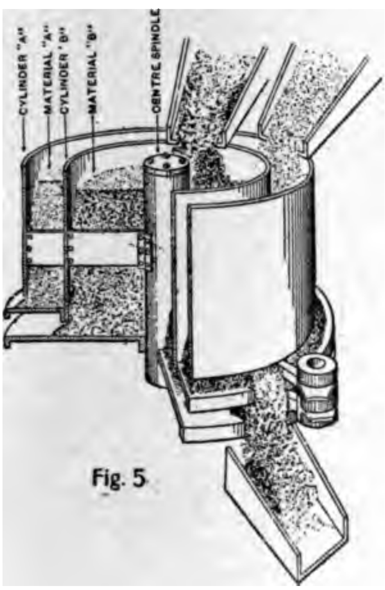
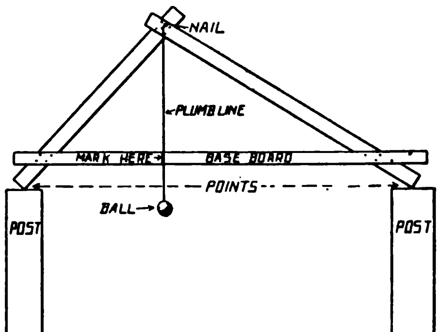


Fig. 5

space between the bottom of the cylinder and the table is made considerably higher than the height of the knife, as the space between the bottom of the cylinder and the top of the knife must be sufficient to let the largest pieces pass through without catching. The amount diverted by the knife is not dependent upon its height, but on the height of the space under the cylinder.

LEVELING TWO POINTS WITHOUT TOOLS

To level up two or more points which are far apart, as posts, etc., without a level, straightedge or square, all that is required is a few nails, three pieces of old board, a



Leveling Device

piece of cord and a small weight, to be used as a plumb bob. Nail the boards together as shown in the illustration at any angle, place the two points of the boards on top of the posts and mark where the line crosses the baseboard. Turn the device about, end for end, and mark the baseboard again. Then raise or lower one of the posts until the plumb line hangs midway between the two marked lines and the posts will be level.—Contributed by Thos. McIntyre, 407 Root street, Chicago, Ill.

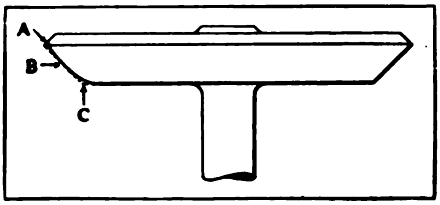
COUPLING A TANK-HOSE

Every engineer knows what a moist job it is to couple up a tank-hose after disconnecting it for the purpose of cleaning the strainer, says Locomotive Engineering. Very few tank valves will shut down perfectly tight; and the leakage, when attempting to connect the hose, is not appreciated by the man who is doing the coupling. Here is a simple remedy: When all ready to couple the hose, start the primer of the injector, when all of the leakage will be drawn into the suction pipe by the strong vacuum so created.

Contributions to the Shop Notes department are invited. Your experience and handy devices are valuable to others also. Pass it on.

LAST RESORT REMEDY FOR A LEAKY VALVE

When every other remedy for a leaky inlet or exhaust valve has failed, try this: Chuck the stem of the valve in a high-speed lathe, and with as fine a flat file as



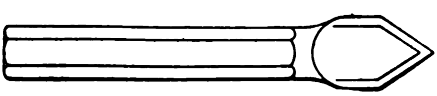
Repairing a Leaky Valve

can be obtained, while the valve is revolving in the lathe at a high rate of speed, touch lightly at A (See sketch), skip B and take off the corner C, leaving the valve with a slightly rounded instead of a flat seating surface. It has been found that this method is sure when others fail, says Motor Way, and that a valve so dressed will hold well for months afterward. It does not matter which way the stem wabbles, for the valve always finds a perfect seat, on account of its spherical shape, the action being similar to that of a ball check valve.

HANDY MARKING CHISEL

A marking chisel is a convenient tool about the engine room. One of the instances in which it can be used to advantage is in marking the eccentric so that it can be readily reset should it slip on the engine shaft.

It is often difficult to mark the eccentric and the shaft so that the lines come exactly opposite. With the tool illustrated this is



Chisel for Marking

made easy, says a correspondent of the Engineers' Review. The cutting edge is made as shown and not at right angles with the side. The point strikes first and makes a true mark on the eccentric hub. By turning the chisel in the opposite direction a mark is made on the engine shaft.

A freshly painted room should not be closed up tight, but opened to the air and light. Paint with driers in it will not dry corked up tight in a bottle.

KEEPING SOLUTIONS IN BOTTLES

It is well known that solutions of easily oxidized substances do not keep so well in bottles which are partially empty as when they are full and The Photogram suggests the following as an excellent method of overcoming the difficulty. Keep on hand a quantity of small glass marbles, and whenever any of the solution is poured from the bottle add sufficient to bring the solution again up to the neck.

NOTES ON SOLDERING

I had not been long out of college when I was first sent out as a road engineer, so it was not to be expected that I would know very much. In those days, I even throught that a soldering iron was made of iron, writes a contributor in the Electric Journal.

When I first used a soldering iron on wire joints, I held a dry iron under a joint and waited for the wire to heat enough to melt the solder placed upon it. After floundering around at that awhile and making a bad job of it, I began to remember how I had seen others do it, and then I placed some solder on the iron and held the iron with the molten solder against the joint, which soon began to sizzle, and as it was clean and well fluxed, the solder flowed at once all through and over it.

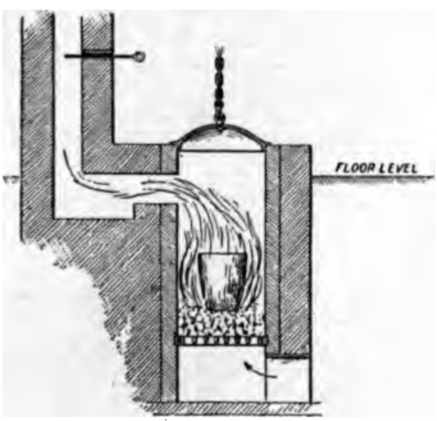
In college, I had taken a course in physics under Professor X. and had heard all about conduction, convection and other things concerning heat, and also knew that copper is a good conductor of heat. But it did not occur to me, in the present instance that those principles had anything to do with the work in hand. After I had mastered the job, I began to see their connection with it.

A soldering iron, when in use, may be considered a reservoir of heat and the object in view is to get as much of the heat as possible into the wire. When the iron is held against the joint it touches only the high spots and there is a thin film of air between, no matter how smooth the surfaces may be. This air is a very good heat insulator, though when solder is run into this space, it unites with both iron and wire and acts as a bridge over which by the principle of conduction heat flows rapidly into the wire from the reservoir.

Clean and hot are the two essentials. One trouble with some novices is that they only half appreciate that statement and seem to have an idea that the solder is the only thing requiring heat, whereas all surfaces to be joined must be brought to the temperature of molten solder before union can take place. This mistaken idea does not lead to much difficulty when the work is confined to joining small wires, for in that case, a small quantity of molten solder contains sufficient heat to quickly raise all parts of the joint to the required temperature. But when large wires or any bulky pieces of metal are to be soldered, this idea leads to trouble.

BRASS-MELTING FURNACE

A good furnace for melting brass is built with a cylindrical fire space, lined with fire brick set in clay and provided with a grate that can be dumped, says the Blacksmith and Wheelwright. The chimney is of sufficient height to insure a good draft and is



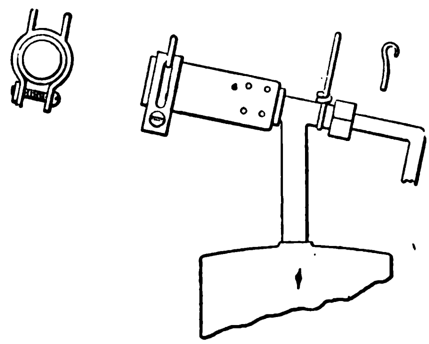
Furnace for Melting Brass

supplied with a damper to regulate the draft. Dome-shaped cast iron covers are used for the tops of the furnace and these may be raised or lowered by means of a chain passing over a pulley. The furnace may be built below the surface of the floor or ground, with a pit for removing the ashes and supplying draft, or entirely above the ground. In the latter case steps and a platform must be used to reach the crucible in which the metal is melted.

A very small furnace may be built of heavy sheet iron, shaped like a cylinder stove and lined with fire brick. Coke or coal that will burn without smoke may be used.

HOLDER FOR SOLDERING-IRON ON GASOLINE TORCH

Many gasoline torches are not fitted with a holder for soldering irons. To such torches this convenience can be attached in the shop. The illustration, from Power,

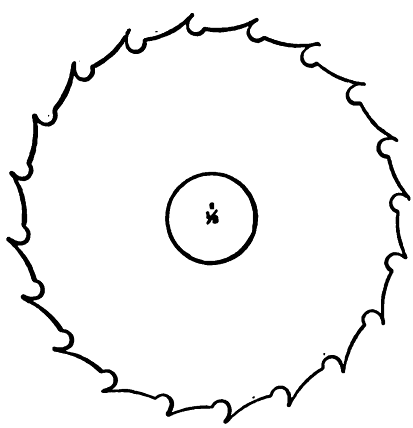


Home-Made Soldering-Iron Holder

shows how this is done. An old hose-clamp, taken from ¾-in. garden hose and two pieces of wire are the materials used.

SAW FOR MILLING GERMAN SILVER

German silver in almost any form is very hard to work, but the cutter shown in the illustration will cut it satisfactorily and outwear the ordinary cutter, says a correspondent of the American Machinist. An



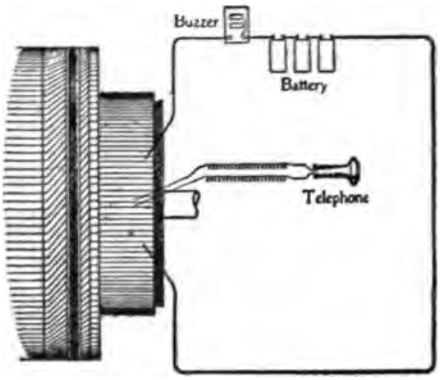
For Milling German Silver

ordinary stock cutter is used and every other tooth is ground down. The grooves are made with a narrow wheel with the periphery made round. One of these saws has cut over 2,000 pieces and is still sharp.

TESTING A CLOSED WINDING WITHOUT DISCONNECTING

A convenient device for testing a closed winding without disconnecting the winding from the commutator consists of three dry battery cells, a buzzer for interrupting the current and a telephone receiver.

To locate a short circuit, says the Electric Journal, pass the interrupted current



To Test a Closed Winding

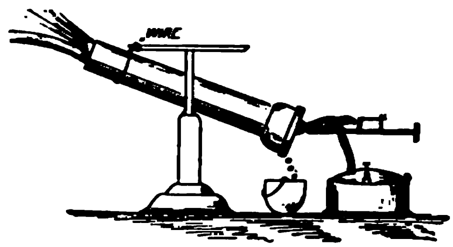
from this apparatus through the winding (see sketch) and move the leads from the receiver from bar to bar on the commutator. There will be no audible vibration in the receiver if there is a short circuit between the bars of the commutator or winding; if these, however, are clear of short circuit at the point tested there will be a distinct vibration or buzzing. The vibration will be more distinct if an alternating circuit of 200 or 100 volts is handy and after attaching the leads of this circuit to almost any part of the commutator of the armature to be tested, the same method as before is followed.

CRIMSON TONES FOR SILVER PRINTS

Silver prints may be toned to a crimson or carmine color by the following process: Make a bath by dissolving 75 gr. ammonium sulphocyanide with 20 gr. iodide of potassium in 3 oz. water. Add 4 gr. gold chloride dissolved in a little water, making up as much of the bath as necessary for immediate use. Carry the printing only to the depth required when finished, then wash the prints well and immerse them in the toning solution. After which fix, wash and dry m. Let them remain in the fixing bath less than fifteen minutes, says the Journal of the Photographic Society of India. The bath described above will produce pictures of a bright crimson by toning from a half to three-quarters of an hour.

TO MELT OLD LEAD PIPE

Having occasion to melt up a lot of old lead pipe I prepared the device illustrated.



Lead-Melting Device

It consists of a boiler stand, a piece of 3-in. soil pipe about 2 ft. long and a firepot of the type shown with the burner reversed. The dross and most of the dirt are burned up in the pipe, only clear lead dropping out. It is surprising how fast lead pipe will melt in this way.—Contributed by R. Stanton, Portland, Ore.

A PIPE-THREADING KINK

Often when threading pipe with a solid die from 1 inch down, it requires considerable muscular exertion with the ordinary small stock. To save strength, make a square of wood to fit any larger stock with larger handles, or have the piece made of iron if preferred. Use the proper bushings and it will work to perfection.—Contributed by H. B. Heineman, Sheboygan, Wis.

HOISTING WITH AN AUTO

An auto which is used for passengers on Sundays and as a hoisting machine on other days, is described by a correspondent in the Automobile. He says:

The machine is a steamer with a cylindrical gasoline fired boiler and an ordinary double cylinder link motion engine developing about 4 hp. The windless attachment is carried on a special frame which is firmly clamped to the rear axle and driven by the sprocket chain which for the time being is removed from the driving sprocket of the car. The gear on the windlass gives a reduction of about 70 to 1 from the driving sprocket to the carved sp-the hoisting rope. I use the rig chiefly for installing elevators. The windlass is jacked down from the elevator entrance, or it may be fastened in any convenient place to withstand the strain. The tackle I use is about 800 ft. of 1¼-in. manila rope with a three-sheave 10-in. pulley block and a two-sheave 10-in. block, giving a leverage of 5 to 1. We generally run the engine with a boiler pressure of 50 lbs. per square inch. The boiler is tested to 300 lbs. The boiler is fired with gasoline, and one man operates the entire affair.

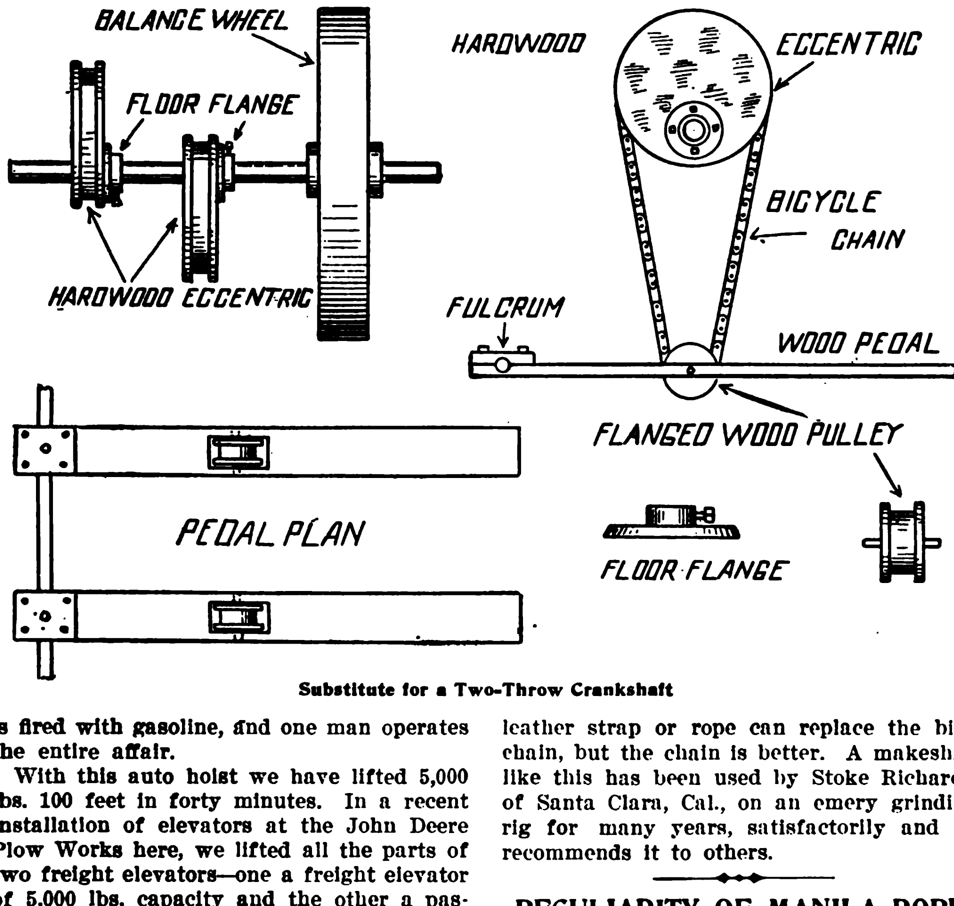
With this auto hoist we have lifted 5,000 lbs. 100 feet in forty minutes. In a recent installation of elevators at the John Deere Plow Works here, we lifted all the parts of two freight elevators—one a freight elevator of 5,000 lbs. capacity and the other a passenger elevator of 2,000 lbs. capacity—to the roof of a new eight-story building.

With the old hand method, it would take six men about six days to do the amount of work that one man can do in two days with the auto hoister.

When going out to a job, we load all the tackle and the windlass on the car, and it will carry the load to any part of St. Louis under its own steam. The fuel consumption in hoisting will average about five gallons of gasoline for 1½ days' work.

SUBSTITUTE FOR A TWO-THROW CRANKSHAFT

A substitute for a two-throw crankshaft which costs about 50 cents is shown in the illustration. The shaft costs about 40 cents and the floor flanges 10 cents, and the device takes the place of a crankshaft 1 in. in diameter with two cranks in center of shaft which would cost not less than $5. The outfit need not be made double and a leather strap or rope can replace the bike chain, but the chain is better. A makeshift like this has been used by Stoke Richards, of Santa Clara, Cal., on an emery grinding rig for many years, satisfactorily and he recommends it to others.



Substitute for a Two-Throw Crankshaft

PECULIARITY OF MANILA ROPE

Manila rope does not show, from the outside, the actual amount of wear that really must be present. In ropes of this character, says the Engineering and Mining Journal, the principal effect of use is shown in the grinding up of the fibres comprising the core, wearing it into short pieces, or even into powder. This is especially noticeable with ropes that pass over sheaves or pulleys of small diameter.

BREAKING STRAIN OF WIRE ROPE IN FREIGHT ELEVATOR SERVICE

The maximum safety load of a wire rope should never be exceeded even in freight

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	250	[illegible]
5/16	[illegible]	[illegible]	300	[illegible]
[illegible]	[illegible]	[illegible]	365	[illegible]
9/16	[illegible]	[illegible]	467	[illegible]
[illegible]	2	[illegible]	5[illegible]3	[illegible]
3/4	2 1/4	[illegible]	864	3/4
7/8	2 3/4	[illegible]	1350	2 1/2
1	3 1/8	155	1600	3
1 1/8	3 1/2	200	2000	4
1 1/4	4	250	2700	5 1/2
1 3/8	4 1/2	300	3300	6 1/2
1 1/2	4 3/4	365	3900	8

service. The National Engineer gives a table showing the breaking strain of several diameters.

TO KEEP A WINDOW FROM RATTLING

To stop a window from rattling when the wind is high, procure some leather washers, about 1 in. in diameter, from the hardware store and nail them with one nail only, through the side (not center) to the board that fits against the window sash. When you wish to raise the sash, slide the washers around on their axes to the front; or when you wish to keep the sash from rattling, crowd the washers between it and the board. Contributed by Gordon M. Backus, Hackensack, N. J.

A good formula for violet-colored bronze is 50 parts copper and 50 parts antimony.

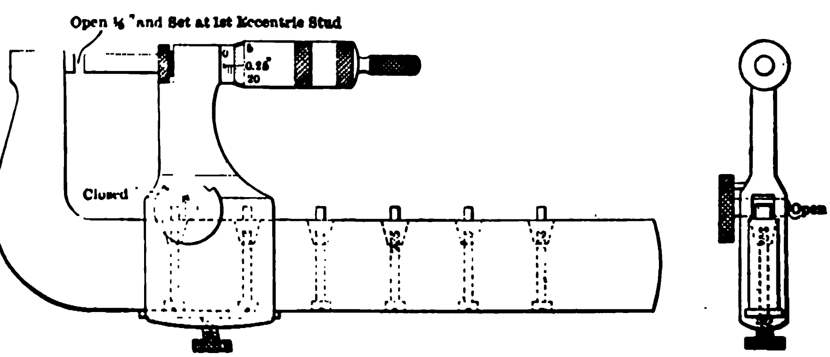
STANDARD UNIT OF REFRIGERATION

F. E. Matthews, in a paper on the "Standard Unit of Refrigeration," presented at the meeting of the American Society of Mechanical Engineers, gave the following proposed equivalent standard units:

"On a basis similar to that of the present boiler horsepower of 30 pounds of water evaporated per hour from feed water at a temperature of 100 degrees Fahrenheit into saturated steam at 70 pounds gauge pressure, which requires 33,306 British thermal units of heat or 34.5 units of evaporation, each of which is equal to 965.7 British thermal units—the amount of heat required to evaporate one pound of water from and at 212 degrees and atmospheric pressure—may be established a standard ton of refrigeration, equivalent to 27 pounds of anhydrous ammonia evaporated per hour from liquid at a temperature of 90 degrees Fahrenheit into saturated vapor at 15.67 pounds gauge pressure (0 degree Fahrenheit), which requires 12,000 British thermal units of heat or 20,950 units of evaporation, each of which is equal to 572.78 British thermal units—the amount of heat required to evaporate one pound of ammonia from a temperature of 28½ degrees into saturated vapor at atmospheric pressure."

TO MAKE A 6-IN. BEAM MICROMETER

Any mechanic can make the 6-in. beam micrometer illustrated, says the American Machinist. After the forgings are shaped out holes are drilled and reamed approximately 1 in. apart, and taper eccentric pieces to fit held in position by screws as shown. The pins can easily be adjusted 1 in. apart by turning the eccentric studs.



A 6-in. Beam Micrometer

PAINTING AN OLD HOUSE

In painting an old house much depends on the condition of the old paint on its walls. If pure white lead was used it can be brushed off; but if the old paint still clings here and there in scales it will have to be scraped off or have wire brushes used on it, says the Metal Worker. Then give it a coat of oil, using one gallon of turpentine and a pint of good drier to four gallons of oil. After this any remaining paint may be scraped off. Let the oil dry, then put on two coats of paint in the regular way.

INDUCTION COIL TESTING

The most accurate method for testing induction coils is to first take terminal No. 1 and put on binding post No. 1, then to fasten one side of the head telephone to the ground binding post and to touch terminal No. 3 with the other side. If you do not get the battery you will know the coil is open.

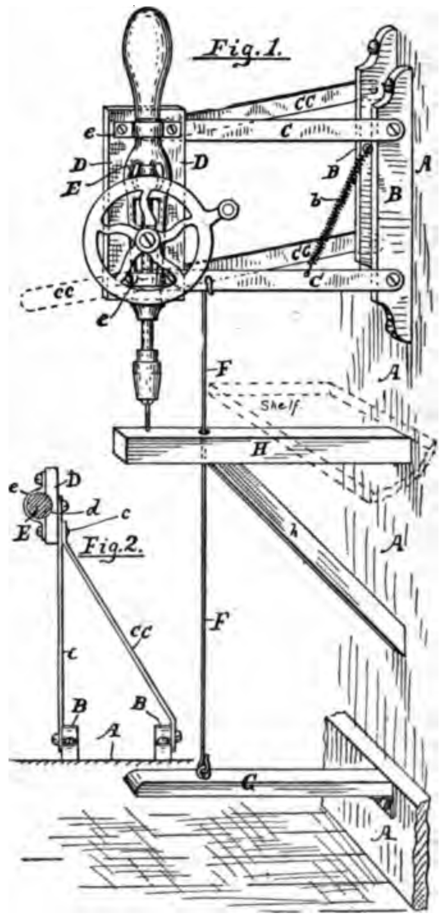
Then touch the receiver cord to terminal No. 2. If you get the battery the coil is crossed; if you do not get the battery the coil is not crossed. The other part of the coil may be tested in the same way. Bear in mind that if you are testing terminal No. 1 you must touch terminal No. 3, but if you do get the battery on either terminal No. 2 or No. 4 the coil is crossed.—Contributed by James M. Cleveland, Chicago.

(The value of this method is that a head telephone receiver is more sensitive than some test instruments. With a good test instrument the results are practically the same.—Editor.)

TO CONVERT A HAND DRILL INTO A DRILL PRESS

Secure blocks B B, Fig. 1, to wall A or some other convenient support. With screws and clips (e) fasten the drill frame (E) to block D (see Fig. 2). In order that block D be in parallel with the drill shaft, it will be necessary to let portions of the drill into the block, as shown at d, Fig. 2. Make parallel bars (C and CC) and rivet them in position so that they meet at c (Fig. 2). The drilling in these parallel bars should be equal distances apart (8 or 10 in.) and on block BB and D it should be equal distances apart, also, but nearer together, owing to the size of the drill.

To the lower bar (C) attach one end of spring b, about midway from the ends, and attach the other end to a screw eye on block B. (Spring b can be attached at one end to the upper bar, C, near the drill and at the other end, by a link, to the ceiling, bracket or any other convenient support, if preferred.) This spring should be strong enough to lift and hold the drill off bracket H. Near the drill in the lower bar (C) at-



Home-Made Drill Press

tach the treadle rod (F), passing it through bracket H to treadle G.

Foot pressure on treadle G will force the drill through the metal, leaving both hands free to handle the drill and the articles being drilled. If the treadle is not desired, or it is preferred to have both lever and treadles, the lower bar (C) may be extended as indicated by the dotted lines cc, Fig. 1, and hand lever force may be used. The two pairs of bars (C and CC) will give almost vertical travel of the drill.—Contributed by Chas. N. Leonard, 1319 Barth avenue, Indianapolis, Ind.

SUPPORTING HANGERS FROM I-BEAMS

There are a number of methods of hanging shafting from structural shapes in use. Figs. 3 and 4 show hangers fastened to the lower flanges of I-beams. The method shown in Fig. 3 is common, but that shown in Fig. 4 is an improvement on it. In this a gray-iron clip (Fig. 5) with a square hole in the top of it to keep the nut from turning is used. For suspending hangers or motors from I-beams, or for eyebolts for chain blocks, the beam fastening shown in Fig. 1 is good, says a correspondent of the American Machinist.

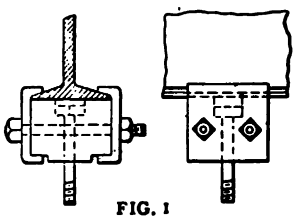


FIG. 1

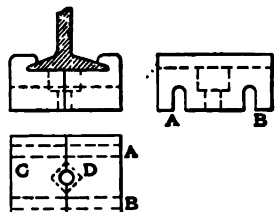


FIG. 2

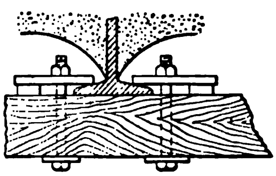


FIG. 3

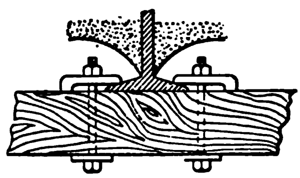


FIG. 4

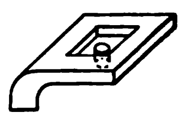


FIG. 5

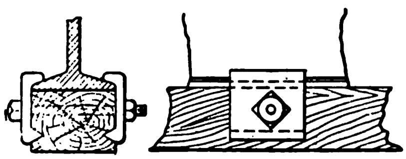


FIG. 6

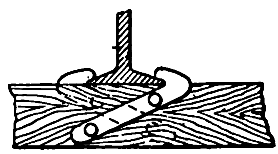


FIG. 7

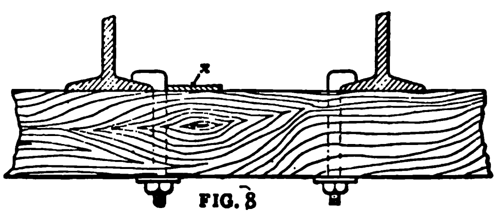


FIG. 8

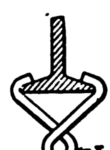


FIG. 9

A clamp for hangers or timber is shown in Fig. 2. Bolts are slipped in at A and B, holding C and D together, and cannot drop out after the hanger or timber is in place. Fig. 6 explains itself. Fig. 7 shows a method of holding a strip of wood to beams for fastening electric wires. The clip is about ¼-in. thick and made of gray iron. Fig. 8 is not a good method unless a plate, x, is secured to the timber, as the bolt has a tendency to split the timber. Fig. 9 shows a method of supporting piping. If an insulator is put in the eye, x, it makes a good electric light wire supporter.

PAINT FOR WIREWORK

Boil good linseed oil with sufficient litharge to make it of a consistency to be laid on with a brush. Add 1 part of lampblack to every 10 parts (by weight) of litharge. Boil over a gentle fire for three hours. Let the first coat be thinner than the others.

RECIPE FOR ALGERIAN LUTE

Pass through a sieve: 2 parts wood ashes, 3 parts lime and 1 part sand. Moisten with water and oil and beat up with a wooden mallet until the compound is of the right consistency.

Frieze Design--London Decorator

STEAM FITTERS' CEMENT

The following formula for steam fitters' cement was presented by S. S. Sadtler in a paper read recently before the Engineers' Club of Philadelphia. The body of the cement consists of either red or white lead. The red lead is often diluted with an equal bulk of silica or other inert substances, so as to make it less powdery. The best way that I have found to do this, however, is to add rubber or gutta-percha to the oil as follows: Linseed oil, 6 parts by weight; rubber or gutta-percha, 1 part by weight. The rubber or gutta-percha is dissolved in sufficient carbon disulphide to give it the consistency of molasses, mixed with the oil, and left exposed to the air for about 24 hours. The red lead is then mixed to a putty. Oxide of iron makes a less brittle cement than red lead. Probably fish oils and red lead would make good cements of the class for joining pipes, as the fish oils are not such strong drying oils as linseed, and their use might be a case of permissible substitution rather than adulteration.

FEEDING BARROW FOR THE BARN

For the distribution of food, either wet or dry, to the stalls on the barn floor, a feeding barrow is convenient, says the Farm Journal. The barrow is shaped so that the food can be shoveled up easily and the sides extend to form the handles. The wheels are cut from a hardwood board. A shovel is carried along with the barrow.

A CORRECTION

On page 1239, December, 1905, issue, is an account of welding aluminum with oxygen gas which is incorrect as to the gas used. Oxygen gas alone cannot be used in this way.

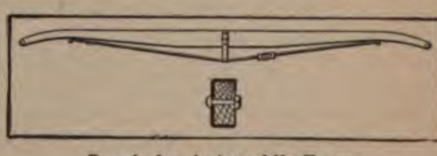
NEW METHOD OF TYING LINE WIRE TO INSULATOR

An improved method for tying line wires to insulators is shown in the illustration and is suggested by a correspondent of the American Telephone Journal. The wire is turned back over the loop formed around the insulator after three turns made around the wire and is then secured by three additional turns outside of the first lashing.

Good Method of Tying

REINFORCING A BENT AUTOMOBILE FRAME

When the frame of your automobile begins to sag in the middle, try reinforcing the side-members of the frame by filling them with wood, recommends the Motor Way. Either ash or elm will answer the purpose. Bed the wood in a coat of white lead as a precaution against the moisture rusting the steel or rotting the wood. Fasten the wood in place with carriage bolts. In doing this you will probably be obliged to strip everything out of the frame and take the side-members off.



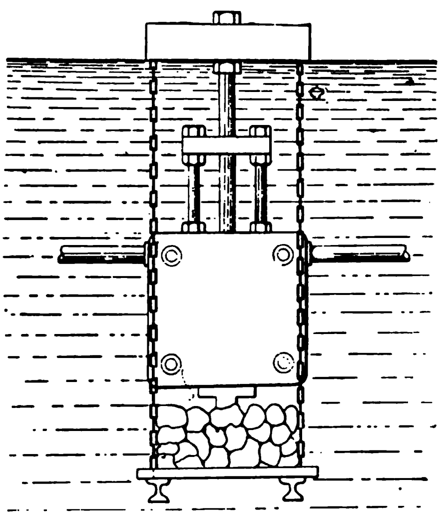
Repair for Automobile Frame

Another method is to put on a truss rod to support the frame where it sags. Use a ⅝-in. rod and have a turnbuckle to draw it in place. This is a cheaper and quicker way, but will not look so well.

OPERATING A STEAM PUMP BY WAVE POWER

A steam pump used for filling a tank was operated by a correspondent of the Engineers' Review without the aid of steam, compressed air or other ordinary power, but by the action of the waves of Lake Michigan.

A platform was built to fit around the top of the base of an upright pump, and then the pump was set upon a flat stone at the



Wave Motor

bottom of the lake. Two lengths of railroad rail were placed on the base as weights, and the platform was laid on the rails: this in turn was loaded down with rock to secure the pump in place. Chains were then run from the rails to a float fitted to the plunger. These chains were of the right length to keep the motion of the float less than the stroke of the pump. With this arrangement, when the lake was calm, the float was partly submerged. Connections were then made to the tank.

The waves operated the pump successfully, supplying all the water required for the tank.

EGG-SHELL GLOSS ON REDWOOD

Put on one coat of orange shellac, sandpaper it to a smooth surface and follow with three coats of white hard oil finish. Rub *the first coat* with hair-cloth and the last *with pulverized* pumice stone and raw *oil.*

INTERESTING ACCIDENTS IN THE SHOP

An accident happened in our shop a short time ago while we were getting out a hurry-up job (a job that is done in a hurry without the proper amount of thought applied to it). We had a wrought-iron eccentric yoke, hardly large enough to fit the eccentric we wished to use it on (Fig. 1). It was taken to the blacksmith to be made larger, therefore the rod, B, was left screwed fast to handle it by when hot. It had not been in the fire long until, with a loud report, it burst, forcing two great swells and parting the wrought iron marked A-A in two places.

Fortunately for the blacksmith, the rod did not blow out. He was standing squarely in front of it. The wrought iron was 7/8 in. thick around the rod and, considering the diameter of the hole, it required a very high pressure to burst. The accident was caused by oil or dampness generating steam under the intense heat.

Another accident that came near resulting fatally occurred while removing a cylinder head without due care. Before removing the head, the two valves, C C (Fig. 2), and the two cocks, D D ,were opened, creating a vacuum within the cylinder when the bolts were out and the head loosened a little. The inrush of air through valves,

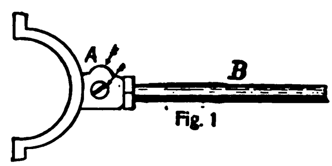


Fig. 1

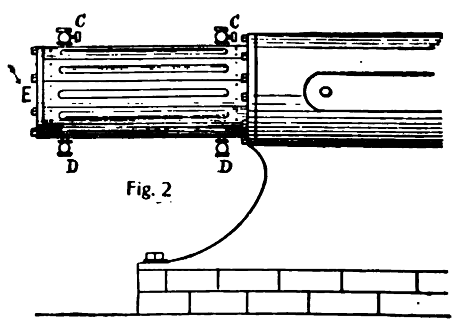


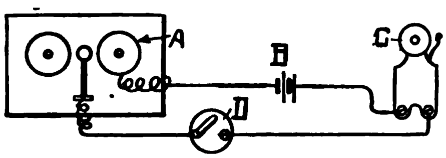
Fig. 2

C C and D D, blew out the head with such force as to break a 2 x 12 plank.—Contributed by Paul S. Baker, Muscatine, Ia.

SHOP NOTES

METHOD OF CONNECTING A BELL TO A TELEPHONE

Referring to the illustration: A is the telephone gong from which the wire is run to the extension bell and which must be



Bell and Telephone Connection

insulated; B, batteries; C, one-stroke extension bell to any part of the shop; D, switch. With this method of connecting the bell will sound the different rings, instead of one continuous ring, until the switch is turned. It will rarely be necessary to turn the switch. —Contributed by A. C. Esty, 2643 Humboldt avenue S., Minneapolis, Minn.

EXPANSION STEAM PIPES

The illustration shows a recent installation of pipe bends to take care of the expansion and contraction. Three wrought steel pipes were used of 8 in. diameter, instead of a single, larger pipe, on account of greater flexibility. A leading manufacturer makes the following recommendations: For bends 12 in. and smaller to regular dimensions and for all purposes up to 200 lbs. pressure use full weight steel pipe; 14 in. to 16 in. outside diameter up to 200 lbs., use ⅜ in. thick; 18 in. outside diameter and larger, up to 150 lbs., use ⅜ in. thick; same

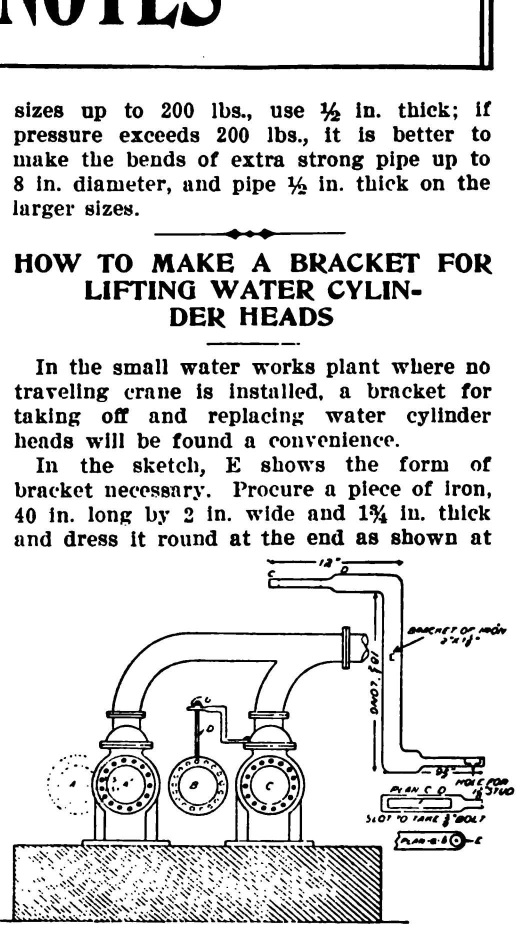
This Method Gives Greater Flexibility

sizes up to 200 lbs., use ½ in. thick; if pressure exceeds 200 lbs., it is better to make the bends of extra strong pipe up to 8 in. diameter, and pipe ½ in. thick on the larger sizes.

HOW TO MAKE A BRACKET FOR LIFTING WATER CYLINDER HEADS

In the small water works plant where no traveling crane is installed, a bracket for taking off and replacing water cylinder heads will be found a convenience.

In the sketch, E shows the form of bracket necessary. Procure a piece of iron, 40 in. long by 2 in. wide and 1¾ in. thick and dress it round at the end as shown at



Bracket for Removing Cylinder Heads

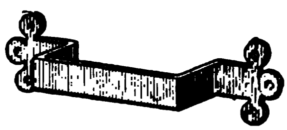
E in plan a-b. Drill a 13/16-in. hole to fit freely over a 1⅛-in. stud, and counter-bore it to a depth of ⅞ in. to receive a 1⅛-in. hex-nut. Forge the bar to shape, as shown in the sketch, making it 9½ in. long on the lower arm, 18½ in. high and 12 in. long on the upper arm (see plan F.). Make the slot indicated in F wide enough to take in a ¾-in. bolt and about 6 in. long, in order to allow for prying the cylinder head clear of the studs while taking it off. Use a piece of ¾-in. round iron, 24 in. long, threaded on each end for 4 in. of its length, with a hex-nut and a washer, to take the head off with.

The position of the cylinder head, as shown by the dotted lines at A, represents it hanging to two studs of the cylinder

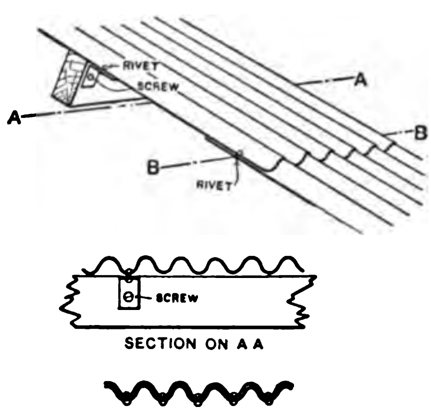
S and S′. By putting the head on the studs in this manner it allows for the use of the bracket on the other cylinder, if necessary. It is also very convenient to cut a gasket for the head joint while hanging in the position shown at B, says the National Engineer, and if in any doubt as to the safety of the bolt or the bracket it is a very easy matter to place a block on the pump foundation directly under the head.

DURABILITY OF COPPER ROOFING

In commenting on copper as a roofing material a correspondent of the Metal Worker describes the capitol roof at Washington, D. C., which was placed on the building after the close of the Civil War. It is of 40-oz. copper in sheets 8 ft. long by 24 in. wide with 2½-in. corrugations. The illustrations show the mode of application, the lapping of the sheets and their fastenings.



Strap for Conductor Pipe.



Fastening Copper Roofing

The cleat on the under side of the sheet is fastened to the copper by a rivet and screwed into the purlin with an ordinary wood screw. These fasteners are spaced about 2 ft. apart in every five or six corrugations. Where two sheets are brought together they are simply lapped and riveted down, the rivet allowing for longitudinal expansion by the sheet's buckling, while the lateral expansion is allowed for by the buckling of the corrugations. No solder is used on the main part of the roof, the protection against storms being afforded by the lapping and riveting of the sheets. In spite of the long use of this roof it is in excellent condition, and has had but few repairs.

On a building where rectangular copper down spouts were used entirely, straps designed like the one illustrated were used to hold the conductors in place. These straps in design conformed with the architecture of the house and made an attractive appearance.

CLEANING IRON BRIDGES BEFORE REPAINTING

"The sandblast furnishes the best method of removing dirt and rust from iron bridges preparatory to repainting," declares C. J. Bogardus of the Erie R. R., "but it is rather too expensive," and adds:

"The least expensive way is to scrape the iron well and to remove dust and scale by pounding it off with a special form of hammer made with a hammer face on one side and a chisel point on the opposite side. This enables one to get into many places about a bridge that could not be reached with the ordinary hammer. Of course, this tool cannot be utilized in all cases, and where such is the case, we use a tool similar to a chisel, only larger, for cleaning off the paint and rust between the ties, etc. After the metal is well hammered and scraped, it is best to use wire brushes and then dust it off before painting. It is very essential that the iron work be thoroughly cleaned in order to get the best results."

VARNISH FOR PATTERN WORK

Shellac cut with grain alcohol is the best varnish for pattern makers. Put the gum in a glazed earthenware jar and cover it with grain alcohol. For fine, light work add a little more alcohol. Never add oxalic acid to the varnish to clear it when old. Rather throw it out and prepare a fresh supply.

"A little drop of oil,
A little bit of care;
Saves a lot of toil,
Avoids a lot of wear."

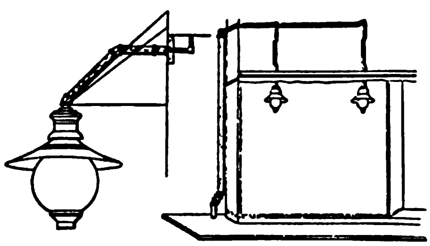
PLAN OF PIPING FOR INSTALLING OUTSIDE GAS LAMPS

The installation of gas lighting fixtures outside of show windows so as to prevent trouble from freezing and protect the gas from cold temperatures was described in a paper read by Arthur Murray, of Detroit, before the Michigan Gas Association.

When only one or two gas lamps are to be installed in front of a store or business place, and there is a ⅜-in. drop with good supply inside the window, attach a ½-in. pipe to this, carry it out through the window and extend it down to the lamp with two 45-degree ells. Drill four 3/16-in. holes in the top of the lamp and place a 2 by 1¼-in. reducing coupling so as come on the outside of the opening in the top of the lamp.

From this reducer extend 1¼-in. pipe, or casing, back to within 1 in. of the window sash and there use a reducing tee with a ½-in. branch pointed upward, from which use a return bend to conduct heat from the inside and thus exclude water from rain or snow storms. The end of the reducing tee should fit closely around the ½-in. run.

Where three or more lamps are to be installed run a riser, cased with a larger pipe, on the outside of the building in the least conspicuous place and let it open into the basement or cellar. Place a tee "bull-headed" on the top of the casing to exclude



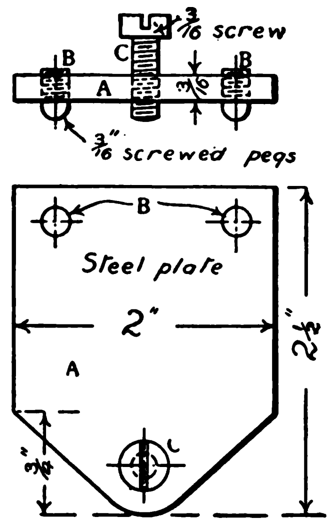
Piping Out-Door Gas Lights

water from rain. It is also necessary to case run or drops. Take a drop from side branch of the tee and where possible carry all drip water back to the riser, where a large drip is placed in the cellar. Where it is impossible to carry all drip back to the riser place an additional drip or extra riser between the store front and carry it back to the basement. Case this also and place a stop in the bottom to let out drip water.

Never use beeswax which has been adulterated with tallow or paraffin wax for pattern work. It will not adhere to the wood.

ANGLE-PLATE FOR DRILLING ANGULAR HOLES

In drilling a hole slightly angular, as is at times necessary. do not pack up with bits of metal, says The Model Engineer, London,



Useful Angle-Plate

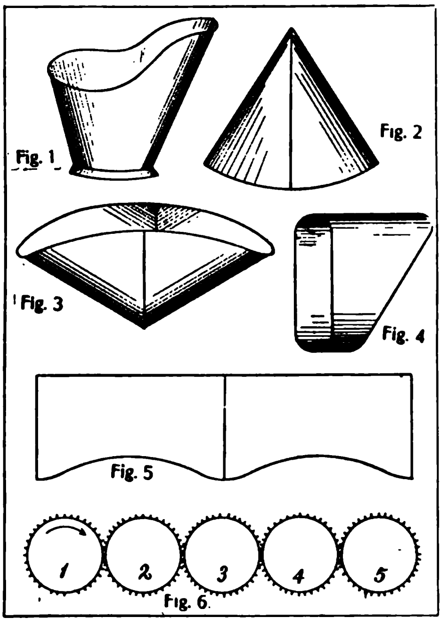
but make an angle-plate which will prove useful many times. File a piece of good straight steel plate, A, to the dimensions shown, drill and tap two 3/16-in. holes and fit two pegs, BB, made from screws, with the ends rounded as shown. At the other end drill and tap a 3/16-in. hole and fit a screw, C (either an ordinary cheese-head screw, or a knurled head screw). To use, move C up and down, according to the angle wanted.

TO RECOLOR ALCOHOL THERMOMETERS

The loss of color in alcohol thermometers is not always due to fading, says a contemporary, but may be caused by the color settling to the bottom of the bulb. To stir it up well, the thermometer should be alternately plunged in water heated to near the capacity of the thermometer, or the boiling point, if the thermometer registers more than 212, and an ice bath. This will cause the alcohol to flow rapidly up and down in the tube and, of course, stir up the sediment in the bulb and color the alcohol again, thus making it easily visible against the scale. Many a thermometer has been discarded as useless when it might easily have been recolored in this way.

THE POWER OF IMAGINATION AS APPLIED TO MECHANICS

That power or faculty of the mind called imagination may seem a little out of place when brought under a mechanical heading, yet this particular power plays an important part in all occupations that produce something from an invisible design. Every person has this power to a certain extent but, like the muscles of the body, in some it is weak and in others strong, owing to lack of exercise. This power can, however, be developed to a state approaching perfection.



To judge the ability of a mechanic by his imaginative power is not wise: Some men are expert workmen with their hands after the work has been laid out for them, but are weak in head work; others have strong imaginative power and can produce great things in their minds only, but cannot produce anything with their hands.

This power or faculty may be divided into two classes, the weak and the strong. In the weak class we find the fellow who thinks that he has a machine firmly stamped upon his mind—when the machine is constructed, its dimensions are three or four times larger than he had expected them to be, and in his mind he had crowded into the ice of a few square inches, enough pieces ll a bushel basket. The weakness of this faculty has caused the downfall of many an inventor. The reason is this: The inventor, as a rule, has no means and is compelled to interest moneyed men; his invention, whatever it may be, is seen in the mind only, therefore we will call it an imaginary machine, sufficiently developed to convince the grocer or merchant, who does not understand mechanics, that his (the inventor's) idea is an assured success. The half-developed invention is constructed and the first one is a failure. The backer becomes discouraged and quits. The inventor discovers his faults, but for want of capital he cannot try again. When the imaginative power is weak, only part of a complicated object is seen. While the brain is busy with one-half of an object the other half vanishes from the mind. In the strong class we find the fellow who can picture to himself nearly correctly an object or an imaginary machine. A man of this class can construct a mechanical device and the first trial proves the value of his idea.

Those who have learned to lay out sheet iron or heavy plate work realize the value of this faculty when developed. He who follows that occupation must be able to imagine how the flat sheet will look when rolled or bent into shape. A flat plate may be laid out for bending or rolling into some irregular shape; looking at the plate one man will see just how it will look when bent, while another can form no idea at all.

Figures 1, 2, 3 and 4 are objects rolled or bent into shape. Can you imagine how they looked before they were formed? In other words, in what shape was the flat sheet cut? What would Fig. 5 make if rolled into a circle? Fig. 6 shows a train of gears. Assuming that 1 runs to the right, can you see in the mind the direction of the other four? When the mind is on 5, does 1 vanish from it? It requires practice to concentrate the mind upon each imaginary gear and control its motion. From the diagram this may be made clear. If 1 moves in a right-hand direction, all the odd numbers, 1, 3 and 5, move towards the right, while 2 and 4 run in the opposite direction.

For the benefit of those interested the next number of Popular Mechanics will contain a plan of Figs. 1, 2, 3, 4 before rolled, and of Fig. 5 after it is rolled to a circle.—Contributed by Paul S. Baker, Muscatine, Ia.

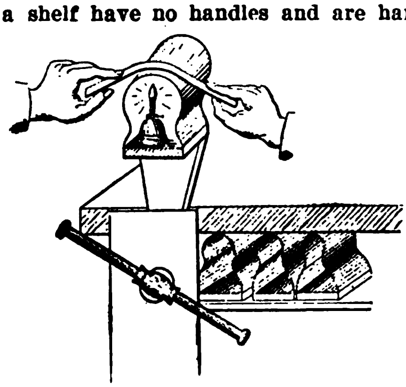
Bayberry tallow applied to the surface of hot iron patterns is quite as good as the mixture of beeswax and tallow, frequently used for this purpose.

HOW TO BEND WOODEN STRIPS

In pattern shops it is frequently necessary to cover a pattern with narrow strips of wood curved to conform to the curves and angles of the surface. These strips are first heated, says Wood Craft, and then, while hot, bent on a device called a "bender."

One of these benders may be made of a length of ordinary stovepipe. Nail the pipe to a board and put a spirit lamp inside of it. That part of the pipe above the flame will become very hot. Now, try taking a strip of pine, ½ in. wide, 12 in. long and ⅛ in. thick, placing it crosswise on the pipe over the heated part and pressing both ends of the strip downward. As soon as the wood is heated through, it will conform to the shape of the pipe and will remain in that shape when removed.

Benders from a tube 1 in. in diameter to 12 in. are required in the pattern shop, more particularly in putting stove patterns together. Small benders are rested on a frame and a gas jet is introduced through a slot on the under side. The illustration shows one form of bender with a lighted spirit lamp within it. This bender has a handle by which it may be held in a vise when in use. Those underneath the bench on a shelf have no handles and are handy



Bending Strips of Wood

to place anywhere. The opposite end from where the lamp enters the bender is closed by a block to which the sheet iron is nailed, holding it rigid.

These thin strips are fastened to the follow-board in the following way: The form when ready to cover is given a coat of shellac, and when this is dry it is sandpapered lightly then thinly greased with tallow or lard. This will hold the strips close. To hold a strip so that others can be glued edgewise against it, use pattern makers' tacks.

TO SLING A PLANK EDGEWISE

A plank on edge is better for supporting a swinging scaffold than a plank laid flat, says the American Machinist, as it is stiffer on edge. The method of slinging a plank edgewise by a rope so that it will stay is shown in Fig. 1. A clove hitch is made

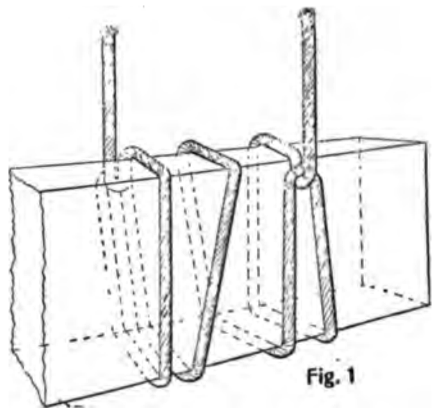


Fig. 1

Fig. 2

around the end of the plank; then one of the parts is twisted around the plank until the ends lead as shown.

To shorten a piece of rope without cutting it, try the sheep's shank shown in Fig. 2. The rope is brought back on itself, making two or more bights, and a half hitch is taken around each bight. This knot will not slip, and will nearly fall apart of its own accord if the strain is released, so that when there is a liability of this happening, it is well to pass a piece of wood through the loop A at each end and pull the rope tight on them.

HEAT LOST BY RADIATION

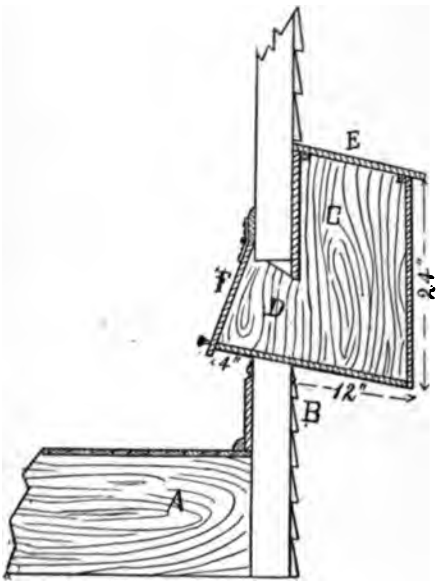
The amount of heat lost by radiation from bare pipes containing steam at 100 lb. pressure has been estimated to be about equal to two tons of coal a year for each 10 sq. ft. of pipe surface. It has also been found that 88 per cent of this loss can be saved by the best pipe covering.

The painter can keep the water in the brush troughs from freezing in cold weather by the addition of salt or a little glycerine. Neither will hurt the brushes.

HANDY COAL BOX FOR HOUSE

In place of the dirty coal bucket setting in the kitchen beside the range a coal box like the one illustrated may be used, eliminating a large amount of dirt and cleaning.

The box is fastened on the outside of the



Substitute for the Coal Bucket

kitchen, within easy reach of the range. It may be of any size, but is amply large if made 12 in. wide, 15 in. long and 24 in. high. An opening, about 8 or 9 in. high, through the wall, with a slanting hinged door on the inside, admits the coal to the kitchen. The coal is deposited in the box from the outside, and is fed to the opening within by gravity. Referring to the illustration, the parts indicated are: A, kitchen floor; B, side of house; C, coal box; D, opening in wall; E, removable lid outside; F, hinged lid within kitchen.—Contributed by Wm. O. Tischendorf, Mt. Vernon, Ind.

RECHARGING DRY BATTERIES

Dry batteries can be recharged, if not too far gone, by the following simple method:

Bore two holes in the top down through the composition there, one on each side of the carbon. Pour into these holes about one gill of diluted sulphuric acid (3 parts water and 1 part acid), and plug the holes up with common soap. Let the batteries stand about 12 hours, when they will be nearly as as new. The batteries I used were ones thrown away by a telephone company as worthless. That was six months ago, and they are in service yet.—Contributed by Wm. J. Slattery, Emsworth, Pa.

PURITY OF SCRAP LEAD

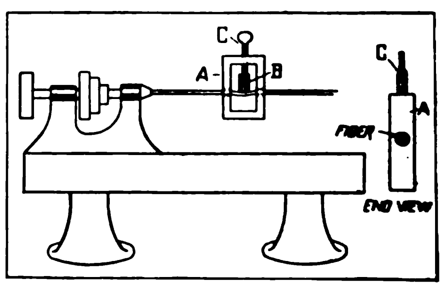
Old lead pipe, or scrap lead, is not always suitable for the purpose to which it is to be put. Often it contains foreign matter of an offensive nature and quantities of water. Sometimes this accumulation of water causes an explosion, more frequently occurring where the water is frozen. As an illustration of this, a kettle may be half filled with melted lead and then scrap lead containing water or ice added. The steam will cause an explosion, possibly blowing out half the lead in the kettle.

Because of frequent remeltings of old lead, it gradually comes to contain a considerable per cent of tin and antimony, but these metals are beneficial, serving to harden the pipe and making it preferable to that made of pure metal, which corrodes more rapidly when exposed to moisture. Underground telegraph and telephone cables are encased in lead pipe containing from 3 to 4 per cent tin, on account of this fact.

In melting scrap lead place a stick of wood in the bottom of the lead kettle and let it boil for some time. This will reduce the oxide and a good clean metal will result when the dross is skimmed off.

WIRE TRUING DEVICE

The wire-truing device illustrated has been used by F. F. Berry, 104 Reed av., Peoria, Ill., daily on hollow tubing 3-32 in. in diameter, with satisfactory results, neither twisting nor breaking the tubing.



For Truing Wire

Part A is made of hard wood 2½ in. wide, 1 in. thick and 3½ in. long with holes made in the sides and plugged up with fiber which is more durable than the hard

Holes for the wire are a little more than 3-32 in. in diameter. B is made of round hard wood and the screw, C, which is made of common iron, sets in loosely. This is said to be an excellent device for hand work on small wire.

STEEL SQUARE AND PIPE WRINKLE

The diameter of pipe necessary to carry the contents of two smaller pipes may be determined roughly by the use of the steel square, says the Engineer.

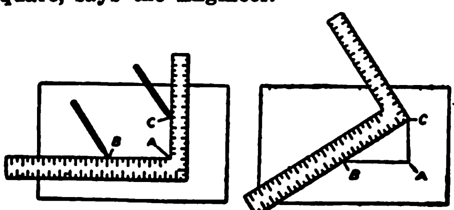


Fig. 1 Fig. 2

On a board or sheet of paper mark off the diameters of the two known pipes, as AB and AC, Fig. 1. Then measure across as in Fig. 2. The distance is the required diameter.

HOW TO PIPE WATER-COOLED MOTORS

In the left-hand illustration, showing a four-cylinder water-cooled motor, the cylinders are cast in pairs and the honeycomb radiator forms the front end of the bonnet. From the base of the radiator the water is drawn by the gear-driven pump to the base of the water jacket, surrounding the rear pair of cylinders. From the jacket it passes from the center of the top of the jacket to the base of the jacket for the front pair of cylinders and finally exits from the top of this pair to the top of the radiator. In this way the back pair of cylinders gets the cold water and the front pair the warmed water from the rear.

This method is incorrect. It is better to have the water in both cylinders as near the same temperature as possible, says the Motor Age. Where the water is distributed to both cylinders evenly, as shown in the second drawing, the cooling is more even. Where the water is introduced to rear cylinders first, the hot water enters the front cylinders at a higher temperature than that of the water in the rear cylinders, which is cooled by the force of the air through the radiator.

HOW TO BABBITT A LOOSE PULLEY

Remove the old babbitt from the pulley and make a base a trifle larger than the diameter of the pulley, to which fasten a round piece of wood, standing vertically as shown at A, Fig. 1. Place the pulley upon the core base, and after leveling across the rim, move it so that core B stands exactly in the center of the hole in the hub (Fig. 2).

Bring a collar (previously put on), of the same size as the core, up against the bottom of the hub and secure it in place by means

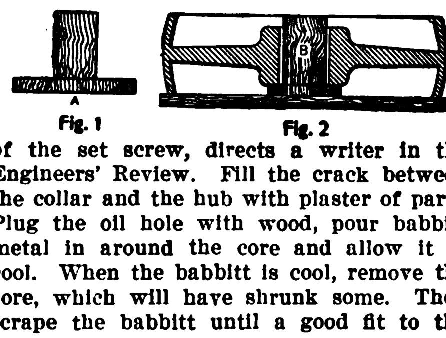
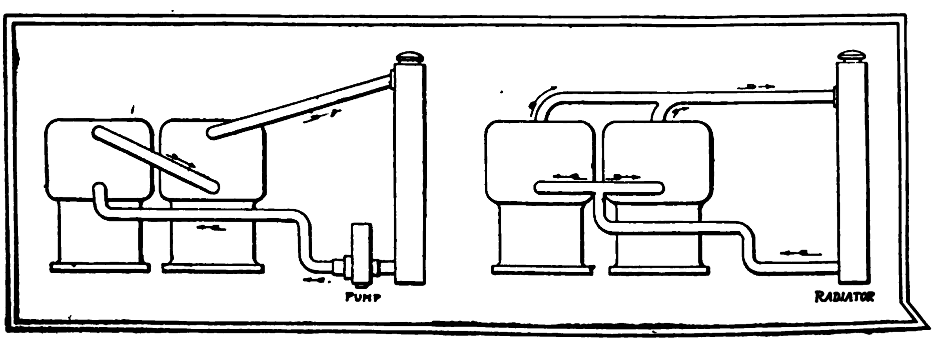


Fig. 1 Fig. 2

of the set screw, directs a writer in the Engineers' Review. Fill the crack between the collar and the hub with plaster of paris. Plug the oil hole with wood, pour babbitt metal in around the core and allow it to cool. When the babbitt is cool, remove the core, which will have shrunk some. Then scrape the babbitt until a good fit to the shaft is made.

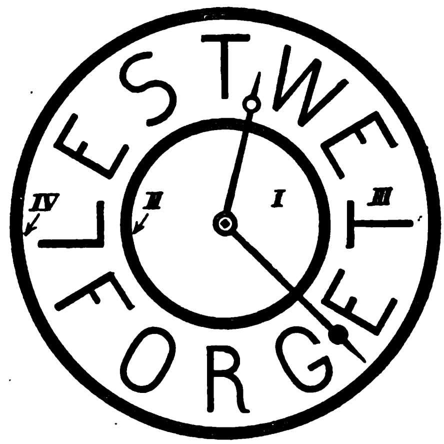


Incorrect and Correct Way of Piping in the Water System

A NOVEL CLOCK DIAL

We made a unique clock dial for our shield clock in the following manner:

Taking out the old dial, which was made of metal, we applied to it two coats of white enamel, allowing the first coat to dry before applying the second. We then painted in aluminum a circular band on the

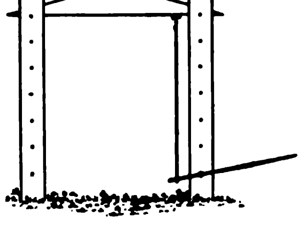


Novel Clock Dial

dial about 2 in. from the center. A band of aluminum was painted on the edge of the dial, also. Between these bands there was one of white enamel, and on this we painted in black enamel the inscription, "Lest we forget," letting each letter represent a figure. Referring to the illustration: I and III indicate white enamel; and II and IV indicate aluminum.—Contributed by Gordon M. Backus, Hackensack, N. J.

RAISING ROOF OF HAY BARRACK

An improved method of raising the roof of a hay barrack is described in the Country Gentleman. The old way has been to use a screw which was more expensive to start with and a time-consumer in



operation. The new method is by means *of a lever,* the use of which is clearly shown in the cut.

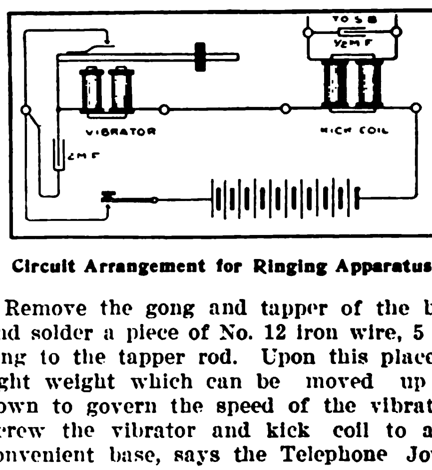
REMEDY FOR SLIPPING SET SCREWS

When the set screw on the pulley of the governor shaft of a 10-hp. engine persisted in working loose, a correspondent of the National Engineer remedied the matter as follows:

The spindle was taken out and a ¼-in. hole drilled lengthwise of it, between the spindle and governor pulley—near the place where the set screw was located. A wire nail, a trifle larger than the hole drilled, was then driven into the hole and prevented the set screw from slipping again.

HOME-MADE RINGING DEVICE FOR TELEPHONE EXCHANGE

To make this device, which with ten cells of batteries will furnish sufficient ringing current for a small exchange, procure a vibrating bell, a ½ M. F. condenser, a 2 M. F. condenser, a push button switch and a kick coil such as is used in telephones in place of a generator.



Circuit Arrangement for Ringing Apparatus

Remove the gong and tapper of the bell and solder a piece of No. 12 iron wire, 5 in. long to the tapper rod. Upon this place a light weight which can be moved up or down to govern the speed of the vibrator. Screw the vibrator and kick coil to any convenient base, says the Telephone Journal, and arrange the circuit as shown in the sketch. Place the push button switch in a convenient position, preferably near the crank of the hand generator. Connect the ½ M. F. condenser across the terminals of the secondary winding of the kick coil, and the other condenser across the make and break contacts of the vibrator.

When the operator rings, pressing the switch closes the battery through the primary circuit of the kick coil and vibrator, this causing the secondary of the coil to deliver an alternating current. The ringing cam is operated in the usual manner.

HOME-MADE LATHE RUN BY A GRINDSTONE

The boy who can find use for a lathe can make one for himself which will do for ordinary purposes. Fig. 2 shows the lathe. Make the ends 4 by 2 in., and the side pieces, 6 by 1 in. by 18 in. long, leaving between the ends 14 in. Nail the parts together securely. Bevel off the side pieces, leaving about 3-16 in. square edge to act as rests for the tools. Screw through each end, rather tightly, a coach or lag screw with the point ground conical on the grindstone; these to act as lathe centers. Cut away part of one of the side pieces, as shown, to clear for the belt.

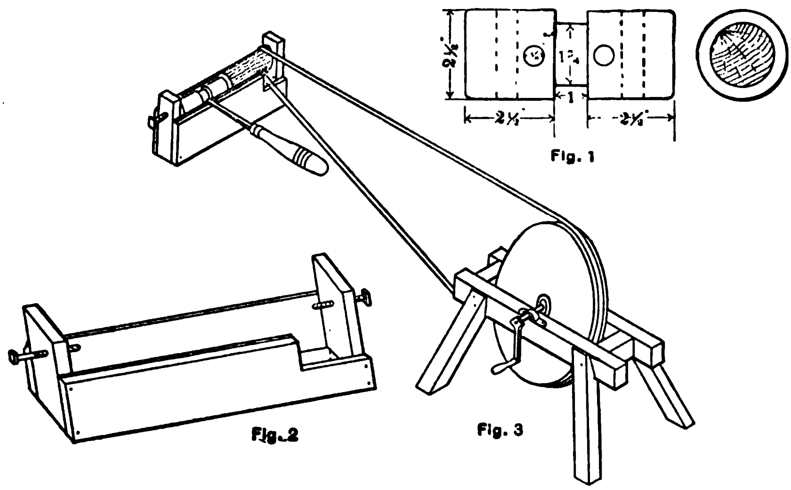
A correspondent of Wood Craft rigged up a lathe like this to make some wooden wire strainers 2½ in. diameter and 6 in. long out of some 3x3-in. studding, work he would otherwise have been obliged to do by hand. Fig. 1 shows the shape of these strainers. To turn them proceed as follows:

Cut off pieces of 3x3-in. stock, 12½ in. long and chop off the corners roughly. Deeply countersink these pieces in the center of each end and put them between the centers to run fairly free. Connect up the grindstone as shown, using old reins for belting, piecing them together with wire lacing and butt joints. Run the belt around the end of a chunk of wood, before fixing the wood between the centers, and then round the grindstone. Now get a small boy to turn the grindstone while you operate the lathe. Do one-half at a time (each piece making two strainers) and then turn the for end and finish. Use an ordinary wood chisel. Bore holes as shown in Fig. 1. These strainers can scarcely be distinguished from those bought at the stores, and are only illustrative of the work that can be done on this simple lathe.

The lathe may be fastened to anything wooden, as a house, fence, gate, etc., at a distance requiring a good long belt to maintain the right tension.

METHOD OF SOLDERING

Clean the parts thoroughly of all grease, rust or scale and wet them with prepared acid. Hold the soldering copper on each part until the article is well tinned and the solder has flowed to all parts.—Contributed by Alex. Betzer, 442 Austin avenue, Chicago.



Practical Home-Made Lathe Run by a Grindstone

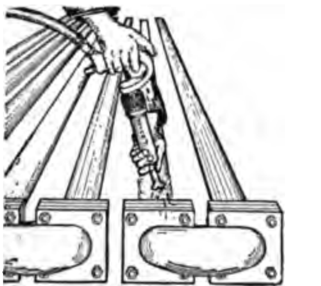
BLUEPRINTS FROM TYPEWRITTEN MATTER

When a number of copies of a specification or other paper are wanted, and none of the ordinary methods is convenient or desirable, make blueprints from the typewritten sheet, suggests a correspondent of the American Machinist.

Write the matter out on the typewriter, putting a piece of carbon paper in back of the sheet to give the printing density on both sides of the paper, then proceed with the blueprints in the usual manner. Use manifolding paper, the grade called unglazed onion skin. For white prints use new carbon paper and make the prints from that, in which case the letters will appear on a white ground. The carbon paper is more expensive than the white paper.

SCALING PIPES WITH PNEUMATIC HAMMERS

Pneumatic hammers are being used in ice and refrigerating plants for scaling condenser pipes. The method is shown in the illustration. The care of the condenser is very important in a plant of this kind, as by a few weeks' negligence the cost of production is greatly increased.



Scaling Condenser Pipes

PORTLAND CEMENT COUPLING FOR PIPE

Needing a coupling for ½-in pipe, and not having one, I used portland cement, making a thick putty and putting it on just as in wiping a solder joint. The same method can be used on bursted pipes, and the cement will hold like a coupling. I also stopped a leak in a heater with a thin paste of cement.—Contributed by Walter Weber, 643 W. 46th street, Chicago, Ill.

REMOVING HARD OLD PAINT

Hard old paint can be removed in the following manner: Dissolve 1 lb. potash in 3 pt. water and heat the mass, then add dry ochre until it is like rough stuff. Spread this on the paint and let stand until the paint softens. Then scrape off the mixture, directs the Master Painter, wash the paint clean, then dry and sandpaper.

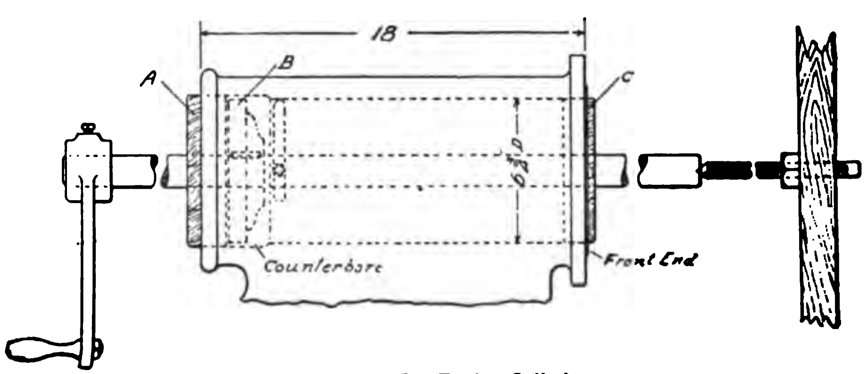
TO MEND AN OLD SHINGLE ROOF

Cut pieces of tin about 7 in. by 2 in. from old cans that are not too rusty and slip these pieces under the joints and cracks in the shingles. Do not nail the tin, as the nails would split the shingles. In this way an old roof can be made to last several years. —Contributed by Gordon M. Backus, 32 Euclid avenue, Hackensack, N. J.

RE-BORING A GAS ENGINE CYLINDER

An 8-hp. gas engine cylinder which was solid with the bed and entirely too large for any of the machines in the shop, was re-bored by a correspondent of Canadian Machinery, by the following method, which proved economical, accurate and a timesaver.

Three hardwood collars were put on a long, true boring bar, as shown in the sketch. The front end of the cylinder was true, the piston not traveling to within 1½ in. of the end of the cylinder. The back end was not worn on account of the counter bore. A hardwood collar (maple), A, was made to fit the boring bar on the inside and a tight fit in the counter bore outside. Close to that was put another collar, B, to fit bar as before, only this was turned to the size the cylinder was to be re-bored to, and as close to this as possible was the cutter, the hardwood collar, C, was fitted at the other end a tight fit to act as a guide or steadier to keep the bar in perfect alignment. On getting a cut started it was found that the bar had a tendency to feed ahead of itself, so a long rod was threaded and a check nut put on, and the same slacked off steadily, and with a crank on the end of the boring bar what had seemed an impossible proposition was accomplished in about one hour.



Re-boring a Gas Engine Cylinder

DO YOUR OWN BINDING

The subscriber who wishes to bind his Popular Mechanics or any other paper may do so himself at practically no cost. The illustrations are almost self-explanatory and the sizes given are for six numbers of Popular Mechanics which make a very handy size book, it being 1¼ in. thick, 7 in. wide and 9¾ in. long allowing the cover to overlap ⅛ in. at top, bottom and right side.

Figure 1 shows the size and shape of the cloth covering which can be of book binders' cloth, thin table oilcloth, old window curtain or other material in this line on which paste or mucilage can be used. It also shows the position of the two pasteboard or mounting-board backs each 6⅛ by 9¾ in., which are to be firmly pasted in place. Fig. 2 shows the outside cover, the backs and an inside cover 9¾ by 15 in. of same material as outside, all in place to be pasted together as shown in Fig. 3.

Figure 4 shows the completed job, where the cover is mounted on the magazines and firmly secured by means of good strong paper fasteners, cord, or whang. Fig. 5 shows another way of attaching the cover which is in some respects neater. This is done by first sewing on a good firm piece as shown and then pasting the complete cover over this, thereby hiding the rough stitches and giving it a finished or book-like appearance. A good flexible back can be made by substituting leather, oilcloth, etc., for the cardboard backs. The writer has used this idea in many cases with very satisfactory results and hopes that many Popular Mechanics subscribers will take the time and pains to avail themselves of this very easy way of preserving their papers.—Contributed by C. M. Shigley, 676 N. High street, Columbus, Ohio.

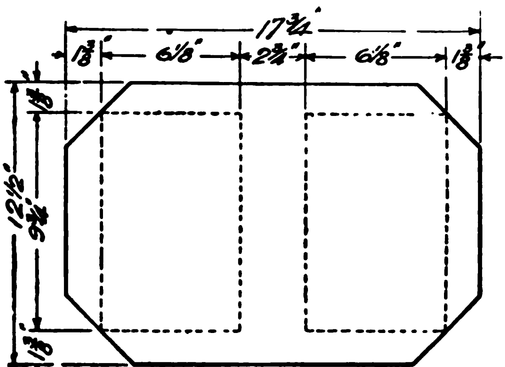


Fig. 1

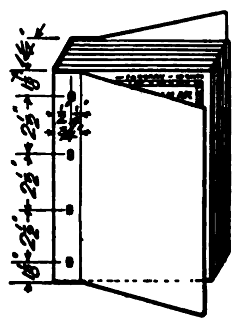


Fig. 4

Fig. 2

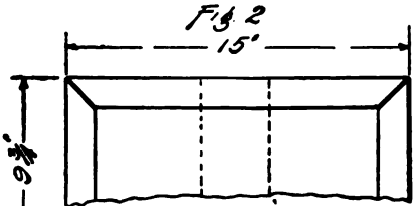


Fig. 3

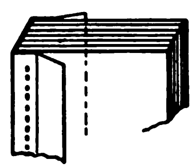


Fig. 5

HOW TO ESTIMATE THE HORSE POWER OF A GAS ENGINE

The horse power of a high grade four-cycle gas engine may be closely estimated by the following rule:

Each square inch of the area of the piston head will give you about 7-16 of a horsepower. This contemplates the engine in perfect condition, igniting at just the right point, etc., running at a speed of 250 R. P. M. The ordinary cheap gas engine sold in the market today will do but little better than ¼ hp. to each square inch of piston head surface. The Prony brake is the only thing where accuracy is required.

AN EMERGENCY WRENCH

When on a wreck down job it is necessary to make a wrench in a hurry, the one illustrated is a good one, says a correspondent of the Blacksmith and Wheelwright.

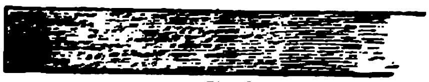


Fig. 1

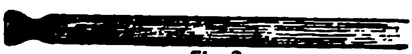


Fig. 2


Fig. 3

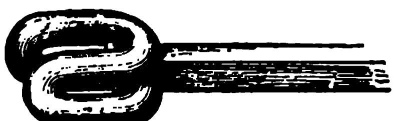


Fig. 4

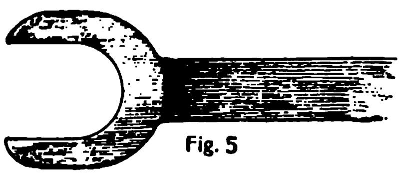


Fig. 5

Take a piece of iron 1¼ by ½ in., or according to the strength of the key required (Fig. 1) and upset the ends a little. With a pair of fullers make the iron like Fig. 2 which shows the edge. Of ¾-in. round iron make an ordinary link like Fig. 3 and weld one end on the bar (Fig. 4.) Then cut the link half through and bend it over to lay on the other side. This makes a good strong wrench (Fig. 5) for any class of work.

WATCHMAKERS' OIL

In a bottle about half full of good olive oil, put thin strips of sheet lead. Expose to the sun for a month's time. Then pour off the clear oil This is a cheap method of making a first-class oil for any light machinery. The oil will not corrode or thicken.—Contributed by Alex. Betzer, 442 Austin ave., Chicago.

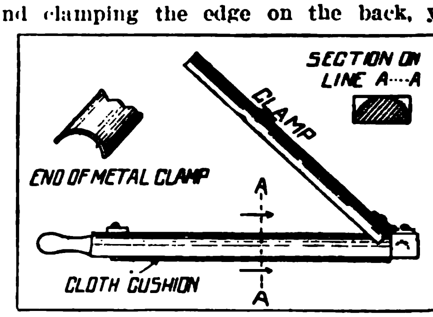
ENCAUSTIC PASTE FOR COPYING PHOTOGRAPHIC PRINTS

Encaustic paste may be bought ready prepared or made at home, as desired, and few photographers realize with what excellent results it may be used, says the Camera and Dark Room. To make the paste, melt 1 oz. of white wax and add to it 6 dr. oil of lavender. When thoroughly mixed, add 1 dr. gum elemi and stir the mixture until it is quite cold.

For copying prints in which there is a tendency to show grain, put a little piece of the paste in the center of the print and rub it in well with a piece of cotton wool, working in a circular direction and rubbing until the wax apparently is all removed. Use the paste in the same way to brighten a print.

HOW TO MAKE A SANDPAPER BLOCK

The block may be made either wide or narrow. For ordinary use a piece of wood 6 in. longer than the width of a sheet of sandpaper and 2 in. wide by 1 in. thick will do. Round off the back side leaving 1 in. at one end. Out of a piece of heavy tin or sheet metal make a piece to fit the rounded side and hinge it to the square end of the wood. On the flat face of the wood fasten a piece of heavy cloth or ingrain carpet. Work the rounded end down to a good handle. Fasten a button on the handle end to hold the metal clamp down. Now by wrapping the sandpaper around the wood and clamping the edge on the back, you



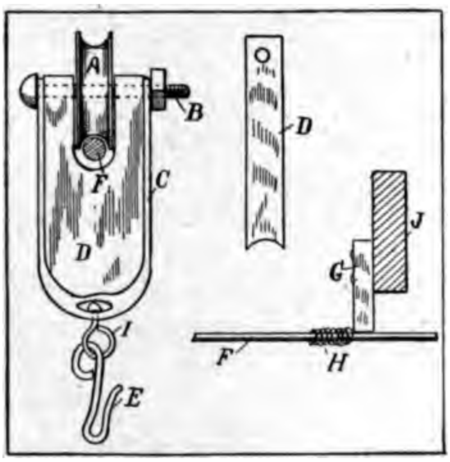
Sandpapering Block

have a rasp that will last longer, do better work and is more easily handled than most blocks.—Contributed by Wm. F. Hoag, Judsonia, Ark.

In hardening small tools that are liable to warp, heat carefully and insert in a raw potato, then draw the temper as usual.

HOW TO MAKE A SIMPLE LANTERN CARRIER

A lantern carrier, made as illustrated, has been in use in my horse stable for nearly a year, and has been very satisfactory. This carrier can be made at little or no expense. The parts are: A, small grooved wheel about 1 in. in diameter with ¼ in. hole through it; B, ¼ in. by ¼ in. bolt; C, weight hook of an old steelyard scale; D, piece of soft pine grooved so that it will fit in the weight hook, as the weight hook is too wide inside for the wheel; E, heavy wire hook bent at one end to hang the lantern on and



Lantern Carrier for Stable

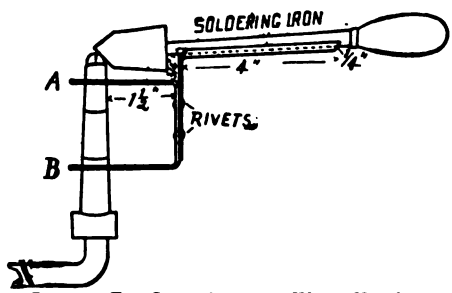
with the other end put through the swivel loop, I, and bent around; F, heavy wire track, stretched tight, upon which the carrier runs; G, stopping block, which is pushed down a few inches and nailed to a joist, J; H, coil spring slipped on the track in front of the stopping block for the carrier to bump against; should it run farther than is desired, the spring will prevent breakage.

The stopping block should be placed far enough away from the wall so the lantern cannot swing and strike it, and the carrier should be equipped with a swivel, I, as the lantern sometimes turns one way or the other, and without the swivel would twist the carrier on the track so that it wouldn't run well. This carrier is a good one, as the lantern cannot be knocked down by loose stock.—Contributed by J. C. Mannel, Lincoln, Kansas.

Dry o-hre or any other dry pigment is too
priming.

HANDY SOLDERING IRON HOLDER TO USE OVER A GAS JET

From 1-in. hoop iron cut one piece 7⅛ in. long to make the top part and another piece 4¼ in. long. Bend these pieces as shown in the sketch and then rivet them together. Make two holes in the ends (A, B) for putting the device on the gas jet.—Contributed



Support For Soldering Iron When Heating

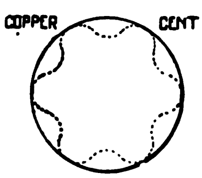
by Wm. T. Ackerman, 1311 N. Stockton street, Baltimore, Ind.

CEMENT FOR PIPE JOINTS

Grind, wash, mix and regrind to a fine powder, 15 parts chalk and 50 parts graphite. Add 20 parts ground litharge and mix to a stiff paste with 15 parts boiled oil. This preparation, says Domestic Engineering, will remain plastic for a long time, if stored in a cool place.

DISK FOR TURNING LAMP WICKS

Many times the disk that is used to turn lamp wicks, becomes unsoldered and is lost. In this case, take a copper cent and file it with a small rat-tail file to the shape shown in the sketch. Drill a hole in the center and solder the cent to the stem. If the wick is hard to turn up or down, this gives a better grip than the original disks with their finely milled edges. I have also used this to advantage on hand bike pump connections.—Contributed by Stoke Richards, Santa Clara, Cal.



Do not use varnishes that contain rosin in any quantity for exterior work.

HOW TO MAKE A DESK LIGHT

From an electrical supply dealer get some office cord, a socket and bulb.

To make the plug which is to fit into the wall socket, get a burnt-out bulb and break the glass; inside there is a small glass tube, break this also, being careful not to break the wires inside of it. To these small wires attach the cord. Cut a piece of rubber to the shape shown in Fig. 1, and fit it in to keep the wires apart. Then bind the wires with tape, to keep them away from the brasswork and prevent short-circuiting.

Cut some pieces of wood, about ¼ in. thick to the following dimensions: One piece, 8 in. by 4 in. (back); two pieces, 8 in. by 3½ in. (top and bottom); one piece 8 in. by 2½ in. (shade); two pieces 4 in. by 3½ in., with a hole in one piece for the socket (ends); one piece 8 in. by 1 in. by ½ in. (standard); one piece 5 in. by 3 in. (base of standard).

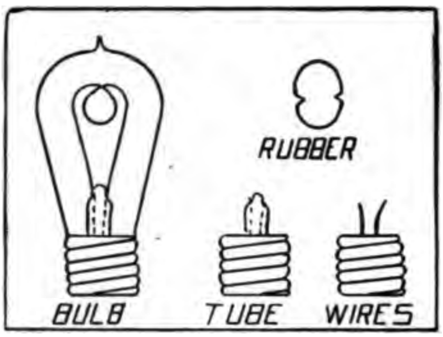


Fig. 1

Fig. 2 shows the back, Fig. 3, the socket end and Fig. 4, the base for the standard, the other pieces are used just as cut.

Of these pieces of wood make an oblong box as shown in Fig. 5. Fit a piece of tin in the back for a reflector. Bevel one edge of the piece for the shade and fasten it on so as to throw the light downward. Cut two pieces of tin, C, to fit over the ends and hold the shade firmly.

Attach the socket to the cord, when you will have the plug at one end and the socket at the other. Put the socket through the hole cut in one end of the box and fit a rubber washer around it inside the box. Then insert the bulb, put the plug in the wall socket and turn on the light.

If the device is too low, bend two pieces of tin about 1 in. wide in the form of the standard and fasten them to the back of the box as at A and B, Fig. 2, so as to let the box slide up and down on the standard cut from the wood, which is fastened to its base (Fig. 4.)—Contributed by R. W. Purdy, Chicago, Ill.

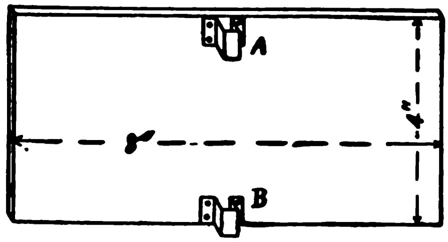


Fig. 2

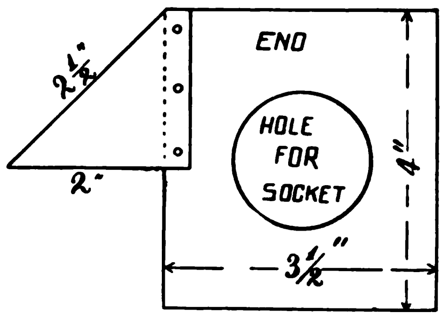


Fig. 3

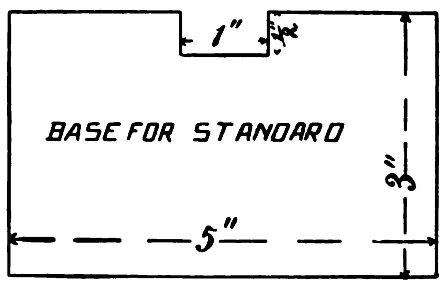


Fig. 4

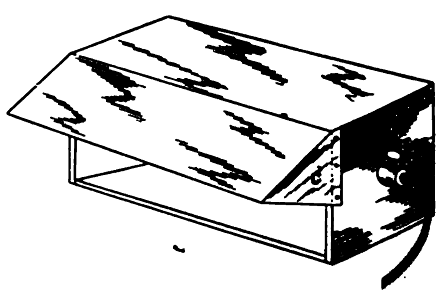


Fig. 5

HOLE JEWEL FOR A WATCH

When the jeweler requires a hole jewel and has not one to fit, he can make one out of a small chip from a glass rod.

Put the chip of glass on a piece of charcoal and heat it with a blowpipe until it draws up into a round ball; then stick it on the end of a match with sealing wax and rub it on an oilstone until it is flat; turn it over and rub the other side until you get the required thickness. Then, with a small drill and turpentine, drill a hole the size of the pivot. Polish the hole with diamond dust on a copper wire and countersink with a large drill for the oil cup. The whole jewel can be polished with dust on a piece of peg wood.

I have drawn down a glass rod and broken off roller jewels, also. Either of these jewels can be bought cheaply, but the glass jewels are better than the brass ones commonly soldered in.—Contributed by Henry F. Shaw, Jeweler, Dalton, Mass.

IMPROVED SOLDERING OR TINNING ACID

Into 1 lb. muriatic acid put all the zinc it will dissolve and 1 oz. sal ammoniac. Add as much clear water as there is of the acid.—Contributed by Alex. Betzer, 442 Austin avenue, Chicago.

FASTENING A ROPE TO A RING: A DEFENSE

Regarding the discussion of the methods of fastening a rope to a ring, which appeared in our September, 1905, number, Joseph B. Kell, of Marion, O., writes:

Mr. Joannis has not correctly analyzed the operation of the fastening, as described by me, when in use. It does provide two wearing surfaces in that the two thicknesses of rope passing through the ring are worn simultaneously, and not separately, as Mr. Joannis seems to think. Moreover, the simple knot in which the ring is tied does not bend the rope so short as in the round turn of Mr. Joannis' method, and hence does not strain the rope so much locally.

For tightening screw connections, dissolve powdered shellac in 10 per cent ammonia and paint the mass over the screw threads after they have been thoroughly cleaned; then screw the fitting home. The joint will be impervious to hot or cold water.

HANDLING PIPE OFFSETS

While installing some 8-in. pipe, a correspondent of the Engineers' Review used the offset fitting shown in Fig. 1 to overcome an offset caused by the 8-in. flange being riveted crooked to a new return tank for the elevator. Fig. 2 shows the elevation of the two elevator pumps and tank which, being crowded well together, required the use of close nipples; it also shows how the piping was run and what fittings were used.

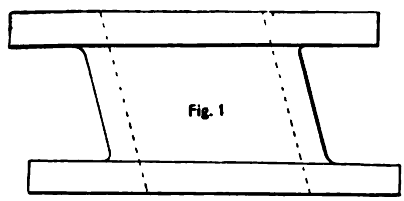


Fig. 1

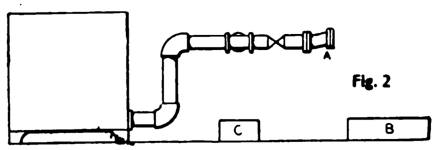


Fig. 2

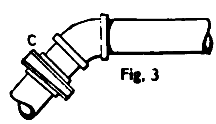


Fig. 3

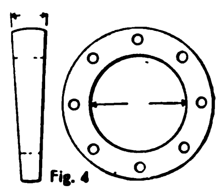


Fig. 4

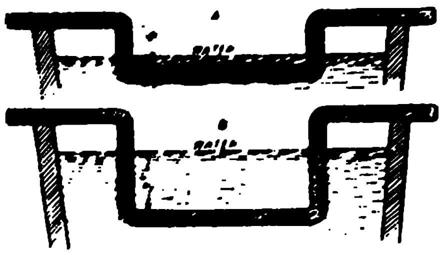
Flange connection was made to pump B, and when trying to connect to the same, it was found that the center of the pipe was 1/16 in. lower than the center of the suction opening of the pump, caused by the crooked thread in the flange pitching down. Cutting a crooked thread on a nipple was tried but the nipple was too short to give enough pitch. Then the special casting, Fig. 1, was made and used as at A, Fig. 2, making a connection without undue strain.

In turning an 8-in. pipe line to make an angle less than 135 degrees and more than 90 degrees (Fig. 3) a 45-degree ell, a short nipple and a flange union, between which was inserted the dutchman shown at Fig. 4, were used to get the right angle. The holes in the casting were drilled large enough to allow the bolts to pass through. The slant was ¾ in. in 11½ in. of pipe.

To render rough woodwork almost non-inflammable, two heavy coats of ordinary lime whitewash is recommended by a painters' journal.

METHOD OF TEMPERING AN ANVIL

[illegible] a good form of water [illegible] through a pipe from the [illegible] and [illegible] some [illegible] and [illegible] them [illegible]. One of these [illegible] the water deeper



Supports for the Anvil

than the other (A and B), says a correspondent of the Blacksmith and Wheelwright.

Let the horn end of the anvil in deepest to give the thin end a chance to draw the temper. Have the thin end ½ in. in the water, but let the horn end go in 3 in. deep. Heat up to an even cherry red. Lay on the iron in the water and let it remain there until the face is cold. If not hot enough so that you can touch it with the file set it on the fire block side down.

◆◆◆

FOR ROUGH HANDS

This is the season when the machine operator's hands are liable to become sore and stiff from exposure. A correspondent of Machinery recommends this: Take a four-ounce bottle and put in same three ounces glycerine, one ounce alcohol, and from twenty to thirty drops of carbolic acid. After washing the hands, and while they are a little damp, apply a few drops and thoroughly rub it in. A good time to use it [illegible]

◆◆◆

PACKING CAST-IRON PIPES FOR HEATING

[illegible] desired position and [illegible] and pack [illegible] of the pipe with a [illegible] of the following [illegible] recommended by the Florists' [illegible] the remaining space.

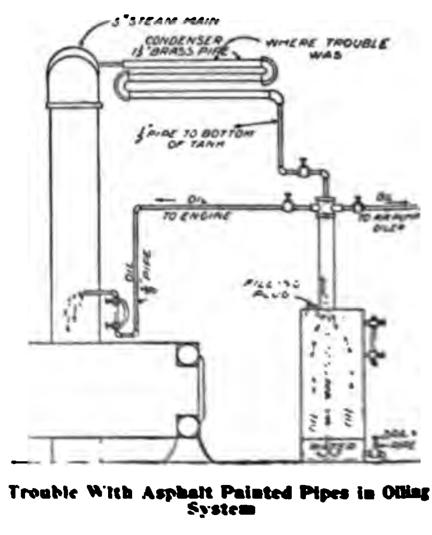
[illegible], 2 oz.; sulphur, 1 oz.; clean [illegible] or borings, 12 lb. Add water to form a paste [illegible]

Iron filings, 4 lb.; fireclay, 2 lb.; powdered potsherds, 1½ lb. Make a paste with strong brine.

ASPHALTUM PREVENTS RADIATION OF HEAT

Painting pipes with asphaltum insulates them sufficiently to keep considerable heat from radiating, declares a correspondent of the National Engineer. In a plant where the exhaust steam was used in the heating system, the pipes of the system had been given two coats of asphaltum, and it was impossible to keep the building warm all that winter. That it was the asphaltum that caused the trouble was not discovered until later.

In another plant the writer had rearranged the cylinder lubricating system by substituting a central oil reservoir for individual cups, as shown in the sketch, with a marked saving of oil. This reservoir was constructed of boiler plate to safely withstand a pressure of 120 lbs. Overhead in the engine room were a number of small



Trouble With Asphalt Painted Pipes in Oiling System

pipes including the condenser pipes shown in the illustration. These pipes were painted with asphaltum one Saturday afternoon when the plant was not running. Then the trouble began with the sight feeds. No change had been made except in painting the pipes, and on examination these were found to be too hot to furnish the condensation necessary for the proper working of the sight feeds. The paint was scraped away and there was no further diff

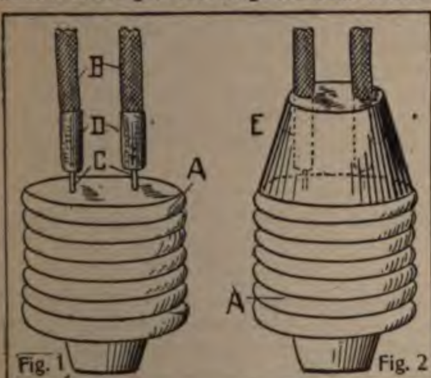
SHOP NOTES

SCREW-PLUGS MADE OF OLD BULBS

Screw-plugs, though not expensive, can be made of old burned-out bulbs, in the following way:

Break the glass off even with the screw base (A) and also the little cap through which the wires are admitted to the lamp. Be sure to leave the wad of felt in to prevent short-circuiting. Connect the wires or cord (B) to the wires on the base (C) securely. Wrap some rubber tape (D) around the connection to keep the wires from touching.

Mix a little plaster of paris and water to



Inexpensive Screw-Plugs

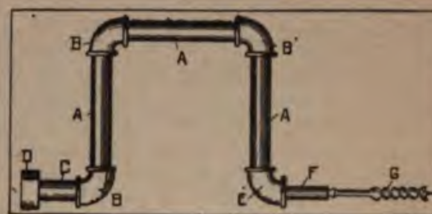
the consistency of putty and fill in the hollow of the base and just high enough to cover well the connections (E, Fig. 2). Round off the top smoothly and leave until perfectly hard.—Contributed by Leslie Peto, Carmi, Ill.

PASTE FOR PAPERING PAINTED WALLS

To make wall paper stick to painted walls, prepare a batter of flour and water in the usual manner, only a little thinner, and for each gallon of batter add 1 oz. powdered rosin. Set the kettle on a moderate fire and stir until it boils and thickens, and the rosin is melted into the paste. When cool, thin down with a weak solution of gum arabic.

HOW TO MAKE A BENCH BRACE

To make a handy brace and a cheap one take 3 pieces of ⅜-in. pipe 5 in. long (AAA); three ⅜-in. ells (BBB); one ⅜-in. nipple 3

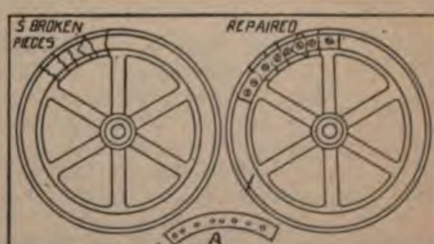


Brace Made of Pipe Fittings

in. long (C); one ⅜-in. cap (D); one ell ⅜ in. by ¼ in. (E) and one nipple 3 in. long by ¼ in. square (F) to fit the shank of the bit (G). Screw all these parts together as illustrated.—Contributed by Scott H. Phillips, Fairmont, W. Va.

HOW TO REPAIR A 20-IN. CAST-IRON PULLEY

One day whilst a large planer was running, a fellow workman threw an 18-lb. sledge hammer across the shop as he thought, but instead it struck the belt and



Mended Pulley

falling, knocked five small pieces out of a 20-in. cast-iron pulley. We could not get another pulley of the same size for the planer in less than a week, so I mended the broken one.

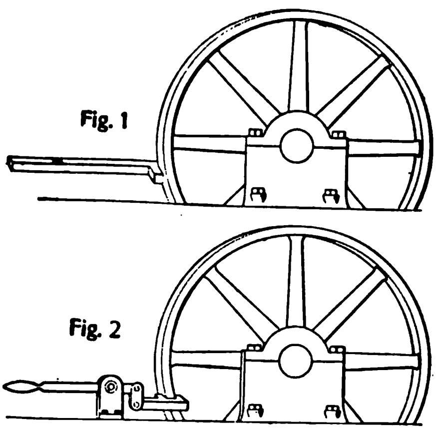
I drilled a hole in each of the small

and two or three in the large pieces. Then in a piece of iron, A, 4 in. wide and the length of the opening between the spokes of the pulley, I drilled holes to correspond with those in the pieces. Then with some flathead stove bolts with nuts and washers bolted the parts together through the holes and tightened all up. The pulley ran all right for that week until we could get a new one.—Contributed by Thomas McGuire, Baltimore, Md.

DEVICES FOR GETTING ENGINES OFF OF CENTER

In Fig. 1 is shown a starting bar for getting engines of 100 to 300-hp. off the center. This is a simpler method than the old way of getting a block and piece of timber and prying the engine over a little at a time, says a correspondent of the Engineers' Review. On a large engine, however, even this wrench will not work.

For engines not too large, try the device



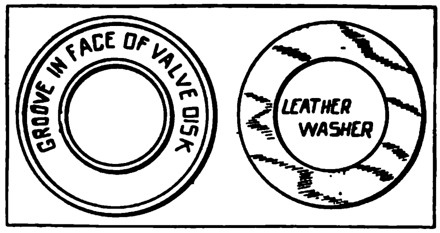
shown in Fig. 2. A clamp grips the rim of the wheel and is connected to a long lever by a short link. The long lever is supported by a stand. When the engineer forces the long lever down at the end, the clamp grips the rim of the wheel and the engine is turned from center.

TEMPLATES FOR PATTERN WORK

Use sheet aluminum, the thinnest hard stock made; lay out the template with a sharp knife. For circular work use a pair of dividers with sharp points, then by working the sheet back and forth, it will break sharp and clean on the line.—A Reader.

REPAIR FOR LEAKY VALVE

We had a 2-in. valve on a line of pipe, carrying a pressure of 40 lb. The valve was practically new, but dripped all the time. We faced up the original disk and poured an old disk with babbitt, but to no purpose,



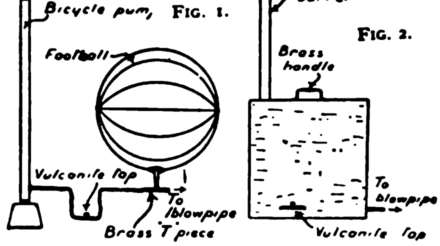
Mending a Leaky Valve

as I suppose there was some roughness on the inside of the valve.

We then burned out the original composition in the disk and replaced it with a leather washer, marked by clamping disk and leather together in a vise, cutting to a driving fit and driving the washer into the groove with a small hammer. Now the valve holds, without any leak whatever, against a cold water pressure of from 40 to 60 lb.—Contributed by Stoke Richards, Santa Clara, Cal.

HOW TO MAKE A BLOWPIPE BELLOWS

A good blowpipe is made of a foot-ball and a bicycle pump connected up as illustrated. The whole apparatus is carefully packed in a 10-in. wooden box in the shape

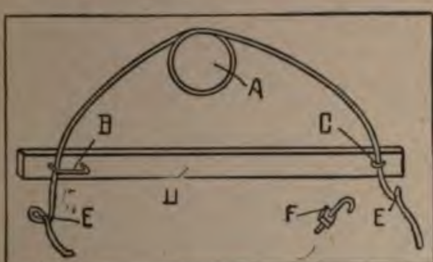


Foot-Ball Blowpipe Bellows

of a cube (Fig. 2). A hole is bored in the top to exactly fit the pump barrel, and the pump is wired down to the bottom of the box. The tube leading from the pump is fitted with a small vulcanite tap, brought outside the front of the box. When a very small pointed flame is being used, as in certain glass-working operations, a sufficient pressure can be easily stored in the football to last a considerable time without further pumping. The tap is then turned off, and none of the air can leak out through the pump (for, however good the pump may be, under the great pressure a slight quantity of air tends to work out backwards through it). Good thick rubber must be used for connections. A correspondent of the Model Engineer, London, uses a blowpipe like this for soldering and melting metals for glass working and for chemical experiments, requiring a higher temperature than a Bunsen burner will give.

SACK HOLDER MADE OF A HORSE RAKE TOOTH

A handy sack holder can be made of a horse rake tooth. Make one full turn as at



Handy Sack Holder

A to form a spring and bend each end like a pig tail (EE) about 4½ in. from the end; then flatten and shape. Place a strip of hardwood (D) on one side of the spring, and fasten it stationary at one end with a hook (C) having a threaded burr as at F on the other side. Make a strong wire loop about 2 in. wide to fasten the hardwood strip at B and to give the spring play for adjustment.

One of these holders can be hung on a nail in the granary while filling the sack and, as they are very light, it can be hooked or unhooked readily without removing the sack until it is full.—Contributed by Nathan Syverson, Stewartville, Minn.

To lace a driving belt for a high-speed machine, hold the ends together and sew them with tough, strong wire, using the shortest stitches possible. This method is recommended in Practical Pattern Making, as excellent for fast-running belts.

SIMPLE GATE HINGE

To make this hinge two pieces of round iron will be required. Heat the pieces and twist them around twice as illustrated, then bend the ends out and flatten them for

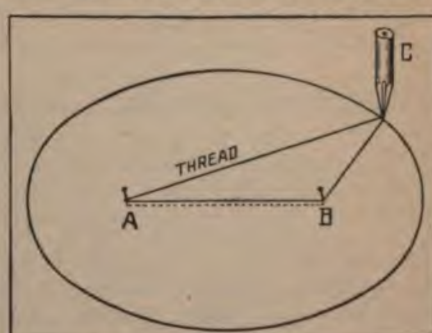
Made of Round Iron

screw holes as at A and B. The twisted part will act as a screw, says a correspondent of the Blacksmith and Wheelwright, and the weight of the gate will cause it to close itself.

TO DRAW A PERFECT ELLIPSE

The following is a very easy way to draw a perfect ellipse 3 in. long, using a pencil, two pins and a piece of thread.

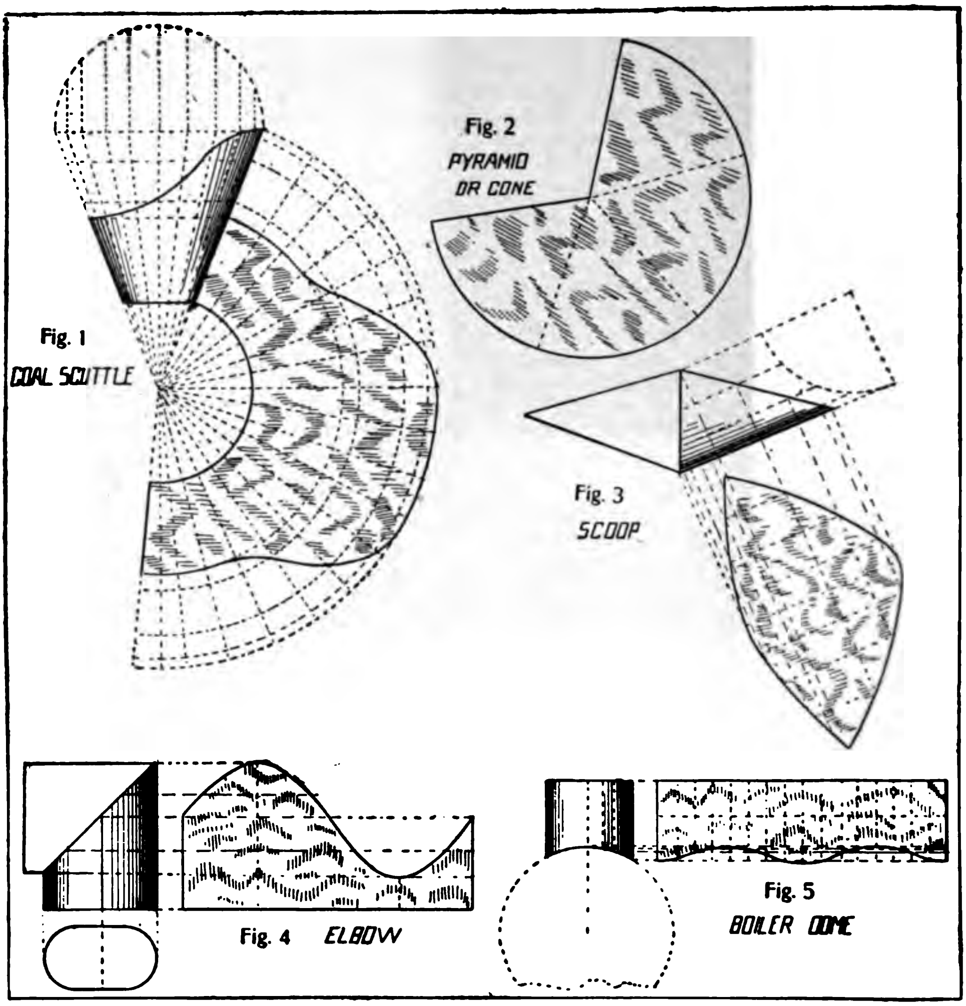
Draw A-B 2 in. long and place a pin upright in the drawing board at each end of A-B. Double a strong thread and tie the loose ends together to form a loop exactly 2½ in. long. This may necessitate several trials. Place the looped thread over the pins and with the pencil point draw the string straight as at C. Then move the pencil around in the direction indicated by the arrow, always keeping the thread tight. The



Easy Way to Draw an Ellipse

curve traced by the pencil will be a perfect ellipse.—Contributed by Harry E. Hoyt, 109 Cross St., Malden, Mass.

Contributions to this department invited. If you have a good kink, send it in.



IMAGINATION AND MECHANICS

In the accompanying illustration the figures correspond with those in the March number under the title "The Power of Imagination as Applied to Mechanics," and answer the question propounded therein. How many had it worked out right?—Contributed by Paul S. Baker, Muscatine, Iowa.

CHIPPING LARGE KEYWAYS

Some time ago I had the opportunity of bidding on a job of removing a wood split pulley, 5 ft. diameter, 20 in. face, from a 6-in. jack shaft and cutting a keyway 24 in. long by 1 in. wide by ½ in. deep, and placing a large 4-ton pulley on same. Several different shops figured on the job, the offers ranging for from two to four days' work on the same. I was given the job to complete in 15 hours and the general opinion was that the keyway alone would take 10 hours.

I rigged up an old man and after laying cut my keyway, took a 15-16-in. drill and drilled 24 holes along the keyway, each about 7-16 in. deep, leaving 1-16 in. in sides and bottom to clean up in. In this manner the keyway was cut and key fitted in seven hours, where if I had chipped all of it, it would have taken all of the 15 hours. This is not a new kink, but it goes to show how easy we can forget the simplest things and sometimes to our disadvantage.—Contributed by Norman Baker, Hoopestown, Ill.

HOW ONE MAN BECAME A SIGN PAINTER

It takes incessant practice to become a good sign painter and no inconsiderable part of the training comes from watching signs and advertisements, picking out their good and bad points and deciding where you would improve them. Effects and wording are important particulars to watch. It is also well to watch sign painters work, when one has opportunity. A correspondent of the Master Painter tells how he began in this way while on the rounds of his daily occupation, not having opportunity to learn in a shop.

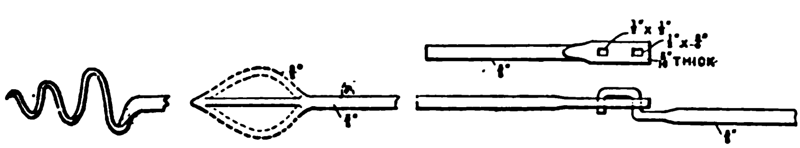
At last he secured a good plate of the Roman letters and numerals and began practicing, formulating rules for himself from measurements made by himself. After mastering this, which took a long while, he advanced to the Egyptian alphabet, and so through patient toil worked his way on to the fancy letters he had admiringly watched others make, and at last felt himself competent to tackle a billboard. He finds his occupation agreeable and well paying and names perseverance as his ladder to success.

DEVELOPER FOR SNOW SCENES

A good single-solution developer for snow scenes, says a writer in the Queen, is as follows: Soda sulphite, 90 g.; potassium carbonate, 15 g.; soda carbonate, 45 g.; hydroquinone, 7 g.; metol, 5 g. Dissolve these ingredients in the order given in one litre of boiling distilled water and then put the mixture in two half-litre bottles, labeling one "old" and the other "new." Use the "old" over and over again for developing, and as it is used up add some of the solution marked "new."

SEWER CLEANING DEVICE

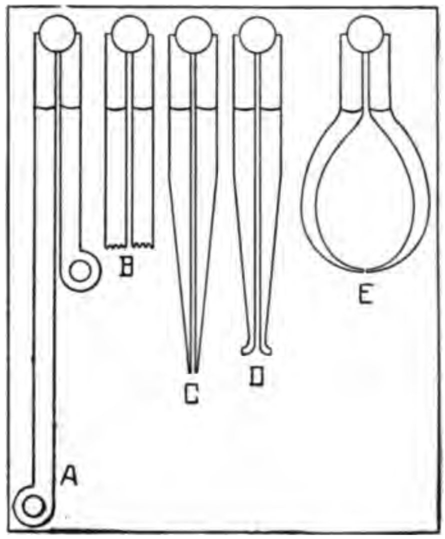
The sewer cleaning device illustrated can be used successfully up to 150 ft., says the Metal Worker. When once the device is in the pipe the joints cannot unlock. The construction is clearly shown in the sketch.



For Cleaning Pipe Sewers

TOOLS MADE OF OLD BUGGY TOP JOINTS

A number of useful tools can be made from the long joints of a discarded buggy top. Any amateur blacksmith can hammer out the tools to suit himself. In the illustration, A shows one of the joints; B, joint after it is cut off; C, dividers made of joint; D, inside calipers; E, outside calipers.—Contributed by John R. Black, Jefferson, Iowa.



Made of Buggy Top Joints

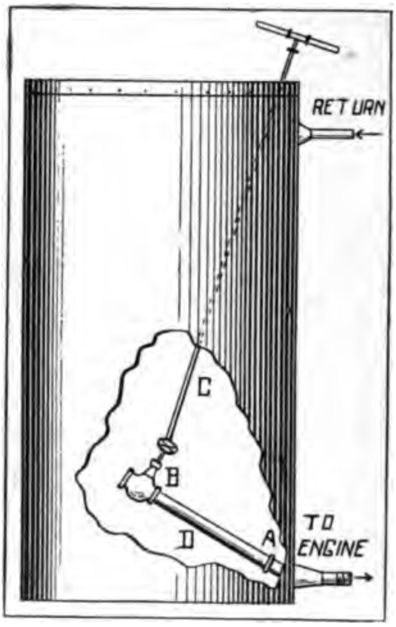
CEMENTS FOR MENDING CELLULOID

Broken celluloid articles, such as triangles, etc., can be mended with a cement consisting of 3 parts alcohol and 4 parts ether mixed together. Apply to the fracture with a brush until the edges become warm, then stick the edges together and leave to dry for 24 hours.

Another cement, recommended by Machinery, is: Camphor, 1 part; alcohol, 4 parts. Dissolve and add equal quantity (by weight) of shellac to the solution.

CONNECTING WATER SUPPLY TANK TO GASOLINE ENGINE

There will be no more trouble from freezing if the water supply tank is connected up to the gasoline engine as shown in the diagram.



Non-Freezable Tank Connection

Extend the intake pipe, D, to the center of the tank and use a 45° ell at A, in order to raise the pipe from the bottom. Use a good brass valve at B. The operating lever, C, can be made of ⅜-in. pipe. Ice may form on all sides without closing the water supply. When running in the day time the warm water will melt most of the ice that forms during the night.—Contributed by Paul S. Baker, Muscatine, Iowa.

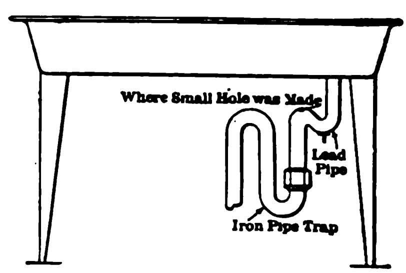
CAUSE OF FAILURE OF BOILER FURNACES

The collapsing of boiler furnaces is almost always the direct result of scale or of oil in the feed water, the latter being a particularly prolific source of trouble, according to a recent paper before the Northeast Coast Institution of Engineers. No ordinary furnace fails for lack of strength if clean and covered with clean water, says the Journal of the Franklin Institute. A very thin smear of oil, however, has an effect totally out of proportion to what might be expected. In a furnace having a normal factor of safety of five, this factor rapidly decreases after the temperature reaches 650 degrees F., and entirely vanishes at a red heat. Steam at a pressure of 200 pounds has a temperature of about 380 degrees, or 270 below the point at which the tenacity of the steel begins to be affected, but a clean furnace, rubbed over with a very clean and thin coat of mineral oil, will soon rise above 650 degrees even under light duty, and often reach 1,200 degrees, at which point 75 per cent of the strength has departed. With the use of high-grade mineral oils the danger is less than with low-grade oils, due to the fact that the latter emulsify and hence cannot be removed from the feed water except by chemical treatment.

DIFFICULTY IN WASTE-PIPE TRAPS

In a factory where the boiler feed facilities consisted of a feed-pump, an ordinary injector and an exhaust injector (which last did the feeding) a new sink was installed so as to catch the overflow from the injector, caused by variation of load. Both injectors were put together and the sink placed under them. The waste-pipe from the sink was connected to a pipe that received the drips from the engines, pumps, heater, etc., and provided with the usual trap under the sink.

After everything was piped up, it was found that the steam pressure in the main drip-pipe forced the water out of the trap under the sink, thereby breaking the seal and allowing the steam to back up into the engine-room. In order to overcome this, a

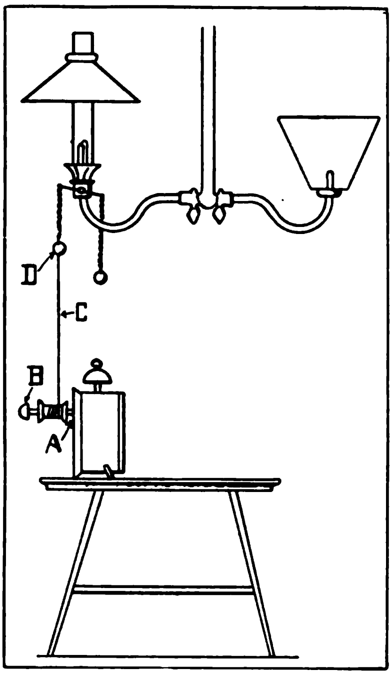


Traps in Waste Pipe

trap was placed in the iron pipe below the trap in the lead pipe. This arrangement was successful in holding back the steam, but after a few minutes' operation the water in the sink refused to run off. A ⅜-in. hose with 30 lb. water pressure was run down the pipe to force out any obstruction. As long as the hose was in operation the sink worked splendidly, says a correspondent of Power, but when the hose was removed the pipe instantly clogged. The suggestion was made that the trouble was due to air being trapped between the two traps in the waste pipe. A small hole the size of a pin was made, and the sink immediately emptied and worked all right.

TIME GAS LIGHTER

This device can be used for either lighting or turning off the gas. Take the alarm

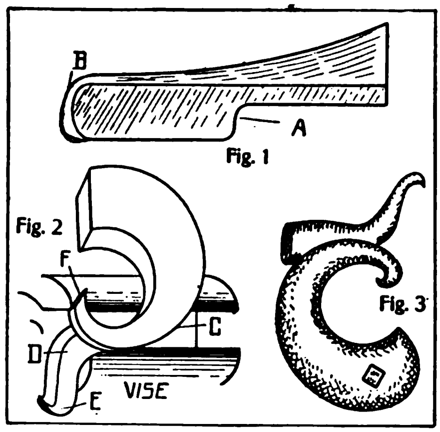


Lights the Gas at Any Hour

winding thumb screw off of an ordinary alarm clock as at A. Get a piece of ⅜-in. round iron 2½ in. long; drill a hole in one end and tap it out to fit alarm winding screw. Fasten a spool to the rod so that the spool will not turn; at the opposite end to where the rod fits the alarm screw, fasten the alarm thumb screw, B, so the alarm may be wound. Run a stout string, C, from the spool to the chain of a self-lighting gas lamp, D. When the alarm goes off the gas will light or go out according to which chain the string is attached.—Contributed by Oliver H. Bradbury, Jr., 142 Grainger av., Knoxville, Tenn.

HOW TO MAKE A CIRCULAR GUN HAMMER

A circular gun hammer may be made from ½-in. round steel without welding. Fig. 1 shows the iron flattened two ways. At A it

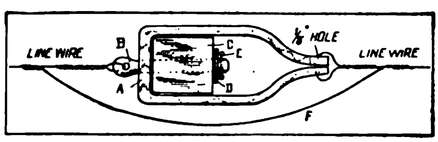


Circular Gun Hammer

is made thick enough to make the nose of the hammer; at B it is thinner. It is then placed in the vise (Fig. 2) and split with a chisel at C and D and the points are turned each way as at E and F. It is then filed to finish as in Fig. 3. This is left hand; to make the right hand work on the right side of the vise.—Contributed by Nathan Syverson, Stewartville, Minn.

ANTI-HUM DEVICE FOR TELEPHONE WIRES

To make the anti-hum device shown, take flat brass, A, 7 in. long, ¾-in. wide and ⅛-in. thick, and hold it in a monkey wrench to bend it to shape. Then drill a ⅜-in. hole in the back and pass a ¼-in. round brass rod, B,



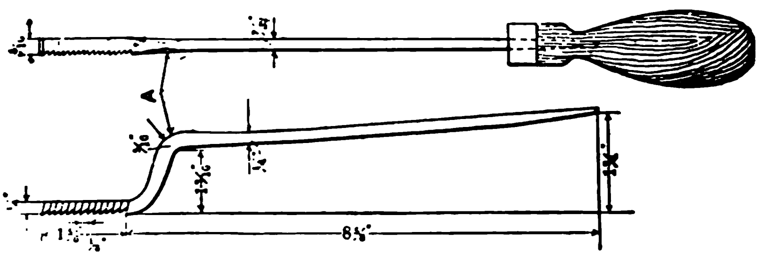
Anti-Hum Device

through. Get a thick old rubber heel and cut out two pieces with the holes in the center and take the rubber washers out and cement them together. Take the ¼-in. round brass rod 1½ in. long, flatten it at one end and drill a hole large enough for telephone wire to pass through in each end. Put the rubber washer on the rod where it passes through the ⅜-in. hole, then push the rod through the pieces of rubber heel, C. Put a brass washer, D, on that end of the rod and a wire pin, E, through the hole. Then put the device on the telephone line as shown in the illustration. I used electric light cord, F, to bridge across.—Contributed by Edward A. Pinkham, Kennebunkport, Maine.

HOW TO MAKE A STEP GRAIL

Many different styles of grails, as well as three-cornered scrapers, flat scrapers and hand chisels, may be made from old files. The illustrations show a goose neck or step grail used to get into a cavity. The cutting end, shown square here, can be made in any shape to suit the need. The tool may have teeth on the bottom side only, or on two or more sides; the corners may be round or square, but round is best, says a correspondent of Wood Craft, because it leaves a fillet of solder on the pattern.

To make this grail, draw the temper out of an old square file, grind off the file teeth and forge it to the size of the largest part of the grail—5-16 in. Bend it to shape and at point A, flatten it out. This gives strength just where needed and prevents it breaking readily. In width the file is now 7-32 in. at the largest part, tapering to ⅛ in.; the step is 1 3-16 in. down; when the teeth are resting on a flat plate, the small end on which the handle fits is 1¾ in. up.



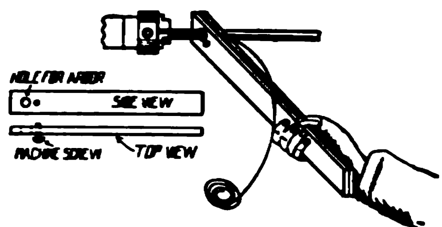
Step Grail Made of Old Files

After flattening out at A, forge out the long end to just a little larger than drawings call for and to the desired shape. Now make it very soft and file it up true and smooth. With a three-cornered file make the cutting teeth ¼ in. apart and 1-16 in. deep. Harden it again and brighten it up with emery cloth. Using alcohol torch, draw the temper on the cutting edge to a dark straw color. Soften all other parts. Make a handle and carefully fit it on the pointed end. You then will have a tool that ... for years.

A SIMPLE SPRING WINDER

The handy spring winder shown in the illustration can be made of almost any kind of flat stock. The hole should be of proper size to fit loosely on the mandrel; the screw must be heavy enough to hold the wire and be placed a distance equal to the diameter of the wire from the mandrel hole.

To wind closed springs, hold the bar or handle at right angles to the mandrel and to wind open springs, hold the mandrel towards the rear end of the lathe. A little practice will make one expert at winding with this method. Springs of any length up to 100 ft., if the wire is long enough, can be wound in this way.



Winding Coil Springs

I have frequently used this method for winding springs to slide over rubber tubing used in laundries on gas irons for protecting the tubing and to keep it from kinking, the springs ranging from 25 to 30 ft. in length.—Contributed by W. J. Barber, North Adams, Mass.

CUTTING WIRE CABLE WITH A HACK-SAW

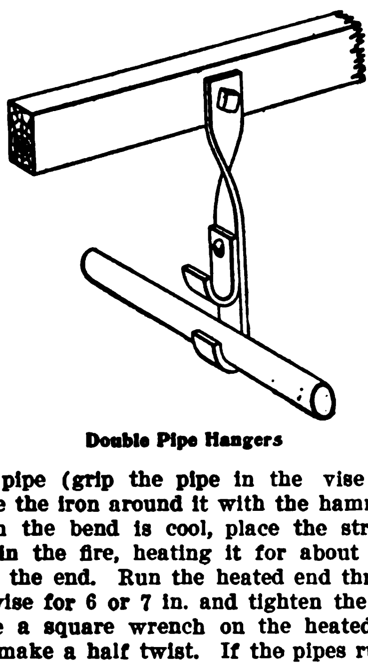
To cut a wire cable or a thin pipe with a hack-saw without breaking the saw, it is only necessary to turn the blade end for end in its frame, so that the saw will cut when pulling it toward you.—Contributed by Thos. McIntyre, 407 Root St., Chicago, Ill.

Two persons were electrocuted in New York recently by electric light wires that broke under the weight of sleet.

HOW TO MAKE DOUBLE PIPE HANGERS

A hanger such as is used to support ammonia coils is shown in the illustration. The coils are hung at distances of, say, 7 and 14 in. from the ceiling, two coils in a row, one directly over the other, says a correspondent of the Engineer. This method saves space and makes the parts easy of access in case of accident. Two small hangers riveted together so as to form two hooks about 8 in. apart form the hanger, the remaining portion of which is straight, having a ½-in. hole near the end to receive a lag screw. Good pipe hangers to fit any size pipe can be patterned after these.

Place one end of a piece of wrought iron 2 in. wide, ¼ in. thick and 24 in. long in the fire until red, then bend it to receive, say, a



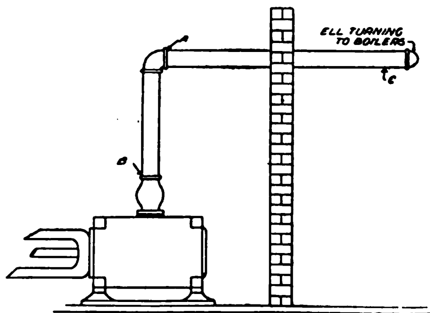
Double Pipe Hangers

2-in. pipe (grip the pipe in the vise and shape the iron around it with the hammer). When the bend is cool, place the straight end in the fire, heating it for about 6 in. from the end. Run the heated end through the vise for 6 or 7 in. and tighten the vise. Place a square wrench on the heated end and make a half twist. If the pipes run in an opposite direction to the beams, this half twist will cause the hanger to fit against the beam better, if not, the twist can be omitted. At a point 8 in. from the top of the hook place another hook of the same size and style, but not more than 4 in. long and with a hole 1 in. from the straight end. Cut another hole in the long hanger, 12 in. from the twisted end, then rivet the two together, one directly over and in a line with the other.

Any section of pipe can be removed without molesting the others.

SETTLING WALL CAUSED LEAKY PIPE JOINTS

A leak occurred in joints A and B in a supply pipe, which with the cylinder of a steam engine is shown in the illustration. After the joints had been taken apart, says

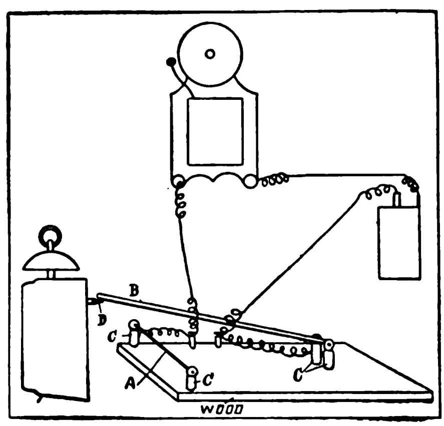


Settling Wall Causes Pipe to Leak

a correspondent of the National Engineer, it was found that the trouble was caused by the settling of the wall separating the engine and boiler rooms and which originally had supported the pipe. When a hanger was placed at C to support the weight of the pipe, there was no further difficulty.

ALARM FOR A SOUND SLEEPER

Referring to the sketch: A is a copper wire; B, brass or copper rod; C, standards;

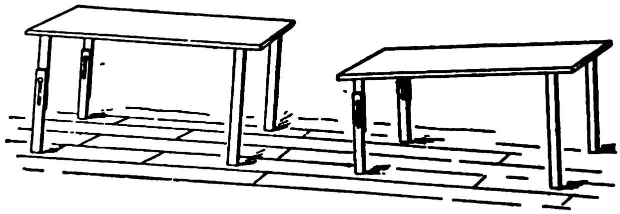


Electric Alarm

D, alarm key. When the alarm key, D, turns, the brass or copper rod, B, drops on copper wire, A, and so completes the circuit, ringing the bell.—Contributed by Eddie Evans, Hudson, S. D.

COMBINATION BACK TABLE FOR BOX SHOPS

A handy back table for use in box shops is shown in the sketch. It may be either level or tilted. The front legs are 1 in. by 4 in., with the lower halves a little longer than the upper ones and slotted about 10 in. A bolt, with a thumb screw, passes through a single hole in the upper leg into the slot of the lower one and a couple of large washers on each side permits of great strain in tightening. The lower leg may be vertical or slanting.

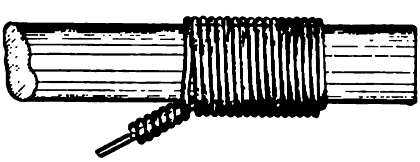


Adjustable Back Tables

The back table is used behind the pony planer to receive the stock as it comes through. This saves rehandling the pieces so many times. When there is no one behind the planer to take away, says the Wood-Worker, the table described may be tilted so that boards, fed one behind the other, in a single or double line, will pile themselves.

ATTACHING WIRES TO GROUND RODS

To solder a heavy wire on a half-inch ground rod is not an easy matter to one who does not know the right way to go about it. Either steel or copper wire may be used for the ground, and should not be smaller than No. 14 gauge (.080 in.). Heat the rod red hot for about 1 ft. at the top end. A combination of blow torches, a coal stove, or a forge may be used for heating, says Telephony. Scrape the heated portion quickly with a file, and wrap the wire on it as in the illustration. The end of the wire is first laid lengthwise of the rod, and each turn of the wire goes around both wire and rod. Let the wrapping proceed away from the top end of the rod. Make not fewer than twelve turns, then twist together the end of the wire laid against the rod and the main length.



The Proper Method

The wire will have become somewhat heated by this time. Bend it down along the rod, out of the way, and lay the heated end, joint and all, in a box of granulated sal ammoniac, rolling the entire joint in it. Dense white fumes will rise, and when a stick of solder is held against the rod it will melt in a pool in the sal ammoniac. The sal ammoniac will clean both wire and rod, and the solder will flow smoothly on both. When the joint is filled smooth with solder, shake it free of any excess metal and allow to cool. Cooling suddenly in water does no harm, but washes away excess sal ammoniac that would cause wire and rod to corrode. The joint should be made a few inches from the end of the rod, so that the end will not break off when the rod is driven. No ground rod should be less than 7 ft. long.

TO REMOVE OLD PAINT AND VARNISH

The following method is good, if the surface is to be repainted, says the Painters' Magazine.

Dissolve 4 lb. caustic soda, 98 per cent. or as many pounds concentrated lye, in 1 gal. boiling water and allow it to cool. In another vessel mix ½ lb. each of starch and china clay in 1 gal. of hot water. Beat this well, so as to have no lumps, and when cooled off some add it to the soda or lye solution, stirring well in the meantime, when it forms a thick, smooth paste. Apply this paste with a fiber (not bristle) brush to the surface in a heavy film, and when the paint or varnish is raised wash with warm water. To remove any traces of causticity give the surface a coat of vinegar and allow to dry before repainting. This method will raise the grain slightly, but that is not objectionable where the surface is to be repainted.

For removing varnish from wood that is to be refinished in the natural, a mixture of 3½ pints American fusel oil and ½ pint turpentine will lift the varnish without raising the grain or discoloring the wood.

WHEN DRILL STICKS IN ROCK

When a drill-bit sticks in a hole, the usual remedy is to strike the shank violently with a sledge until the bit is loosened. It is better to strike a moderate blow on the shank, near the hole, and never so high up as to strike the chuck, because then a bent piston or a broken chuck is likely to result. Small pieces of cast-iron, nuts or other fragments are used to keep the drill straight and prevent sticking or "running off."

TO MAKE HARD PUTTY

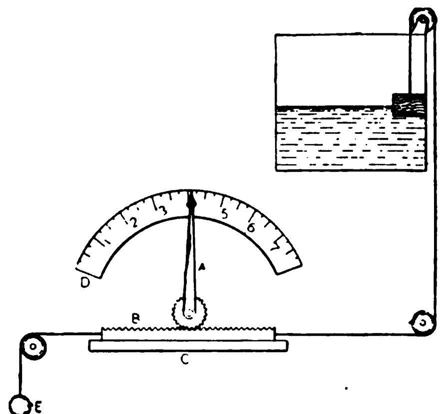
A little red lead added to oil-whiting putty will make it hard but not brittle, says the Master Painter. Rub varnish makes putty both tough and hard.

TOOL FOR CUTTING JOINTS ON CIRCLES

The tool illustrated does away with the necessity for drawing so many lines in order to find a joint on a circle. The device will cut any circle by placing the pin on the radius. It is marked off like a rule in inches and twelfths on the inner edges and may be provided with the slide or not, as liked. The pin runs through the hinge about ⅛-in. to hold the instrument in place while measuring the distance from A to B.—Contributed by Chas. Walters, Mt. Vernon, Ohio.

SIMPLE TANK GAUGE

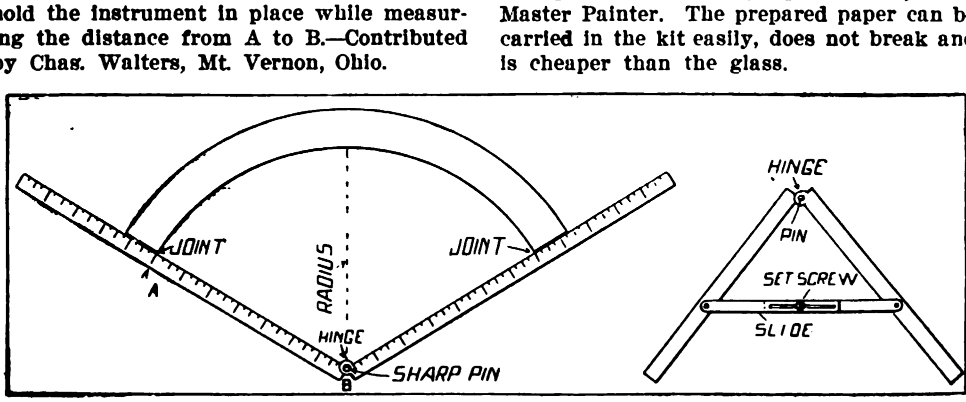
A handy tank gauge consists of a gear wheel set on a pinion to which is attached the hand A. A rack gear, B, meshes into the gear wheel and slides on the seat C. The hand A moves around a dial, D, with as many inches marked on it as it is desirable to let the water fluctuate up and down in the tank.



Handy Tank Gauge

When the float in the tank falls, the rack gear is drawn toward the right, causing hand A to move to the left. When the float rises with the water in the tank, weight E draws the rack toward the left and the hand moves in the opposite direction till it reaches 7, or whatever the number may be, indicating that the tank is full. This device is recommended by a correspondent of the Engineers' Review.

Heavy manila paper coated with shellac on one side makes an excellent substitute for glass for the sign painter, says the Master Painter. The prepared paper can be carried in the kit easily, does not break and is cheaper than the glass.



For Cutting Joints on Circles

DRILLING MACHINE MADE OF SCRAP

A small drilling machine may be made of scrap material by any one with a little ingenuity. For the one illustrated a piece of an old fret machine was used for the head (A). An old lathe head stock will do as well. Screw the part to a piece of wood 1 in. thick and then screw the wood to the workshop wall. Take a band over pulley B at the end and over the small pulleys, C, C_1, C_2, and over flywheel D at the bottom.

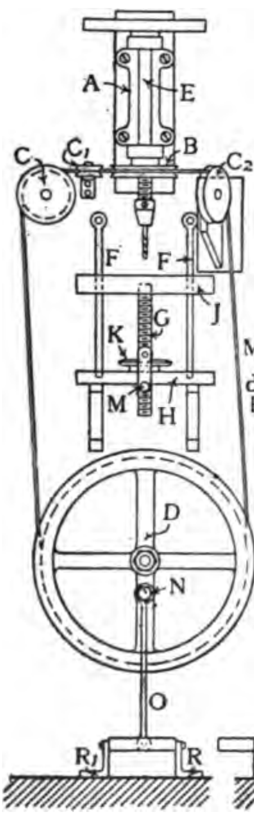


Fig. 1.—Front Elevation.

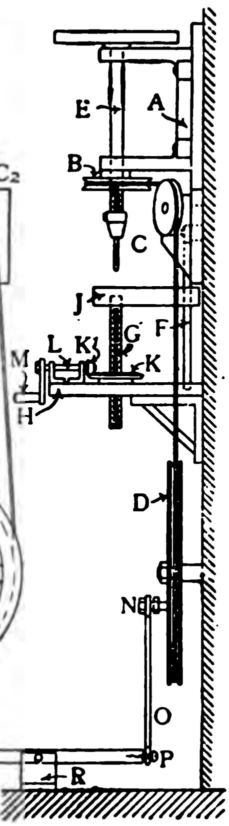


Fig. 2.—Side Elevation.

Place the small pulley C_1 horizontally to give the band a good grip on pulley B. Tap the end of spindle E to fit a drill chuck off of a small level-wheel drill. Arrange the table feed of the drill as follows:

Procure a piece of hard wood to project about 3 in. beyond spindle E, which may be of any convenient length; also, procure three pieces of ¼-in. iron—two to form the guides, FF, and the other to form the feed-screw, [illegible] a small bracket to the wall, midway between the end of spindle E and the top of the flywheel. Drill a hole through one end of each of the guide-bars, and let the other end into bracket H about ½ in. from the wall. Do not let them go quite through. Bore two holes through table J, ½ in. from the edge, and put a brass plate each side of each hole to allow the ¼ in. guide-bars to slide through easily.

Tap the third ¼-in. bar and make two nuts to fit it. Screw one nut up to within ¾ in. of the top; square the end above this nut and drive it into the table J, so that when the table is put on to the guide-bars and they are in their places, screwed to the wall by a screw through the hole before mentioned, in one end, the feed-screw G comes exactly under the end of the spindle E. Before putting the table in its place get an egg-beater (one of the bevel wheel kind) and take off the large cog-wheel and one of the small ones. Bore a hole through the large wheel so that it will slide easily over the screw G. Now turn a wooden disk the same size as the large wheel and cut a hole in it to fit the nut on the feed-screw.

Screw the large wheel on top of this disk (cogs upward) and put the nut into the square hole in the wooden disk, and screw a small brass plate on the opposite side of the cog-wheel to keep the nut in its place. Bore a hole in the bracket at the same distance from the wall as the hole for the feed-screw in the table J. Screw the cog-wheel and disk on to the feed-screw G, and pass the guide-bars through the hole in the table J, and pass the feed-screw through the hole in the bracket and screw the guide-bars to the workshop wall, but put a ½-in. washer on the screw between the wall and guide-bar. Take the small cog-wheel off the egg-beater and fit it to an axle. The best way of doing this is to get a piece of wire slightly larger than the hole in the cog-wheel. Tap this for 1 in., so that it will screw into the cog-wheel, and make two nuts the same thread. These nuts must be slightly smaller than the cog-wheel. Screw one as far as it will go.

Next screw on the cog-wheel and a nut outside that. These nuts must be screwed up fairly tight to keep the cog-wheel from revolving on the axle. Now cut off the axle about 2 in. from the small cog-wheel and fix a piece of brass about ⅛ in. by ½ in. by 2 in. This should be fixed as follows:

Square the end of the axle and drill two holes in the brass plate about ¼ in. from each end. Into one of these secure a small handle; drive the other end on to the squar end of the axle and screw on a small nut outside it. Get two small brass plates, and bend over the bottom about ½ in., L-shaped, and drill two small holes through the bottom of the L to screw down to the bracket H. Drill another hole on the other side of the angle to take the axle L. These holes should be drilled so that when the brackets are screwed down the small cog-wheel meshes with the large one K. Put a small washer outside the plate between the handle and plate, and cog-wheel plate. Now screw these plates to the bracket so that one comes up against the small cog-wheel and keeps it in place. Screw the other one up against the handle, so that axle L has no end play.

If, when handle M is turned to the left, table J will not come down of its own accord, pass a piece of brass over the large cog-wheel, K, and screw down at each end. The flywheel may be taken from an old sewing-machine, and if it is not quite heavy enough, put a lead weight on it. Pass a bolt through the center of the flywheel with a shoulder on behind. This bolt should run through the workshop wall and a nut put on from the outside.

Put a bolt, N, into one of the spokes of the wheel and put a piece of thick iron wire around this and connect it to the end of the treadle by a screw at P. Make the treadle of wood, 9 in. by 4 in. by 1 in. Screw the iron wire on at one end, not tightly, but so it can move a little each way. Swing the treadle in the middle by two screws, passing through small metal plates, R, R_1, at each side. A machine like this was rigged up by a correspondent of the Model Engineer, London, and worked very satisfactorily.

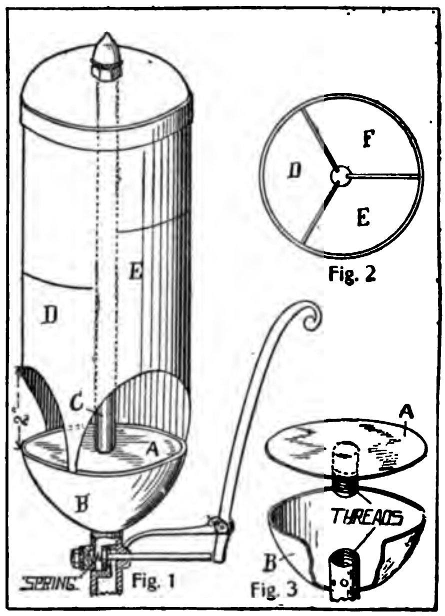
TO GILD ON GLASS

Thinly coat the places to be gilded with a saturated borax solution on which lay the gold leaf and press down well and uniformly with cotton wool. Heat the glass over a spirit flame until the borax melts and allow to cool off.

If the glass is to be decorated with gilt letters or designs, paint the places to be gilded with water-glass solution of 40 degrees, lay on the gold leaf and press down uniformly. Then heat the object to 86 degrees Frahrenheit, so that it dries a little; sketch the letters or figures on with a lead pencil, erase the superfluous gold and allow the article to dry completely at a higher temperature.

HOW TO MAKE A CHIME STEAM WHISTLE

Procure a piece of seamless brass tubing 8 in. long, 4 in. in diameter and 1/16 in. or less, thick. Have cast a bowl, B, 4 in. in diameter, and with a place in the bottom for inserting a 1-in. pipe. Also have cast, or make yourself, a disk, A, 3⅞-in. in diameter, allowing 1/16 in. between the edge of the disk and the bowl for the escape of the steam that strikes the bell. Then get a ½-in. bolt, C, 10 in. long, threaded on both ends and with three slots, just wide enough to



Home-Made Steam Whistle

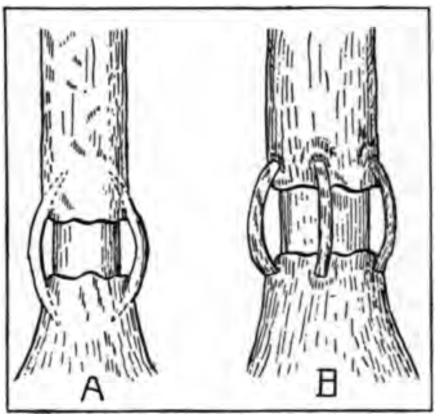
fit sheet brass partitions for cells running its entire length into.

Cut the tubing into thirds by dividing it up as indicated in the sketch, and use sheet brass for forming the cells, soldering it in. Let one cell be 4½ in. high, D; one 5¾ in. high, E; and the other 8 in. high. Put a brass cap 4 1/16 in. in diameter, threaded, on the top and use an acorn or other ornament to finish it.

To make the valve drill a hole through the bottom of a 1-in. check valve, and stick the stem of check through the hole, as shown in the sketch. Put a brass spring in behind seat or valve disk to force it closed after using, then fasten the lever around the valve, as shown, and your single bell chime whistle is complete. This whistle makes a beautiful sound and can be heard much farther than the ordinary whistle. Fig. 2 is an inside view of the bell, looking down from the top; Fig. 3 shows how the disk is fastened into the bowl.—Contributed by Thos. McGuire, Baltimore, Md.

TO SAVE A GIRDLED TREE

When a valuable tree is girdled it may pay to try to save it. The following method has been successful. When, in the spring, the tree is found girdled, drive a small chisel into the bark above and below the girdled portion as shown by the dotted lines in A. Then cut some large healthy twigs of the preceding year's growth from the top of the tree, each a little longer than the distance between the opposite cuts in the tree. Sharpen both ends of the twigs and bend them until the ends can be placed in the cuts as shown at B. Press the twigs in until they are as near straight as possible, so that there is a perfect union between the inner bark of both twig and tree. Four or more twigs, according to the size of the tree, should be placed around it. Then cover the whole with grafting wax. If the work is skilfully done, says the Rural New-Yorker, the tree will be completely cured in a few years.



Saving a Girdled Tree

To render ivory flexible, immerse in a solution of pure phosphoric acid, sp. gr. 1.13, until it partially loses its opacity; wash in cold soft water and dry. It will harden again if exposed to air, but may again be made pliable by immersing in hot water.

TANK TO KEEP WATER FROM FREEZING

To keep water from freezing make a tank of galvanized iron two or three inches narrower at the bottom than at the top, says the Rural New-Yorker. Set the iron tank in a bottomless wooden box and place the whole directly on the stringers of the well and plank up to it on each side. Provide a cover to the box. Warm air from the well striking the bottom and sides of the tank will keep the water warm.

WELDING A PALM ON AN ANCHOR

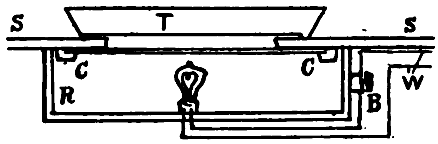
Sometimes an anchor with the palm broken off as shown at A, comes into the shop for a new palm or the old one to be welded on. If the break is not even, trim it a little with the chisel, fit a good pair of tongs to the palm, swing the anchor in the crane (this applies only to heavy anchors 500 lb. and up) and put both ends of the break in the fire and heat them up.

Have a piece of iron or any old metal about 4 in. by 1 in. heated in another fire, and when ready bring them all out, place the anchor and the palm together and weld the flat piece across the break. This saves lap-scarfing or rigging. Turn the anchor over and cut out a V-piece as shown at B. Now place the anchor in a clean fire (not a hollow fire), get a good heat, fill in with the V-piece and finish off that side. Then turn your piece over, cut away the flat piece and cut a V into this side. You now proceed the same as on the other side, says the American Blacksmith, heating the part where V was cut, placing a wedge in and welding and finishing. You will have a good job by this method if the heats are right.

To Repair an Anchor

HANDY DARK-ROOM LAMP

For those who use glass trays the diagram shows a convenient way to rig up a dark-room lamp. S is a shelf with a



Ruby Lamp for Dark Room

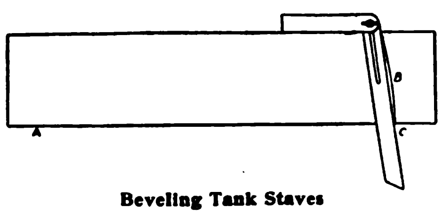
square hole about 1 in. smaller each way than the tray cut in it; C is a piece of ruby glass held by clamps to the shelf; R is a box which encloses the electric light; B is a switch, which may be placed anywhere convenient; W are wires leading to the light. When the light is turned on the negative will show up plainly.—Contributed by Harold W. Moffat, 476 Main St., Orange, N. J.

TO MEND A GRINDSTONE

A piece broken out of a grindstone can be replaced by covering the surface of the piece and the broken surface of the grindstone with a strong solution of pure Portland cement and water, then pressing the piece firmly in position. Give plenty of time to dry.—Contributed by G. W. Gander, Nappanee, Ind.

BEVELING STAVES FOR ROUND TANKS

Many workmen make an elaborate process of getting the bevel of staves for round tanks. Much of their work is unnecessary, says a correspondent of the Wood-Worker. A simple method is illustrated. Take one of the pieces intended for a stave, set the

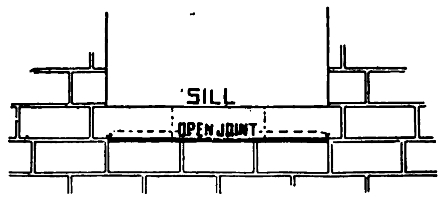


Beveling Tank Staves

trammel to the radius used in striking the bottom, or to be absolutely accurate, to that of the outside of the tank and from a point A at one edge of the stave strike curve B. Set the bevel to touch the two ends of this curve and it will be correct; the usual practice is to set it back a little at C, so the staves will be slightly open on the outside. When the tank is wet the openings close and the staves spring to the curve of the bottom.

TO PREVENT CRACKS UNDER WINDOW SILLS IN CEMENT BLOCK BUILDINGS

In erecting buildings of cement blocks, the blocks under window sills frequently crack. This is because proper provision for settlement has not been made, says Municipal Engineering. In most cases the trouble is probably due to the settling of the sills in full bed of mortar when they are first set. To prevent the cracking, in either brick or concrete construction, set the sills at first with joint full of mortar only at the ends, leaving a space under the sill for the whole width of the window space. The settlement of the



Sill with Open Joints

wall can then occur during the construction without bringing the breaking strain upon the sills. After the work is completed and the settlement is presumably all done fill the open joints under the sills with mortar and thus finish the wall. No cracks will then appear in either blocks, bricks, wall or sills under ordinary circumstances, and unless there is a great settlement, such as would come from insufficient foundation and bad design.

TO KEEP WATER PIPES FROM SWEATING

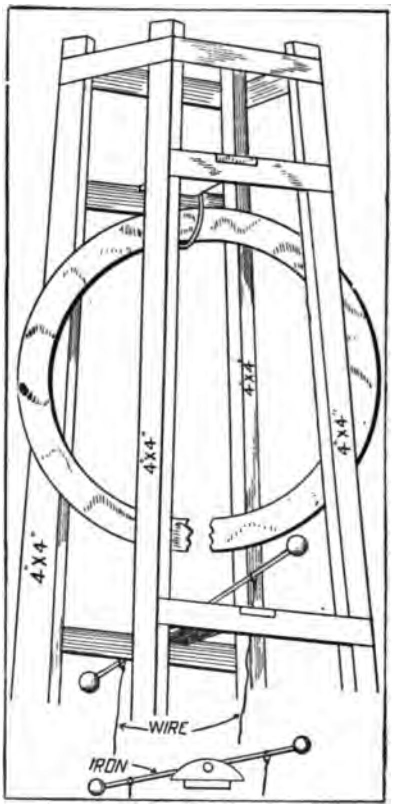
Wipe the pipe dry with an old cloth, then wind it with two or three thicknesses of good heavy paper. Cover this wrapping with 4-in. strips of heavy cotton cloth. This kink was tried on 100 ft. of pipe and there was no further trouble from dripping.—Contributed by Fred Connor, Hydeville, Vt.

To prevent the annealing of metal above the place where heat is to be applied, stick the rod or band iron in a potato.—Contributed by E. M. Atkinson, Portland, Ore.

LOCOMOTIVE TIRE AS FIRE ALARM

Inexpensive--Effective

In many of the smaller cities where an electric fire alarm has not yet been installed worn out or cracked tires from the driving



Novel Fire Alarm

wheels of locomotives are used in place of fire bells. The cost is less, the sound is very penetrating and is unlike a bell. For many years Marengo, Ill., used one of these tires before alarm boxes were put in. W. F. Mead of that place furnishes a sketch which will indicate the manner of erecting the tower, which in this case was on top the fire engine house. The tire was hung by an iron ring from a cross piece, but some towns erect a 20 or 30 ft. tower on the ground. The striker has an iron ball at each end, with two wires passing down to the ground floor one of which is grasped by each hand. By this means more rapid strokes can be sounded than on a bell.

Shop Notes for 1905 and 1906 are a gold of *information* to any mechanic.

PRESERVING OLD SCREWS

Do not place old nuts, screws, etc., which you save in tin boxes. They will soon become rusty and unfit for use. A better way is to keep them in small large-neck bottles, says Machinery. Always sort the screws, etc., according to size and provide the bottles with corks and labels.

WHEN TO VARNISH GOLD LETTERS

When gold leaf is very thin or largely alloyed varnish will protect it and make it wear longer, says the Master Painter. But for leaf of good quality and stout the varnish is undesirable. It impairs the lustre and is apt to crack.

WHEN THE HANDS OF A CLOCK COME TOGETHER

Having worked out the little problem involved in ascertaining the exact time at which the two hands of a clock come together in making their respective circuits, and thinking the information might be sufficiently novel to merit space in your columns, I submit the following table.

I say this seems novel, because I do not remember ever having seen it in print, or heard the matter discussed.

					12	o'clock
5	min.	$27\frac{3}{11}$	sec.	past	1	"
10	"	$54\frac{6}{11}$	"	"	2	"
16	"	$21\frac{9}{11}$	"	"	3	"
21	"	$49\frac{1}{11}$	"	"	4	"
27	"	$16\frac{4}{11}$	"	"	5	"
32	"	$43\frac{7}{11}$	"	"	6	"
38	"	$10\frac{10}{11}$	"	"	7	"
43	"	$38\frac{2}{11}$	"	"	8	"
49	"	$5\frac{5}{11}$	"	"	9	"
54	"	$32\frac{8}{11}$	"	"	10	"

Contributed by J. Raymond Campbell, Frick building, Pittsburg, Pa.

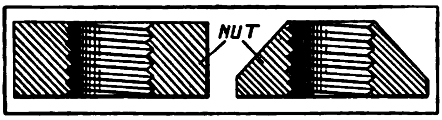
LOCATING BEARINGS FOR SHAFTING

Every master mechanic knows how troublesome it often is to tell in advance the exact location of the bearings for a new line of shafting. To overcome this have the shafting keyseated the entire length and then fill the keyways where the bearings come with babbitt, after the line is in place. Another advantage in this is that additional pulleys can be placed at any time. Use babbitt of a different grade from that in the boxes.—Contributed by F. C. Perkins, Harkness, N. Y.

SHOP NOTES

A BOLTING KINK

A good way to bolt a plate or angle iron to some other structural piece, having bolts in it but so short that the nuts come just flush with the ends, and where you cannot take the bolts out to put in longer ones, is as follows:



Using Short Bolts

Countersink the holes in the plate or angle to be bolted on, then screw the nuts on an old bolt and grind them down taper to fit the countersunk holes.—Contributed by Thos. McIntyre, 407 Root St., Chicago, Ill.

GOOD FLOOR POLISHES

1. Put a small quantity of spermaceti in a saucepan on the fire and mix with it enough turpentine to make it fluid. Apply to the floor a thin coat, using a piece of flannel for the purpose. Rub with dry flannel and brush the same way oak stains are brushed. The rubbing and brushing process, says the Practical Carpenter, take a long time, if properly done.

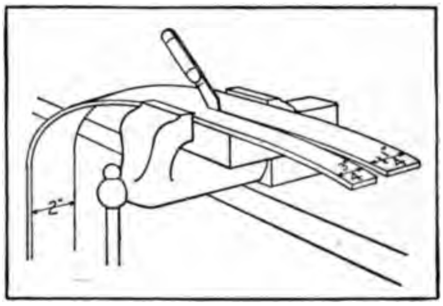
2. Dissolve ½ lb. potash in 3 pts. water in a saucepan on the fire, and when the water boils throw in 1 lb. beeswax cut up into small pieces. Stir until the wax is melted. If the polish is too thick when cold, add more water. Apply with a brush, painting the boards evenly, and when dry rub with flannel tied on the end of a broom.

TO MAKE A RIVET SET

To make a useful rivet set, take a square head bolt, cut it off 4 in. from the head and drill a $\frac{3}{16}$-in. hole in the bottom.—Contributed by Wm. T. Ackerman, 1311 Stockton St. Baltimore, Ind.

HOW TO CUT A BELT

If one lacks the regular tools for cutting a belt a good job may be accomplished with only a knife, a vise and a block of wood. The wood should be the same width as the belt or a little wider and should be fastened in the vise about ⅜ in. below the top of the jaws. Drive the knife in the wood making the distance between the jaw of the vise and the knife blade, the re-

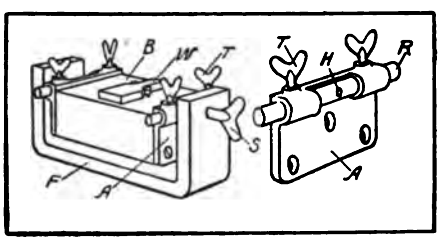


How to Cut a Belt

quired width of the belt. Then draw the belt through as shown.—Contributed by J. J. Hunziher, Cleveland, O.

A JIG FOR FILING SMALL WORK

For the benefit of bench men or any one who has to file small work requiring a perfectly flat surface, the following device is described.



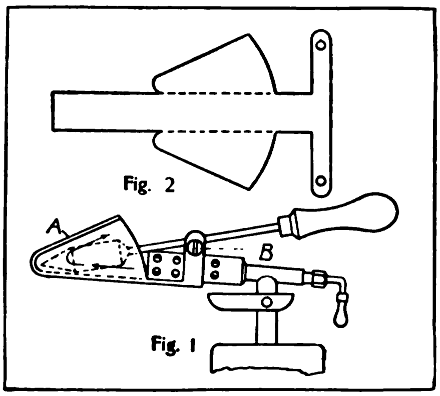
Jig for Filing Small Work

A block B, similar to those generally used for filing small work, is mounted in a frame F by thumb screws S which allow the block to swing and thus prevents rounding the ends of the work. The adjusting plate A has a sliding rod R with a hole in the centre H to receive the pointed thumb screws S, the rod R being adjusted and held in place by the thumb screws T.

The frame F may be either of wrought or cast iron, and should have screw holes in the bottom to fasten it to the bench. The wood block B is fitted with pins to hold the work. The adjusting plate A can be made of brass or cast iron and the rod R and thumb screws S, T are made of steel.—Contributed by G. D. B., Springfield, Mass.

SOLDERING IRON HOLDER FOR BLOW TORCH

A device for heating soldering irons very quickly and with little fuel consists of a sheet iron pocket A, Fig. 1, and a $\frac{3}{8}$-in. stove



Holder For Heating a Soldering Iron

bolt B for fastening to blow torch. Cut a piece of No. 18 sheet iron to the shape shown in Fig. 2 and drill holes for the $\frac{3}{8}$-in. stove bolt as shown. Bend the sheet iron as shown in Fig. 1 and fasten to the burner, and the heater is complete.—Contributed by G. L. Housman, Prattville, Mich.

HOW TO SENSITIZE SILK

Prepare a solution by pouring 10 oz. boiling water on 50 gr. ammonium chloride and 30 gr. Iceland moss; allow to become nearly cold, then filter. Soak the silk in this solution for 15 minutes, let it dry, then sensitize it by soaking for another 15 minutes in a silver nitrate solution (20 gr. to the ounce) with a little nitric acid added. Dry the sensitized silk in the dark room and treat precisely as P. O. P. To obtain good results the printing should be very dark.

HOW A STEAM TURBINE WORKS

The turbine mode of propulsion, which is so rapidly finding favor as a marine propeller, is most aptly described by the well-known figure of a pinwheel, says Marine Journal. The turbine, in fact, is a series of pinwheels, one behind the other, fixed to a shaft which turns with them. Now everyone knows that when a pinwheel is blown upon it revolves. For this motion in the turbine a jet of steam is employed. Fixed to the inside of the cylinder in which the propeller revolves is a series of stationary blades projecting into the space between each wheel and set at such an angle that they will deflect the stream of steam to strike the propeller at an angle which will give the most force.

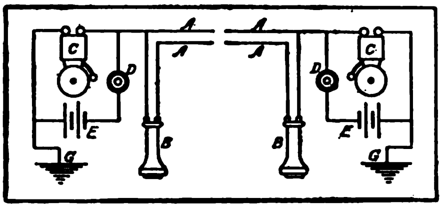
The Parsons turbine consists of a cylindrical case with numerous rings of inwardly projecting blades. Within this cylinder, which is of variable internal diameter, is a shaft or spindle, and on this spindle are mounted blades, projecting outwardly, by means of which the shaft is rotated. The former are called fixed or guide blades, and the latter revolving or moving blades. The diameter of the spindle is less than the internal diameter of the cylinder, and thus an annular space is left between the two. This space is occupied by the blades, and it is through these the steam flows. The steam enters the cylinder by means of an annular port at the forward end; it meets a ring of fixed guide blades which deflects it so that it strikes the adjoining ring of moving blades at such an angle that it exerts on them a rotary impulse. When the steam leaves these blades it has naturally been deflected. The second ring of fixed blades is therefore interposed, and these direct the steam on to the second ring of rotating blades. The same thing occurs with succeeding rings of guide and moving blades until the steam escapes at the exhaust passage

TO REMOVE BROKEN SECTIONS FROM A MOWER SICKLE

Place the sickle in a vise with the points of sections down. Screw the vise up tight enough so the sickle bar will not go through. Then with a heavy hammer drive the broken sections straight down. One stroke will remove each section, if properly made. —Contributed by J. J. Hogan, Parnell, Iowa.

SIMPLE TELEPHONE LINE USING RECEIVERS FOR TRANSMITTERS

An ordinary telephone receiver—the ear piece—can be used for purposes of transmitting and receiving on lines of reasonable distance. In this case a push button and



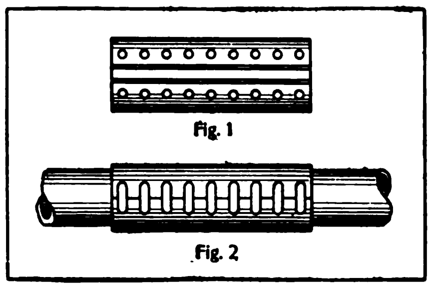
No Transmitters Used on This Line

call bell must be installed at each end of the line with which to make the call. A reader writes as follows: "I have always been interested in your shop notes and am sending you a diagram for a simple telephone. It consists of two receivers, into which the words are spoken and heard alternately, and a ringing attachment. It gives very good results, as I have one to a friend's house some 500 ft. away, which works as well as the larger, complicated telephones. Anyone can easily put up a line and make the connections by following the diagram shown. A 2-wire line is required, also grounding at each end. In the diagram, A, A, are the line wires; B, B, receivers which also serve as transmitters; C, C, call bells; D, D, push buttons; E, E batteries; and F, F, the ground connections. The cost of such a line, say 500 ft., is about as follows: 1,000 ft. No. 14 galvanized iron wire, 75 cents; 2 receivers, $1; 2 sets call bells, push buttons and four batteries, $1.02; 18 insulators and 100 ft. No. 18 annunciator wire, 66 cents. Total, $3.43.—Contributed by Edward Band, 1232 Wrightwood Ave., Chicago.

REPAIR FOR LARGE HOLE IN OUTER CASING OF AUTO TIRE

The materials required are a piece of old outer casing for the patch, of length and thickness according to the size of the hole; a lacing needle, and a piece of cord or tape to lace the patch on with.

Trim the ends of the patch so it will fit evenly on the tire and punch lacing holes in the sides so it can be laced over the tire. The outer casing and patch should be the same diameter. Put the patch over the tire and lace as tight as possible, then

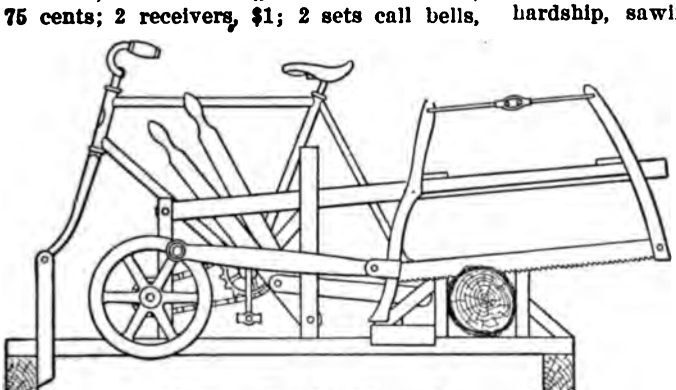


Repairing an Auto Tire

put the tire on the wheel. Fig. 2 shows the patch laced on the tire.

HOME-MADE FOOT-POWER SAW

Instead of being a back-breaking, tedious hardship, sawing wood may be made a pleasant exhilarating exercise. Any person with even a slight knowledge of tools can make a foot power saw. The illustration will sufficiently explain how it is done. My machine was constructed from an old bicycle frame and buck saw, the reciprocating motion being obtained by the use of a crank pin and connecting rod as shown. The upper lever raises and lowers the saw and the lower lever clamps the wood in position.—Contributed by E. Ponton, Northampton, Mass.

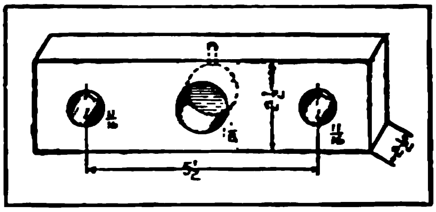


Reduces Hard Work to a Minimum

SHOOTING OFF AIR PISTONS

When stripping an air pump for overhauling, it is often difficult to remove the air piston. A correspondent of Railway and Locomotive Engineering shoots it off.

The device which was used with 8-in. and 9½-in. air pumps consists of a block of machine steel 2½ in. square by 7¼ in. long,



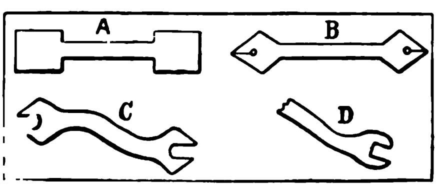
For Shooting off Air Pistons

having two ⅝-in. holes 5½ in. apart for ⅝-in. bolts and a hole 1⅛ in. in diameter and 1½ in. deep, with fuse hole drilled through in the center of the block to hole for the end of the piston rod to slip in. Then a thimble full of gunpowder and a leather wad with some paper, if necessary, is rammed in. The block is bolted up to the air piston, some powder is put in the fuse hole and touched off with a heated rod.

The piston will be removed without burring the threads or breaking anything. It is well to set up a block to keep the piston from going too far.

AN UNBREAKABLE S-WRENCH

Forge down a piece of old buggy spring as at A, then work it on the edge of an anvil to a diamond shape by stoving as at B. Punch a hole in each diamond-shaped part a little in front of the center and cut out to edge. Drive in a punch to spread the



Durable S-Wrench

jaws, and bend one each way sideways and work to shape on the edge of the anvil. Bend back straight and finish on the hardy, leaving jaws with a diamond corner as at C. This wrench will not break as those made in the usual way (D) often do. I find that old springs make the best wrenches.—Contributed by O. V. Simpson, Hersman, Ill.

HOW TO GALVANIZE IRON

The two general methods of galvanizing are the dipping process and the electroplating process. The dipping process is the one generally used, as it protects the iron and prevents it from rusting to a greater extent than the electro-plating method. There are some articles, however, which require electro-plating, especially when a very thin coating of zinc is required.

In the dipping process the article is first dipped in a solution of sulphuric acid. It is then placed in a solution of hydrochloric acid, and after drying is immersed in the molten zinc. Compressed air lifts are generally used for handling large work, and small articles are sometimes placed in perforated ladles. The troughs for holding the acids are usually made of wood, and the tanks for melting the zinc are made of steel 1 in. or more in thickness. The melting is usually started with lead, which melts first and surrounds the zinc. This saves time in melting and prevents over-heating the tank.

This process is very wasteful, as the amount of zinc deposited on the work is only about 53% of that put into the tank. Of the remaining zinc about 30 to 40% is converted into dross; 15 to 20% oxidizes and rises to the surface; and 5% or more evaporates.

The dross is an alloy of zinc and iron and, being heavier than zinc, sinks to the bottom of the tank and is often very difficult to remove. It is sold at a considerable loss and is used in making zinc oxide for paint. The skimmings are also sold, but the evaporated portion, of course, is a total loss.

A new process for galvanizing has been perfected lately which will probably be less wasteful than the one described. The new process is as follows: Pickle the article to be galvanized for a few hours in a solution of 1 part of sulphuric acid (concentrated) in 100 parts of water. Use a wooden or porcelain vessel for this process. Then scour the article with a brush, wash well and place in a solution of lime and water until ready for the galvanizing process.

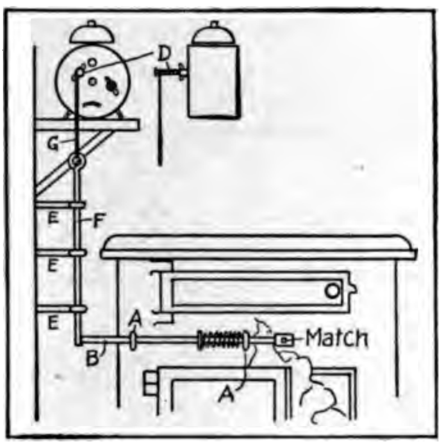
Just before galvanizing immerse the article in a solution of zinc chloride and ammonium chloride until bubbles appear on the surface of the metal. To make this solution place zinc in hydro-chloric acid until no further action takes place, decant, and add sal ammoniac. Dry the metal with the film of bubbles on it on a heated iron plate, then place in a bath of heated zinc. "Be very careful not to overheat or 'burn' " zinc," warns the Model Engineer, London, and to prevent the oxidation of the metal place either some sal ammoniac or charcoal on the surface. Withdraw the article from the molten metal and beat it to remove the excess of zinc.

This process is excellent for fittings used for yachts, water motors, etc., as iron castings thus treated will resist the action of water for a considerable time.

TIME FIRE KINDLER FOR COOK STOVE

An alarm clock can be connected up to light a fire in the cook stove at the time desired, and thus save one getting up before the kitchen is heated.

Drill two holes in the stove and screw in two eyes (A A), then place a rod (B) with a spring in the eyes as shown. In the end of this rod drill a hole to receive the match. If the match is too small to stay in, use a wedge to hold it. On the eye in the middle of the stove solder a piece of



Time Lighter for Cook Stove

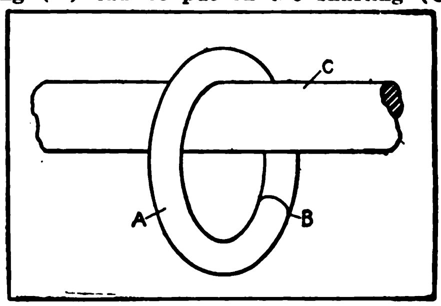
stiff tin, so that the match will be drawn against it when the rod is thrown by the spring.

Solder a nail (D) to the key of an alarm clock and place the clock on a shelf near the stove. Under the shelf use three screw eyes (E E E) to hold a perpendicular rod (F) connected with the stove rod as shown, and with the alarm key by a stout cord (G).

Set the alarm for the time you want the fire kindled and have the kindling device in readiness, as illustrated. When the alarm runs down it will wind the cord G on the nail D attached to the key and thus pull rod F off of the end of rod B, which will be thrown by the spring and so strike the match. A piece of paper, or other easily inflammable material, should be placed near the match so the flame will catch.—Contributed by O. E. Vessels, 313 E. Yorwood St., Indianapolis, Ind.

TO KEEP SHAFTING BRIGHT

A good way to keep shafting bright is to cut rings either of fibre or leather and put two between each hanger and pulley—or three if they are very far apart. The ring (A) can be put on the shafting (C)



Leather Rings Keep Shafting Bright

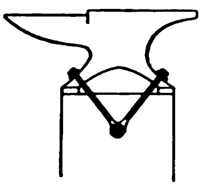
by cutting a slit (B) in one side. When the shafting is in motion the rings travel back and forth on it.—Contributed by W. J. Slattery, Emsworth, Pa.

TO ENAMEL ALUMINUM

A coating for aluminum ware, aiming to produce a coloring of durable character or in rendering the surface adapted to enameling can be obtained by a process patented in Germany, according to Metallurgie, by a Mr. Lang. The surface is covered in the first instance with a solution of a quicksilver compound—as, for instance, chloride of mercury—and by this means a coating of aluminum amalgam is obtained. After this is removed a very active process of oxidation of the surface is said to take place, which action may be interrupted by strong heating, and the aluminum oxide will serve as a foundation for the enamel. If during the process of oxidation the metal is exposed to the action of chromic acid or other suitable chromates or to some other readily reducible substances, these compounds are at once reduced. The action of heat may also be employed to give different colored coatings, and the colors obtained may be gray, green, brown or black. They are said to resist the action of fire and render the aluminum more difficult to melt.

DEADENING THE SOUND OF AN ANVIL

If the anvil block is wider than the base of the anvil, hew it down to fit, then bore a ¾-in. hole through the block 10 or 12 in. from the top. Make four ⅝-in. bolts with ¾-in. eyes and a ¾-in. bolt long enough to go through the block and take two eyebolts on each side. Make yokes of ⅝ by 1 in. stock and punch or drill ⅝-in. holes in each end. Measure the anvil so as to have the bolts hug it closely; put the ¾-in. bolt through the block, slip on the eyebolts, put on the clamps and nuts and tighten up. A correspondent of the American Blacksmith who devised this method, says that it will both hold the anvil securely and effectually deaden its ring.



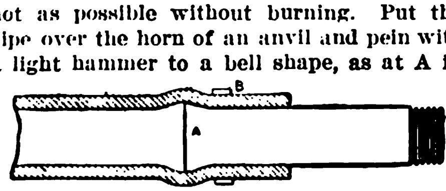
CUTTING WINDOW GLASS

When a pane of glass is broken and you have no light to fit, a larger glass can be cut to size by the following method:

Moisten a cloth with vinegar or turpentine and wet the light where you intend to cut it. Break off a piece of a triangular file and proceed as with a glazier's diamond. Double A glass can be cut successfully in this way.—Contributed by F. Knospe, Clyman, Wis.

TO KEEP STEAM HOSE FROM BLOWING OFF WHEN TUBES ARE BLOWN

Thread one end of a piece of ¾-in. pipe, 6 or 8 in. long, and heat the other end as hot as possible without burning. Put the pipe over the horn of an anvil and pein with a light hammer to a bell shape, as at A in the sketch. Work the pipe into the hose and put on a good fitting clamp, as at B. The harder it pulls, says the Engineer's Review, the tighter it will get. Couple the hose to the steam pipe with a dart union, which makes an excellent hose coupling, and *can be screwed* tight with the hands.



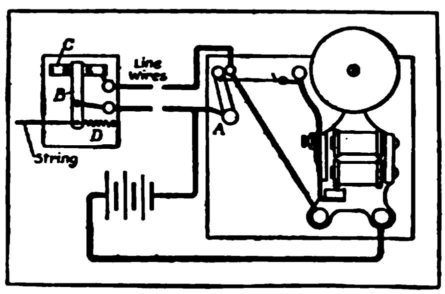
Pipe Peined to Prevent Hose Blowing off

CONTINUOUSLY RINGING BURGLAR ALARM

A continuously ringing burglar alarm is a very simple affair; the only addition to the ordinary alarm being a one-point switch (which may be home-made) and a little wire, so if one has an alarm, this may be made without extra expense.

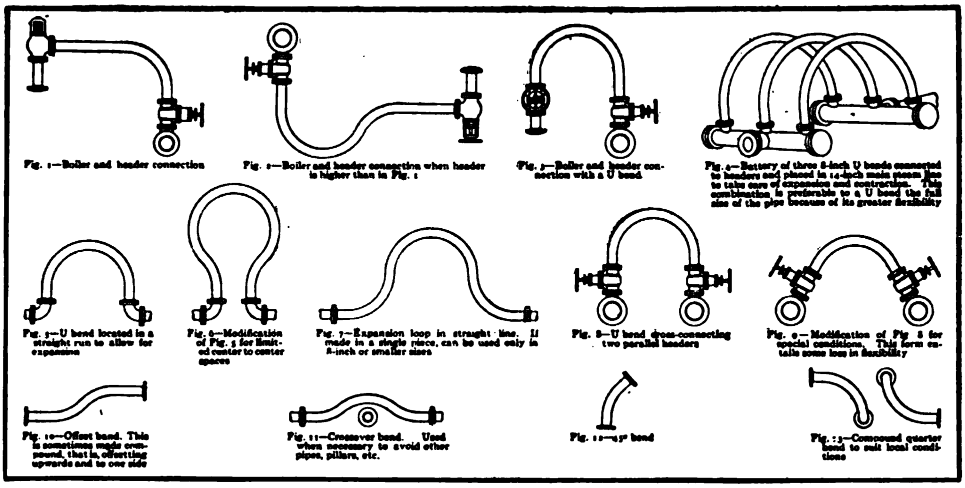
Connect up the alarm, battery and bell in the usual manner, but shunt in the one-point switch, A, as shown in the sketch. Then nearly close the switch and fasten the movable end to the tapper of the bell by means of a small copper wire soldered to it and a piece of string. (The string should not be omitted, for the switch, which works very easily, might be pushed off connection by the stiff copper wire.)

The arrangement that starts the alarm ringing is seen at the left. If a burglar in entering pulls the string the pivoted lever B will make contact with terminal C at one side and the bell will ring; and if in endeavoring to stop the alarm, he cuts the string, spring D will move the lever so that it contacts at the opposite side of the terminal and the bell will ring on. With the ordinary alarm, should a burglar hear the bell he need only step back from the string or close the door or window, if the string is attached to either of them, and the chances are that the bell would not be heard; but a loud bell ringing continuously is sure to awaken someone.—Contributed by Jack Stair, 258 E. Market St., York, Pennsylvania.



Continuously Ringing Alarm

Before putting screws in soft wood fill the holes with thick glue, or if glue is not convenient, put powdered resin around the holes and heat the screws before driving. The Practical Carpenter says this will keep the screws from working loose under strain.



Common Forms of Pipe Bends

Courtesy Valve World.

COPPER PLATING WITHOUT A BATTERY

Make the plating solution by dissolving 1 oz. sulphate of copper (blue vitriol) in 6 oz. water and then adding ½ oz. sulphuric acid. Get a piece of zinc about ⅛ in. thick and 2 in. square and solder to it at its center one end of a piece of copper wire 18 in. long. Then wrap a thick rag around the zinc, tying it close. This is the plate.

Carefully clean the tin, iron or brass article to be plated, so that it is free from grease; sand and soda is good for this purpose. Now fasten the other end of the wire to the article. The wire must be bright in order to make a good connection. Dip a sponge in the plating solution and rub it over the article. Wherever the solution touches it will immediately coat the metal with copper, and the longer you rub the heavier the coating will be.—Contributed by Ira Emery, 12 E. Simpson St., Dayton, Ohio.

TIME INDICATOR FOR PLANTS

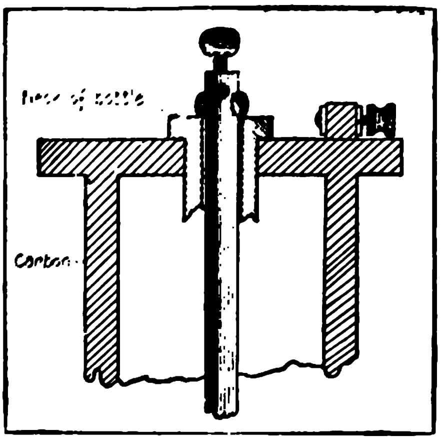
The time indicator illustrated was originally used in a mill to show the actual number of hours the mill ran throughout the week. The device could be adapted to other plants for the same purpose.

Time Indicator for Plants

Figure 1 consists of a speed indicator, two batteries and an eight-day clock. When the mill is shut down the hand of the indicator points upward and when the mill is at proper speed the hand points downward. A small cog-wheel, having eight cogs is fastened on the hour stem of the clock, says a correspondent of the American Miller, and the other cog wheel has 112 cogs. The small wheel turns around twice in 24 hours, and the larger one makes one revolution in seven days. A chart (Fig. 2) is fastened on the large wheel and is punctured by the magnet (Fig. 3) every time the hand on the indicator passes the button in either starting or stopping.

SUBSTITUTE FOR BATTERY INSULATOR

Sometimes the porcelain insulator which insulates the zinc from the carbon in a carbon cylinder battery becomes lost or broken,



Improvised Battery Insulator

and if one cannot be procured right away, here is a good substitute. Get a bottle with a flange on the neck, break the neck (A) off and insert the zinc (B). This insulator will be just as good as a porcelain one.—Contributed by W. J. Slattery, Emsworth, Pa.

HOLDING PISTON RINGS WHILE FILING

In filing piston rings to fit, the following scheme for holding them will be found convenient:

Lay the ring on a 12x14x1½-in. board as shown in the sketch, mark holes A and B

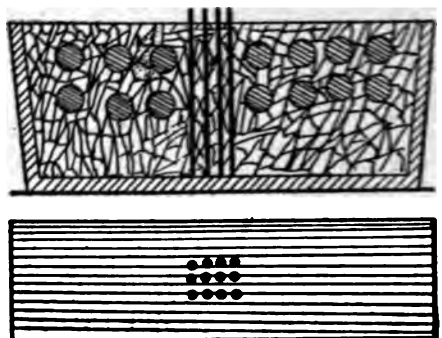
To Hold Piston Rings

and drill for ¼-in. pins, snug fit. Do not drill clear through the board. Make three pins large enough so that when in they will be 1/16 in. below the top of the ring. Make a wedge of ¼-in. stuff 3 in. long with ¼ in. taper on that length. Lay the ring on the board, touching pins A and B, and drill hole H so that in placing the wedge the ring will be forced against A and B.

By having several holes ¼ in. apart, rings of different diameters can be held in place on the board while filing.—Contributed by F. Clausen, 121 Vine St., Ravenna, Ohio.

TEST WIRES IN BOX ANNEALING

Where the method of annealing by packing the pieces in an iron box with powdered charcoal and subjecting the whole to the heat of the furnace for a length of time suited to the work and then allowing to cool slowly is employed, test wires should be used to determine when the contents of the box are red hot. The wires should be 1/16 in. in size and run down through ¼-in. holes at the center of the cover of the box.



Test Wires in Box Annealing

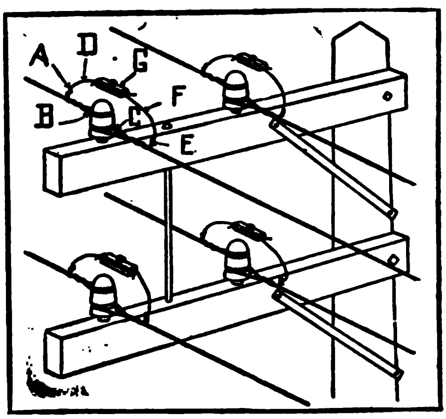
None of the pieces should come nearer than 2 in. to the box at any point, for if the box is cast-iron it will take the carbon from the steel, says the American Blacksmith.

When the last layer of pieces is packed in the box so they do not come too near the box nor less than ½ in. of each other, fill the box with charcoal, place the cover in position and seal with fire clay. Run the test wires through the cover to the bottom of the box and when the fire clay is dry, place the box in the furnace to heat. Give it time to heat through, then remove one of the test wires. If the wire is red hot for its entire length, the contents of the box are of the right temperature. If the wire is not red hot, let the box remain a time, then draw another wire, proceeding this way until you pull a wire that is red hot. After a few trials one will be able to gauge the time required without the use of the wires.

TEST POLE FOR RURAL TELEPHONE LINES

A test pole at the city limits for testing rural lines when there are many of them connecting with the city wires is a great convenience, says the American Telephone Journal. When heavy iron wire is used for the farmers' lines it is very difficult to make a test when the line has to be opened and later a splice made for closing the connection.

The test pole should be located at the city limits and to separate the farmers' lines from the city leads definitely, the wires should be dead-ended upon double grooved insulators. In making the dead end



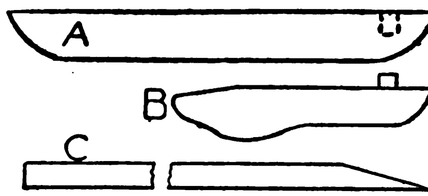
For Testing Rural Lines

leave the end of the wire about 1 in. long projecting from the final turn of the spiral used for fastening. To this projecting end solder a soft copper tie wire 14 in. long. Arrange each of the four ends terminating upon the two insulators in this way. Then join the copper wires for the city and country ends of the line by means of test connectors, to allow the line to be quickly opened and closed again after the test is finished. The copper tie wire is flexible and can be bent into any desired form. It is also easy to make a transposition at this pole, if necessary. Referring to the illustration the arrangement of the connections on the test pole is as follows: Line ties B, C, have long ends A, E, to which are soldered copper extensions D, F. The line is carried through by connector G.

To keep plaster of paris from hardening so quickly mix it with vinegar instead of water.—Gordon M. Backus, Hackensack, N. J.

TOOL FOR REMOVING DENTS IN GUN BARRELS

A good tool for removing dents in gun barrels is made of two pieces of $\frac{3}{4}$-in. half-round iron, one piece (B) $3\frac{1}{2}$-in. long and the other piece (A) 5 in. long. Put the



For Removing Dents in Gun Barrels

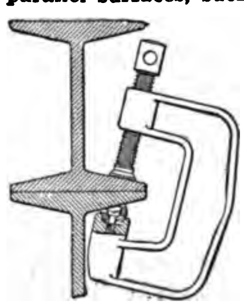
pieces together and file them down until they are slack at the muzzle of a 12-oz. gun barrel. Put a $\frac{5}{16}$-in. rivet in the longer piece $\frac{1}{2}$ in. from the end, and in the short piece drill a hole in which the rivet will fit loosely to keep the pieces together in the barrel.

File the $3\frac{1}{2}$-in piece oval, as in the sketch, and make a short taper wedge so as not to stick too tight in the spreader. Now place tool in the barrel opposite the dent (short piece next to dent), warm the barrel on a hot iron at the dent, put oil on the wedge and drive with a light hammer. The dent will come out very easily. A good size for the wedge is about 18 in. long and made of a suitable stock.

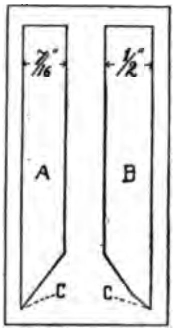
With a little care and good judgment, writes a correspondent of the American Blacksmith, very bad dents can be removed with this tool.

SCREW CLAMP WITH SPHERICAL BEARING

For holding objects that do not present parallel surfaces, such as I-beams, etc., the clamp illustrated is useful. It is made of a steel casting, says Machinery, and has an I cross section with stiffened back, and if sprung can be brought back to proper shape when hot, like forged ones. The spherical bearing on the under jaw allows all the adjustment out of parallel that is ever likely to be called for.



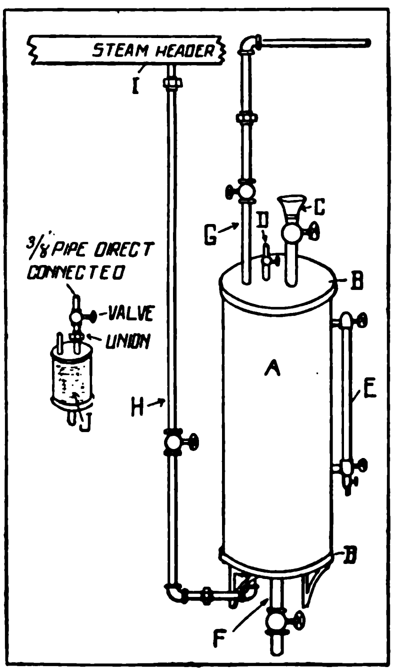
CHISEL FOR CUTTING ON A LINE



A very good cold chisel can be made of 7/16 or 1/2 in. square tool steel with the slope on one side only. The bevel may be in one angle or two, as shown in the sketch. C in each case indicates the cutting edge. This chisel is especially useful for cutting on a line. In cutting sheet metal the workman can see his line perfectly as he proceeds.—Contributed by Cecil Marshall, Dowagiac, Mich.

SUCCESSFUL LUBRICATING SYSTEM

The illustration shows a self-lubricating system rigged up by myself for an engineer who has used it successfully for the past



Simple Lubricating System

five months and claims that it works like a charm. The reservoir is filled with oil, then the steam is turned on slowly and as there is no perfect circulation, it condenses at the bottom. The oil, being lighter than water, floats on top, while the pressure keeps raising the water and at the same time forcing the oil through the feed pipes to the lubricators and oil cups. The connections to the lubricators and oil cups are made with 3/8-in. pipe with a valve close near cup.

The parts indicated in the sketch are: A, piece of 4-in. pipe, threaded on ends, used for reservoir; B, caps for 4-in. pipe tapped for fittings as shown in the illustration; C, funnel connected to valve and nipples, for filling reservoir with oil; D, aircocks; E, gauge for oil; F, drain for drawing water from reservoir when filling; G, oil feed to cups and lubricators; H, steam feed to reservoir; I, steam feed from boiler; J shows how the connections are made to lubricators and cups.

The reservoir has to be filled about once in every two or three weeks.—Contributed by Joseph A. Burkhart, Emsworth, Pa.

CONVERTING A GAS ENGINE INTO AN AIR COMPRESSOR

An old automobile gas engine was converted into an air compressor by a correspondent of the Engineer's Review, who found it all that was required for his needs. He drilled and threaded a hole through the head and screwed on a check valve as at A, Fig. 1. Then, as the combustion chamber destroyed the efficiency of the compressor, he placed a piece of hard wood al-

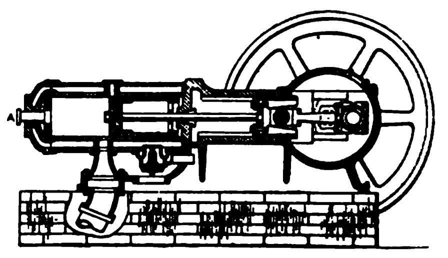


Fig. 1—Gas Engine Converted into an Air Compressor

most as thick as the combustion chamber was deep, behind the crank brass nearest the cylinder. This caused the piston to move nearer the head of the cylinder giving the minimum clearance. Small clearance is essential in a compressor, as the compressed air remaining in the clearance must expand to atmospheric pressure before more air can be drawn in; and by the time this has taken place the piston has traveled a good part of its stroke.

Another time, at a stone quarry where a large engine had just been installed in place of a 50-hp. engine, the same writer converted the smaller engine into a compressor to supply air for running drills and hoisting engines.

The engine, for the purpose of starting, had its combustion chamber connected to a tank

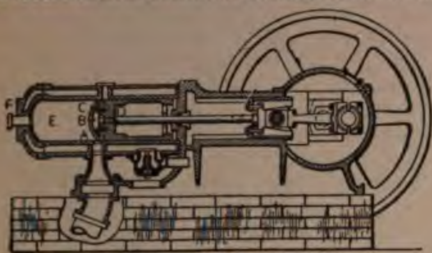


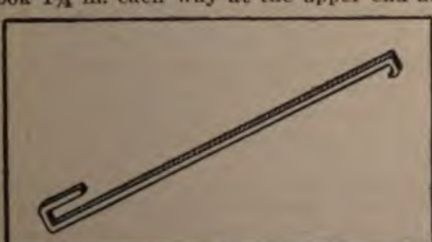
Fig. 2--False Head Bolted to Piston

containing compressed air. This pipe was closed at the engine by a hinge valve, having an opening and closing lever attached. The "locking sheet" arrangement was taken off and a coil spring substituted. On account of the spherical form of the combustion chamber, E, Fig. 2, clearance could not be reduced, as in the other case, by using a block behind the crankpin brass. Instead a hollow hemisphere, B, was cast and bolted on to the end of the piston with the balls A and C, packing the joint so no air could get in. The expense did not exceed $5.

ROOF HOOK FOR SHINGLING

An old hack tire will make the best hook as it is flat and will lay down on the roof out of the way of the chalk line, but a rod of iron may be used, if preferred.

Make the middle part 5½ ft. long; turn a hook 1¼ in. each way at the upper end and

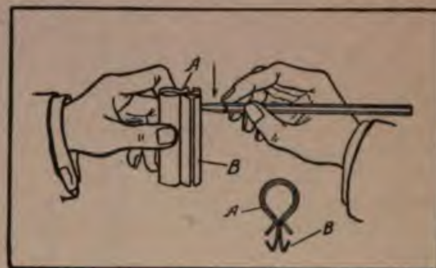


Roof Hook for Shingling

make the point sharp so it will hook over the comb, when the top of the roof is reached. At the lower end turn down 2½ in. and up 6 in. so that it will hold a 2x4 in. timber for a scaffold, says the Practical Carpenter. To use, merely hook end A in the shingle lath.

A HANDY PENCIL POINT SHARPENER

This device, which will be especially appreciated by draughtsmen, consists of a metal holder A, which can be made out of



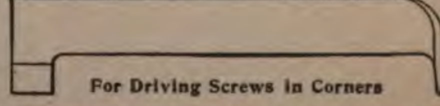
an old Spencerian paper clip, and a piece of fine emery cloth B, with the edges folded over as shown. To use it the pencil is placed in the crevice and moved up and down, giving a sharp chisel point. A round point may be made by revolving the pencil between the fingers while sharpening.—Contributed by J. R. Sourby, Chicago.

HEAT-RESISTING BRONZING LIQUID

For a liquid to mix with the bronze mix one part clear baking varnish with from two to three parts turpentine. When the surface is to be sized and the dry bronze rubbed over it, mix any good slow-drying varnish of the same nature as baking varnish with an equal quantity of turpentine, and when the surface is sufficiently tacky rub on the bronze. A fair bronzing liquid to mix with either gold or aluminum bronze, says the Plumbers' Gazette, may be made of any light-colored varnish and two to four parts of turpentine.

HORIZONTAL SCREW DRIVER

A screw driver for use in a corner or other awkward place may be made of sheet steel as shown. In the one I made the



For Driving Screws in Corners

length was 4 in., the width ⅝ in. and thickness ⅛ in. The screw blade is ⅜ in. wide. —Contributed by Gordon M. Backus, Hackensack, New Jersey.

HOW TO BUILD A SMALL PILE DRIVER

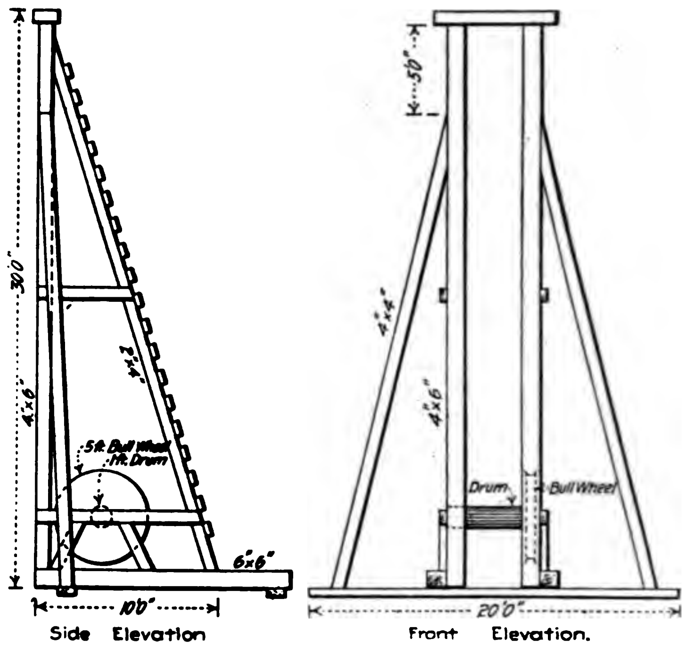
In many cases where a pile driver is needed it is cheaper to build one than it would be to buy or rent one. Such a driver can be built by four men in two days at a total cost of $102. This estimate is for a driver with a 1,200 lb. cast-iron hammer, the "leads" or "gins" that guide the hammer to be made of 4 in. by 6 in. sticks 30 ft. long, and the rope that raises it, 1-in. manila.

One end of the hammer rope is fastened to the nippers that clutch the lugs on the hammer; the other end of the rope passes through a pulley and around a wooden drum 12 in. in diameter. At one end of this wooden drum is fastened a wooden "bull wheel" 60 in. in diameter. Another rope is wound around this bull wheel and a horse hitched to the rope. The horse can easily raise the hammer to the top of the leads where the nippers are automatically tripped, allowing the hammer to fall. Only one pulley block is used. The use of the drum and bull wheel not only reduces the number of the blocks required, but does not consume the power of the horse in friction to such degree as pulley blocks would.

To build this pile driver the following bill of lumber will be required:

Piece. in. in. ft.	ft. B. M.
2— 4x 6x30 (leads)	120
1— 6x 6x 4 (cross-piece)	12
2— 6x 6x16 (base)	96
2— 2x 4x32 (ladder)	43
2— 2x 4x 2 (ladder rungs)	24
2— 4x 4x26 (sway braces)	64
1— 2x 4x20 (long front sill)	13
1— 2x 4x14 (short rear sill)	3
1—12x12x 4 (drum)	48
30— 1x12x 6 (bull wheel)	180
Total	603

Also about 24 bolts, ½ by 8 in., and a few 'unds of nails. Shape the drum out of a in. by 12. in. stick and leave it square



A Small Pile Driver

where the bull wheel is to be fastened on. At each end cut out a wooden axle 4 in. in diameter and 6 in. long, and fit them to wooden bearing blocks, daubing well with grease. Make the bull wheel by spiking together five layers of 1 in. by 12 in. planks, each layer running in the opposite direction to the one under it. Spike three of these layers together and mark a 5-ft. circle on them, then cut out the 5-ft. wheel with a keyhole saw. Spike another layer of plank on each side of this wheel and saw to a circle 5 ft. 8 in. in diameter. These outside layers form the rims of the wheel and keep the "bull rope" from sliding off.

The items of expense for the driver should be, approximately, as follows:

700 ft. B. M. lumber at $20	$14.00
Bolts and nails	2.00
Labor	18.00
1,200-lb. hammer	50.00
1 pair nippers	5.00
1 snatch block	3.00
240 ft. 1-in. rope	10.00
Total	$102.00

To operate the driver three men, a horse and a boy to drive the horse will be required, the daily cost, counting the horse at $1, being $9. Nine piles per day with an average penetration of 6 ft. can be driven with it, says Engineering-Contracting. A driver of this kind must have a level runway on which to work, and if the ground is irregular, scaffolding must be put up.

SPEED AND POWER TRANSMISSION

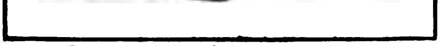
The factor of safety for a pulley may be greatly above the speed at which the belt will transmit power, owing to centrifugal force, says the American Machinist. At 5,250 ft. per minute, laced leather belts transmit a maximum of power; and riveted belts at 6,325 ft. per minute. Supposing a belt could be run safely at a speed of 9,250 ft. per minute, it would transmit an amount of power scarcely appreciable.

STEAM FITTERS' CEMENT

Dissolve 1 part, by weight, rubber or gutta percha in sufficient carbon disulphide to give it the consistency of molasses, then mix with 6 parts, by weight, linseed oil and leave exposed to the air for 24 hours. Then mix to a putty with red lead. A less brittle cement is made by using oxide of iron in place of red lead.

AN ADJUSTABLE SANDPAPER BLOCK

A good sandpaper block, which is especially useful for pattern makers, can be made from a pine block about 1 in. thick and a piece of new leather belting. Glue the leather to the block and, after it has dried, saw the wood in narrow strips as



Pattern Makers' Sandpaper Block

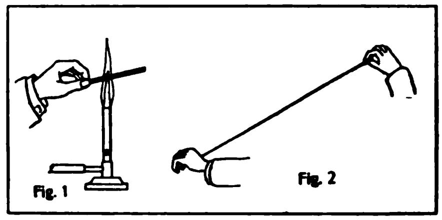
shown. This makes a block which can be held straight or curved.—Contributed by R. B. Gregg, La Fayette, Ind.

When on a hurry-up job your belt will not pull the cut you desire, says Machinery, just hold a piece of tar soap on the inside of the belt while it is running and it will soon pull all right.

SIMPLE PRINCIPLE USED IN MAKING DIES FOR SMALL WIRE

How to Make a Hole 1/1000 of an Inch in Diameter

Those who are not familiar with the operation of drawing glass tubes will understand how it is done from the illustration. The glass is first heated in the flame of the Bunsen burner, Fig. 1, and then stretched out as shown in Fig. 2. A small tube may be



Drawing Glass Tubes

stretched several feet in this way and so reduced in size that the diameter at the middle is no larger than a fine thread, but the hole through the center is not closed in doing this. By placing the broken thread in water and blowing in the other end, bubbles are seen to come from the small end, showing that the bore has not been closed.

In making dies for fine wire it is found impossible to make a drill small enough, so the smallest size jeweler's drill is used and the steel is then heated and drawn the same as the glass. In this way dies have been made for drawing wire 1/1000 of an inch in diameter.

MAKING OVER PHONOGRAPH RECORDS

Owners and users of phonographs and the amateurs who enjoy making records will find the following kink of interest:

For scraping the record or making a blank of it a knife is usually furnished with the machine, but a simpler and more convenient way is to rub the outside of the record with kerosene oil, then rub with a cloth or the bare hand until all of the cuts are erased and the cylinder is perfectly smooth. Then wipe it with a dry cloth and leave a few minutes to dry. Remove any rings from the hand before rubbing so as not to scratc the record, and do not try to record on tl cylinder until it is perfectly dry.—Contri uted by W. Carey Smith, 5 S. Fulton Ave Mt. Vernon, N. Y.

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[illegible]

Fig. 1

[illegible]

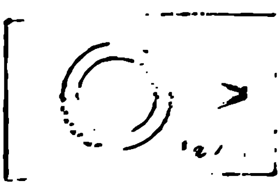


Fig. 2

[illegible] can be seen from the farthest end of the boiler room. An occasional wiping of the dust from the screen will keep it in order.

ENAMELED SLIDE IN FURNACE DOOR

Sometimes in feeding the furnace I have thought that the slide in the ashpit door was open when it really was not. To avoid this mistake, I enameled the part that slides back and forth white, and the rest of the slide black.—Contributed by [illegible], Hackensack, N. J.

TO PAINT STEEL CEILINGS

[illegible]

TO MAKE TRACING CLOTH LAY FLAT

The reason tracing cloth curls up at the edges [illegible] is because when manufactured it is rolled with the concave

[illegible] the glossy side. The drawings are made on the glossy side, and then when they are laid away in drawers they will not lay flat, and when put into the printing frame the edges are apt to get folded down and look bad on the prints. If the tracing cloth is rerolled with the dull side out, says a correspondent of [illegible], and then left for a time the edges will curl down instead of up, which is much more convenient.

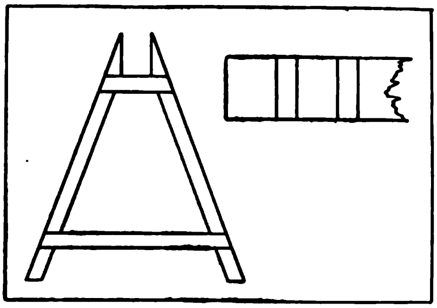
KEEPING SHOW WINDOWS FREE OF FROST AND MOISTURE

A simple and effective way to keep frost out of show windows is to bore a small hole—½ in.—in the framework directly below and another directly above the glass. For a very large window bore two holes top and bottom. The holes give free circulation of the air and make the temperature of the glass outside and in more nearly equal. If it is impracticable to bore holes, rubbing the glass with alcohol frequently will help.

For moisture in windows, place a small box of lime directly under the glass. The lime will absorb all the moisture.

PORTABLE SAW HORSES

In moving from one job to another the carpenter will find portable saw horses a great convenience. The usual form of saw



Portable Saw Horse

horse is very awkward to stow away or to move. The sketch shows the construction of a portable horse recommended by a correspondent of the Practical Carpenter.

GRAIN OF LUMBER IN PATTERNS

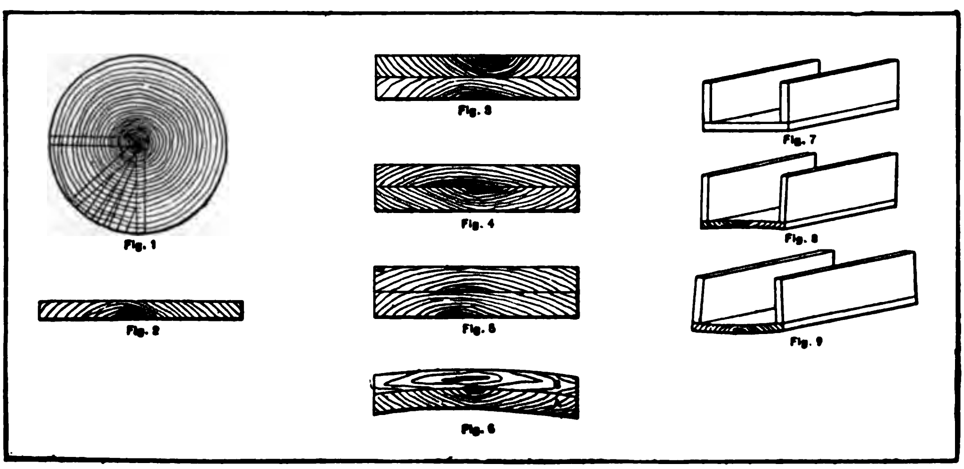
Quarter-sawed lumber is the best stock to use for thin patterns that have no ribs to hold them straight, but it is not always easy to get. Quarter-sawed boards are cut radially (Fig. 1) and to cut more than a few from each log would waste the material. One can tell a quarter-sawed piece by examining the grain at the end, says the American Machinist, and it pays to use it if possible as it will not warp under many changes of atmospheric conditions.

Lumber for patterns should be carefully selected. A board like Fig. 2 will not stay straight long. Fig. 3 shows how to lay two pieces with regard to the grain when gluing them together. The warping of one piece will counteract that of the other, and the joint will not open readily on the edges as it will if the pieces are laid as in Fig. 4, or Fig. 5. If one piece is glued across another the effect shown in Fig. 6 will result, unless the glue does not hold or the piece splits in shrinking. Board A pulls enough in shrinking to bend board B in its length. With absolutely dry lumber of four or more thicknesses cross grain is effective.

A pattern like Fig. 7 is more serviceable made with length of the bottom piece running from one rib to the other, as the bottom will stay straight and the side will always draw. If made like Figs. 8 and 9 you will get the effect shown, which will distort the ribs so that the pattern will not draw. When the grain of the wood can be put in to run in the same direction as the line of draft, a slight warping will not affect the drawing of the pattern. This cannot always be done, because patterns so made would be weak in vital parts.

HOW TO CLEAN FELT HATS

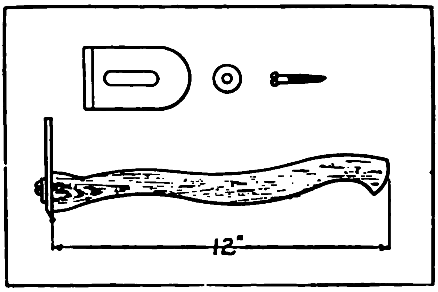
To clean felt hats use weak ammonia. Brush the hat thoroughly while dry, then brush over with the ammonia, using a sponge for the purpose. Treat the whole of the outside and the leather lining as well. Renew the ammonia solution when it is made dirty by the sponge being dipped in so frequently.



Grain and Shrinkage in Pattern-Making

HOW TO MAKE A GLUE SCRAPER

Nearly every wood-worker has a glue scraper, which is generally made from a

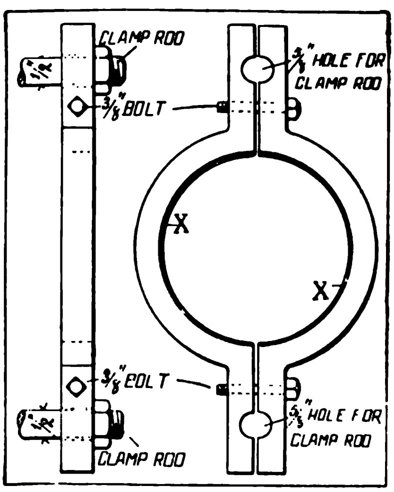


Handy Glue Scraper

strip of iron or a flat file, but a better one can be made as shown in the illustration. The handle is made from a piece of hard wood 1¾ in. by 1¼ in. long by 12 in. The blade is made of an old plane bit and is fastened to the handle by means of a screw and washer.—Contributed by R. B. Gregg, La Fayette, Ind.

CLAMP FOR LEAKY PIPE

Having had considerable trouble with a pipe that was leaking badly, I used the clamp illustrated to remedy matters. The pipe was 3 in. diameter, screwed into the side outlet of a tee, partly broken off, and



Good Pipe Clamp

about 4 ft. under ground. The pipes could not be taken up very well for threading (had no dies) as one piece was under a railroad track and the other under a building. The clamp has been in use satisfactorily for three months.

Referring to the sketch, Fig. 2 shows the two pieces of the clamp held together on the pipe by two ⅝-in. bolts. The ⅝-in. holes are for the ½-in. clamp rod to go through as shown in Fig. 1.

To apply the clamp put Fig 2 around the leaking pipe and clamp rod (Fig. 1) around back of tee and through ⅝-in. holes (Fig. 2). Use some good packing between the shoulder of the tee and the clamp, and screw up on clamp rod. Next screw up the two ⅝-in. bolts. If the clamp is beveled on inner edges, X, it will hold the packing better. The pressure on the leaky pipe was 5 lb. per square inch. The clamp was made and put on in three hours.—Contributed by Fred. Wm. Keller, Mannheim, Ill.

METHOD OF TINNING A SOLDERING-IRON

Dress the iron down with a smooth file in the usual way, then heat it warm enough to melt a tallow candle. Rub a candle over the surfaces of the iron and it will be found to work fine.—Contributed by C. E. Faulks, 65 Block F, Pueblo, Colo.

COLORING SHELLAC VARNISH

To color shellac varnish black, add lampblack; for red, use Chinese vermilion; and for blue, use Prussian blue. A very good quality of blue cannot be obtained. Have all coloring matter dry and finely pulverized. To mix, add the coloring matter to a little of the varnish and work to a smooth paste. Then add varnish, and alcohol if necessary, in proper quantity to make the mixture spread nicely.—From Practical Pattern Making, by F. W. Barrows.

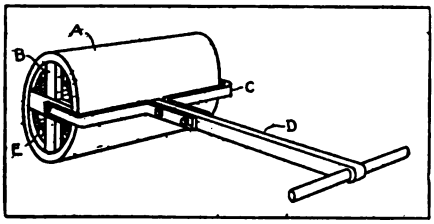
MALLEABLE CASTINGS RUST MORE THAN STEEL

Malleable castings buried in the earth will rust even more than steel, says the Iron Age. The skin and immediate interior of a malleable casting is practically a rather open steel. It is crystalline in structure also, due to the original placing of the crystals of the white iron, before annealing, perpendicular to the surfaces; and so moisture can penetrate it quite a ways.

SHOP NOTES

EASILY MADE LAWN ROLLER

A good lawn roller can be made from a piece of sewer pipe, A (see sketch), with very little expense. The greatest difficulty is removing the flange, which has to be chipped off unless one has a piece of plain

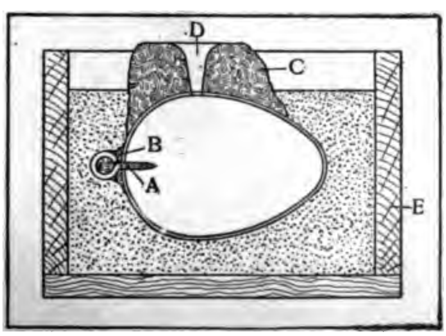


Lawn Roller

pipe. The bricks, E, are to give weight, and are fastened in with cement. The cross pieces, B, are 2 in. by 4 in. wood, and the forks, C, are made of wrought iron. The handle, D, is of wood, with a piece of pipe or broomstick driven through the end. The roller I made cost only $2 and does very good work.—Contributed by Warren M. Morse, 50 Elmore St., Newton Center, Mass.

HOW TO MAKE A PLUMB-BOB MOLD

Make a small hole in the center of the large end of an egg, and another in the side, and blow out the contents. Dry the empty shell in an oven, and then fasten a small screw eye, A, in the end hole, by means of a piece of clay, B. Place another piece of



Mold for a Plumb-Bob

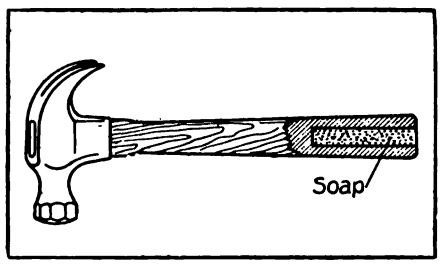
clay, C, over the side of the egg, leaving an opening, D, to pour in the melted lead later.

Place the egg, with the clay on it, in a box, E, and pack with sand, having the opening, D, on top, as shown.

Having thus prepared the mold, melt about a pound and a half or two pounds of lead and pour in the opening. Allow plenty of time to cool, and then break away the egg shell, and you will have a good plumb bob.—Contributed by W. J. Slattery, Emsworth, Pa.

HAMMER WITH LUBRICANT COMPARTMENT

In driving wire nails into hard wood they are not so apt to bend if lubricated with soap. A good way to have the soap always on hand for this purpose is to bore a hole in the end of the hammer handle, as illustrated,



Lubricant for Nails in Hammer Handle

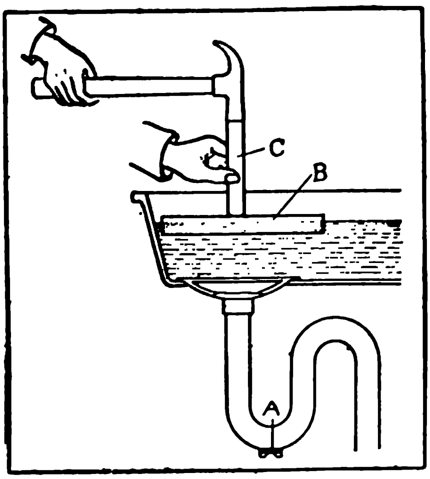
and fill it with soap. In driving small brads into hard wood this will be found particularly useful.—Contributed by J. Weldon, 433 Columbia St., Brooklyn, N. Y.

GOOD WHITEWASH FOR OUTBUILDINGS

Place 1 bu. good fresh lime in a barrel and add 20 lbs. beef tallow; slake with hot water. When the lime is slaked the tallow will have disappeared, having formed a chemical compound with the lime. Dry colors may be added to make any color desired. Add the color before slaking the lime, or, if after slaking, mix with alcohol and then add to the strained wash. This is flow nicely from the brush. A coat of this wash will last as long and look almost as well as much of the lead paint used, and costs a mere trifle to make.—Contributed by H. W. Kennicott, Palmyra, Va.

REMOVING OBSTRUCTIONS IN DRAIN PIPE

When a drain pipe becomes stopped up unscrew the plug, A, and remove the lint or other substance with a bent wire or old button hook. If the trouble is not remedied by this operation, it shows that the stoppage is at the other side of the plug. In this



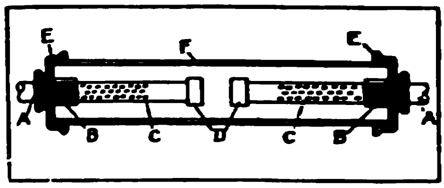
Clearing a Drain Pipe

case draw 3 or 4. in. of water in the sink, and lay a board, B, over the outlet as shown. The board should be about 8 in. square and about 1 in. thick. Hold a stick, C, on the board and strike the end of the stick with a hammer. The shock of the hammer blow is transmitted through the drain pipe for a distance of many feet and will nearly always remove the obstacle.

HOW TO MAKE A GAS ENGINE MUFFLER

The use of a gas engine in a residence district is often objectionable, as the noise of the exhaust, even when greatly reduced, is very annoying, but by using the following apparatus, which only slightly reduces the power of the engine, the exhaust may be muffled down to absolute silence.

The muffler (see Fig.) consists of a 4-in. p[illegible]n. long, F, with a 4-in. by 1-in. reducer screwed on each end, E. The 1-in. pipes, AA, project through far enough to



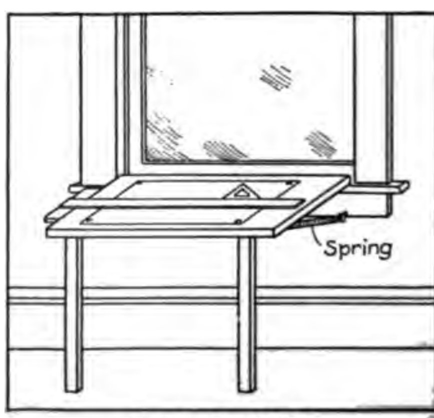
Gas Engine Muffler

hold the couplings, BB, and are each drilled with forty-eight 3-16-in. holes and fitted with caps, DD. One of the pipes, AA, connects to the engine and the other to the exhaust pipe, which is reduced at each connection until it is ¼ in.; eight 3-16-in. holes are drilled in the ¼-in. pipe near the end, which is covered with a cap.

This muffler is being used with a 3-in. by 4-in. engine, making about 400 r. p. m., and the only noise produced is a slight hissing sound, which cannot be heard 10 ft. away.—Contributed by Edgar L. Drinkwater, 51 N. Ada St., Chicago.

TO CONVERT A DRAWING BOARD INTO A TABLE

Make two legs about 30 in. long, and buy two stiff springs about 8 in. long. Fasten the legs to the drawing board with hinges, and attach the springs by means of screw eyes. Screw two hooks in the bottom of the window casing and attach springs, as shown in the sketch. The springs hold the drawing board against the casing and also hold the legs down firmly on the floor, thus making the whole apparatus solid. The front edge of the board may be lowered by inclining the legs. When not in use the springs can

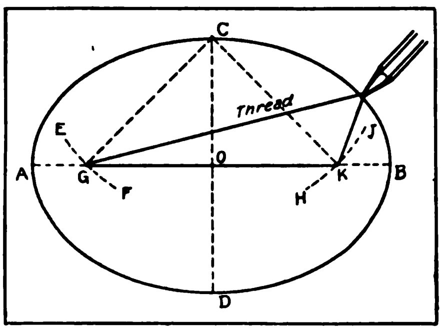


Drawing-Board Table

be detached and the apparatus may then be folded up and put away. I have been using my board in this way for a long time, and find it very convenient, and its use does not mar the window casing in the least.—Contributed by Chas. A. Prickett, Auburn, Ind.

TO DRAW AN ELLIPSE: GIVEN THE LENGTH AND WIDTH

A previous article in "Shop Notes" shows how to draw an ellipse having a required length, but the following method will give the required width as well. This method is as follows: Draw line A B—the required length; and line C D—the required width intersecting line A B at right angles at the middle point O. With C as a center and radius O A describe arcs E F and H J intersecting line A B at G and K, the foci of the



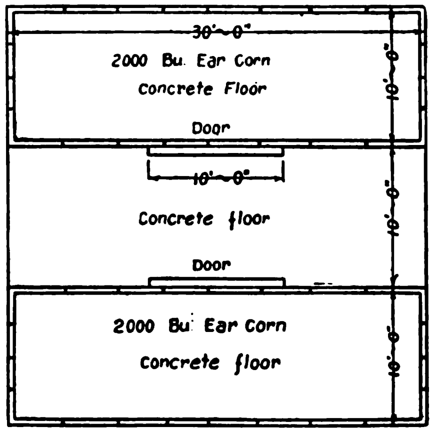
To Draw an Ellipse

required ellipse. Drive pins or tacks in these points and form a loop of thread, just long enough to enclose the triangle G C K. Then place a pencil in the loop and trace in the ellipse, as shown.—Contributed by W. J. Slattery, Emsworth, Pa.

DOUBLE CORN CRIB AND FEEDING FLOOR

Select your site and lay out a space 30 ft. square—or whatever dimensions you may decide on; dig trenches 8 in. deep and 8 in. wide around the square and two crossways the square on either side the driveway. Board up these trenches and box up to a height some 6 in. above the ground and fill them with concrete.

As soon as this concrete has set put a layer of concrete 4 in. thick over the whole surface, as a floor for both corn crib and driveway. While laying the concrete, along the trenches set ½-in. bolts 6½ in. long upright every 5 ft. and bolt on 2x6's the flat way to use as sills. Toe-nail 2x6's upright



Plan of Rat-Proof Corn Crib

every 2 ft., 14 ft. high to eaves and 20 ft. high along the driveway, making the crib 23 ft. high. The rafters should be 20 ft. long and the roof shingled.

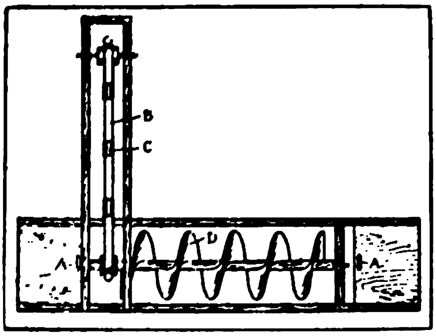
The crib will hold 6,000 bu. ear corn if the driveway is filled. Or one could have an oat granary of 5,000 bu. above the entry and need not scoop the grain out, but let it run into the wagon when loading. I use the driveway (30 ft. by 10 ft.) as a feeding floor and put ear corn on either side and use a portable corn elevater with horsepower. A door 10 ft. wide opens horizontally on each side of the driveway to let corn out to feed. My crib cost $225 painted and complete, not charging anything to my own work. Used 20 cu. yds. of gravel and 116 sacks of cement. The concrete floor does not cost more than sills and board floor and my crib is rat-proof and will not rot.—Contributed by M. D. Johnston, Danvers, Ill.

A GOOD GUTTER PAINT

Put all old paint skins, cleanings of buckets, siftings and pieces of dry putty into an old iron kettle with raw oil and boil until all is dissolved. Then add fine, dry sand until the mixture is as thick as will spread under the brush. Apply quite warm — a heavy coat. When dry it will form an enamel like granite and can be colored to match the cornice. If properly prepared this paint should be as smooth as glass. It is also good for patching old tin roofs.—Contributed by H. W. Kennicott, Palmyra, Va.

PONTOON WATER ELEVATOR

There are many ways of raising water from a stream, by utilizing the power of the current, but probably the simplest and most efficient method is obtained by using the apparatus here illustrated, which I made myself at very little expense.



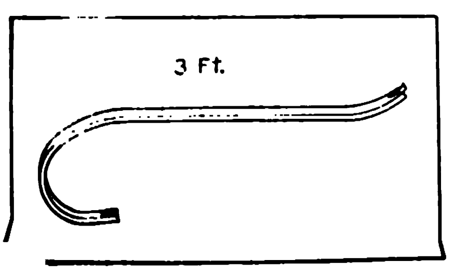
Pontoon Water Elevator

This device consists of a helical water wheel, D, which, in revolving, operates the bucket elevator at the left. This elevator consists of a belt, B, with several tin cans attached, as shown. I used two floats in making my machine, but in some devices of this kind three or four are used. The device is fastened by ropes, passing through the screw eyes, AA, and is set in the water at an angle of 45°.

I have only used this device for irrigating, on a small scale, but think that larger ones could be made to take the place of pumping stations, as there is no expense in operating. It could also be used to advantage in dredging and gold mining.—Contributed by Millis Knickerbocker, New Lenox, Ill.

TOOL FOR DRAWING SPIKES

For material take a piece of an old buggy axle, flatten and split both ends, and bend as illustrated. The claws of the rounded end can be driven under the head of the spike by striking with a hammer.—Contributed by Leander Manning, Akron, Iowa.



For Drawing Spikes

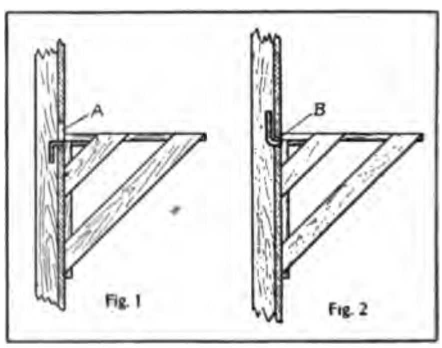
TO WRITE ON METALS

To write on iron, steel, silver or gold mix together 1 oz. muriatic acid and ½ oz. nitric acid and use as follows:

Cover the place on which you wish to write with melted beeswax; when the beeswax is cold write the name or words plainly with a file point or an etching needle, carrying it through the wax and cleaning all the wax out of the letter. Then apply the mixed acids with a feather, carefully filling each letter. Let the acid remain for from one to ten minutes, according to the appearance desired; then put on some water, which will dilute the acid and stop the process. Either of the acids separately would cut iron or steel, but it requires the mixture to take hold of gold or silver. After the acids are washed off, it is well to apply a little oil.—Contributed by Howard H. Iszard, Cuyahoga Falls, Ohio.

IMPROVEMENT IN PORTABLE SCAFFOLD BRACKETS

In "Shop Notes" for June, 1905, the portable scaffold bracket, shown in Fig. 1, was de-



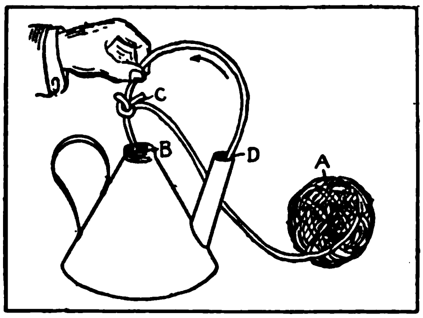
Improved Scaffold Bracket

scribed. I have found this form of bracket to be very useful and handy, but think it can be improved by turning the hook up (Fig. 2) instead of down. By so doing a longer hook may be used and the hole in the sheathing can be made much smaller than when the hook turns down. To remove the bracket it is only necessary to raise the outer end and draw the hook out of the hole, but the hook cannot come out when the bracket is in use.

—Contributed by Arthur Gray, Cliffs

TO PUT A WICK IN A TORCH

Unwind enough of a ball of wick, A, to go through the torch and push it in at B. Raise the torch to your mouth and give one hard



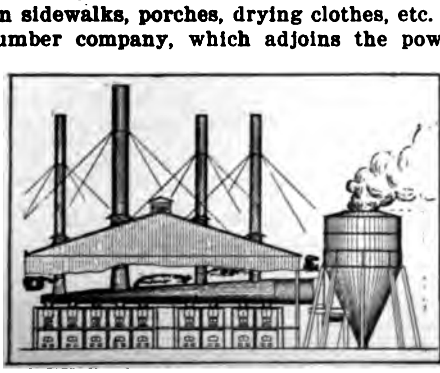
Putting Wick in Torch

blow, which will send the wick out at D. Tie it at C, making a circle about 14 in. in diameter. Then draw back from B until the mouth, D, is as full as wanted. Cut the wick off at D and push the rest in at B. This should not be done with oil above the wick pieces.—Contributed by Albert N. Crawford, 8 Lautner St., Allegheny, Pa.

PREVENTING CINDERS WHILE BURNING SAWDUST

In the power house of the Oregon Consolidated Ry. Co., where sawdust is used for fuel, the sparks and cinders emitted from the stacks have been so dangerous and objectionable that a cinder separating plant has been installed. This has not only relieved the residents and manufacturers within a half-mile radius, but has considerably increased the efficiency of the boilers.

The installation was the result of numerous complaints, due to cinders accumulating on sidewalks, porches, drying clothes, etc. A lumber company, which adjoins the power



No Cinders in this Smoke

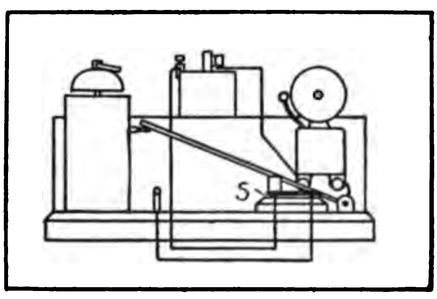
house, has had thousands of dollars' worth of lumber refused by inspectors on account of being blackened by falling cinders.

The accompanying illustration shows how the separator is applied. The large breeching, or smoke box, over the boilers connects to an immense draft fan, which discharges into the separator at the right. This separator works exactly like the ordinary dust separator, seen in nearly all large woodworking factories. As the smoke and cinders enter they receive a whirling motion, and the cinders, being heavier, gradually work down in a spiral path to the bottom of the separator, where they are automatically conveyed to the boilers to be consumed.

The cut shows only one section of the plant, the entire equipment, as stated in the Street Railway Journal, costing about $19,000. The smoke coming from the separators has been carefully examined by powerful field glasses without revealing the slightest vestige of cinders. This, and the increased efficiency, make the cinder separating plant worthy of consideration for other localities where similar conditions exist.

PORTABLE ELECTRIC ALARM

In rigging up an alarm for a sound sleeper, as described in our April number, Geo. Albach, 95 West Twenty-first street, Bayonne,

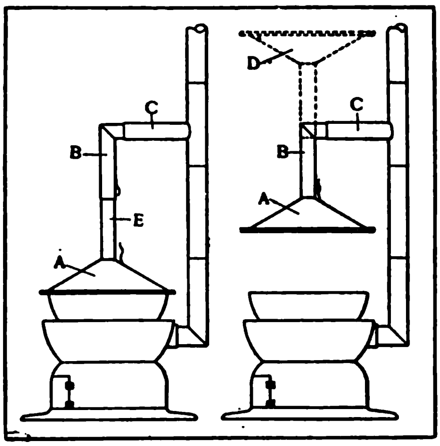


Portable Electric Alarm

N. J., made some improvements. He mounted the device on a board 12 in. by 7 in. by ¾ in., having beveled off the upper edge. At the back he nailed a piece 5 in. high and of the same length as the board. The bell he fastened to this back piece, and the battery was placed on a shelf on the rear side of the back piece. He also added a switch, S, which he fastened in the empty corner of the board, making it convenient to stop the bell. The apparatus can be placed near the bed at night and stowed away during the day.

DEVICE FOR CARRYING STEAM FROM KETTLE

"In my candy-boiling department I have used a device for carrying steam from the kettle all winter," writes A. F. Houser, 114 S. James St., Hamilton, Ont., "and find it a great convenience."



Steam Hood for Candy Kettle

Referring to the illustrations, A is a cover with a pipe, E, attached, which pipe telescopes into B and, when raised, can be fastened with a hinged clasp to the bottom of B; B is an elbow which telescopes into C the proper distance to bring the cover over the kettle; C is a short length of pipe connected to a length of stovepipe.

The cover, A, with pipe, E, attached can be entirely detached from B, or telescoped into B and attached to it by means of the spring catch, or swung up out of the way when not in use, as at D, Fig. 2. The device is made of galvanized iron and riveted.

FORMULA FOR MANUFACTURING YEAST

Boil together for one-half hour, in a copper kettle, 40 gals. of water and 2 lbs. of ground hops; pass over refrigerator to cool to a temperature of 160° F.; pass the liquor from the refrigerator to a stout tub; add 1½ bu. (about 63 lbs.) crushed malt and stir the mixture thoroughly. Allow the mash to stand at that temperature for 1½ hours, then filter from the grains and cool to 70° F. The passage over the refrigerator serves to aerate the wort. At this point allow spontaneous fermentation to set in.

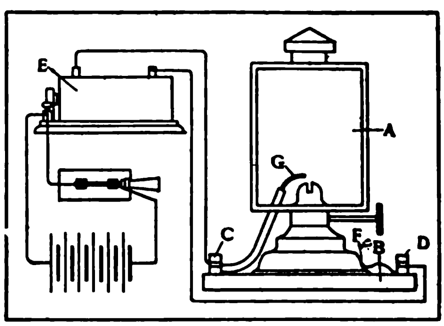
The yeast can be used in 24 hours, but is better if allowed to stand two days. Keep the fermenting tubs and other vessels clean by scalding from time to time with live steam. Said to give excellent results.

HOW TO MAKE AN ELECTRIC-KEROSENE LAMP LIGHTER

A device for lighting a ruby lamp is here shown, in which a spark from a jump-spark coil vaporizes the oil and ignites it. The ruby lamp, A, is mounted on a board, B, somewhat larger than the base of the lamp. Two binding posts, C and D, are placed on the board and connected to the secondary of the jump spark coil, E. A wire is fastened to binding post, D, and soldered to the lamp at F. The wire, G, is enclosed in a piece of rubber tubing, such as is used for insulating in automobiles, and the extremity so located that it will nearly touch the wick.

The spark from the vibrator would spoil the plate if the jump spark coil were put in the dark room, so it should be put outside, or placed in a box, in such a way that no light will fall on the plate. A ⅜-in. spark is about right and about six dry batteries should be used with the coil.

This device will also light an ordinary kerosene lamp and might be useful when



Electrically-Lighted Kerosene Lamp

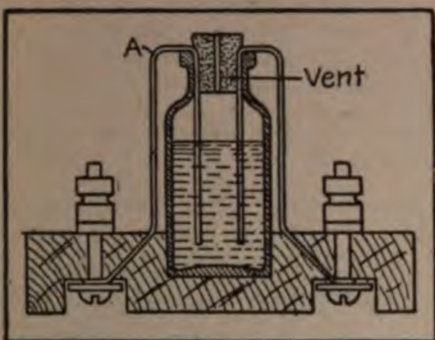
the lamp is in a hall or some place where it is hard to get at.—Contributed by Chas. Buettger, R. R. 8.

TO MAKE A CRACKED GONG SOUND

The sound may be restored to a cracked gong by sawing down the crack with a hacksaw so that the two edges do not touch. The gong will sound as well as when new.—Contributed by E. Okerlund, San Francisco, C

HOME-MADE POLARITY INDICATOR

To make a polarity indicator for batteries, all that is required is some sulphuric acid, two thumb bolts and nuts, some copper wire and a block of wood 4 in. long, 2 in. wide and ¾ in. thick. In the center of the block of wood chisel a hole 1 in. square and ½ in. deep to hold the bottle containing



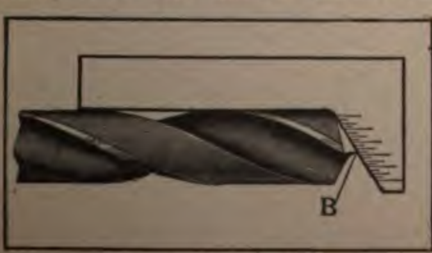
Polarity Indicator

the acid solution. On the opposite side of the block cut two ½-in. grooves ½ in. from the sides. In the center of each of three grooves bore a ¼-in. hole for the thumb nuts. From these holes drill holes to the space in the middle, as shown by the sketch. Set the bottle in the hole prepared for it, and run wires, A, to it from each thumbscrew, as shown. Fill the bottle with a solution of 1 part sulphuric acid to 4 parts water.

When the device is connected to the battery the zinc or negative pole will give off gas. This will cause bubbles in the solution.—Contributed by G. Fry and I. Van Dalsem, 903 Vine St., San Jose, Cal.

GAUGE FOR TESTING ANGLE AND CENTER OF DRILL

This device is made of sheet steel. By holding it on both sides of the drill and

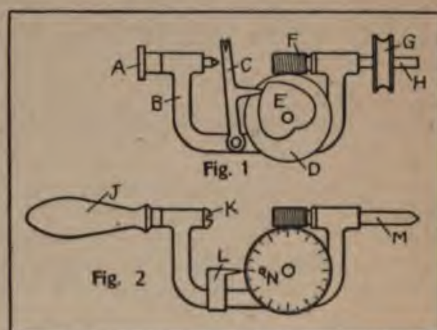


How the Gauge is Used

comparing the relative position of center to point B, one can tell whether it is accurately located. Also, if the angle of the drill coincides with the gauge, the angle is correct.—Contributed by J. Weldon, 433 Columbia St., Brooklyn, N. Y.

HOME-MADE SPEED INDICATOR

A bobbin winder from an old sewing machine, Fig. 1, will make a very good speed indicator by making a few alterations. Remove part A and C, and if possible remove the heart-shaped cam, E, from the worm wheel, D. Take off the pulley, G, and sharpen the end of the shaft, as shown in Fig. 2. Attach a small file handle, J, by means of a screw, K, and solder on the indicator, L, which may be made of sheet brass. Scratch the graduations on the worm wheel, as shown, making the total number of notches

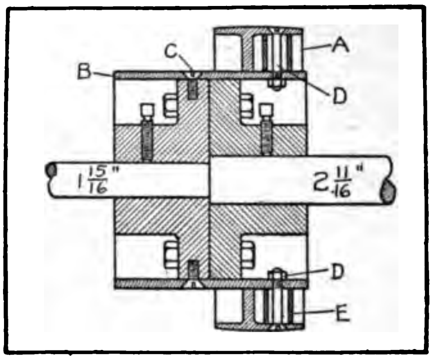


Speed Indicator Made of Bobbin Winder

equal to the number of teeth. It is well to make a center punch mark, N, to allow counting the number of revolutions of the worm wheel in taking high speeds.—Contributed by Ray Earley, New Sharon, Iowa.

HOW TO MAKE A COMBINATION PULLEY AND COUPLING

Some of the readers of Shop Notes might be interested in a problem of coupling shafting which occurred at our shop recently. I had occasion to couple two shafts of different sizes, at a point where a pulley was needed, and overcame the difficulty as follows: I setscrewed the coupling to the shaft, as shown in the sketch, and covered the setscrew heads with a piece of pipe, B, fastened with flat-head screws, C. These screws v staggered, an equal number being plac each half of the coupling. Then I bor spokes on an old pulley, A, to fit the pipe, and fastened it on with bolts, D, countersunk in the rim and pipe separators, E. The load on the 1 15-16-in. shaft being very light, was easily carried by the setscrews, and both the coupling and pulley are now in successful operation.—Contributed by M. E. Hood, Tuckahoe, N. Y.

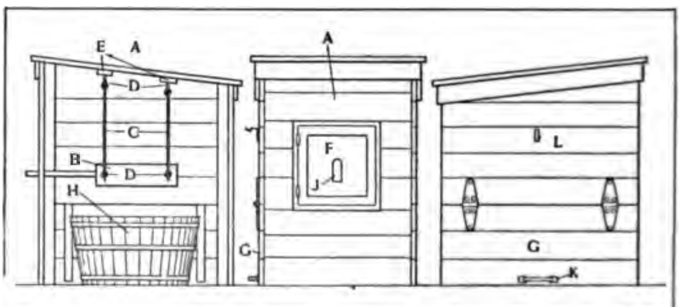


Combination Pulley and Coupling

HOW TO MAKE AN ASH SIFTER

The accompanying sketch shows a device which will be greatly appreciated by all who sift ashes. By its use the expensive waste of coal is prevented, without incurring the greater expense of spoiled clothing. The dust arising from the ashes is confined by a housing, A, which can be built of ¾-in. boards, or made from an old dry goods case.

An ordinary ash sifter is supported by a frame, B, which swings from the roof by the iron rods, C. These rods may be bent from old iron curtain rods or heavy galvanized telegraph wire, and are held by large screw eyes, D, in the roof and frame. Two cleats, E, nailed to the roof will distribute the weight over the entire surface.



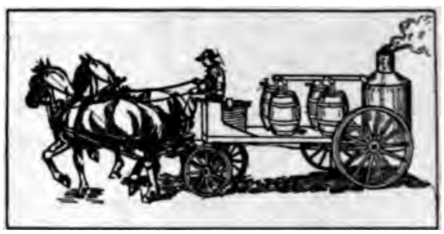
Housing for Ash Sifter

A door, F, should be made in the front, large enough to admit the ash sifter, and another one, G, in the side should be of a sufficient size to allow removing the tub, H. The door, F, should have an opening, J, for the ash sifter handle and the door, G, ought to have a handle, K, and a spring catch, L, to hold the door up when removing the tub. This catch may be bent out of a piece of sheet iron.

If the tub is placed on the ground it may be difficult to slide, in which case strips of wood, for tracks, should be embedded in the ground.—Contributed by Arthur W. Passage, 831 West Pierce Ave., Niagara Falls, New York.

PORTABLE SPRAY COOKER

The lime-sulphur hot sprays used by orchardists are often cooked at some central point by means of a stationary boiler, but a better device is found in the apparatus illustrated herewith.



Portable Spraying Outfit

The boiler is suspended from the back of the wagon, and the steam is carried to four barrels containing the spraying mixture. It is not necessary to buy a new boiler for this purpose, as many discarded ones would answer. A subscriber to the Rural New-Yorker used an old fire engine boiler, which he recovered from a scrap pile.

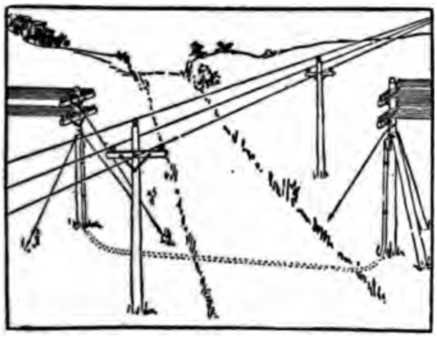
An outfit of this kind will deliver enough material to supply six or eight spraying nozzles, and the expenditure would be insignificant if divided among several members of a coöperative spraying club.

For cleansing steel articles use unslaked lime.

UNDERGROUND CROSSING FOR TOLL LINES

An underground crossing for toll lines as a method of protection against induced currents from power wires is shown in the illustration. The crossing is rather expensive, but if properly built gives good protection, says the American Telephone Journal.

An iron pipe 1½ or 3 in. in diameter, according to the wire capacity desired, is laid below the frost line from pole to pole. The usual pipe bend is made at each of the



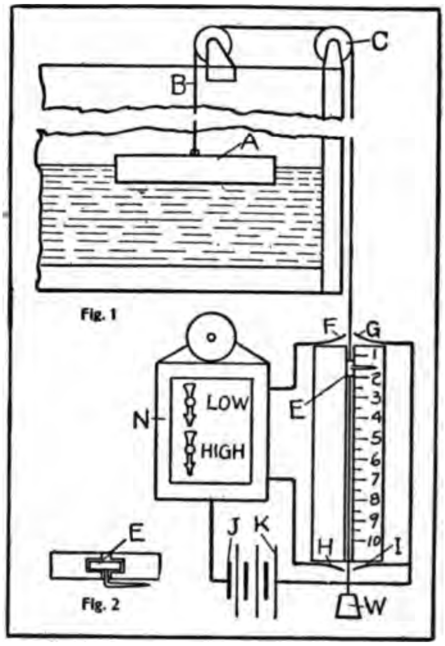
Underground Crossing for Rural Lines

poles, which are properly guyed, and at the end of the pipe, where it runs up the pole, a goose neck is used to keep out the rain. For draining the conduit of moisture, due to condensation, a hole is drilled at the lowest point of the duct over a pocket filled with crushed stone.

No. 14 twisted pair "distributing wire" used in one of these conduits has given little trouble. The wire is fused direct to the line, without fuse or spark gap protection. Where these crossings are remote from a repair man, it is better to risk losing a pair of wires at $1.47 per 100 ft. than to hire a team and send a man after every lightning storm.

SIMPLE TANK GAUGE WITH ELECTRIC ALARM

A tank gauge that is very easy to rig up and gives good service is shown in the illustration. A wooden or cork float, A, is attached to a chain, B, which runs over a small pulley, C, and then to the dial or gauge which may be placed on the side of the tank or other convenient place. The numbers on the dial read from the top downward. E (see detail at Fig. 2) is a piece of metal which runs in grooves and moves the pointer along the dial according to the rise and fall of the liquid.



Simple Tank Gauge

The electric alarm (Fig. 1) is for calling some person when the water gets too high or too low. F, G, H, I are brass springs projecting so that the indicator, E, will close the circuit when it reaches either the top or bottom of the gauge. J, K are batteries in the circuit, and the annunciator, N, has the words high and low marked on it in their respective places.—Contributed by John M. Singer, 5915 Wabash avenue, Chicago, Ill.

GOOD CLEANSING POLISH

A good encaustic, which will clean and polish at the same time, is composed of 1 gallon soft water, 4 oz. yellow laundry soap and 1 lb. of white wax, shaved up. Boil together, stirring well, and then add 2 oz. sal soda; put the mixture in something which can be closely covered, and stir constantly until cool. If necessary dilute with water before using; lay on with a paint brush and polish off with a hard brush or cloth. Can be used on furniture, marbles, tiles and bricks. Will remove ink stains.

STANDARD SYMBOLS FOR WIRING PLANS

AS ADOPTED AND RECOMMENDED BY

THE NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION OF THE UNITED STATES.

COPIES MAY BE HAD ON APPLICATION TO THE SECRETARY, UTICA, N. Y.

- Ceiling Outlet; Electric only. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.
- Ceiling Outlet; Combination. $\frac{4}{2}$ indicates 4-16 C. P. Standard Incandescent Lamps and 2 Gas Burners.
- Bracket Outlet; Electric only. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.
- Bracket Outlet; Combination. $\frac{4}{2}$ indicates 4-16 C. P. Standard Incandescent Lamps and 2 Gas Burners.
- Wall or Baseboard Receptacle Outlet. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.
- Floor Outlet. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.
- Outlet for Outdoor Standard or Pedestal; Electric only. Numeral indicates number of Stand. 16 C. P. Incan. Lamps.
- Outlet for Outdoor Standard or Pedestal; Combination. $\frac{6}{6}$ indicates 6-16 C. P. Stand. Incan. Lamps; 6 Gas Burners.
- Drop Cord Outlet.
- One Light Outlet, for Lamp Receptacle.
- Arc Lamp Outlet.
- Special Outlet, for Lighting, Heating and Power Current, as described in Specifications.
- Ceiling Fan Outlet.
- S^1 S. P. Switch Outlet.
- S^2 D. P. Switch Outlet.
- S^3 3-Way Switch Outlet.
- S^4 4-Way Switch Outlet.
- S^D Automatic Door Switch Outlet.
- S^E Electrolier Switch Outlet.

Show as many Symbols as there are Switches. Or in case of a very large group of Switches, indicate number of Switches by a Roman numeral, thus; S^1 XII; meaning 12 Single Pole Switches.
Describe Type of Switch in Specifications, that is, Flush or Surface, Push Button or Snap.

- Meter Outlet.
- Distribution Panel.
- Junction or Pull Box.
- Motor Outlet; Numeral in center indicates Horse Power.
- Motor Control Outlet.
- Transformer.
- Main or Feeder run concealed under Floor.
- Main or Feeder run concealed under Floor above.
- Main or Feeder run exposed.
- Branch Circuit run concealed under Floor.
- Branch Circuit run concealed under Floor above.
- Branch Circuit run exposed.
- Pole Line.
- Riser
- Telephone Outlet; Private Service.
- Telephone Outlet; Public Service.
- Bell Outlet.
- Buzzer Outlet.
- Push Button Outlet; Numeral indicates number of Pushes.
- Annunciator; Numeral indicates number of Points.
- Speaking Tube.
- Watchman Clock Outlet.
- Watchman Station Outlet.
- Master Time Clock Outlet.
- Secondary Time Clock Outlet.
- Door Opener.
- Special Outlet; for Signal Systems, as described in Specifications.
- Battery Outlet.
- Circuit for Clock, Telephone, Bell or other Service, run under Floor, concealed. Kind of Service wanted ascertained by Symbol to which line connects.
- Circuit for Clock, Telephone, Bell or other Service, run under Floor above, concealed. Kind of Service wanted ascertained by Symbol to which line connects.

SUGGESTIONS IN CONNECTION WITH STANDARD SYMBOLS FOR WIRING PLANS.

Indicate on plan, or describe in specifications, the height of all outlets, located on side walls.

It is important that ample space be allowed for the installation of mains, feeders, branches and distribution panels.

It is desirable that a key to the symbols used accompany all plans.

If mains, feeders, branches and distribution panels are shown on the plans, it is desirable that they be designated by letters or numbers.

NOTE—If other than Standard 16 C. P. Incandescent lamps are desired, Specifications should describe capacity of Lamp to be used.

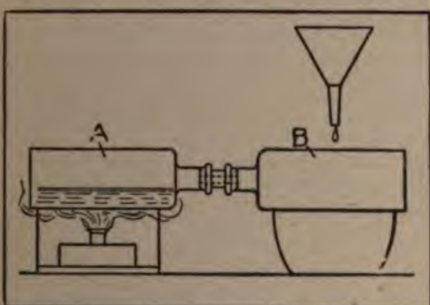
BABBITTING BEARINGS

In babbitting ordinary split shaft bearings, it is a good plan to wrap the shaft with one thickness of common writing paper and then wind with string in a spiral. The paper keeps the shaft from chilling the babbitt and gives clearance enough to do away with the time-killing scraping; and the spiral groove formed by the string makes the best oil channel possible.—Contributed by E. V.

HOW TO MAKE A WATER STILL

Any water containing lime or other impurities is not good for photographic work, but the water obtained by distillation will always give good results.

The still shown in the sketch is one that is easily made and inexpensive. Obtain two thin glass bottles, A and B, and join together with a cork having a hole through the center. A quantity of water is placed in bottle A, and heat is applied, which vaporizes



Plan of Water Still

the water and forces it in bottle B, where it is condensed.

The bottle A may be heated by means of a small gas stove, or alcohol lamp, and the other bottle may be cooled by water from a hydrant or from a funnel, with a piece of cloth in the mouth, to allow the water to drop slowly.

If a mixture of alcohol and water is placed in bottle A, the alcohol will evaporate first and condense in bottle B before much water has evaporated.—Contributed by Charles Lea, Brunswick, Mo.

TO TIN OLD SOLDERING IRONS

Some of the readers of "Shop Notes" may have trouble with old soldering irons. To tin same, heat well and dip in pulverized sal ammoniac a moment and then rub with solder. This operation will be effective, no matter how many pit holes there are in the iron or how dirty.—Contributed by Harry Casslebury, Altoona, Pa.

AIR AS A POWER

There are other sources of energy in air besides its velocity. The energy of the heat contained in the atmosphere is sufficient to run all the power plants in the world without decreasing its temperature any appreciable amount. The problem is to maintain a difference of temperature between two

An Interesting Experiment

places, as heat produces no energy while at rest, but only when moving from one place to another.

There are many easily volatilized liquids which would boil readily at atmospheric temperatures, and thereby produce a constant pressure in any boiler, without the use of a fire, but such liquids are very hard to condense, as it requires very extreme cold to cause them to liquefy. A new source of cold might solve this problem, but all sources of cold thus far discovered require either power for its production, or chemicals which soon cease to be effective.

When dry air is confined and heated, the increase in temperature is only 1-273 of the original pressure for each degree Centigrade, but moist air expands very much more. This may be illustrated by holding a bottle upside down, under a hot water faucet, and then dipping the mouth in cold water, as shown in the sketch. A difference of temperature of only a few degrees will cause the water to half fill the bottle. It is evident from this that moist air, heated the same amount, would double its pressure. Thus, air at atmospheric pressure would increase to 15 lbs. above atmosphere, and air at 100 lbs. pressure would increase to 215 lbs. above atmosphere. If the air were heated twice as much, the pressure would be increased a corresponding amount, as the increase in pressure is directly proportional to the increase in temperature.

There are several varieties of hot air engines being made at the present time, but we are unaware of any attempt being made to utilize the increased efficiency obtained by the use of moist air.

It is doubtful if the weight of the air could be utilized for a source of power, although a device for doing this ought to be very powerful as a cube of air 31 ft. on each side weighs over a ton.

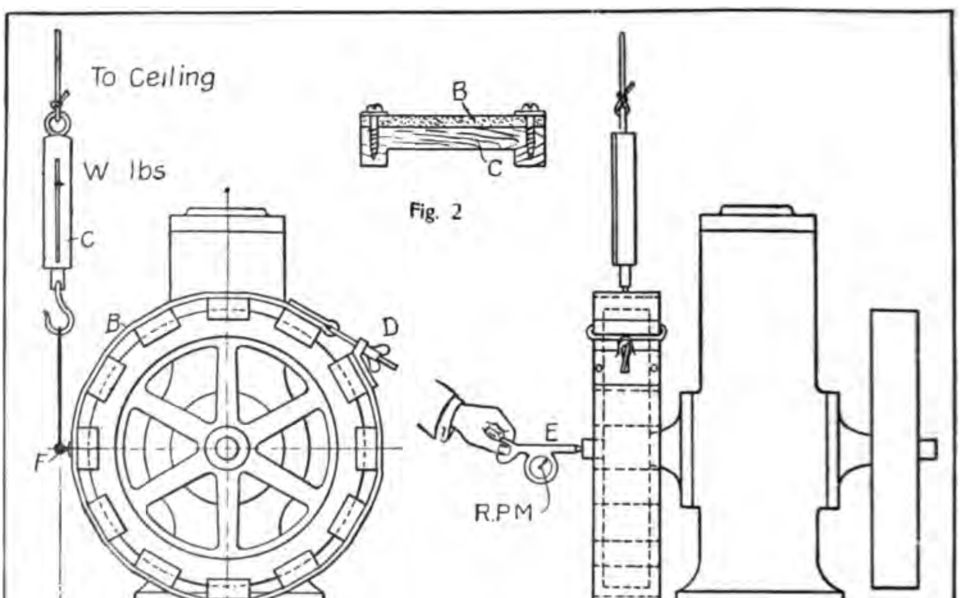
HOW TO MAKE AND USE A PRONY BRAKE

The brake shown in Fig. 1 can be made of a piece of leather belt, B, Fig. 2, with a number of wood cleats, C, fastened as shown. A tension screw, D, Fig. 1, can be *fastened* by any method that will make it secure, and the screw eye, F, should be used to attach the spring balance, C, the other end being attached to the ceiling as indicated.

To obtain the horsepower of an engine apply the brake, as shown in Fig. 1, and take the speed in revolutions per minute (R. P. M.) with the speed indicator, E, at the same time noting the weight in pounds (W) shown by the spring balance. Measure carefully the distance from the center of the engine shaft to the screw eye in inches (A). If the values of W, A and R. P. M. are known the horsepower may be found as follows:

$$\text{hp.} = \frac{\text{A. x W. x R. P. M.}}{63025}$$

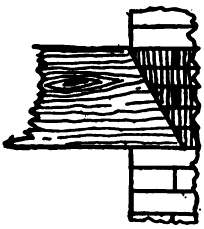
For example: If A = 16 in., W = 20 lbs., and R. P. M. = 500; then, hp. = 16 × 20 × 500 ÷ 63025 = 2½ hp. The constant 63025 is obtained by multiplying 12 × 33,000 and dividing by 6.2832; 12 being the number of inches in a foot; 33,000 the number of ft. lbs. per min. for each horsepower; and 6.2832 the ratio between the radius and circumference of the flywheel.



Details of Making and Using a Prony Brake

To crystallize glass flow heavy alum water over it; then let it dry.

SELF-RELEASING BEAMS IN WALLS



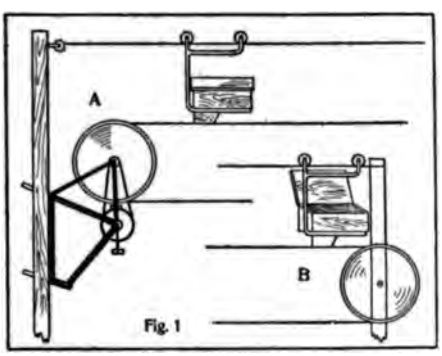
When the ends of beams that go into a wall are cut on a slant, as illustrated, a lower insurance rate can be secured. Beams so cut will fall out easily without overturning the wall in case of fire, says the Practical Carpenter.

MAIL BOX TROLLEY FOR RURAL PATRONS

Patrons of rural routes living some distance back from the road will find a trolley for drawing the mail box to the house and sending it back again a great convenience. The illustrations show such a line, which was devised by a correspondent of the Rural New-Yorker.

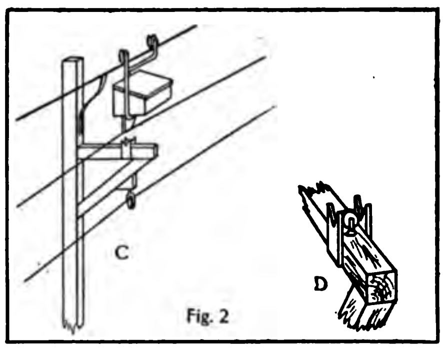
At the house end of the line a stout post is set in the ground and a bicycle, with saddle and front wheel removed, is fastened with pins against the post, as shown (Fig. 1), to serve as motive power. For the main wire No. 9 is the size used, and No. 17 galvanized for the belt wire. For a short line on level ground broom wire would do.

Posts are set every 50 or 60 yds. between the house and the road ends of the line. Each of these intermediate posts has a



Terminals of the Line

bracket (D, Fig. 2) of 2x2-in. stuff, and an iron at the top for supporting the main wire (C, Fig. 2). This iron is made of old spring-wagon tire with a half-round groove on top for the wire to rest in. The top wire is high enough above the notched guides below so the bottom of the box will not bump when passing a bracket. The arrangement of pulleys and guides at these intermediate posts is shown at D, Fig. 2. The guides are of 1-in. hard wood, screwed to the arm of the bracket. The outside pulley is underneath the arm and 1 ft. distant from the other pulley, so that the wire cannot get tangled on windy days. A wire fence ratchet is used to keep the top wire tight. The post at the road end of the line has a wheel. An ordinary R. F. D. mail box is used, with a hardwood block one-half its length underneath it. The belt line starts at this block, runs the length of the line over the wheel on the post at the roadside, returns over the pulleys of the intermediate posts, passes around the bicycle wheel, and is fastened to the block under the box in a small hole in a piece of strap-iron fastened in the block.



One of the Intermediate Posts

The wheel at the road end can be the front wheel of the bicycle or an old sewing machine wheel, and a trough or support for the box is provided at this end to hold it firm while being opened or closed (B, Fig. 1). The device as rigged up in this instance cost about $5. The line is 250 yds. long and travels uphill 75 ft. to the road. An electric alarm to let the patron know when there is mail in the box could be added by one of a little ingenuity.

TO REMOVE A BROKEN STUD BOLT

A broken stud bolt in a casting or machine part may be removed as follows:

Drill a small hole in the broken part to be removed and use a lefthand tap. If it is a lefthand threaded stud bolt use a righthand tap to get it out. Be careful not to use too large a drill, as it would leave too thin a shell to tap in, and the expansion would cause it to bind.—Contributed by G. J. Lesperance, 425 Howland avenue, Kenosha, Wis.

PORTABLE KETTLE AND FIRE-PLACE FOR GRAVEL ROOFER

Whatever thickness of metal is used for this purpose, the construction shown in Fig. 1 is suitable. The fire pot, A A, is seamed to the bottom, B B, at C C and at its top an angle iron, D D, is riveted, as shown at a a. The elbow, E, is beaded and flanged, as shown by b c; F shows the damper in position.

The angle iron, H H, riveted, as shown, supports the grate, J J, while K shows the opening for the ash pit door, around which grooves are riveted, into which the door will slide as shown by e e. The opening for the fire door is at L and around it grooves are riveted, as indicated at f f. The tar kettle, M M, is double seamed to the bottom at N N, on the top of which an angle, O O, is riveted, as shown by i i. The pitched cover, P, is seamed to the collar, as shown by R R. The handle, S, is riveted at m m. The wheels and axle, T U T, are fastened to the bottom of the fire pot, as shown in Fig. 2, in which A is part of the fire pot and B the section of the axle, which is fastened to the bottom by means of the angle, C C, riveting at a a a a. The balance legs are shown at D D, one being fastened on either side of the fire pot and riveted at F [illegible] which forms a pivot.

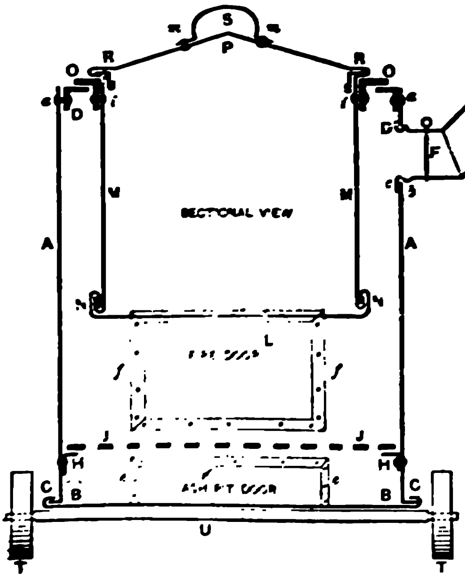


Fig. 1.—Sectional View of Fire Place and Kettle.

When the fire pot is to be wheeled to a certain place, says the Metal Worker, the legs, D D, are raised, and afterward lowered, thus preventing the kettle from tipping. Fig. 3 shows how the slides and grooves for the doors, L and K in Fig. 1, are constructed, while A A in Fig. 3 shows the part body of the fire pot, cut out as shown from b to b. The riveted grooves are shown by B B, in which the door, C, slides, D being a handle riveted at a a.

Fig. 4 shows the construction of the grate, which can be made from band iron. The outside ring, A A, should be a trifle smaller than the inside diameter of the angle iron ring, D D, in Fig. 1, so that it can be removed when desired. Three of the grate bars, as a a a in Fig. 4, are to project over the ring, as shown, these projections to rest on the angle iron, H H, in Fig. 1. The balance of the grate bars, as b b b, etc., in Fig. 4, are riveted. It will be noticed that the angle iron ring at the top of the kettle in Fig. 1 rests upon the angle iron ring, D D, at the top of the fire pot. This allows the kettle to be removed for cleaning purposes. If desired the fire pot and kettle can be made square, using the same construction, which can be modified to suit.

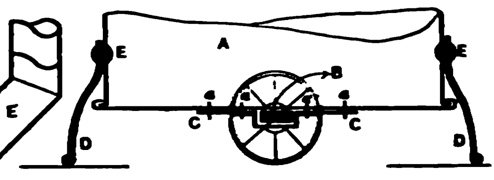


Fig. 2.—Method of Fastening Axle and Balance Legs.

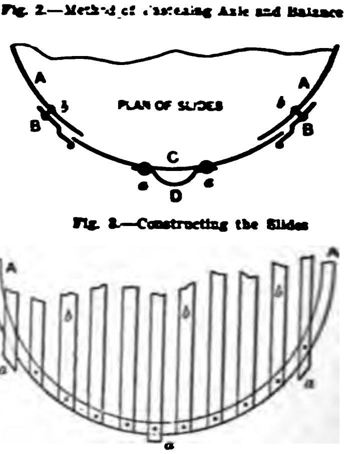


Fig. 3.—Constructing the Slides

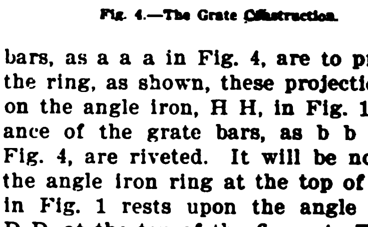


Fig. 4.—The Grate Construction.

ANOTHER DEVICE FOR GETTING ENGINES OFF CENTER

Fit a jaw over the rim of the wheel and pivot it to a handle or lever as shown. Se-

Turning Engines Off Center.

cure the handle to a block of wood, from which to get leverage. When engine is on dead center, says the Engineers' Review, place the device in front of the wheel and the jaws on the rim of the wheel and bear down on the outer end of the handle.

ROLLED A BOILER NINE MILES

A 125-hp. boiler was rolled nine miles from the railroad station to the Marine Hospital at Ft. Stanton, N. M. The process was very similar to the movement of a road roller. The roads were too soft to support a wagon with such a load, hence this unusual method of transportation was resorted to. Ryerson's Monthly says: "It was necessary to transport this boiler nine miles over the plains and mountains in order to reach its destination, and as it was found that the roads were in such condition that they would

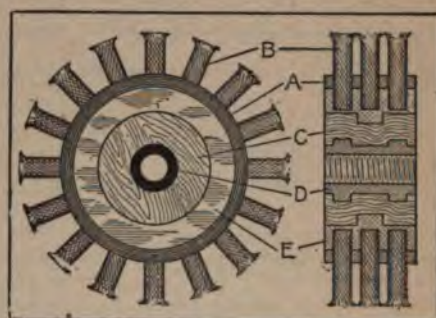
Mules Rolling the Boiler.

not support a wagon with any considerable load, it became a very pretty problem to solve. The boiler was finally rigged up as shown in the illustration — a heavy pipe being used as an axle and fourteen mules furnishing the motive power, the boiler being safely rolled the nine miles from the railroad to the hospital, reaching there none the worse for the rough usage to which it was necessarily subjected.

HOME-MADE IMPROVED BUFFER

A good buffing wheel can be made of a metal band, A (see sketch), drilled to receive a number of cords, B, a hardwood hub, C, and a babbitt bushing, D. If a narrow buffer is desired, one row of cords, as shown in the side view, will be sufficient, but if a wide buffer is wanted the required width can be obtained by making several rows, as shown in the section. If more than one row is used, the holes should be drilled diagonally.

The pieces of rope may be taken from sash



An Improved Buffer.

cord, or if the buffer is intended for very smooth work a soft, braided cotton cord should be used. It is unnecessary to ravel the ends of the cord, as they will soon ravel themselves after a little use. The cords are held in by melted rosin, E, which is poured in the cavity after the other parts are assembled and carefully centered. A little beeswax, tar or paraffine stirred into the melted rosin will make it less brittle. The bushing, D, may be made of either lead or babbitt, and is made to fit the shaft of the buffing machine.

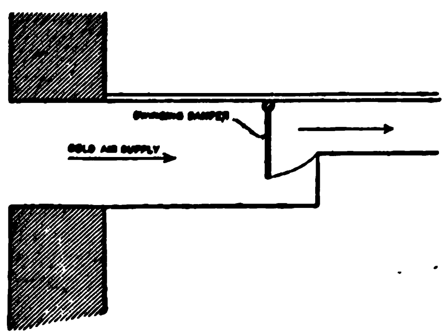
A buffer of this kind will do the work better and quicker than any muslin buffer I have ever used.—Contributed by Stoke Richards, Santa Clara, Cal.

AQUARIUM CEMENT

A good cement for aquariums is made as follows: Mix 1 gill plaster of Paris, 1 gill litharge, 1 gill fine white sand and 1/3 gill finely powdered rosin together, and add an equal quantity of boiled linseed oil and turpentine, until the consistency is about the same as putty. This cement will dry hard in a few days.

GUARD FOR AIR DUCT IN HOT AIR FURNACE

When there is a strong wind from the outside blowing into the air supply duct of a hot air furnace, the swinging damper



Wind Guard for Air Supply Ducts

shown in the illustration can be used to prevent the admission of too much air, says the Metal Worker. The damper is hinged at the top and swings loosely in an enlarged entrance to the air supply duct. Under excessive wind pressure the damper is blown up against the opening of the duct leading to the furnace, closing it off and preventing the cold air from entering too freely.

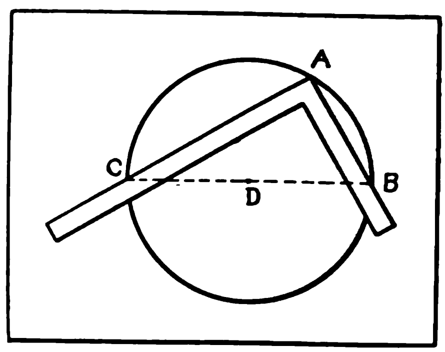
DEVICE FOR DRAWING CORNERS

A device more convenient than compasses for drawing round corners and fillets of various sizes is shown at Fig. 1. Radii are marked, the outside ones being made enough smaller and the inside ones enough larger to make the corners the size indicated when drawn with a pencil or inking pen. They can be of various other radii, and if the draftsman wishes to mark what the radius of his curve is, he has the figures before him.

Sheet metal, nickel-plated or celluloid is the proper material for this instrument. It should be ½ in. thick, beveled on one side and used flat side down for the pencil and up for the inking pen. Fig. 2 shows its application. Curves A and B were drawn by using the outside corners, says the American Machinist, and the others by using the inside corners.

TO FIND THE CENTER OF A CIRCLE

To find the center of a barrel-head or other circular object lay a steel square on the circle with the point touching any part of the circumference A. From the intersections, C B, of the two legs with the circumference



Finding the Center of a Circle

draw the line C B. Bisecting this line at D gives the required center of the circle.—Contributed by H. J. Heaton, Sidney, Iowa.

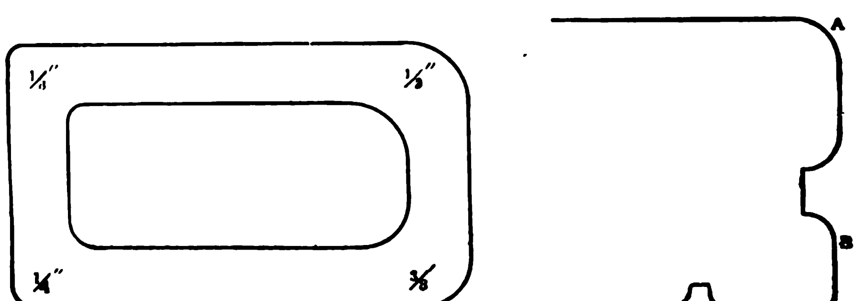


Fig. 1 Fig. 2

Useful for Drawing Round Corners and Fillets

TO COLOR COPPER ROOFS GREEN

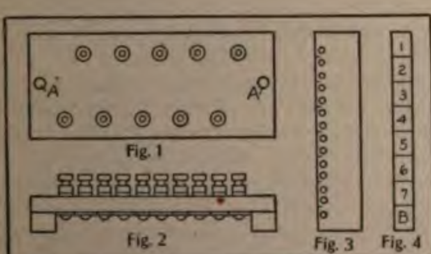
To 5 gal. water add 1 lb. sal ammoniac, dissolve thoroughly and let stand 24 hours. Then apply the solution to the copper with a brush, covering the entire surface carefully. Let it stand for one day, says the American Artisan, then sprinkle it lightly with water, using a brush. Do not use too much water or it will run the color and streak it.

The same effect can be produced by using ½ lb. salt to 2 gal. water.

HOME-MADE LOCK-NUT STRIP

It is often handy to have a lock-nut strip to fasten wires on when testing. The diagram shows a strip that is cheaply made by using the binding posts from the carbons of old dry batteries.

Cut out a piece of ¼-in. oak, or white wood, 4 in. long and 2 in. wide, and bore a hole, A, in the center on each end to receive screws for fastening the strip down. Bore a row of holes, ½ in. apart, down one side and another row the same distance apart on the opposite side, so that they are on a line between the holes of the first row. Insert the binding posts, which should fit snugly, in these holes and lock them tightly with the small nut that was next to the carbon. Place two brass or copper washers on each post and screw on the thumb nuts. Place one wire under the bottom washer and the other between the two washers and fasten them down with the thumb nut. The strip can be made any length to suit the number of connections.

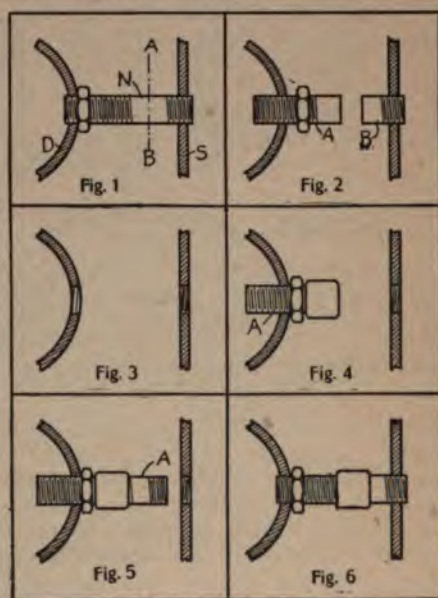


Lock-Nut and Form Strips

A form strip to go with the lock-nut strip is shown in Figs. 3 and 4. It is made of a piece of the same wood, 1 in. wide and 4 in. long. Bore holes, according to the size of wire used, ¼ in. apart, ¼ in. from the edge. Bore a hole at each end through the 1-in. way for fastening screws. Sandpaper the face of the board and shellac it. Then with a saw cut niches ½ in. apart across the top, so as to bring two holes in each space. Number the spaces to suit the job (Fig. 4).—Contributed by H. H. Fountain, Brooklyn, N. Y.

RENEWING A RUNNING THREAD NIPPLE--A PROBLEM IN PIPING

On testing a low-pressure boiler we had put up at Riverdale, N. Y., we found a defective nipple, N, Fig. 1, which connected the section, S, and the drum, D. The distance between S and D could not be changed,



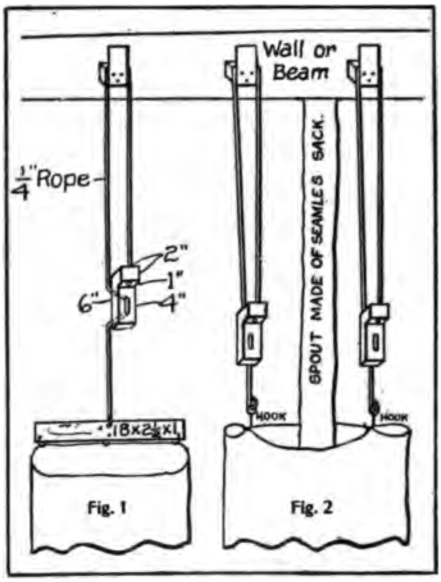
Problem in Piping

so we cut the nipple on the line A B, and ran the lock nut up to the end of the thread on piece A, Fig. 2. We then screwed the half A into the drum, far enough to remove the piece B. This made room enough to remove the half A, thus leaving both openings clear as in Fig. 3.

We then made a running thread nipple, A, Fig. 4, with lock nut and coupling attached, and screwed it into the drum as far as possible (Fig. 4). Then we screwed a short nipple, A, Fig. 5, into the coupling, and unscrewed the running thread nipple, thus bringing the connection into the section, as shown in Fig. 6. The lock nut was then screwed tightly against the drum, as shown, and the job was complete.—Contributed by Gus Cook, 153 W. 62nd St., New York City

LABOR-SAVING SACK HOLDER

A handy sack holder, the device of a correspondent of the American Miller, is shown in the illustration. The materials used in its construction did not cost more than 25



Handy Sack Holder

cents, and yet the device saves the labor of one man.

The holder can be raised or lowered to suit the height of the sack being filled, by catching the board, or lower rope, with one hand and raising or lowering the block with the other.

HOW TO RESHARPEN OLD FILES

Clean the files thoroughly, using a scratch brush and a strong solution of washing soda in hot water, then wash off the soda with hot water.

Prepare a bath of 1 part nitric acid to 4 parts water contained in an earthen vessel. Sort and grade the files according to fineness and immerse those of each grade in the bath. The finer files should be left in the bath about a minute, and the coarser cuts five or six minutes, says the Metal Worker. After the acid bath, wash the files in hot water, dry, and grease them while still warm with vaseline.

In preparing the acid bath pour the acid into the water very slowly, as the heat action is great.

HOW TO MEASURE BELT ON PULLEY

A short rule for finding the change required in the length of belt when one of the pulleys on which it runs is changed for one of different size, is as follows: Take three times the difference between the diameters of the pulleys and divide by two. The result will be the length of belt to cut out or put in.—Practical Engineer.

FATIGUE OF MATERIALS

In a former number of Popular Mechanics, a description was given of the fatigue of metals, showing that great precaution should be used in designing machinery subjected to varying loads. The necessity of observing this property of matter has been emphasized by other examples of fatigue, which have recently been brought to our notice. It has been found that watch springs often break several hours after the last winding, although the tension at the time of breaking is much less than when wound up tight.

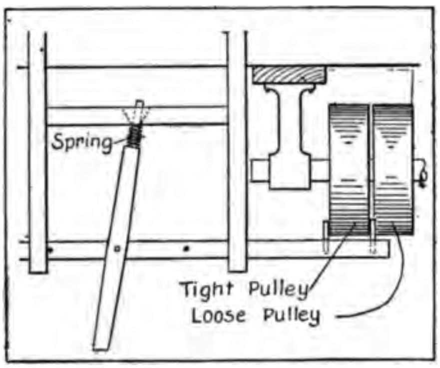
In larger machines the same thing often occurs. Crane hooks which have, in many instances, carried 20 to 25 tons, break with a load of 10 or 15 tons, and valves which are tested to several hundred pounds hydraulic pressure, sometimes break on less than 50 lbs. For this reason the hydraulic test used on boilers should not be carried to excess.

Probably the most remarkable cases of fatigue are found in floors. The top floor of a five-story factory building, which was heavily loaded with paper, fell in the dead of night, taking the other four floors with it, and crashing down into the basement. All the machinery in the building was in operation the day previous to the disaster, and the heavy jarring and rapid vibration would be expected to determine the time of falling, but the jarring and vibration evidently ceased slightly before the stress in the material reached the yielding point. Another still more remarkable case occurred in France a few years ago. In this instance, a ball room floor which had been crowded with dancers the entire evening, gave way with a sudden crash, after all the people had left and the only load was its own weight.

SHOP NOTES

TO SET A BELT SHIFTER

Anyone who has had trouble with a belt sliding over to the wrong pulley will appreciate the following device: The shifting mechanism is the same as an ordinary belt shifter with the exception of the lever, which has a spring at the upper end, as shown in

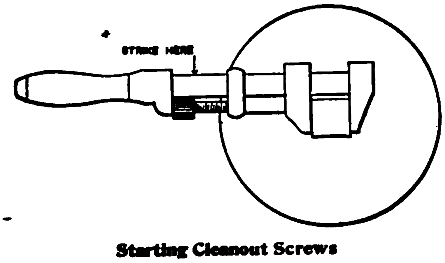


Belt Shifter

the cut. This spring, which is in compression, forces the shifter to the extreme position in either direction and holds it there.—Contributed by C. E. Holcombe, 2912 Edina Blvd., Zion City, Ill.

STARTING SCREWS IN CLEANOUT COVERS OF TRAPS

Considerable difficulty, oftentimes, is experienced in starting the screws when removing brass cleanout covers from traps. A good way, says the Metal Worker, is to give the wrench a few sharp strokes with a hammer at the point indicated in the sketch.

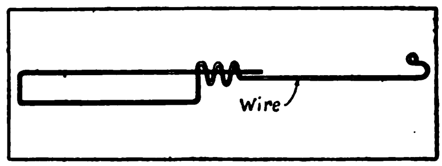


Starting Cleanout Screws

The shock will make the brass let go and the cover can be readily unscrewed.

WIRE FOR STRINGING WATCH PARTS

A very simple and convenient device for watch repairers is shown in the sketch herewith, and is used for stringing the parts of a watch during the process of cleaning. It

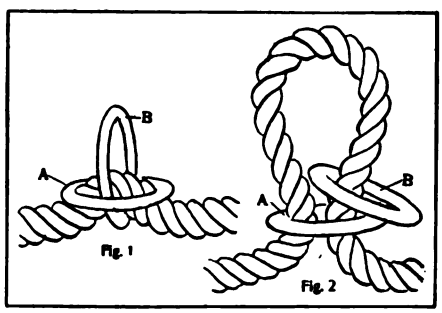


Wire Stringer for Watch Parts

can be easily made by any repairer, says a correspondent of the Keystone, and will soon pay for the time required to make it.

ADJUSTABLE RING FASTENING FOR A ROPE

An adjustable rope fastening, such as is shown in the sketch, will be found very effective for guy-rope fastenings, derrick fastenings, jury-mast knots, temporary mast



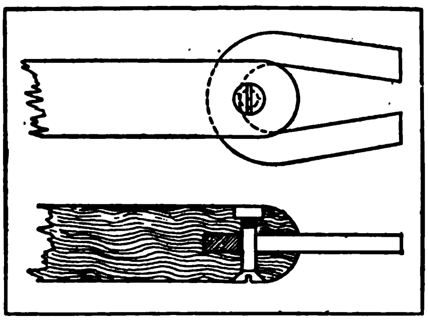
Adjustable Rope Fastening

bands, and numerous other devices where ropes are used. When used on the neck ropes of horses, a snap should be fastened to the end of the rope and hooked to the ring B. The size of the noose can then be made larger or smaller by drawing the rope through ring A, as shown in Fig. 2, and moving ring B the required distance.

when the rope is drawn back, it will leave the rings as shown in Fig. 1. The rings can be made of iron or steel, somewhat smaller than the diameter of the rope, and when a number of fastenings are to be placed on one piece of rope, the rings, A, should be made oval-shaped so that they may be passed over the others. When only one fastening is required both rings may be made round.—Contributed by Harry Hall, Brooklyn, Iowa.

MAGNET FOR A BROOM HANDLE

Shop brooms equipped with the following device will be very useful for recovering brads, small screws, and other articles from the shavings. The broom handle is slotted a short distance and a magnet is held in

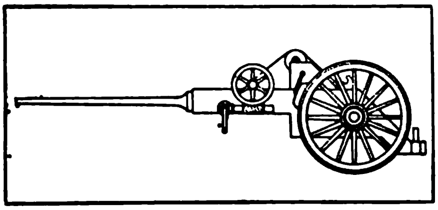


Magnet Attachment for Broom Handle

the slot by a $\frac{3}{16}$-in. stove bolt, as shown in the sketch. I use this device every time I sweep up, and usually find large quantities of brads, staples, and small screws. I upset a box of brads once and they fell in a lot of shavings and dust, but were quickly separated with the magnet.—Contributed by Edwin Howland, Baltimore, Md.

CABLE DRUM CARRIAGE

This device is used for holding the large spools, upon which is wound the lead-covered cable used in electrical work. The handling of these reels of cable, which has always been very difficult, owing to their great



Cable Drum Carriage

weight, can be done by one man when using this device. With it the cable can be unwound either backwards or forwards and the drums can be easily raised by means of the powerful worm gear.

With the exception of the shafts and wheels the apparatus is built entirely of steel and is designed to carry varying sizes and weights of drums.

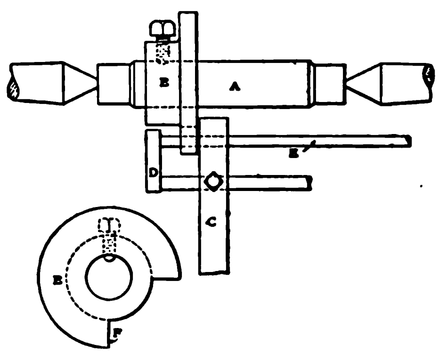
IMITATION ROSEWOOD STAIN

Put 1½ lb. logwood chips in a gallon of water and boil until reduced in volume to 2 qt. Apply boiling hot, says the Master Painter, and if several coats are necessary, let each coat dry before applying the next. Grain the finished surface with a camel's hair pencil dipped in logwood infusion containing the sulphates of iron and copper.

HOW TO SHEAR WIRE IN A LATHE

Instead of having a shaper rigged for shearing, this work may be done on the lathe, says the American Machinist.

Swing the mandrel, A (see sketch), which has a circular shear, B (made of tempered tool steel), on it, between the centers. Fasten a tool-steel piece, C (drilled for the wire, E, to be sheared and for the stop, D,



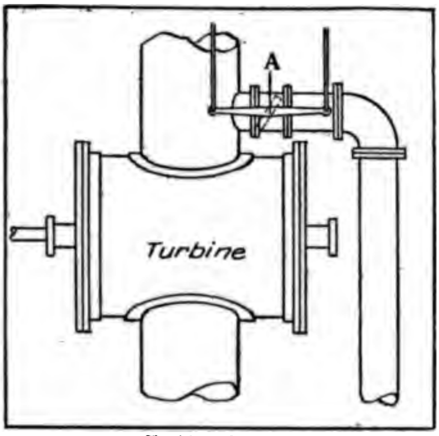
Shearing in a Lathe

which determines the length of the pieces to be cut), in the tool-post.

Operate as follows: Start the lathe, enter wire, E, in the hole in C, and press toward stop, D; when opening, B, is opposite the hole in C, press the wire up against D, and cutting edge F will shear it off. The piece C can have a series of holes in it to suit different sized wires. The circular shear, B, will last for a long time as there is plenty of stock for grinding.

A NEW METHOD OF TURBINE CONTROL

In a paper read before the American Institute of Electrical Engineers, Mr. Lamar Lyndon describes a form of governor by-pass shown in the sketch. It has been found that when the supply of a turbine is suddenly checked, the momentum of the moving column of water causes an enormous increase in pressure, which would probably burst the pipe if it were not for the relief valves, which open and thus allow part of the water to escape.

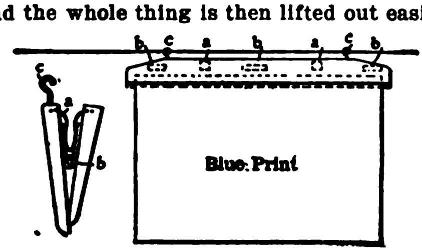


Turbine Governor

In the new method the relief valves are replaced by the compensating valve, A, which operates in connection with the governor. This arrangement prevents the oscillatory movement of the governor, and gives a more uniform speed in the turbine.

HANGER FOR BLUEPRINTS

In hanging blueprints on the line to dry, they are apt to be torn or hung so that they dry unevenly. The hanger illustrated eliminates this difficulty. The blueprint is clipped with the hanger while in the water, says a writer in the American Machinist, and the whole thing is then lifted out easily.



Hanging Blueprints

HOW TO LEVEL AN OILSTONE

For use in properly truing up oilstones provide a block of cast iron 1½ in. thick, 9 in. wide and 12 in. long, with a projecting ledge ½ in. wide and ½ in. high on one side, this to keep the block from slipping when on the bench. Plane the block up true on both sides and the three edges, says the Patternmaker, and place on the bench convenient to sink water; also provide coarse and fine emery powder.

To true up an oilstone or slip, place a small quantity of the coarse emery powder in the middle of the block, pour on a little water and rub the oilstone back and forth until its surface is level; then repeat the operation, using fine emery powder with water. To true the round side of a stone, and preserve its original radius, turn the stone while rubbing.

This method will entirely remove all the glaze, so objectionable in oilstones, and leave a nice surface similar to that obtained by grinding.

PUMPING TO A 100-FOOT ELEVATION

With two piston type steam pumps for tank service, either of them able to discharge sufficient water to a 50-ft. elevation with a nominal lift of, say, 10 to 15 ft., it is possible to force water 100 ft. vertically by the following method:

Connect the suction of one of the pumps to the water supply and the discharge to a receiver capable of holding the required pressure, in this case 21.7 lb. Connect the suction of the second pump to this receiver also and connect the discharge to the main that carries the water to the 100-ft. elevation. To steady the action of the pumps, says a correspondent of the Engineer's Review, the receiver must be fitted with a good-sized air chamber.

In operating keep the steam valve on the first pump open full and control the speed with the steam valve on the second pump. The second pump not having any lift will be able to overcome the increase of friction in the discharge main. Any boiler will do nicely for a receiver, but it would be better not to use too large a receiver.

This scheme will work on rotary pumps as well, but not on plunger pumps. The two-pump scheme can be worked very nicely for fire service at a distance and in a great many other ways as well.

BENDING AN OIL CAN SPOUT

To make a bend in a spout for an oil can or a machine oiler proceed as follows:

Form the straight spout in the regular way over the blowhorn stake and solder the seam. Plug the small end of the spout with a piece of wood and pour melted resin into the spout until it reaches the point where the bend is to be made. Let the resin cool till solid, then make the bend over the round stake or mandrel to the desired form without a buckle.

Heat the spout gradually over an oil torch, says a writer in the American Artisan, until the resin again melts and runs out.

A NEW WAY TO BEND TUBES

The principal difficulty in bending tubes is the tendency to buckle and wrinkle. This has been overcome in some instances, by pouring melted resin into the tube before bending, and while this method prevents the tube from wrinkling in long radius bends, it has been found unsuitable for making sharp bends or for making bends in which the exact diameter of the tube is to be maintained. The tube is also slightly flattened at the bend, and is therefore not perfectly round.

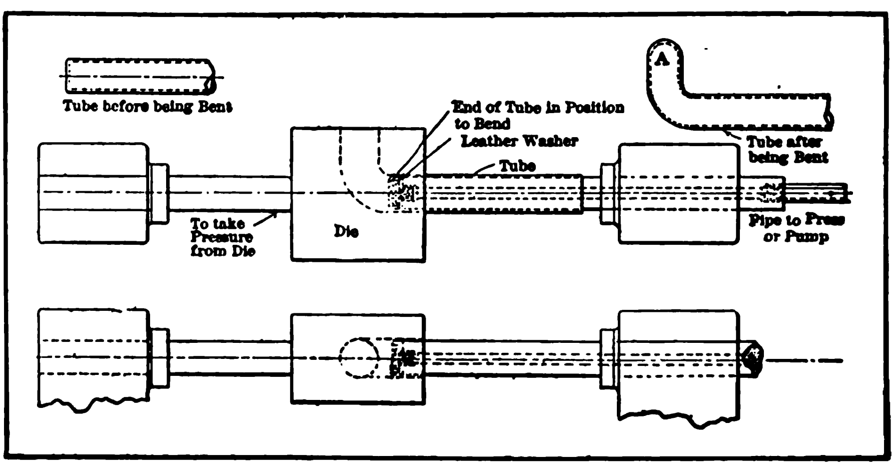
It being required to bend a number of brass tubes through 90° without any wrinkles, creases, or change in section, a correspondent of the American Machinist made use of the "fluid punch" principle. The tubes were forced through a die, as shown in the sketch, and a water pressure of 6,000 lb. per sq. in. applied to the inside of the tube. The tube being closed at the end was forced through the die by the pressure of the water, and as the diameter of the die all around the bend was the same as the tube, there was no place for the metal to go except in the desired direction. The diameter could not be increased because the walls of the die prevented this, and it could not be decreased at any point on account of the high pressure within.

In using this device the end, A, became rounded as a result of the pressure, and was afterwards cut off. If the die is supplied with a liberal amount of oil it will last a long time and do good work.

TO REPLACE A BROKEN CASTING

When a cast-iron part of a stove or other article is broken the following method is usually the cheapest way to replace it: Take the broken casting to a foundry and have a new casting made, using the original as a pattern. The molder can easily place the broken parts together so that the duplicate casting will be perfect unless it is very complicated.

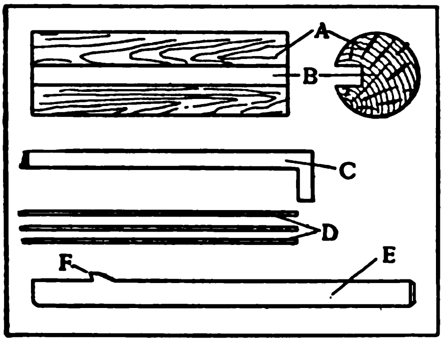
The duplicate casting will be a little smaller than the original as cast iron shrinks about ⅛ in. in a foot in cooling. If the shrinkage should be an objection it may be partially overcome by annealing, as suggested by a correspondent of Machinery. To anneal the casting, heat it in a slow charcoal fire to a dull red heat, and then cover it over about 2 in. with fine charcoal. Sprinkle several inches of dry ashes on top and allow to cool slowly. This will permanently expand the casting which will then be very nearly the size of the original.



A New Way To Bend Tubes

CUTTING A KEYWAY WITHOUT A MACHINE

A keyway can be cut in a pulley, gear, or other piece of machinery without the use of a planer or slotting machine by the tools shown in the sketch, and a hammer. The cylinder, A, is made of hard wood and turned up to fit the bore of the pulley. The groove, B, is the same width as the



Home-Made Keyseating Tools

keyway required, and deep enough to receive the iron piece, C, and the steel chisel, E. The piece C has the end bent over as shown to prevent it from sliding out of the groove. The shims, D, can be made of galvanized iron, thin strips of hard wood, or almost any material obtainable.

To use these tools put the cylinder in the bore of the pulley and put piece C in the bottom of the groove. Drive the chisel through the bore and then shim up with the strips, D, driving the chisel clear through each time.

About six shims will be required for making most keyways, but it is well to have more as the depth of the groove, B, will not then have to be an exact dimension.

TO KEEP PLASTER OF PARIS FROM HARDENING QUICKLY

In the May number G. M. Backus says: "To keep plaster of paris from hardening so quickly, use vinegar instead of water for mixing." That depends on how long you wish to keep it from hardening. After thirty years' experience with plaster of paris I find that mixed with clear vinegar it will not harden in six hours, but will work like putty.

The better way is to add one-fourth, or possibly one-half vinegar to the water. If wanted for stopping cracks in walls, one-half vinegar will give all the time required and will make a better filling than when all vinegar is used; one-fourth vinegar will give ample time and make a still better stopping.—Contributed by W. C. Bunker, D. D. S., Oregon, Ill.

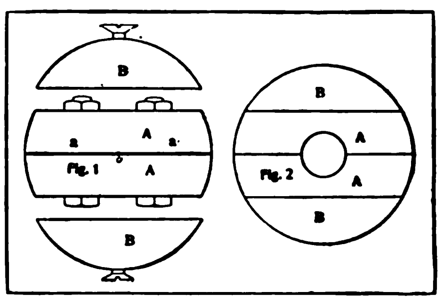
HOW TO MAKE A SMALL SPLIT PULLEY

To make a small split pulley up to 10 in. in diameter, the following method is excellent, says a writer in the Wood-Worker:

Take two pieces of firm stock, A A, as long as the desired diameter of the pulley, plus a little to work off, and as wide as the desired face. Join them up and make a light saw mark across the center, as in making a wooden box, then bolt them together with a piece of heavy cardboard or very thin wood, a a, Fig. 1, between. This cardboard or wood should be cut through at o, so that there will be a hole there for the worm of the bit to follow.

Having bolted the pieces together, bore a hole of the size of the shaft. Now take two pieces, B B, of the right thickness to complete the circle, saw roughly to size, fit them over the bolt heads and nuts, and screw on, being sure to countersink the screw heads sufficiently to allow for the turning. Mark piece B, which covers the nuts, so that the pulley may be taken apart by removing that piece only.

Having built up the rough pulley in this way, take off the piece B, remove the nuts

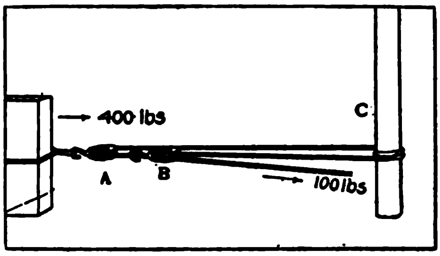


Small Split Pulley

from the bolts, take apart the pieces A A, remove the thin pieces—you have no further use for them—and having made a wood mandrel of exactly the size of the shaft, clamp your pulley on it, and turn as desired. The pieces A A need not be of especially hard wood; white pine has been used with perfect success, and they are doubtless better for being thin enough so that when the bolts are drawn up they will have a slight tendency to spring, thus bringing the end grain to bear on the shaft and clamping it tighter than if they were rigid.

PROBLEM IN ARRANGING PULLEYS

In the ordinary method of using two single-block pulleys, the pulling force is only doubled, but by arranging the pulleys and rope, as shown in the sketch, the force is increased to four times that of the power



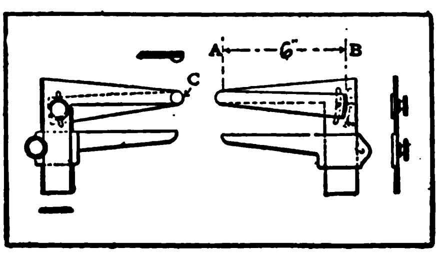
To Get a 4 to 1 Pull With Two Single Block Pulleys

applied to the end of the rope. The pulleys A and B are connected, as shown, and the rope is then given one turn around a post, tree or other object, C.

When the pulley B reaches the post C, loosen the rope and slide pulley B back to pulley A, which will have traveled half the distance traveled by pulley B.—Contributed by A. D. Newlin, Dunlap, Cal.

A MACHINIST'S TAPER GAUGE

The sketch shows a taper gauge made by a correspondent of the American Machinist, and found useful for measuring the taper of lathe centers and other tapered work. The principle used is the same as that found in the taper attachments of a lathe. The lower jaw slides up or down to adjust the work; the upper one swings on a stiff joint, C, to adjust the taper; both jaws are locked with thumbscrews.



Useful Taper Gauge

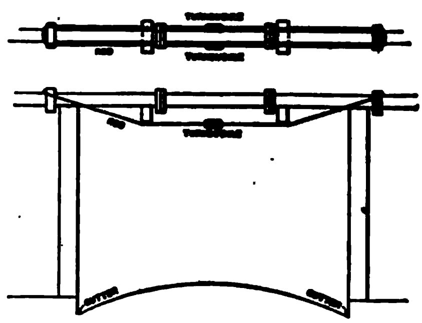
As it is half a foot from A to B, the graduation is made one-half size, so that a distance of ½ in. on the scale should read 1 in., which gives the taper in 1 ft.

SUPPORTING LONG LINES OF PIPE

Often it is not desirable to support long lines of heavy piping with trestle or bridge work. A correspondent of the Metal Worker describes his method in such case.

Three lengths of 6-in. iron pipe, each about 14 ft. long, were to be used in crossing a street, leaving an unobstructed clearance of 15 ft. The pipes were arranged to rise in a vertical line above each sidewalk and near the riser were placed two 10x10-in. posts to support the pipe line and the weight of water in it. The three lengths of pipe were joined together with flanges, giving the abutting ends maximum bearing surface and assisting materially in keeping the line rigid.

A block of wood was placed toward each end of the line and over these were passed



Trussed Pipe Line

two ½-in. round iron rods, bearing underneath two other blocks 6 by 8 in. in size, placed as shown. The rods were screwed together by turnbuckles. The size of the rods is determined by the length of the span and the bends they are to be given.

TO CUT INDIA RUBBER

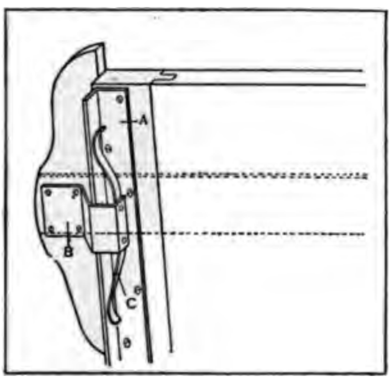
Those who have had to cut heavy gaskets or other rubber articles have found that substance an unpleasant material to work. The cut can be made neat and clean, says a correspondent of Machinery, if the knife be kept wet; and if conditions permit, this can be best effected by doing the cutting under water, as good housewives know to (peeling onions. Potash water is plain.

BORING A HOLE IN A CEILING

A man who wanted to bore a hole through the ceiling in his house, accomplished the task without getting any plaster or chips on the carpet, though his wife had told him he surely would, says American Machinist. He thrust the bit through the bottom of a pasteboard box, mounted a stepladder and bored the hole, catching all the litter in the box.

T-SQUARE ATTACHMENT

The device shown in the sketch will keep the T-square true at all times, and saves many movements of the left hand when working near the end of the blade with a triangle. A piece of angle brass, A, is screwed to the drawing board near the left-hand edge on the under side. A piece of sheet brass, B, is bent, as shown, and screwed to the head of the T-square. A steel



T-Square Attachment

spring, C, is fastened to B and slides on the brass angle, A, thus keeping the square true at all times. The sketch shows a view of the under side of the drawing board.—Contributed by A. L. T., Lansing, Mich.

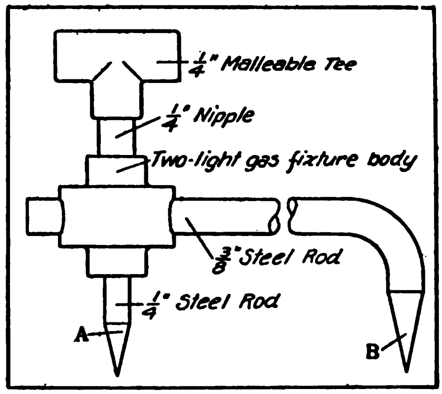
CHALK IN THE SHOP

A good way to keep a file from filling up with the metal being filed is to rub it with chalk; especially is this good, says Wood Craft, in reducing a shaft by means of a file.

Chalk makes a good oil extractor for old belts, also. Rub the chalk into the belt thoroughly, then pack the belt in chalk and let stand for a day or two. The capillary action induced will draw the oil from the belt into the chalk, and enough will be re-
make the belt fit for service.

EASILY MADE TRAMMEL POINTS

A trammel point in which no fine adjustment is required, can be made from pipe fittings and a steel rod, as shown in the sketch. The device can be made with either one traveling point, A, and one stationary



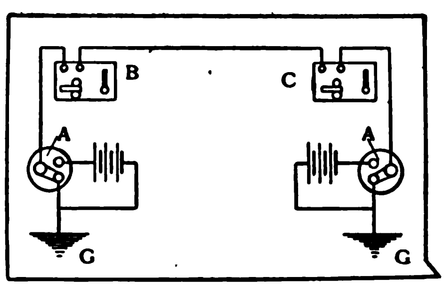
Trammel Points

point, B, or with two traveling points, as may be desired.

In making the traveling point a two-light gas fixture body is drilled to receive the $\frac{3}{8}$-in. rod, and tapped for the steel point, as shown. The $\frac{1}{4}$-in. nipple acts like a set-screw, and the $\frac{1}{4}$-in. malleable tee serves as a handle. The $\frac{3}{8}$-in. steel rod can be made any length desired and can be bent either hot or cold.—Contributed by Geo. A. Madison, Baltimore, Md.

KINK FOR TELEGRAPH LINE

A friend and I use the accompanying kink on our telegraph line, doing away with the dirt and cleaning of gravity battery; we use dry cells instead. A A are two-point switches; keep the switches on left-hand point when not in use. When B calls C simply put switch on right-hand point

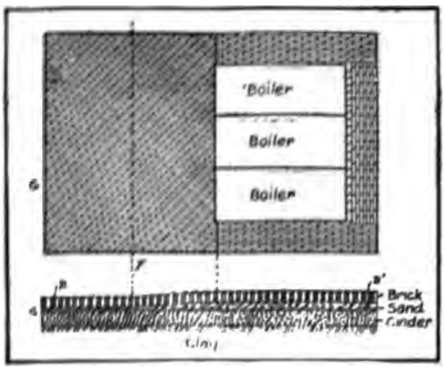


Wiring Kink for Telegraph

and call as usual. In connecting up the battery, observe that the positive pole is connected to switch at one station, while the negative pole is connected to the switch at the opposite station, giving a chance to use both batteries, if desired.—Contributed by F. L. Wheeler, Cliftondale, Mass.

LAYING A FIREROOM FLOOR

The fireroom floor should be planned not only to give good wearing value, but for comfort as well. The following plans, with modifications to suit the individual needs, is excellent:



Laying a Fireroom Floor

First provide a supply of material: bricks, cinders, sand and cement, then proceed to excavate the part of the fireroom where the bricks are to be laid to a depth of at least 15 in. below the door sill. In this excavation lay a course of cinders 8 in. deep (see sketch); the cinders should be slightly wet and tamped in place thoroughly with tamping tools. Follow the cinders with a layer of coarse, sharp sand 4 in. deep at B' and 2 in. deep at B. In part of the fireroom the brick should be laid diagonally, but as there is considerable waste in making broken joints, they may be put in straight at the sides of the floor and the rear of the boiler.

In front of the boilers the floor should slope slightly so that water from the ashpit which comes out with the ashes when the fireman is cleaning fires will not form small pools which do not conduce to comfort. The heaviest work of the fireroom comes on the space between the boiler fronts and the dotted lines, FF, therefore the brick should be thoroughly grouted in there. To do this, mix up clear Portland cement with water, very thin and pour in all the joints. When the joints are full to overflowing, spread the cement all over the space with a coarse broom. Cover that portion of the floor from the dotted lines FF to the outer wall at G with very fine sand, tamping thoroughly; then when all the joints are filled, sweep off the sand. Vitrified brick, which is very hard, should be used for laying the floor. A correspondent of the Practical Engineer says that a floor laid in this way will give excellent satisfaction and last a great while.

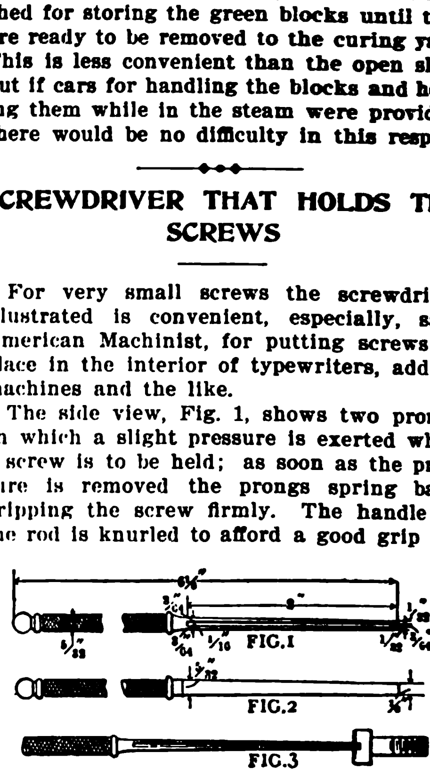
CEMENT BLOCKS CURED BY STEAM

Cement blocks or bricks made by the dry process may be cured by steam, says Municipal Engineering. Where the block plant is operated by steam, the exhaust steam can be used for curing and the extra cost is very small. It is necessary to use a closed shed for storing the green blocks until they are ready to be removed to the curing yard. This is less convenient than the open shed, but if cars for handling the blocks and holding them while in the steam were provided, there would be no difficulty in this respect.

SCREWDRIVER THAT HOLDS THE SCREWS

For very small screws the screwdriver illustrated is convenient, especially, says American Machinist, for putting screws in place in the interior of typewriters, adding machines and the like.

The side view, Fig. 1, shows two prongs on which a slight pressure is exerted when a screw is to be held; as soon as the pressure is removed the prongs spring back gripping the screw firmly. The handle of the rod is knurled to afford a good grip for



Screw-Holding Screwdriver

the fingers in turning. Spring steel rod is the material used for this device. The ends are made quite thin in order to have the spring as sensitive as possible. The method of using the driver is shown at Fig. 2.

RECIPE FOR MARINE GLUE

One part of pure india rubber dissolved in naphtha. When melted add 2 parts of shellac. Melt until mixed. Pour out on tin until cold. Melt and use with a brush at water-bath heat.

Or take a handful of quicklime and 4 oz. linseed oil. Boil, and pour out on a plate until hard. Melt and use.

Or take 1 lb. of common glue—not fish glue—in 2 qt. of skim milk. Soak and boil.

All these are good.

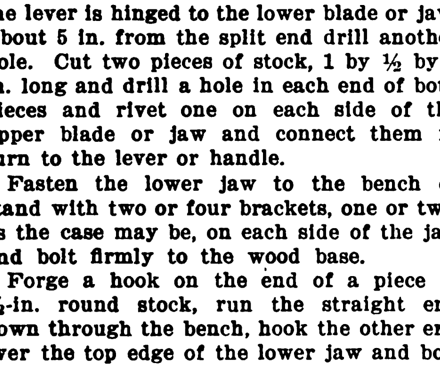
HOW TO MAKE A CUTTING SHEAR

A very handy cutting shear can be made at little expense and requires little more than a couple of hours' labor, says a correspondent of the American Blacksmith.

Make the stand or bench of 4x6-in. oak lumber, similar in construction to an ordinary work truss, and 4 ft. long. Secure two cutter-bars from an old reaper and bend the end of one up and the end of the other down and rivet the two bent ends together. Make the lever or handle of ½-in. stock 4 ft. long. Split one end of this piece so as to evenly distribute the strain on the rivet by which the lever is hinged to the lower blade or jaw About 5 in. from the split end drill another hole. Cut two pieces of stock, 1 by ½ by 6 in. long and drill a hole in each end of both pieces and rivet one on each side of the upper blade or jaw and connect them in turn to the lever or handle.

Fasten the lower jaw to the bench or stand with two or four brackets, one or two, as the case may be, on each side of the jaw and bolt firmly to the wood base.

Forge a hook on the end of a piece of ½-in. round stock, run the straight end down through the bench, hook the other end over the top edge of the lower jaw and bolt

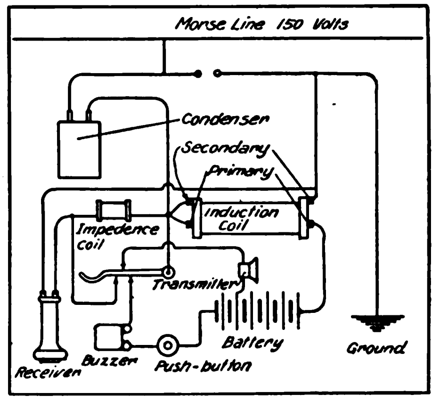


Home-Made Cutting Shear

the lower end firmly to the floor, thus holding the sheat rigid. This tool can be used to cut flat stock ¼ by 3-in. or ½-in. round rods.

COMBINATION TELEGRAPH AND TELEPHONE LINE

The accompanying diagram shows a system which I recently installed in Kansas for simultaneous telegraphy and telephony and which is giving as good results as could be had were they entirely separate. On account of its simplicity it can be made by



Wiring for Combination Telegraph and Telephone Line

anyone for less than the cost of any standard telephone made.

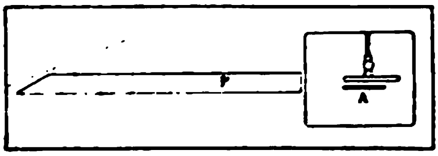
A word explaining its operation may prove useful. When receiver is on the hook in its normal position, the pushing of the button completes the circuit of six cells through an ordinary buzzer, primary of induction coil back to the battery, thus giving an interrupted direct current through this circuit and generating an induced alternating current in the secondary of the induction coil which passes out over the line, actuating the diaphragms of all receivers and vibrating them in unison with the buzzer of the ringing telephone. Receivers in this way act as "howlers" in addition to their usual function.

The condenser of course prevents the Morse current from reaching or working through the telephone to ground. The impedence, or retarding coil, may be made by using one of the coils out of an ordinary Morse relay (150 ohms), as its resistance is 75 ohms. Where Morse sets come between telephones on the line, both key and relay of the set should be completely bridged across with a condenser of small capacity. Where it is possible to use two telegraph wires and make a metallic circuit, a 1 microfarad condenser on each side of telephone will serve the purpose of the 2 micro-farad condenser shown in diagram.—Contributed by C. V. Patterson, Independence, Kan.

DEVICE FOR RIPPING LONG STOCK

Long stock for moldings, etc., is easily ripped when a device like the one illustrated is used, says a correspondent of the Wood-Worker.

In the sketch, A is a plan view of the



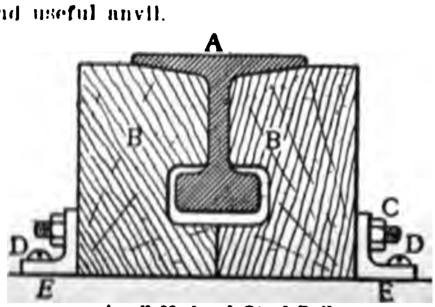
For Ripping Long Stock

saw table and P is the top of a bench, or trestle, for the stuff to run out on. This top, P, may be independent of the saw table, and made with four legs adjustable to height, if the saw table is adjustable, or it may be secured to the saw table at the one end and have a leg at the other. The entire efficiency of the device lies in having it a little over half the length of the longest stock to be worked, say 10 ft. long for 16-ft. stuff, and having the outer end cut on a long bevel, as shown. A strip being ripped off, it will lie on the table till the next pushes it along; then when the center passes the end of the bench, it will tip and slide off the bevel end, falling to the floor in the position indicated by the dotted line. With a device of this kind one man can rip molding stock very nearly as fast as two could do it without.

◆ ◆ ◆

ANVIL MADE OF STEEL RAIL

The amateur blacksmith can make himself a very satisfactory anvil of a piece of steel rail often to be found at the junk shop. A in the sketch shows the rail; BB, two blocks of wood just the length of the rail, used to prop it; C, two bolts; DD, four long screws, and EE, two pieces of angle iron of the same length as the piece of rail. The Model Engineer, London, says this makes a strong and useful anvil.

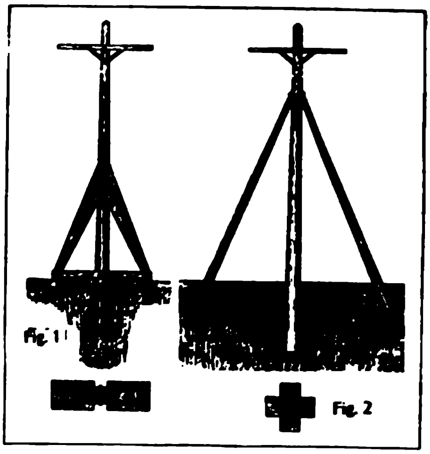


Anvil Made of Steel Rail

SUPPORTING POLES IN SWAMPY GROUND

In setting telephone poles in swampy land where the mud is too soft and deep to give a solid bottom, a cheap and easy method of supporting them is shown at Fig. 2. Bolt to the foot of the pole two pieces of creosoted pine planking, crossing at right angles. Reinforce the pole, if necessary, by putting in a push and brace, with planks bolted at the foot the same as at the base of the pole. Where the line will be exposed to strong winds fill a hole around the base of the pole with concrete, says the American Telephone Journal.

Where the ground is too soft for this



Setting Telephone Poles in Swampy Land

method to be successful, plant the pole and bolt to it just above the ground and at right angles to the line, two pieces of planking about 10 ft. long (Fig. 1). Nail short pieces of planking 3 ft. long to these 10-ft. planks and at right angles to them. Then on each side of the pole fasten two pieces of planking to extend from a point on the pole about 5 ft. above the ground to the ends of the 10-ft. planks.

◆◆◆

TO CUT HARD RUBBER

Hard rubber in sheets is very difficult to cut under ordinary conditions, but by placing in hot water it becomes soft like a piece of leather and may then be easily cut in any shape desired by using ordinary shears. When it begins to cut hard dip in water again and continue until the cutting is done. Then lay on a flat surface and allow it to remain there until cold.

ETCHING ON BRASS OR STEEL

In the usual method of etching on tools or instruments of any kind, the article is covered with melted paraffin and then marked with the name, monogram or other inscription, by means of a pin or scriber of some kind. In a new method, described by a correspondent of Machinery, a rubber stamp is used in place of a scriber, and asphaltum varnish is used as a "resist" in place of paraffin. If the stamp has a fancy border it will add greatly to the appearance. The varnish is used on the stamp in place of ink and the impression is then made on the article to be etched. When the varnish has dried, apply the acid, which will eat into the metal at the exposed places and leave the letters in relief.

The following acids for etching will be found to give good results:

IRON AND SOFT STEEL.—Nitric acid, 1 part; water, 4 parts.

HARD STEEL.—Nitric acid, 2 parts; acetic acid, 1 part.

DEEP ETCHING.—Hydrochloric acid, 10 parts; chlorate of potash, 2 parts; water, 88 parts.

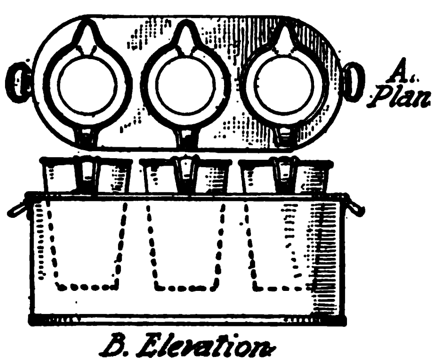
ETCHING BRONZE.—Nitric acid, 100 parts; muriatic acid, 5 parts.

BRASS.—Nitric acid, 16 parts; water, 160 parts. Dissolve 6 parts potassium chlorate in 100 parts of water, then mix the two solutions and apply.

BOILER FOR HEATING GLUE SIZING

For this device use No. 24 galvanized iron, making the boiler 13 by 30 in. and 13 in. deep. Double seam the bottom like a wash-boiler and pane the top on and solder it.

Make the three pitchers about 9 in. at the top, 5 in. at the bottom and 14 in. deep, and fit them into holes in the top of the boiler so

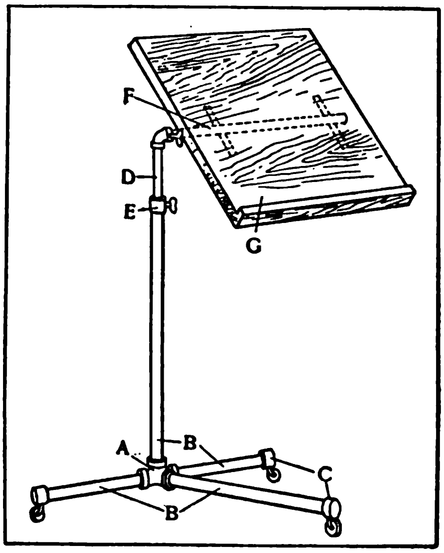


Boiler for Heating Glue Sizing.

that the bottoms of the pitchers are 2 or 3 in. above the bottom of the boiler. The pitchers should have a large solid lip like camp coffee pots, says the American Artisan, so that the glue will not clog when pouring. Wire the handles heavily and place them so as to just rest on the top plate of the boiler.

HOW TO MAKE AN ADJUSTABLE DRAWING TABLE

An adjustable table, which can be used for either drawing, reading or writing, can be made as shown in the sketch. The ¾-in.



Adjustable Drawing Table.

side outlet tee, A, unites the four ¾-in. pipes, B B, and the three caps, C, are drilled to receive castors, as shown. The cap, E, is drilled for the 13-16-in. rod, D, and tapped for a thumb screw. The ½-in. pipe, F, holds the board, G, and if necessary should have holes drilled and rods passed through, to prevent board from twisting. A narrow strip of wood, screwed on at the lower edge of the board, G, will prevent the drawing board or other article from sliding off.—Contributed by Subscriber, N. H.

EXAMINING PRINTS WHILE DEVELOPING

During the development of a print do not take it out of the solution to examine it. It is entirely unnecessary and is liable to result in stains and discolored lights.—Photographic Times.

THE SLIDE RULE A COMPLETE WIRE TABLE

By S. H. Graf, Corvallis, Ore.

Since the slide rule is now recognized as a necessary adjunct to the practical engineer's equipment, the following directions for readily finding the properties of copper wire, as given in the common wire table, will perhaps be appreciated by those engaged or interested in electrical work:

In the October, 1905, issue of the Electric Club Journal there appeared an article giving a method for finding the resistance per thousand feet of any size of copper wire. This article led to further study of the subject and brought about the discovery of methods for finding the other equally important properties recorded in the wire table. In order to make the list here complete, and owing to the fact that the method for finding the number of feet per pound is based on the rule given in the article spoken of, it will be well to give in brief this rule.

To find the resistance in ohms per thousand feet (at 20° C.) of a given size of wire, draw out the slide until the right hand index on the under side of the rule is at the units figure of the given number on the equally divided or logarithmic L scale; that is, for No. 18 place the index on 8; for No. 9 place it on 9, etc., and multiply result by 10. Example: Required ohms No. 18 wire (1,000 ft.). Set slide (holding rule upside down) at 8 on the logarithmic L scale, then (holding rule right side up) read on scale D the number .632. Multiplying by 10 gives 6.32 ohms for the resistance of 1,000 ft. of No. 18 wire. The exact resistance as given in the tables is 6.35 ohms, the difference being less than one-half of 1%.

In order to know where to place the decimal point, it will be necessary to remember the following:

The resistance of No.	0	wire is	.1	ohm	per	1,000 ft.
" " "	10	"	1	"	"	1,000 ft.
" " "	20	"	10	"	"	1,000 ft.
" " "	30	"	100	"	"	1,000 ft.
" " "	40	"	1000	"	"	1,000 ft.

Sizes between those given have proportionate resistance, and if the order is observed it will take but a minute to memorize the little table above.

To find the number of feet per pound, simply multiply the number of ohms per *thousand feet*, as found above, by the constant 10 π [or 31.4 approx. (10 π=10×3.1416 =31.4)]. The following shows where to place the decimal point:

No. 000000.............	1 ft. per pound
No. 5.................	10 ft. per pound
No. 15................	100 ft. per pound
No. 25................	1000 ft. per pound etc.

The rule for finding the diameter in inches of any size wire is not quite as simple as the above, yet it can be mastered with very little effort.

The diameters of the wires, Nos. 2, 6, 10, 14, 18, 22, 26, 30, 34 and 38, may be found directly by placing the right under index on the units figure of the number as before and reading the result over the left hand index of the slide on the A-scale. For wires larger than No. 11 place a decimal point before the value read: as for No. 2 we have .258; for wires larger than No. 31 but smaller than No. 10 place a decimal point and one zero before the significant part of the result; and for wires smaller than No. 30 place a decimal point and two zeros before the answer.

The diameters of the sizes not given in the series must be found by interpolation. This may be done very readily on the slide rule. For example, suppose we wish to find the diameter of No. 15, B. and S.: Place the right under index on 4 (for 14), then, as No. 15 has a smaller diameter than No. 14, move the slide back or to the left one-fourth of a whole division and read over left top index of slide as before; the result is .057. The same result could have been obtained by setting the index on 8 (for 18) and moving the slide to the right three-fourths of a division. Try it.

To find the diameters in millimeters, multiply the results obtained by the last method by 25.4. This merely reduces inches to millimeters.

To find the area in circular mils, square the diameters in inches and multiply by 1,000,000.

The other measures, such as feet per ohm, ohms per pound, etc., are so simple that anyone familiar with the manipulation of the slide rule can find them from what has been given, without further directions.

The mastery of these few simple rules, a task of less than an hour, is equivalent to memorizing more than four hundred three- or four-place numbers, a practically impossible task. Also, as will be evident, the rules are not limited to copper wire alone, for the resistances of wire made of any given metal may be found by multiplying the resistance of a copper wire hav the same cross section area by the specific resistance of the given metal as compared to copper.

The results obtained by means of the slide rule in the manner described are very nearly correct for the larger sizes of wire, and the error is in no case greater than 3 per cent. This gives as great a degree of accuracy as is ordinarily required. In case it is required to know the number of feet per pound more accurately than the rule already given will permit, multiply the number of ohms per thousand feet by the following instead of by 31.4 for all sizes:

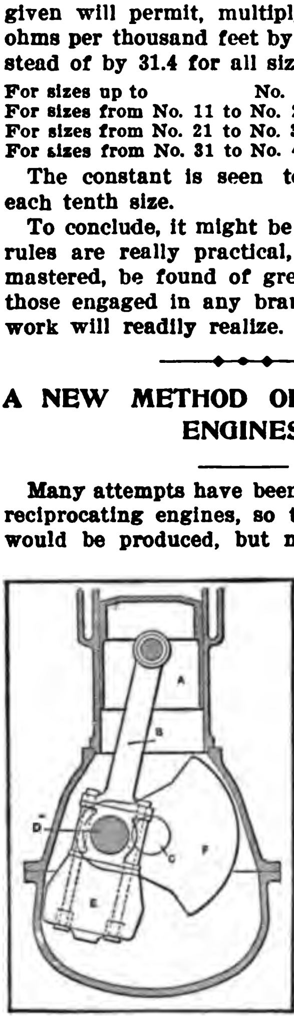
For sizes up to No. 10 multiply by 31.4.
For sizes from No. 11 to No. 20 multiply by 32.0.
For sizes from No. 21 to No. 30 multiply by 32.6.
For sizes from No. 31 to No. 40 multiply by 33.2.

The constant is seen to increase by .6 each tenth size.

To conclude, it might be added that these rules are really practical, and will, when mastered, be found of great advantage, as those engaged in any branch of electrical work will readily realize.

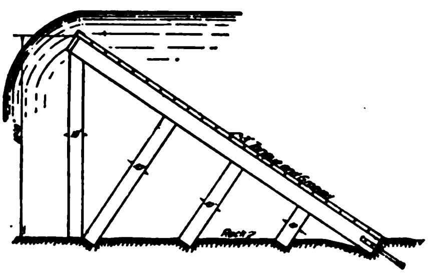
A NEW METHOD OF BALANCING ENGINES

Many attempts have been made to balance reciprocating engines, so that no vibration would be produced, but none, so far, has been successful. A new method has recently been patented, which consists principally of a cast-iron weight, E (see cut), so proportioned that the center of gravity of the weight and connecting rod combined is located at the center of the crank. The counterweight, F, is of sufficient size to just balance the weight of the connecting rod and attachment, so that the center of gravity of all revolving parts is at the center of the main shaft, C. This device, if effective, would be invaluable for all gas engines and high-speed steam engines, as the vibration of these engines is always a great objection.



DURABLE WOODEN DAM

A good type of wooden dam and one that when well constructed of sound material will last upwards of a half century is shown



Good Type of Wooden Dam

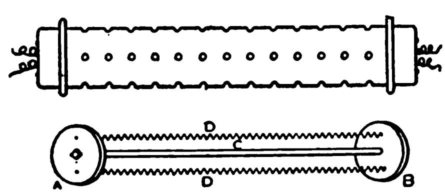
in the illustration, taken from the American Miller.

The dam has a plank face supported by stringers, the latter being held by supports carried to the rock. Ice is about the only thing that can damage such a structure.

SIMPLE ELECTRIC HEATER

A good electric heater is made as illustrated. A and B are two porcelain disks. Through a hole in the center of these run an iron rod having bolt threads at the ends. Hold the bolt firmly, says Practical Machinist, by a ½-in. iron pipe covering it and forming a butt at each end.

Use German silver wire for the coils; its resistance is 13.91 ohms and by sending a current of electricity through the coils, three times as much heat is generated as with galvanized iron coils; it requires more current to heat the German silver coils, however. Nos. 13 and 15 or Nos. 12 and 14 wire is suitable.



Home-Made Electric Heater

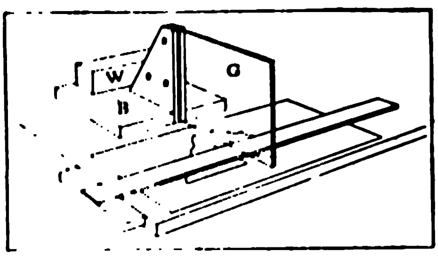
Thread both ends of a suitable length of 1¼-in. loricated conduit pipe to fit 1¼-in. caps and drill ¾-in. holes, 2 in. apart, around the circumference of the pipe for its full length. Fit this over the heater passing the feed wires to heater through ¼-in. holes in the caps.

HOW TO MAKE AN INVISIBLE PATCH IN TRACING CLOTH

A method of making invisible patches in tracing cloth, the discovery of a correspondent of the American Machinist, is as follows: The portion to be cut out is laid on a piece of plain tracing cloth, and both pieces are cut at the same time with a sharp knife. This makes a patch the exact shape of the hole. The patch is then placed in the hole, and the edges coated with liquid courtplaster. The butt joint thus formed is flexible, tough, and so transparent that the patch is practically invisible in the blueprint.

USEFUL DEVICE FOR MAKING SYMMETRICAL DESIGNS

In making mechanical or artistic designs it frequently happens that right- and left-hand views are required of the same figure.



For Reversing Figures

A mechanical drawing having this requirement, usually necessitates considerable time for duplicating all the dimensions, and a freehand drawing gives even more trouble, as it is almost impossible to make two figures symmetrical by using the eye alone as a guide.

The apparatus shown in the sketch can be made by almost anyone and enables a person to make a symmetrical duplicate of either mechanical or freehand designs, without taking a single measurement. The piece of glass, G, is held by the wooden base, B, so that the lower edge of the glass is about ¼ in. from the drawing board. This allows room for the paper and T-square blade underneath. A heavy weight, W, prevents the apparatus from tipping forward. The glass should be firmly fastened to the base and if a large piece is used a quantity of bicycle rim cement should be used to fasten it in the groove. If desired, holes may be drilled in the glass to receive screws. In drilling glass use an ordinary twist drill and keep the point moist with turpentine. In mounting the glass be sure that the surface is exactly perpendicular with the base; otherwise the two figures will not be symmetrical.

In operation the lower edge of the glass is placed directly over the axis of symmetry, and the reflection in the glass will then reverse any figure on the paper underneath making it appear reversed on the opposite side of the glass. The glass being transparent enables the operator to look through and trace the reversed image without any difficulty.

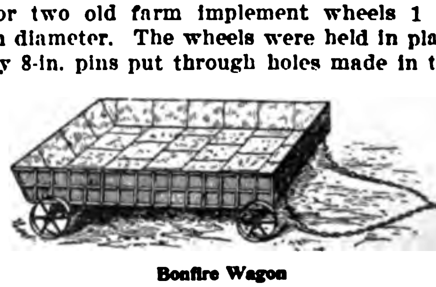
OIL FINISH FOR WOOD

A good, durable finish for wood can be obtained by soaking the article in linseed oil for a week and then rubbing with an oil-soaked cloth a few minutes each day for about two weeks. This solidifies and preserves the work, says a correspondent of Machinery, and gives a much more durable finish than French polishing.

PORTABLE BONFIRES FOR BURNING BRUSH

An Oregon orchardist who found it required a great deal of time and labor to haul away his orchard prunings, rigged up a portable brush burner which is drawn by horses down the rows of trees and consumes the brush as fast as it is thrown in.

He made a frame or running gear of four poles about 6 in. in diameter, using two 7-ft. ones for axletrees and bolting the other two (10. ft. poles) on top of these near the ends to form a rectangle. To the under side of one he fastened a round iron rod and used the projecting ends as spindles for two old farm implement wheels 1 ft. in diameter. The wheels were held in place by 8-in. pins put through holes made in the



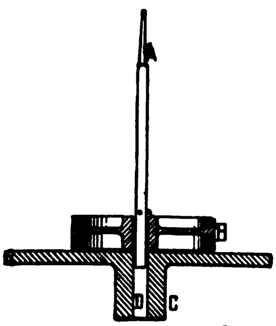
Bonfire Wagon

ends of the spindles. The burner proper, says the Rural New-Yorker, was a huge iron basket or crate 6 by 10 ft. on the bottom and 2 ft. deep, made of old wagon riveted together. The meshes of this crate were nearly a foot in diameter but close enough to hold the brush. To keep the coals of fire from falling through, the bottom was covered with old sheet iron scraps. At the front end to which the team was hitched the crate was sided up with sheet iron to screen the horses from the heat, and chain or iron rods extended 10 ft. forward to give the team plenty of space between it and the fire.

As this vehicle passed through the orchard the brush was piled on the fire kindled in it and immediately consumed. Not enough brush was burned at a time to hurt the trees.

KEY-SEATING WITH THE DRILL PRESS

In cutting key seats through long hubs the drill press can be used to an advantage; for rapid work the lever should be used.



Referring to the sketch: A is a bar with the cutter the required width; B is a pulley bolted to the drill faceplate; C-D is the hole through the faceplate for which bushings can be made to fit any size bar. After each stroke of the lever, tap the work, B, with a hammer, which will move it enough for another cut.

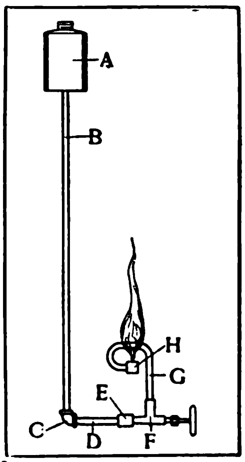
This does better work than can be done with a hammer and chisel and is a time-saving device. For tapered key seats tip the work by means of a piece under one side.—Contributed by Paul S. Baker, Muscatine, Ia.

A GLASS HONE

Take a piece of plate glass, 2 in. by 6 in., the usual size of a hone, and rub the surface thoroughly with a similar piece of glass with emery flour (the finest powder of emery) and water until the surface is evenly ground, then wash the surface with water. Hone the razor in the usual way from heel to point, using a lather made by rubbing the surface of the hone with an ordinary slate pencil and water. The lather should be of the consistency of thick cream Follow this by stropping in the ordinary way. The surface of the hone will become smooth in course of time, but can be reground as before. Try it.—Contributed by Dr. W. H. Mayfield, 722 First St., Louisville, Ky.

HOW TO MAKE A SMALL GASOLINE BURNER

I have found a small gasoline burner, like the one illustrated, very useful for melting babbitt and lead. An old coffee flask, A, is soldered to a piece of ⅛-in. pipe, B, about 2 ft. long. This is screwed into a ⅛-in. elbow, C, which holds a ⅛-in. by 3-in. nipple, D. A ⅛-in. coupling, E, connects this to a ⅛-in. needle valve, F, which holds a piece of ⅛-in. pipe, G, 10 in. long, bent as shown, and covered at the end by a ⅛-in. cap, H, with a 1/32-in. hole drilled through the upper side.



In making this device be sure to have all the joints screwed up tight, and a good soldered joint between the flask and vertical pipe, as a small leak might result in an explosion.—Contributed by A. Laughlin, Winona, Minn.

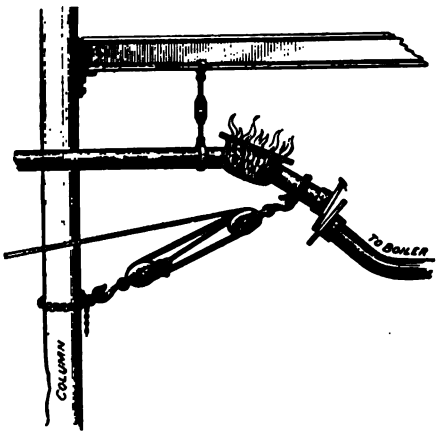
TIGHTENING BRISTLES IN PAINT BRUSHES

Any person who uses a paint brush has suffered annoyance from the brush losing bristles. A good remedy is to stand the brush, handle down (in a vise, if convenient), separate the bristles with a knife blade and pour in a small quantity of shellac varnish, just enough to saturate the bristles at the base only. Leave the brush in that position until dry.—Contributed by Andrew Whiton, 9 Kinsley St., Hartford, Conn.

Rust spots on marble may be removed by applying a mixture of 1 part nitric acid and 25 parts water, then rinsing it off with 3 parts water and 1 part ammonia.

HOW TO MAKE A SLIGHT BEND IN LARGE PIPE

In installing an 8-in. main pipe to lead from a boiler and swing by two easy bends to a higher level, it was found necessary to



Making Slight Bends in Large Pipes

bend the pipe a trifle more than had been expected, in order to bring the ends together for bolting through the flanges.

The pipe was anchored securely and fastened overhead with a hanger, which in turn was fastened to a strong beam. A basket of charcoal was then placed at the joint and a fire started. The basket was made of sheet iron with holes in the bottom to induce a draft and was supported on the pipe by pieces of small-size wrought-iron pipe. The heat of the fire softened the metal sufficiently, says the Metal Worker, to permit the joint to be drawn up by means of a block and fall. The chain, as is absolutely necessary, was fastened to some strong object, in this case a column.

LAWN ROLLER MADE OF KITCHEN BOILER

A good lawn roller can be made of an old kitchen boiler. If the boiler is too long, cut it to the desired length. Run a piece of pipe through the center lengthwise, allowing it to protrude about 6 in. Then fill the boiler with concrete and if it has been cut short, block up the end. Then attach a handle to the pipe ends.

A roller 3 ft. long and 1 ft. in diameter is made of a piece of heavy galvanized iron 36 in. wide and 40 in. long. Roll it so as to make a 2-in. lap and rivet. Block in one end, put a pipe through, fill with concrete, and block up the other end. When the concrete hardens you have a good, heavy, durable lawn roller at little expense.—Contributed by W. S. Barrows, 628 Dover Court Road, Toronto, Canada.

OILER FOR WORKBENCH USE

Take a can about 2½ or 3 in. in diameter and cut it off smoothly about 1½ in. from the bottom. Cut a strip of old ingrain carpet, felt or other suitable material, about 2 in. wide, and roll up enough of it to fill the can tight. Saturate with oil and you have a handy oiler to keep on the workbench for oiling saws, etc.—Contributed by P. P. Simmons, La Jolla, Cal.

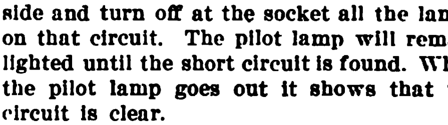
FINDING SHORT CIRCUITS

To find a short circuit in a lighting system, screw in a plug on one side of the cutout and an Edison base lamp on the other side and turn off at the socket all the lamps on that circuit. The pilot lamp will remain lighted until the short circuit is found. When the pilot lamp goes out it shows that the circuit is clear.

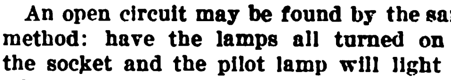
An open circuit may be found by the same method: have the lamps all turned on at the socket and the pilot lamp will light up when the circuit is closed through the load. This method is also useful in finding a ground that blows the fuse. The system can only be used with Edison cut-outs. It requires no special apparatus and the necessary materials are at hand on any job.—Contributed by A. T. Senecal, Watertown, Ill.

HOW TO MAKE QUARTER-ROUND MOLDING

The sketch at the top shows how to run quarter-round mold, four to eight at a time, on a 14-in. machine. Let top head cut en-



RUN FOUR TO EIGHT AT A TIME



RUN FOUR AT A TIME

tirely through on thin stock, says the Wood-Worker, and on thick stock nearly through, the bottom head finishing the cut. Crown mold is run four at a time and practically the same way.

TESTING CONDENSER WATER PIPES FOR ANIMAL INCRUSTATION

An electric station at Galveston, Texas, takes salt water for condensing purposes from a bay through a 10-in. iron pipe about 3,700 ft. long. Screens, strainers and other precautions are used at the intake end, but despite this, a large amount of oyster and barnacle spawn and spats is drawn up by the suction and these attach themselves to the inside of the pipe and build their shells. In time this incrustation would reduce the carrying capacity of the pipe, if it were not carefully watched and removed when necessary. The Street Railway Journal describes the method of determining the inside diameter of the pipe.

Copper balls of different sizes and having very thin shells, so that they will crush easily, are used in the tests. These balls are inserted at the intake end of the pipe and allowed to be drawn up by the force of the water. The test begins with balls 2 in. in diameter, followed by 2⅛-in. balls, and increasing sizes. Each ball as it comes up is carefully examined for scratches and when these begin to appear the largest ball passed through is taken as the minimum size of the opening of the pipe. When other balls are not obtainable, copper balls are borrowed from steam and water traps in the power house and replaced after the tests.

One of the means employed to kill the crustation-forming spats is by feeding creosote, by means of an injector lubricator, drop by drop into the condensing water at a point just inside the intake end. This kills the spats before they form their shells.

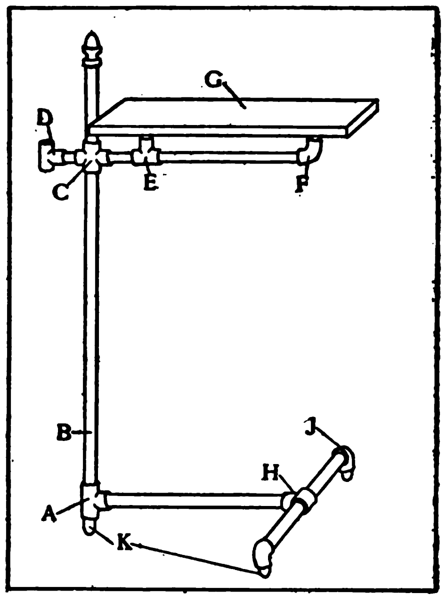
TO REDUCE THE SIZE OF A HOLE IN IRON OR STEEL

When a hole has been bored out too large by mistake, if the shape of the piece will allow, the following method may be used to reduce the size of the hole, says a correspondent of Machinery:

Heat the piece red hot, and dip in water up to the center of the hole. Half of the metal around the hole will become cold and shrink. The other half, that is still red, will shrink while hot, being pulled together by the cold part, and when it gets cold will shrink still more, becoming smaller than the original size. Heat the piece again and dip the other half in water. Repeat this operation, dipping each end alternately, until the size of the hole has been reduced enough to allow a nice cut to be taken to bore it to the right dimension.

A BED-TABLE MADE FROM PIPE FITTINGS

A bed-table will be found a most convenient article for the sick room, or for those who wish to read in bed. The table may be made to hold the book or dishes, as



Adjustable Bed Table

the case may be, in any desired position without the slightest effort on the part of the patient or reader.

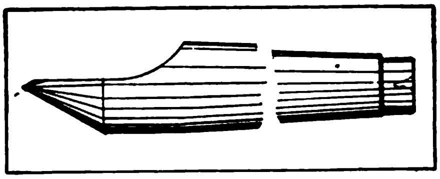
In the sketch, which shows the assembled table, A and H are ½-in. tees; B is a ½-in. pipe; C is a ¾x⅜-in. cross; D is a ⅜-in. tee used as a handle to tighten the short nipple, L, which acts like a set screw; E is a ⅜-in. tee; F is a ⅜-in elbow, and K, knobs of hard wood driven into the fittings, as shown.—Contributed by H. N. Barth, Chicago.

FOR CLEANING OLD BRASS

A good formula for cleaning old brass is as follows: Take 1 oz. of oxalic acid, 6 oz. rottenstone, ½ oz. gum arabic, all in powder; 1 oz. sweet oil, and sufficient water to make a paste. Apply a small portion, and rub dry with a piece of flannel or soft leather.

HINTS ON LATHE WORK

DRILLING IN THE LATHE.—In boring holes in work held in the chuck it often happens that the hole must go through solid stock. In this case it is desirable to take out most of the stock to be removed with a drill held in a chuck, or other suitable holder, fitting the tail stock. It is the general practice to make a countersink in the work with a tool held in the tool-post (called a centering tool) to insure the drill



Half Center for the Lathe

starting and keeping in the center of the work. This involves accurate grinding and setting of the tool, and, except in certain cases, is unnecessary. A very quick and accurate method of centering the drill in the work is to face the work off square, not making any countersink at all; place the drill in the chuck or holder with the point as near the center of the work as convenient; select any lathe tool that is fairly square across the back end and clamp it in the tool post so that the square end nicely clears the work and is in such position that when pushed forward by the cross feed-screw it will bear against the lip of the drill; start the lathe and feed the drill in a little, then push the tool against the lip of the drill until the drill appears to be central; back the tool away from the drill and if it is central, proceed to drill the hole; if not, repeat the operation. After a little practice one will generally be able to center the drill the first time. The method only holds good, however, until the drill begins to cut full size, unless the drill is very small or the work projects so far from the chuck that it will spring.

A HANDY CENTER FOR THE LATHE.—A very handy center for facing the ends of work held between the centers is shown in the accompanying sketch. It can be made in the same way that an ordinary lathe center is made, or an old center may be cut or ground away in the manner shown. To use it, place it in the tail stock with the part cut away toward the front side of the lathe. This center will allow you to use most any kind of a facing tool and leave a clean end with no fin or ridge at the center to be taken off afterward.

A RAPID WAY TO CUT THREADS IN THE LATHE.—(This method applies to lathes with a compound rest only.) To cut an ordinary V-thread of 60° angle, loosen the compound rest and swing it around 30° and clamp it fast; clamp an ordinary threading tool in the tool-post at right angles to the work to be threaded; if a stop is available, push the tool up to the work with the cross feed-screw and set the stop so that it can go no farther; proceed to cut the thread in the usual manner, only do not move the stop, but feed for each cut with the compound rest screw. As the compound rest is at an angle equal to one side of the thread, the tool will cut on one side and not on the other and still preserve the shape of the thread. As the tool only cuts on one side, the tendency to dig in and tear is relieved and a fairly heavy cut can be taken. When the thread is well roughed out, a few light cuts may be taken over it, feeding with the cross feed-screw, thus giving a good finish to both sides of the thread. In cutting threads of a coarse pitch it is well to use two tools, the first one with a little top rake away from the cutting side, the other ground in the usual manner for finishing the thread.

The writer does not claim that the methods of doing the work described are original, but that they are not as generally known to lathe hands as they should be.—Contributed by "Tap."

RENEWING SCREWDRIVER EDGE

When the point of a screwdriver is worn away so that it jumps the nick in the screw, the edge can be renewed as follows:

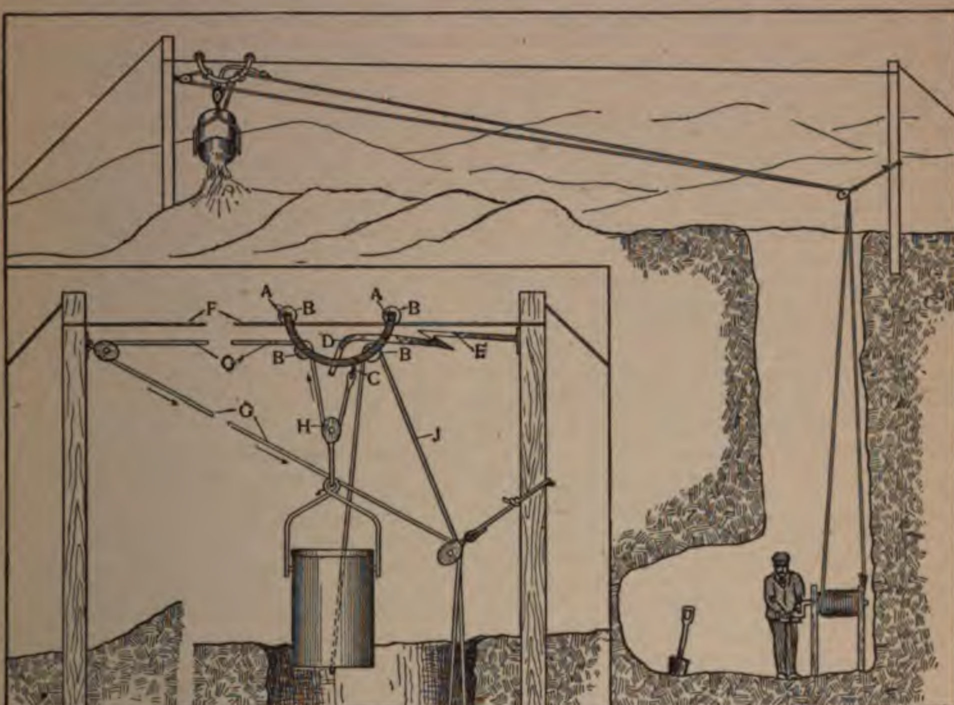
Hold the screwdriver in the vise with the bevel of the point lying horizontal and projecting above the surface of the vise jaws; then use a medium flat file on it, giving a forward thrust only, and keeping a horizontal position throughout, directs the British Optical Journal. Turn the driver over and repeat the operation until the edge becomes very thin. Then file it down to a perfectly straight margin and regulate its width for the size required. This method is more satisfactory than truing up the point on a grindstone.

A great difficulty in the production of power from peat gas is the rapid formation of tar. This has to be separated and constitutes a serious loss of heat.—The Engineer.

SHOP NOTES

ONE-MAN HOIST AND AUTOMATIC DUMP

By H. E. Bowcher, Dawson, Y. T.



Details and General View of Hoist

Having had considerable experience as a prospector, and not finding a suitable prospector's device for excavating, I decided to make one, and constructed the apparatus about to be described. This device enables one person to sink a shaft of practically any depth and hoist the dirt from the shaft and take it away and dump it at a distant pile, without having to come out of the shaft to operate it, as the windlass is located down the shaft. The device weighs but 15 lb., and can be carried readily in the prospector's pack.

The trolley frame, A A, is made of flat iron or steel, ⅛ in. thick by 1½ in. wide. When bent to shape as shown, the ends, A A, are about 20 in. apart.

Six holes are drilled in the frame; four to receive the grooved wheels, B B B B; one for the ring, C, and one for the trigger, D. This trigger catches on the hook, E, and locks the trolley in place, until the pulley, H, strikes the trigger, thus releasing the trolley and allowing it to travel along the steel wire cable, F.

The rope, G, is connected to the windlass and moves in the direction indicated by the arrow when the windlass is being wound up. This movement of the rope, G, has a tendency to raise the bucket and move the trolley on the cable at the same time, but as the trolley is locked at E, it will not move until the pulley, H, strikes the trigger. The bucket by that time having left the shaft is ready for its trip to the dumping pile.

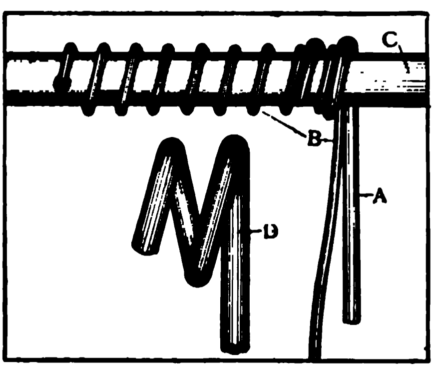
A second rope, J, is fastened to the bottom of the bucket at one end, the other end being secured to any fixed object in the bottom of the shaft. This rope is fastened at such a length that the bucket on reaching the dumping pile will be turned over, the rope having traveled its entire length. The trolley cable being slightly elevated at the dumping end causes the bucket to return to the shaft by gravity.

When ready to hoist, the operator starts the windlass at the bottom of the shaft, which causes the bucket to ascend until the pulley, H, strikes the trigger. The trigger is then released from the hook, E, and the traveler moves with the bucket to the dumping pile, where it is dumped by the rope, J, as stated above. The traveler then returns to the shaft, by gravity, and is locked in position by the hook, E. The bucket then descends the shaft ready for the next cargo.

I had this device in successful operation for many years in Australia and am using it at present in the Klondike.

HOW TO MAKE A SIMPLE SPRING WINDER

A good spring winder, suitable for use in a lathe, can be made by bending a piece of stiff wire to the shape shown at A in the sketch, and in detail at D. The wire, B, of which the spring is to be made should be smaller than the wire used for the winder, as the pitch (distance between coils) of the spring is determined by that of the winder.

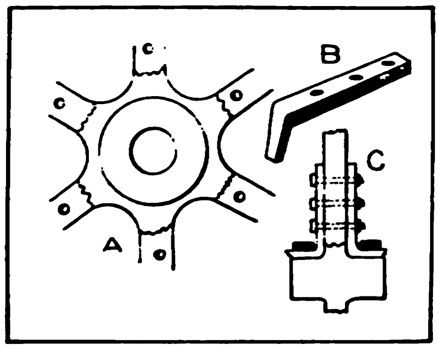


Simple Spring Winder

If the wire of which the spring is to be made is very heavy, the winder should be made of a flat strip of steel, in place of wire, as this is more easily bent to the required shape and is more rigid. The arbor, C, determines the inside diameter of the spring, and should always be used in connection with this winder.—Contributed by L. G. Harren, 14 Barnett St., New Haven, Conn.

HOW TO MEND A BROKEN DRIVING PULLEY

All the spokes on a driving pulley from a 40-hp. engine were broken at the hub as shown in the sketch at A. The pulley was mended by a correspondent of the American Blacksmith as follows:



Mending a Pulley

Two pieces like B were made and bolted on the foot to run out over the hub and ⅛ in. off, as shown at C. These were used on each spoke and when all the pieces were on, two rings 1½ in. square (shown in section at C) were driven on hot and allowed to shrink on the feet, thus drawing the spokes down tight. The engine has been used a long while since the repair was made and the job still holds good.

TO FIND CENTER OF SQUARE OR OBLONG CEILING

Rub the line with chalk or charcoal and stretch it across the ceiling from diagonal corners. Two persons will be required to do it. The point where the two lines cross each other, says the Master Painter, will be the center.

If there is a deep chimney breast abutting out into the room stretch the lines from corners made by drawing a line across the breast, and not from the true room corners. This in order that the center may not appear too close to the breast.

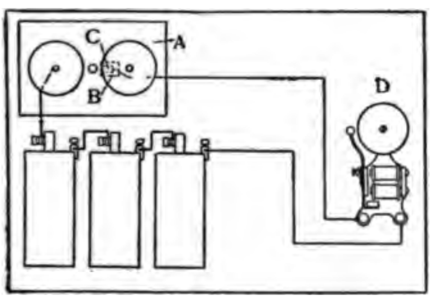
TO DUSTPROOF A WATCH

During long automobile tours, fine dust and grit is sure to clog the works of one's watch, sometimes causing it to stop just when most needed. To prevent this, says the Automobile, cut a match chisel-shaped at one end and with it apply a thin coat of vaseline all about the seat of the case where the lid fits. Treat the back and front lids both in the same manner. This will make the watch dustproof and waterproof.

EXTENSION CALL BELL FOR A TELEPHONE

In many shops, where the telephone is in the office and the proprietor spends a great part of the time in the shop, the telephone often rings repeatedly without being answered, as there is nobody within hearing distance. In many cases of this kind an extension call bell, such as is shown in the sketch, could be used to advantage.

The telephone bell, A, is fitted with a piece of hard rubber, B, having a metal contact, C, which is placed so that the hammer will strike it and make contact. Part of the gong may be cut away to do this, or if necessary, the whole gong may be removed. The other gong is connected to one side of the battery, and the other side connects to an electric bell, D, which can be placed in any desired location. If the bell does not work well, short circuit the interrupter. This will not prevent it from vibrating, as the current is intermittent, being



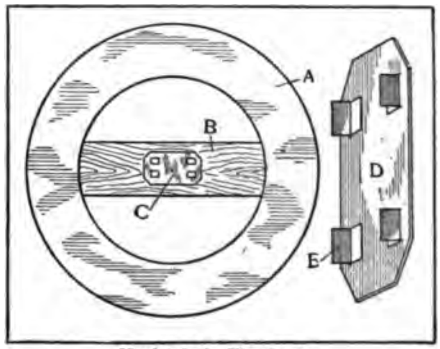
Extension Call Bell

interrupted at C, and if the interruptions at C and D are not in unison the result will not be good.

I have one of these bells in use at the present time and find it a great convenience. —Contributed by Frank H. Kimball, Ballston Spa, New York.

A HANDY TIN CENTER FOR MACHINISTS

In locating the centers of castings, such as the flange shown at A in the sketch, most machinists use a piece of wood, B, and find the center by means of a compass or calipers. The center is then marked on the wood, and the drilling or other work to be done is laid out from the point thus



Machinist's Tin Center

located. A piece of tin plate nailed to the wood makes a better working surface than the wood alone, but most machinists dislike the trouble of finding the nails and fastening the tin to the wood.

To obviate the use of nails, and to provide a tin center which can be easily and quickly applied, J. G. Campbell, 404 N. E. Border St., Cleburne, Texas, devised the center shown at C in the sketch, and in detail at D. This center, which can be made in one operation with a blanking and forming die, is made of medium heavy tin plate, and is provided with four tongues, shown at E, which take the place of nails. To fasten it to the wood, simply lay it on the desired location and strike two or three blows with the hammer.

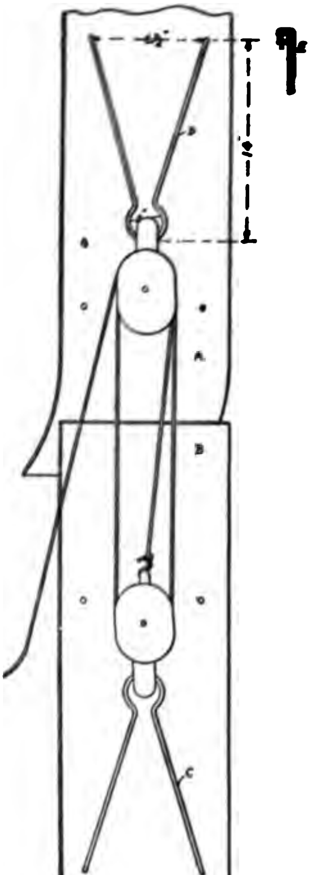
HOW TO FROST GLASS

Glass cutters' sand and water, or even clean, washed sea sand rubbed on with a smooth block of marble will produce a frosted appearance on glass, says the Master Painter. Finish with emery for a fine appearance.

A fair imitation of frost may be produced by a hot solution of Epsom salts and gum arabic water. Apply warm. Strong alum water gives the same effect, but with neither of these last is the result durable.

ADJUSTABLE TIGHTENER FOR ELEVATOR BELTS

A tightener for elevator belts is shown in the illustration. A and B represent upper and lower ends of elevator belt; C and D are hooks made of 3/16-in. spring steel, bent in round ring 2 in. in diameter, to receive lug of awning pulley; E, ½-in. hook at top to hook in cup bolt holes, from which cup has been removed. The pulleys are common awning pulleys, one double and one single. As it is impossible to get an awning pulley with becket, F, a screw-eye can be tapped into the end of the single block. A common sash cord is the best and strong enough to bend any head shaft. To hold the belt after it has been tightened, and while the splice bolts are being put in, pass the pall or pulling end through under the other strand, as per dotted line, G, and pull it up tight against the pulley. No other knot is necessary, says the American Miller. The spring steel hooks are readily adjustable to any width of belt.



The town of Ringwood, Okla., has established a municipal cyclone refuge—a large centrally located cave or cellar—and has appointed a cyclone crier to arouse the people on the approach of a storm.

TO CLEAR SEDIMENT FROM ENGINE PUMPS

Sometimes a quantity of the sand used in the foundry in making the castings remains in the water jackets of cylinders and, becoming loosened by the circulation of the water, finds its way into the pump when it is fitted low and close to the motor, to the disconcertion of the motorist who is his own chauffeur. With centrifugal pumps, this sand tends to wear away the pump vanes, says the Automobile, and in a new car it is advisable to occasionally disconnect the pump and clear it of sediment.

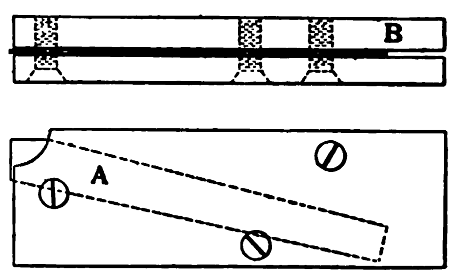
Many rotary pumps set up end thrust which forces the vanes up against one side of the pump and in time wears them down, until the pump leaks and fails to circulate the water. A simple temporary remedy is to solder a strip such as a short length of wire, along each of the worn vanes, but a permanent cure can only be effected by putting in a new thrust bearing.

RECIPE FOR FRENCH PUTTY

Boil in raw oil about half the weight of umber, says the Master Painter; then slowly add dry white lead and whiting. Mix the mass thoroughly.

OLD HACKSAW BLADE FOR CUT-OFF TOOL

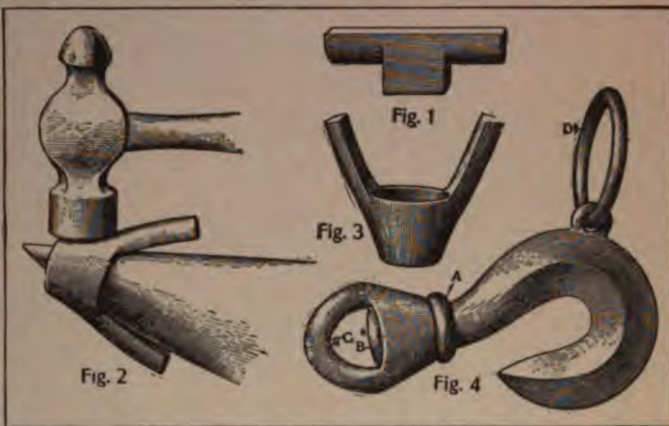
For cutting up brass tubing the tool here shown will be found very useful. A thin piece of steel, A, is ground to the shape shown in the sketch, and firmly clamped between two pieces of 1x¼-in. steel, B, if the hole in the tool-rest of the lathe is large enough to admit that size; if not, use 1x3/16 in., or some size that will suit the dimensions of the tool-rest. A correspondent of Machinery used an old hacksaw blade for the part, A, and found that it worked perfectly.



Cutting Off Tool for Brass Tubing

HOW TO MAKE A SWIVEL HOOK

A good swivel hook may be made by the following directions, which are given by a correspondent of the Blacksmith and Wheelwright: It is all constructed of Swedish iron. Fig. 1 shows the piece of iron which has been cut down at each end to one-half round as shown. Then turn the ends up, and punch a 5/8-in. hole. Turn the top end over the horn of an anvil, as shown in Fig. 2, and hammer until the top is beveled or countersunk so as to make it 1 7/16 or 1½ in. across the top. At the bottom where the hook goes up through it should be ¾ in. This leaves it as shown in Fig. 3. Then the hook should be made of 1-in. square iron, as shown in Fig. 4. Use a collar of 5/16-in. round iron welded on as shown at A, and have the shank rounded down to ¾ in. Heat the shank well and place it in the vise. Put the swivel on and pound the shank down level with the top of the swivel as seen at B. Then heat and turn the swivel around so that it may move freely. Weld the two shanks together as shown at C. Finally put on a 3- or 4-in. hinge to handle the hook by when attached to the whiffle tree, as shown at D, and you have a complete swivel hook.



Making a Swivel Hook

SUNSTROKE--INDICATIONS--TREATMENT

There are two forms of sunstroke. The mildest is that known as heat exhaustion. This manifests itself in the case of people who are overcome by heat without being actually sunstruck. In this form the skin is pale, cold and clammy, and the pulse feeble. While death sometimes results, the patients under good treatment will usually recover. Persons affected in this way should be removed to a shady spot and have their heads and chests dashed with cold water. Spirits of ammonia (hartshorn) should be applied to the nostrils, and sometimes it is necessary to administer small quantities of stimulants.

Heat stroke or insolation is the serious form of this trouble, and the one to be most closely guarded against. In cases of real insolation the face becomes purplish, eyes bloodshot, veins swollen and corded and the skin dry and burning hot to the touch. It is not always fatal, but many of those whose lives are saved are ever afterward invalids, with brain power more or less impaired. The effect of the sun's heat seems to be most marked on the brain and spinal marrow. When real insolation occurs the brain becomes so heated that the human "heat center," controlling the production of bodily heat, is affected and the temperature rises from the healthy mark of 98½ as high as 110 or over, and often keeps on rising for some time after death. The "heat center" lies at the back of the head and should be protected from the direct rays of the sun.

Insolation is so dangerous that a physician should be called as soon as possible. While waiting the doctors' arrival much good can be done and life often saved by applications of ice to the head and spinal column. It is best broken in small pieces and placed in cloth or rubber bags, but when these are not to be had, ice can be placed directly about the head and neck.

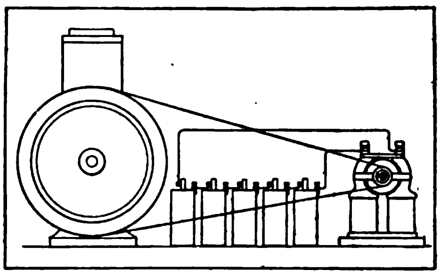
Workmen and others exposed to the direct rays of the sun should have their heads well protected and should wear woolen next to the skin. A very useful precaution is a pad of cotton batting or flannel sewed along the back of the undergarment so as to cover and protect the spine.

It is well to bear in mind the old rules: Keep cool as to temper and your body will not get so hot; avoid all alcoholic drinks; eat less than usual and more simply; walk on the shady side of the street; avoid overexertion; let the air circulate freely about the head, either by frequent removal of the hat or by wearing a perforated head covering.

Insolation is more far-reaching and dangerous in its effects than most people know of; therefore a doctor should be called at once to any one with the symptoms above described as indicating heat stroke or true insolation.—Bulletin of Chicago Health Department.

RECHARGING DRY BATTERIES WITH GENERATOR

Having heard that dry batteries could be recharged by sending a current through them, in a direction opposite to that given



Recharging Dry Batteries

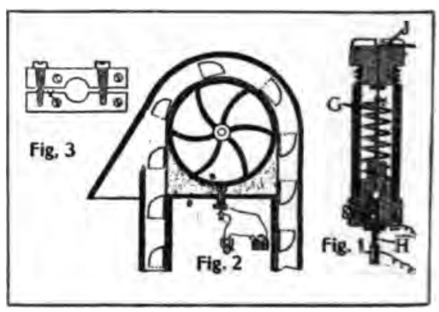
by the battery, we rigged up a small generator and gas engine, as shown in the sketch, and connected the batteries in series with the motor. After running a few minutes we stopped the engine and disconnected the batteries, which then gave a fairly strong current. Thinking to increase the charge, we connected the batteries exactly as they were the first time and started the engine in the same direction as before, and let the outfit run several hours. On returning we found the zincs all corroded and the batteries completely run down. Desiring to learn the cause of this seemingly peculiar behavior, we connected a new lot of batteries and proceeded as before. The engine was then stopped and the belt was removed from the generator, thus allowing the current of the batteries to run the generator as a motor. We expected the generator to run in a direction opposite to that used in charging, but were surprised to see it continue running in the same direction. The explanation is that the current from the batteries reversed the field, and also the armature, thus making two reverses which is the same as none at all. Then when the generator was run again by the engine the current was reversed because the poles of the field had been changed by the batteries.

We concluded from these experiments that in charging batteries in this way it is necessary to either change the connections on the battery, or reverse the rotation of the engine each time it is started. As the engine was two-cycle it was more easily reversed than the battery connections, and in this way, the batteries were recharged without any difficulty. A stronger charge may be given to batteries in which a quantity of water has been poured in holes drilled through the top.—Contributed by A. Davis, Chicago.

FIRE ALARM FOR GRAIN ELEVATORS

A choke in the elevator head which stops the belt while the head pulley keeps revolving is frequently the cause of fires in grain elevators, says the Grain Dealers' Journal. The pulley rubbing against the belt soon generates sufficient heat to start a blaze.

An alarm to warn the operator when the elevator head is becoming overheated has been devised. A round hole is bored in the middle of the strut board for the insertion of the device, which consists of a metal plug, shown in Fig. 1. The upper stopper of the plug fits loosely and rests against the pulley. The lower electrode, H, is firmly set while the upper electrode, G, is drawn up by a cord, J, held in place by wax. Overheating



Alarm for Grain Elevator Head

of the alarm melts the wax, releases the cord, permitting the coil spring to draw the upper electrode down into contact with the electrode, H. The closing of the circuit rings a bell placed in any convenient location. Fig. 2 shows the head with alarm in place, and Fig. 3 a clamp for holding the device in position.

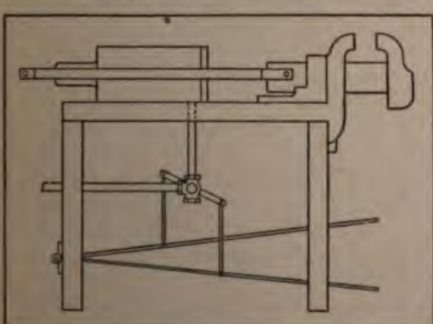
Frieze Design from the London Decorator

GREASE ERADICATOR FOR CLOTHING

Mix together 2 oz. oleate of ammonia and 2 oz. ammonia water; shake well and add 1 oz. ether and 5 oz. benzine. Shake well again and then add 1 oz. chloroform. Shake again, let stand a few minutes, then shake at frequent intervals until the preparation is of the consistency of cream.

AN AIR VISE

An old air brake cylinder, which had for years given good service to the S. P. Railroad, lay rusting on a scrap pile amid other discarded appliances, when, one day, C. C. Perry, of Houston, Tex., assistant foreman of the shop, conceived the idea of an air vise. He accordingly made the device shown in the sketch. An old vise, A, in which the screw had become nearly worn out, was connected to the air brake cylinder, B, in such a



Air Vise

way that the air entering the cylinder brought the jaws of the vise together. When the air was released the spring in the cylinder would open the jaws again.

The air in this arrangement is controlled by a 3-way cock, C, which is operated by the foot levers, D. A vise arranged in this way is not suitable for small work, as there is danger of injuring the hands, but for heavy work, which has to be changed frequently, it is a great labor-saver.

REMOVING MATCH MARKS FROM PAINT

To remove match marks from white paint, rub the spot with a cut lemon, says the Master Painter. Then to prevent a repetition of the offense apply a little vaseline and rub the spot dry with a rag. It will be difficult to strike matches there again.

POLISHES FOR BRASS

For cleaning hot brass cylinder heads and jackets, try the following recipe, which a correspondent of the Practical Engineer says works fine:

Sift coal ashes fine and mix with kerosene oil to a thick paste; add as much air-slaked lime as can be conveniently mixed with it. Apply this polish to the bright parts, rubbing hard; wipe off and polish with dry slaked lime.

Whiting and ammonia mixed to a paste is another good polish for brass. Apply and rub dry.

SAFETY CLASP FOR LAMP CHIMNEY

In carrying a hand lamp about the house, the chimney not infrequently falls off and is shattered. To prevent this, attach a wire loop to the lamp as illustrated, hinging the loop at the base of the chimney.—Contributed by T. L. Reed, La Porte City, Iowa.

SOME HINTS ON TEMPERING

One of the most essential conditions in properly hardening steel, is uniform cooling. An apparatus like that shown in Fig. 1, which was contrived by a correspondent of the Practical Machinist, will give good results for many kinds of work. The vertical inlet pipes have holes along the inner sides, which direct the stream of water to all parts of the piece to be hardened.

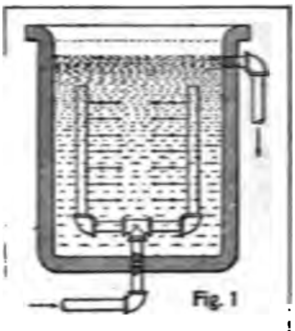


Fig. 1

In tempering a piece of steel like that shown at A, Fig. 2, it is not well to have the hardening stop at the shoulder, as there is then a great liability of cracking. Either harden beyond the shoulder, or if the smaller portion is sufficiently long, let the hardening stop short of the shoulder.

In tempering a tool such as is shown at B, Fig. 2, the best results will follow if the cutting end is not chilled until after the heavier, solid parts have contracted somewhat. If the lighter portions are chilled and contract before the heavier ones, the tendency is for the heavier parts, which are stronger than the lighter, to distort the lighter parts making them conform to the shrinkage of the heavier, and as the steel is hard and rigid it must crack.

When hardening tools having holes it is advisable to fill the hole with fire clay in order to prevent the water from entering. If the design is such that the tool is liable to crack when quenched, it should be dipped into the bath with the teeth uppermost, and the water should be warmed to reduce the liability to cracking.

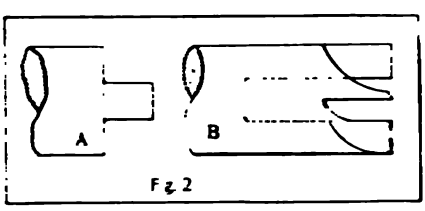


Fig. 2

aste can be prevented from souring by
ng a little pulverized bluestone.

SYSTEM OF NUMBERING FOR PARTY LINE TELEPHONE EXCHANGE

In rural districts where there are a great many party lines on the telephone exchange it is often difficult for the operator to quickly ring a certain party on a party line, because he must know the party's number and his ring also.

In an exchange with about 250 subscribers and 49 party lines, this difficulty was ingeniously overcome by a system of numbering. Take, for example, line 49: The first party on the line has one long and one short ring; his number is 491½; the next party has two rings, and his number is 492; the next has two long and one short ring and his number is 492½, etc. Suppose some one calls for No. 491½: All the operator has to do is to plug line 49 and give one long and one short ring. He has not a second's doubt, the number has told him exactly what to do. In this way an inexperienced operator can handle a party-line switchboard with ease.—Contributed by L. H. Meckstroth, New Knoxville, Ohio.

AN IMPROVED SOLDERING ACID

A very satisfactory soldering acid may be made by the use of the ordinary soldering acid for the base and introducing a certain proportion of chloride of tin and sal ammoniac. This gives an acid which is superior in every way to the old form. The method of making it is as follows.

To make one gallon of this soldering fluid take three quarts common muriatic acid and allow it to dissolve as much zinc as it will take up. This method, of course, is the usual one followed in the manufacture of ordinary soldering acid. The acid, as is well known, must be placed in an earthenware or glass vessel. The zinc may be sheet clippings or common plate spelter broken into small pieces. Place the acid in the vessel and add the zinc in small portions so as to prevent the whole from boiling over. When all the zinc has been added and the action has stopped it indicates that enough has been taken up. Care must be taken, however, to see that there is a little zinc left in the bottom, as otherwise the acid will be in excess. The idea is to have the acid take up as much zinc as it will.

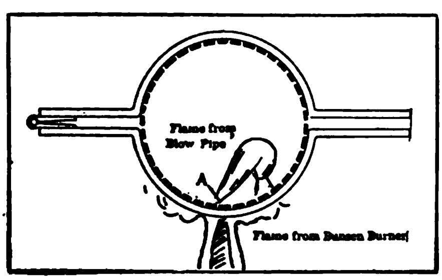
After this has been done there will remain some residue in the form of a black precipitate. This is the lead which all zinc contains and which is not dissolved by the muriatic acid. This lead may be removed by filtering through a funnel in the bottom of which there is a little absorbent cotton, or the solution may be allowed to remain over night until the lead has settled and the clear solution can then be poured off. This lead precipitate is not particularly injurious to the soldering fluid, but it is better to get rid of it so that a good, clear solution may be obtained.

Now dissolve six ounces of sal-ammoniac in a pint of warm water. In another pint dissolve four ounces of chloride of tin. The chloride of tin solution will usually be cloudy, but this will not matter. Now mix the three solutions together. The solution will be slightly cloudy when the three have been mixed, and the addition of a few drops of muriatic acid will render it perfectly clear. Do not add any more acid than is necessary to do this, as the solution would then contain too much of this ingredient and the results would be injurious.

This soldering acid is used in the same manner as any solution of this kind, but it will be found that it will not spatter when the iron is applied to it. It has also been found that a poorer grade of solder may be used with it than with the usual soldering acid. From my experience I have found that a solder composed of two parts of lead and one of tin works equally as well and produces fully as strong a joint as that obtained with the customary half and half solder.—Charles H. Poland, in the Brass World.

METHOD OF BRAZING LIGHT WORK

A good method of brazing light work is illustrated. The dotted lines indicate the work—a light brass ring 2 in. in diameter, ⅛ in. wide and 1/32 in. thick. The ring is held together in the fixture made of ⅝x⅛-in flat iron. Place a bunsen burner under



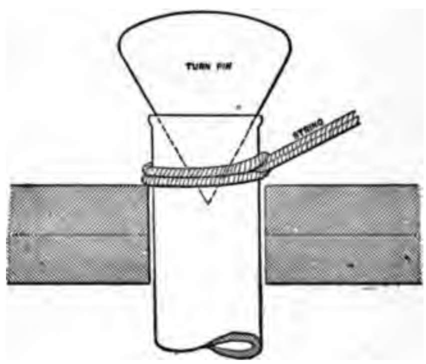
Brazing Light Work

the fixture, which will keep the work and the fixture hot, but will not melt the brazing compound. Bring the flame from a blowpipe in contact with the joint at A.

This is a clean and handy method, says a correspondent of the American Machinist, and the brass has no tendency to adhere to the iron.

HOLDING A WASTE PIPE TO FLANGE IT

When there is no helper around to hold the bath waste or other waste pipe that



To Hold a Waste Pipe While Flanging It

must be flanged above the floor, try the following plan:

Tie a piece of strong twine around the pipe and draw it up through the hole in the floor, holding it in place by means of the twine until the turn pin is inserted as illustrated, and the pipe is sufficiently expanded to prevent its dropping down again. The pipe can be flanged over entirely as desired, says the Metal Worker, after which cut off the string.

RAISING TEMPERATURE IN DRY KILNS

In a plant where the kilns used were of the moist air type and did not have coils enough to get a high temperature with exhaust steam, they were improved by a correspondent of the Engineers' Review as follows:

A fan was installed at one side of the kiln and the hot air was drawn from the top of the kiln at the cold end and forced back over the coils and up through the lumber again. This gave good circulation and resulted in drying the lumber much qui-

The fan is driven from the line sl

of the plant, and runs only 10 hours a day. At night live steam is supplied and the circulation is set up through the duct to the fan, but only in a slow current.

A vacuum pump placed on the end of the return from the kiln coils gives a more rapid circulation of the exhaust steam and relieves the engine of about 4 lb. back pressure. With this system a temperature of 160° is maintained.

THREADING STEEL PIPE

Most of the steam, gas and water pipe, which was formerly made of wrought iron, is now being made of mild steel. Steel pipe can be made cheaper and stronger than iron pipe and has the advantage of being more ductile and homogeneous. Mr. Frank N. Speller, of the National Tube Company,

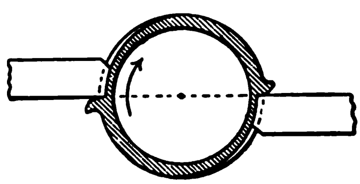


Fig. 1

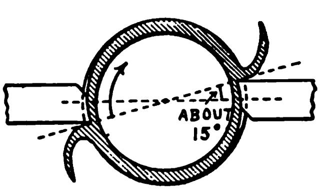


Fig. 2

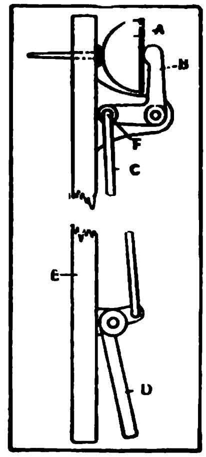
has prepared a paper touching upon these points, from which the following has been condensed:

Steel pipe is capable of receiving a smoother finish than iron, if the proper form of cutter is used. The old form of chaser (Fig. 1), in which the cutting edge is on the center, is not suitable for steel. Instead, the cutting edge should be advanced about 15°, as shown in Fig. 2. Many of the cutters in use at the present time are made like Fig. 1, which probably accounts for the slight prejudice against the new material. The use of the cutter shown in Fig. 2 will produce a better finish than can possibly be given to an iron pipe.

Recent tests of durability steel pipes corroded more than iron in salt water; in fresh water, the corrosion was the same for each, and in acidulated water the iron pipes corroded the most.

AN OVERHEAD SHAFT OILER

The device here shown is very useful for oiling shafting and inaccessible machines. The oil can, A, is compressed by the bell crank, B, which is moved by the connecting rod, C, and the grip lever, D. The strip of wood, E, can be any desired length and should be drilled at the end to receive the oil can as shown. The connecting rod, C, can be made of either small iron rod or heavy wire and should be made to disconnect at F, thus allowing the removal of the oil can. The other parts can all be made of wood, but if desired the cranks and brackets may be made of metal, which would allow making them much smaller.

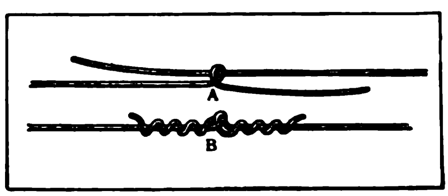


The Oiler

This device was patented about twenty years ago, but the patent has expired. It is practical, and very useful, as can be certified by a correspondent of the Wood-Worker who made several of these oilers.

TYING IRON WIRE

A method of tying iron wire which has been found an especially good joint for rural lines is shown in the illustration, from the American Telephone Journal.

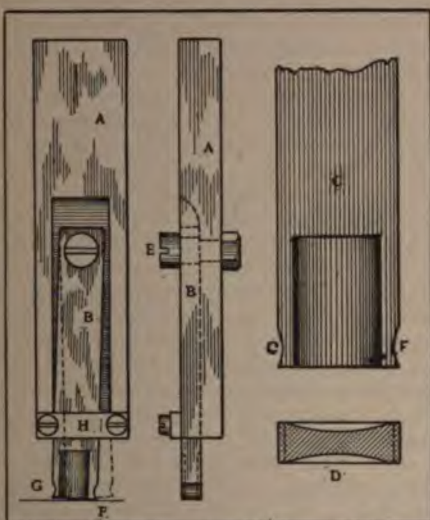


Tying Wire

Where there is danger that insecure joints may be made by inexperienced linemen, this method will be found especially satisfactory.

HOW TO MAKE A DOUBLE-CUTTING SLOTTING TOOL

Most of the tools used on planers and shapers take a cut while going in one direction, and then slide over the work on the return stroke, without accomplishing anything, but the tool shown in the sketch cuts in both directions. This tool consists of a holder, A, and a cutter, B, which is shown in detail at C and D. The cutter rests in a groove, cut in the holder, and swings from a bolt, E, which allows it to move about ¼ in., as indicated by the dotted lines. This raises the back edge, and gives the necessary clearance between the tool and the work. Each time the motion is reversed the cutter swings over to the opposite side,



Making a Double Slotting Tool

and raises the other edge, and thus takes a cut in both directions.

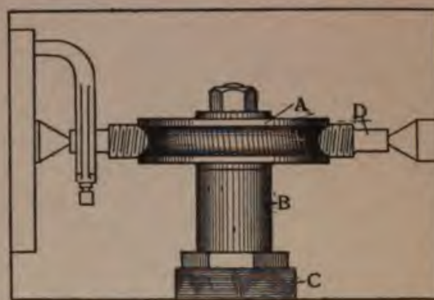
When the work requires a sharp cutting edge, the cutter should be ground away on the edges, as shown at F and G, and when used for slotting, the sides should be made concave, as shown at D. In order to prevent lateral movement of the cutter, a small piece of steel is screwed across the groove in the holder, as shown at H.

We have one of these tools in our shop and use it nearly every day and have yet to find one that will do better or quicker work.—Contributed by L. G. Harren, 14 Barnett St., New Haven, Conn.

Popular Mechanics' "Shop Notes for 1907" will be ready December 1, 1906.

HOW TO CUT WORM-WHEELS IN A LATHE

Some machinists will not attempt to make worm-wheels without the use of a milling machine, but a very good job can be done in a lathe, by making the simple attachment shown in the sketch. The blank

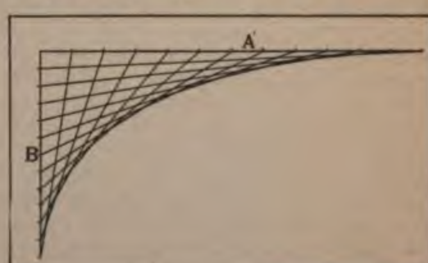


Worm Wheel Cutting Attachment

worm-wheel, A, which is to be cut, is fastened to an arbor, B, which is used in place of the tool post. The wheel is fastened in such a manner that it is free to revolve and a tap, D, is placed between the centers, and revolved by means of a dog. As the tap revolves the wheel is fed slowly against it, the pitch of the threads causing the wheel to revolve.—Contributed by Norman Baker, Hoopeston, Ill.

HOW TO LAY OUT AN APPROXIMATE ELLIPSE

An approximate ellipse can be drawn by the following method, which is used largely in laying out elliptical arches. Draw the



line A, equal to one-half the required length, and line B, equal to one-half the required width. Divide both lines into the same number of equal parts, and then connect the points of division as shown. This will form one quarter of the required ellipse.—Contributed by C. R. Gilkey, Sono

ACETYLENE AS A MOTIVE POWER FOR GAS ENGINES

By J. K. Rush, Canandaigua, N. Y.

The desirability of using acetylene for power purposes, and the great demand for a good acetylene engine for general purposes is conceded by all who have paid any attention to the rapid development of the acetylene industry in this and foreign countries within the last few years. Today acetylene is used on a large scale in all civilized countries, and in many instances where nothing else would fill the bill; it is used, not only to illuminate the homes of the well-to-do farmer and suburbanite, but even in some of the largest cities in this country it is used in competition with city gas and electricity, both for lighting homes and factories. It is not generally known that acetylene is now being extensively used for laboratory purposes where the very purest and most intense heat is desired, and it is very valuable for this purpose.

After enumerating only a few of the various places where acetylene is being used at the present time, both for illuminating and heating purposes, it can be readily seen what a wonderful field there is for the use of an acetylene engine. The farmer who lights his home, and uses acetylene to do all the cooking with an acetylene range (there are thousands in successful operation today), as well as using it for the instantaneous hot water heater in the bath room, which is heated with an acetylene heater, would much prefer to use an acetylene engine for pumping water and the various uses to which a gas engine is utilized on the farm today, than to be obliged to use some other method of accomplishing the work of a good gas engine, if it could be successfully done with acetylene manufactured on the premises, where one small machine will supply necessary gas for all of the above requirements.

Now we come to the question, "Is acetylene practical for power purposes?" In answer, it must be said that it is practical, but owing to the richness of the gas, which the analysis shows to be C_2H_2, it is not the easiest proposition in the world to figure out just how an acetylene engine should be constructed, and for that very reason, there are not as many successful acetylene engines in use as there would be if it were as easy to build an acetylene engine as one for coal gas or gasoline, but there are a few successful acetylene engines, nevertheless. It is only a few years ago that it was not ible to use acetylene for heating or cooking purposes, for the self-same reason that it is not used more in gas engines. The trouble with the use of acetylene for fuel purposes was that it is so rich in carbon that it was very difficult to mix it with the proper amount of oxygen to bring about proper combustion. But that trouble has been thoroughly overcome so far as the use of gas for fuel purposes is concerned, and today acetylene is successfully used in thousands of homes and laboratories for fuel and heating purposes.

One of the most important features of an engine to use acetylene successfully, is a perfect and very sensitive carbureter so arranged as to bring about a perfect mixture of gas and air. When this is done and all other conditions are complied with, acetylene works perfectly in an engine. Owing to the richness of the gas, a very small amount of acetylene is used and a much larger proportion of air than is the case with the use of coal gas. The writer is of the firm belief that if it were not for the fact that every manufacturer of a good gas or gasoline engine is having all he can do to fill orders for his regular line, that some of them, or more properly speaking, more of them would take an interest in the development of a good acetylene engine, and we would soon be able to get all of the acetylene engines we might desire, and have them for the various purposes for which they are so admirably adapted.

One reason why there has not been more done pertaining to the use of acetylene for engines is that only within the last three or four years have the generators been perfected to such an extent that it was possible to get acetylene of a standard quality and regular pressure. These difficulties have now all been overcome, and today there are at least six makes of generators manufactured in this country that can be depended upon to do all that their manufacturers claim for them, and are really high grade machines. But in this line as in all others there are a number of machines on the market that produce such a low grade of gas, and under such variable pressures that any mechanic who tried to do any experimenting with the use of acteylene for an engine would soon give up the job, when, as a matter of fact, it was the machine he was using that was at fault rather than the gas.

The same statement applies to acetylene

as to the use of steam, "You cannot get good results without good apparatus." You must have a good boiler and engine to get good results with the use of steam, and you must also have a good generator to get good results with the use of acetylene.

Mold on paper may be removed by applying with a soft hair brush a solution of 1 part salicylic acid in 4 parts grain alcohol.

TWO GOOD FORMS OF FILTERING CISTERN

To construct the cistern shown in Fig. 1, make the walls of stone, laid in hydraulic cement. For the bottom mix concrete, using 9 parts of gravel and sand to 1 of hydraulic lime, just moistened. Lay on in a mass to depth of 4 in. and pound hard. Let the lower course of flat stones of the wall (the footing) project 4 in. into the cistern to prevent cracks. Cover the top with two limestone flags, 6 in. thick, resting on the walls, with a manhole at one corner, and so cover and fit the whole with cement that insects or surface water cannot enter, except through the leader from the roof. Cover the manhole with a flagstone, cementing it at the edges, and surround it with a brick wall 1 ft. high, which cover with another flagstone, making air-tight with cement, thus leaving a foot of confined air and excluding frost. Cover the upper flagstone with a foot of earth, turf it, and then cover the whole cistern with earth.

For the filter, construct a vertical hollow cylinder, 2 ft. inside diameter, of good weather brick laid in hydraulic cement and extending from the concrete bottom to the top covering, with a 1-in. air-hole to allow

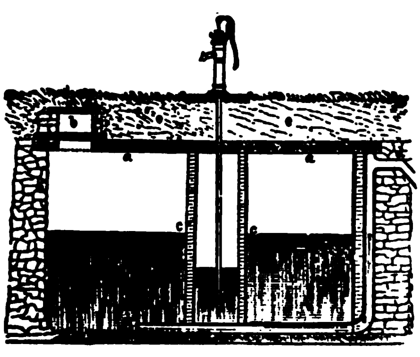


Fig. 1—Cistern for Filtering
a, a, Flags for Cover; b, Man-hole; c, c, Vertical Shaft for Filtering; d, d, Overflow; e, e, Earth.

the air to escape as the cylinder fills with water. This form of construction resists any sudden pressure of water against the exterior the same as an arch does. The water, after soaking through the 4 in. of brick, is well filtered.

Make the overflow from the cistern so as to give an escape for the filth coming from

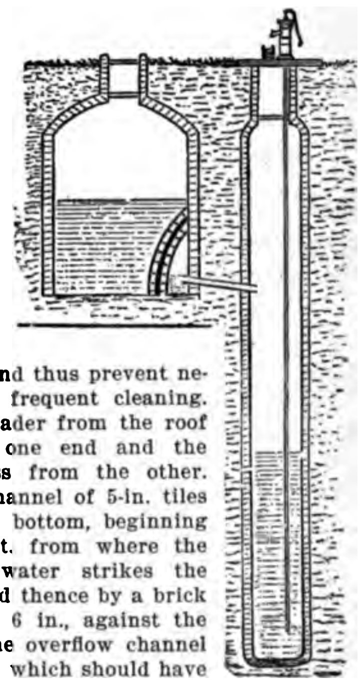


Fig. 2

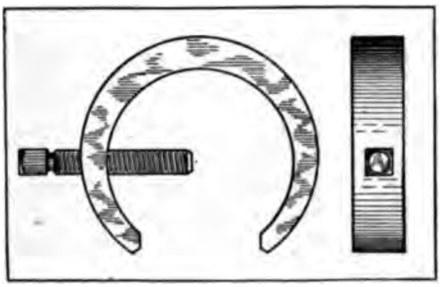
the roof and thus prevent necessity of frequent cleaning. Let the leader from the roof enter at one end and the waste pass from the other. Make a channel of 5-in. tiles across the bottom, beginning about 3 ft. from where the entering water strikes the bottom and thence by a brick flue, 4 by 6 in., against the side, to the overflow channel at the top, which should have a sharp descent through tiles, terminating in a 4-in. galvanized pipe with a self-acting valve at the bottom to be closed when no water is running. Cement well the whole channel inside the cistern.

In Fig. 2 the cistern for holding the filtered water is 24 ft. deep. Arch it with brick over the top, starting the arch 6 ft. below the surface. Make the cistern that receives the water from the roof 7 ft. deep, placing it at the side of the deeper one, and connecting the two with a pipe-tile. Make the filter of two walls of brick on edge, enclosing 2 in. of charcoal, the whole in a curve, with about 10 sq. ft. of surface, the water to pass freely through the brick. The washings from the roof and all warm rains are turned off and no waste pipe is required, says the Country Gentleman. Use a chain pump which will keep the water stirred. Bricks are used only for the arch at the top and the cement is plastered on the smooth surface of the earth.

A QUICK REPAIR FOR LEAKY PIPE

Factories, stores and other buildings, containing valuable stock, which is easily damaged by water, should be equipped with some means for stopping leaks in steam pipes, such as pinholes, as soon as discovered; otherwise the steam and rusty water coming from the pipe may cause expensive loss of property.

By having a number of clamps on hand, as shown in the sketch, a temporary repair



Repairing a Leaky Pipe

can be made almost instantly. These clamps can be made to take three or four different sizes of pipe, and are used in connection with small sheet steel plates and rubber gaskets. The steel plates and rubber gaskets should be about 1 in. square and about $\frac{1}{16}$-in. or $\frac{1}{8}$-in. thick. To stop a leak place the rubber on the hole; lay the piece of steel on the rubber, and apply the clamp, screwing same up tight, and having the center of the screw over the hole in the pipe. The steel pieces should be bent concave to fit the pipe, thus making a tight joint.

If desired the clamp may be left on the pipe permanently. I have two of these clamps in use which were put on over two years ago.—Contributed by O. C. Pottorff, 1310 N. 6th St., Springfield, Ill.

EXPERIMENTAL TELEPHONE LINE

In a recent issue of your magazine I noticed an article on how to make an experimental telephone, using the earth for a battery. A few days ago I built a similar line using carbon and zinc instead of water pipe for the ground and I now have a line running over to our neighbors with the very best results.

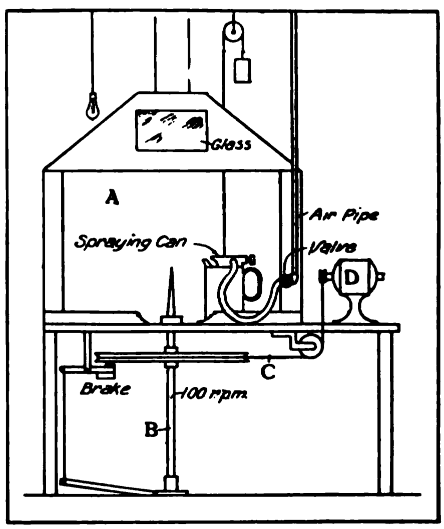
I noticed that about five o'clock p. m. each day a peculiar humming noise could be heard on placing the receiver to the ear, and later I discovered that the noise was caused induction from the electric wires which pass over my lines about 2 or 3 ft. above them. On experimenting with it further I found that by cutting out the ground at one end (I have a metallic circuit to use in case the other should fail) and connecting it so as to have a metallic circuit, the induction formed from the electric light lines would transmit the sounds just as well as the other.

I have a disc record phonograph which I play over the line every evening. I take the horn off and hang the receiver on a hook which holds it up against the mouth of the leather elbow. On connecting it up (with the ground circuit or metallic) the music is plainly heard at the other end.—Contributed by Stewart H. Leland, Lexington, Ill.

COMPRESSED AIR JAPANNING MACHINE

The machine about to be described is one which could probably be used to advantage in all factories where japanning is done, as by its use twice as much work can be turned out and many articles can be given a much more even coat than is possible by the dipping process, or by hand work. It is especially useful for round or cylindrical work, but can be used for japanning any article that is not too large.

A wooden hood, A (see sketch), is left



Japanning Machine

open at the front, and is provided with a pipe at the top to carry away the fumes. Four glass windows are made in the top, as one or more electric lights are arra as to illuminate the work. A vertical shaft, B, is revolved by means of a cord, C, which runs to an electric motor, D. The shaft is pointed at the top to receive a flat piece of wood for holding the work, nails being driven in the wood to accomplish this purpose.

As the work revolves it is given a coat of japan, by means of the spraying can, which contains the japan and is connected to an air hose, as shown. These cans can be purchased ready to use, and are provided with a special compressed air nozzle, which atomizes the japan and deposits it on the work. The japan used for this purpose should be thinned with turpentine before using, as it would otherwise make an uneven coat.

The machine should never run more than 100 r. p. m., and unless the work is very small 80 r. p. m. would be better. If it is run too fast the japan will be thrown off the work by centrifugal force. About 30 lb. air pressure is sufficient, but a greater pressure may be used by throttling down with the valve.—Contributed by W. J. S., Emsworth, Pa.

HOW TO MAKE A SMALL TAP-WRENCH

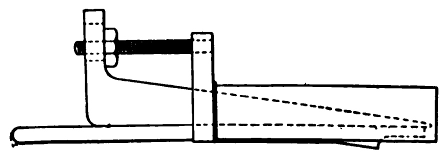
A small tap-wrench may be made of two pieces of pipe, a T fitting and two bolts. On one end of a piece of 3/8-in. pipe, A, cut a standard thread and file a 7/16-in. machine bolt, B, to fit it snugly. Then file the head of the bolt to go inside the 3/8-in. T, indicated by D. File a groove, C, in the top of the head. Screw this pipe into the T tightly.

On a similar piece of 3/8-in. pipe, E, cut a long, loosely-fitting thread and stick a 3/8-in. bolt, F, into the end. This bolt should fit loosely, so it will remain stationary while the handle is being turned to tighten the wrench. Cut a groove, G, in this bolt, also. The tap is inserted in the third opening of the T and is held firmly when the loose handle is screwed up.—Contributed by Homer Keesling, Eden Vale, Cal.

HAND-CUT KEYWAYS IN PULLEY HUBS

The following method of cutting keyways in pulley hubs by hand was resorted to by a correspondent of the American Machinist who had a job that could not be done on a slotter.

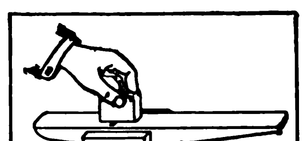
A piece with a flange at one end was forged and turned to size; the slot was then



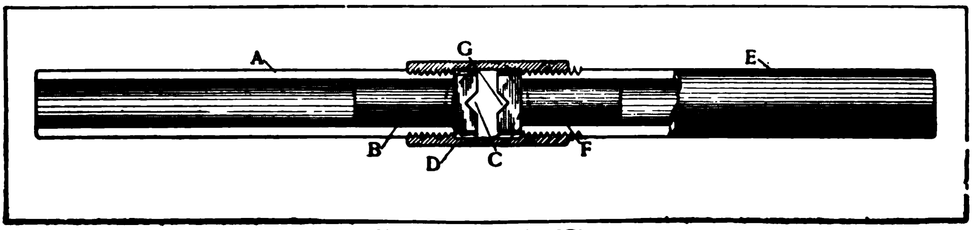
planed at an angle or taper and a wedge piece was made with a gib head having in it a slot through which passed a stud, the other end of which was tapped into the flange on the first piece mentioned. The stud was provided with a nut which held the gib wedge in place, while the drift or broach was driven through. The taper of the wedge was made to suit the taper wanted in the key seat. By turning the nut on the stud at each cut made, the feed was obtained.

A PATTERNMAKER'S KINK

Patternmakers and other wood workers know how difficult it is to plane a small block of wood without rounding the edges. A good way to avoid this trouble is to fasten the plane in the vice instead of the wood. The plane should be fastened in an inverted



position, and the work can then be rubbed on the surface as shown. In this way a



Tap-Wrench Made of Pipe

good true surface to the exact dimensions may be obtained, as the work is always visible and the corners are not rounded in doing so.

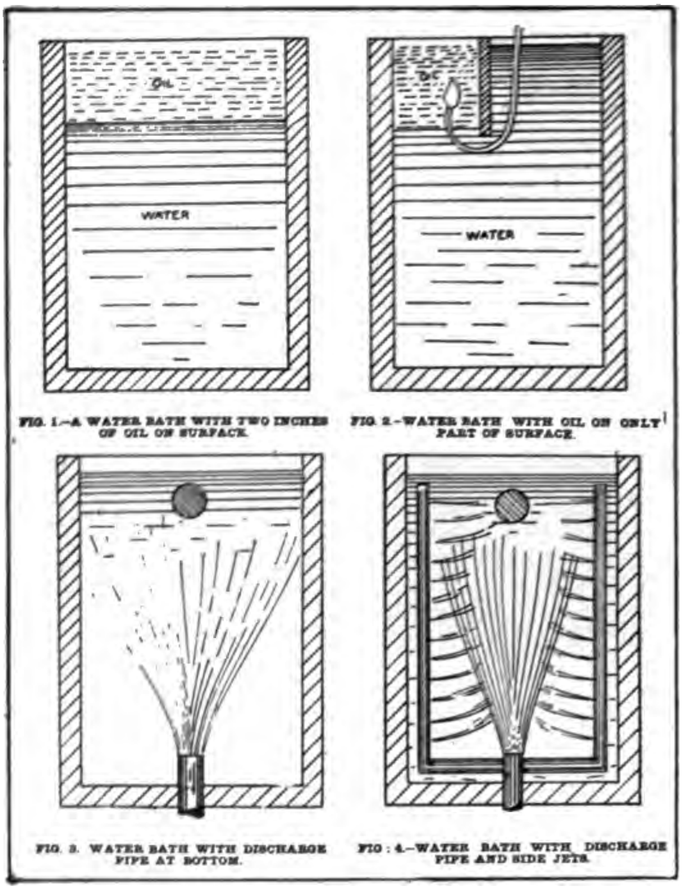


FIG. 1.—A WATER BATH WITH TWO INCHES OF OIL ON SURFACE. FIG. 2.—WATER BATH WITH OIL ON ONLY PART OF SURFACE.

FIG. 3. WATER BATH WITH DISCHARGE PIPE AT BOTTOM. FIG. 4.—WATER BATH WITH DISCHARGE PIPE AND SIDE JETS.

THE SMALLEST BOOK

The smallest book in the British Museum and probably the smallest in the world is "The English Bijou Almanack for 1839." The book is printed in very clear type, but so small that the naked eye can hardly read it. It is illustrated, too, though, as will be observed, the little volume is scarcely larger than a man's thumb nail. It is kept small box with a glass lid.

KINKS FOR TEMPERING

When steel is heated red hot and then plunged into water, the rapid contraction sometimes causes it to crack. This is especially true of articles having small projections, or parts of different thicknesses. To avoid this difficulty a correspondent of the American Blacksmith recommends the use of a quantity of oil on the surface of the water, as shown in Fig. 1. This being a poorer conductor of heat than the water, does not chill the steel so suddenly, and prepares it for the water or brine below.

It is sometimes desirable to harden only the surface of a piece of steel and leave the interior tough. To do this a bath is constructed, with a partition extending below the surface of the water or brine, as shown in Fig. 2. This compartment is filled with oil, and the object to be hardened is fastened to a piece of iron, bent in the form of the letter J, as shown. The steel may then be passed from the water to the oil without exposing it to the air. Linseed oil is generally used for this purpose, although lard oil and sperm oil are sometimes substituted.

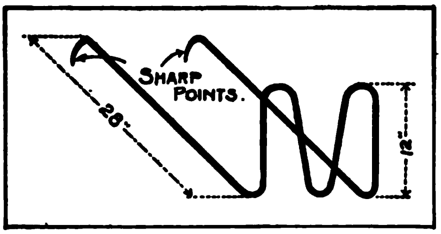
The baths shown in Figs. 3 and 4 are the ones generally used when it is desired to keep the contents agitated. This is very necessary for large work, as the hot steel forms steam, which collects in some places and leaves other portions exposed to the brine. This results in uneven cooling, which should always be avoided, as it leaves the steel softer in some places, and often cracks the work.

To free lampblack of grease, says the Master Painter, saturate it with alcohol and then set fire to it. The pure carbon, only, will remain.

SHOP NOTES

A HANDY HOLDER FOR LOOSE SHINGLES

In shingling, where the roof is sheathed tight and especially at the top in putting on the last rows of shingles a shingle holder



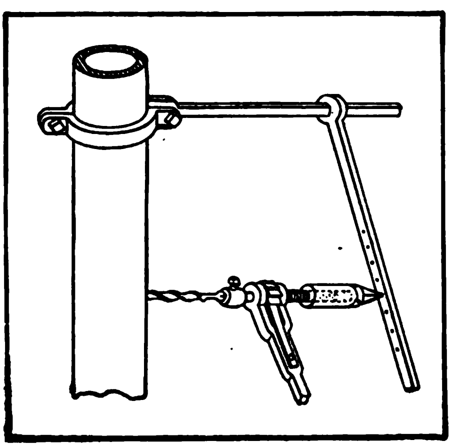
Holder for Loose Shingles

for loose shingles will be found a decided convenience. The holder is made of ⅜-in. steel pump rod and has sharp hooks which can be set anywhere on the roof or hooked over the comb. A half dozen of these holders, says the American Carpenter and Builder, will be plenty for anyone.

DRILLING HOLES IN VERTICAL COLUMNS

For drilling holes in vertical iron or steel columns try the following method:

Obtain an ordinary pipe hanger, which is made in two parts and so constructed that



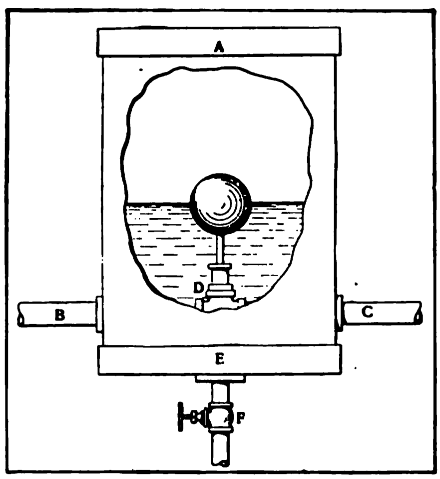
To Drill a Hole of Any Depth

the ends do not meet, and clamp it to the column as shown. Place a 1-in. steel rod, 2 ft. long and having an eye in one end, between the two clamp bars and pass a bolt through the clamp bars and the hole in the end of the rod.

Place a square wrought-iron rod, 1 in. thick, with an eye in one end, on the horizontal bar as shown, says the Engineer. Then put the ratchet in place and by moving the vertical bar nearer the column, the ratchet may be used to drill a hole of whatever depth desired.

HOW TO MAKE A STEAM TRAP OF PIPE FITTINGS

To make a steam trap of old pipe fittings, get a cast-iron pipe 2 ft. long, cap it at both ends, A and E, then drill and tap holes



Home-Made Trap

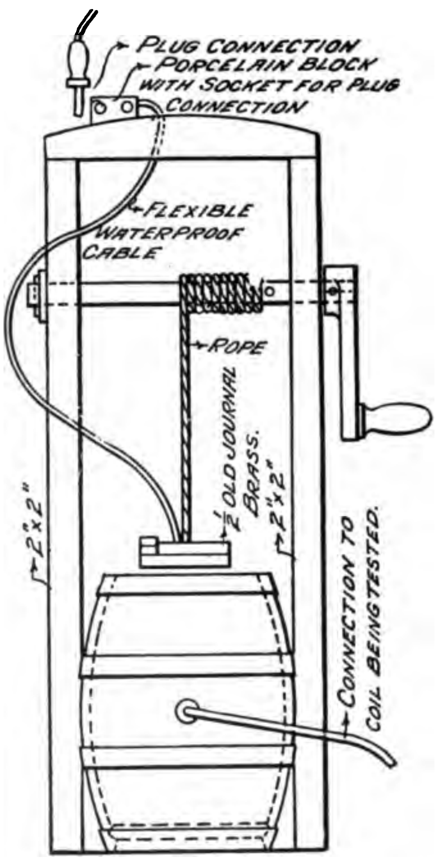
opposite each other for the pipe, B and C. The inlet is at B and the outlet at C. On to pipe C, which should have an extra long thread, screw an old globe valve, D, having previously removed the threads from the spindle of the same.

Attach a float ball to the spindle as shown. Valve F, says the Engineers' Review, is to drain the trap when necessary.

If valve D is properly connected, very little packing need be used on the spindle, as the pressure will tend to close the valve. The trap is for low pressure. When it fills with water the float will rise and so let the water out.

HOME-MADE WATER RESISTANCE

A portable home-made water resistance for testing purposes was made in the electrical repair shop of the street railway at Lansing, Mich. The Street Railway Review describes the device. By reference to the accompanying illustration it will be noted that this



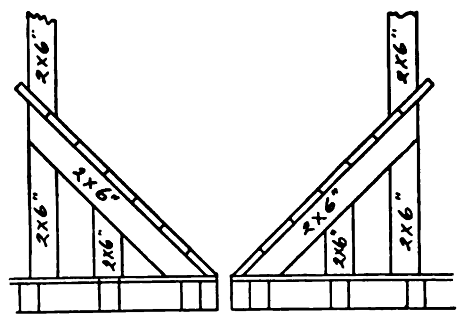
Home-Made Water Rheostat

water resistance consists of a small barrel or keg to the sides of which are fastened vertical 2x2-in. wooden posts. Near the top, these posts are pierced by a horizontal shaft fitted with a crank at one end. On this shaft is wound the rope which supports an journal brass used for making electrical contact with the water in the barrel. By means of a flexible cable this piece of brass is electrically connected to a porcelain connection socket fastened to the framework holding the small windlass. A suitable plug with a flexible cable completes the circuit between the porcelain connection block and the source of current. The cable, from a plate immersed at the bottom of the inside of the barrel, is brought through a wooden bushing driven tightly into the bung hole. This cable is of sufficient length to connect with an ammeter or other instrument in the circuit with the coils to be tested.

WHEAT BIN THAT WILL NOT LEAK

A form of wheat bin which may be made large or small, built of any size lumber and will never leak is shown in the illustration from the American Miller.

Build the hopper first. Put in the rafters,

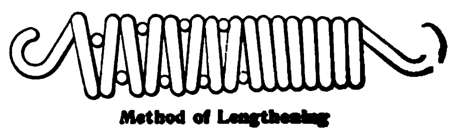


Non-Leakable Wheat Bin

then floor them, running the flooring crosswise and having it extend out past where the studding will be. Cut the studding on a bevel to fit the hopper. The sketch is an end view.

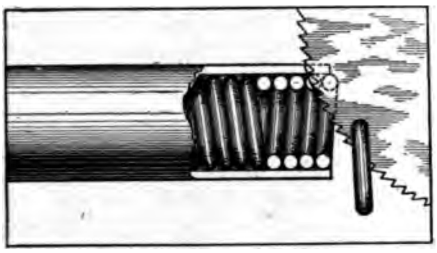
HOW TO LENGTHEN A SPRING

This is a simple matter, but often very convenient. Drive wedges in between the coils, and before taking the wedges out, drive wire nails in between the coils. Then place the spring where it is to be used, says the Engineers' Review, and drive out the nails, letting the tension come on the spring.


Method of Lengthening

RAPID METHOD FOR MAKING RINGS

Having had occasion to make a large number of brass wire rings, I found the following method the quickest and best: The wire to be made into rings was first made into springs, which were then cut along one side, thus forming as many rings as there were coils in the spring. As the springs



Ring Cutter for Lathe

were wound with the coils touching each other, the elasticity of the wire brought the ends of the rings opposite each other, thus doing away with any offset at the junction.

To cut the rings I used a very thin circular saw, fastened to an arbor and used in a lathe. Then I fastened a piece of brass tubing in the tool post, by means of a straight-tail dog, and fed the coils through by hand, running the lathe backwards at high speed. In this way I cut over 2,000 an hour, the rings dropping out of the end of the tube, as shown in the sketch.

There are many methods of making wire into springs, and any device which makes good close wound springs will do, but for this particular purpose I have found the following method very satisfactory: The wire is wound on an arbor in a lathe, and is fed through two pieces of wood held by the tool post. The pieces of wood should be clamped together so that the friction will draw the wire out perfectly straight, and the tool post should be fed by the screw-cutting attachment of the lathe.—Contributed by A. W. Griggs, 955 Market street, Kenosha, Wis.

WATERPROOFING FOR CEMENT BLOCKS

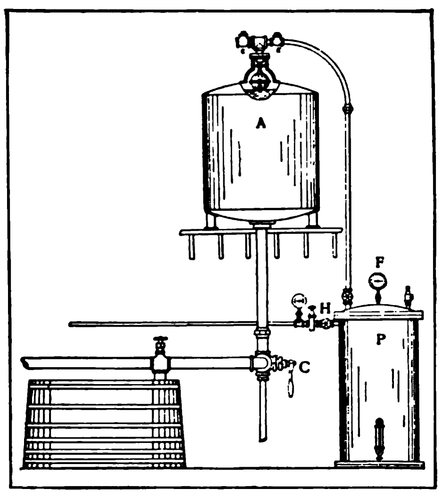
Shave ½ lb. castile soap into 1 gal. water; let dissolve, but do not make a suds. Apply it while boiling hot to the surface of the blocks, using a brush. After the soap wash dries apply a lukewarm solution of ½ lb. powdered alum in 4 gal. water. Two applications, says Cement Era, will close all pores and make a perfect waterproofing.

HOW TO MAKE A WATER AIR COMPRESSOR

In an establishment consuming an average of 25,000 gal. of water per day, drawn from the city mains through a 1½-in. pipe under an average pressure of 60 lb. and discharged into tanks of 1,000-gal. capacity each, the water was made to supply all the compressed air required for several machines, thus doing away with the expense of operating an air compressor. The system was arranged as follows:

A tank, A, of 1,000-gal. (133 cu. ft.) capacity was placed over the water tank room, and another tank, P, of 66 cu. ft. capacity was placed below tank A, in the water tank room and the piping was arranged as shown.

To operate, the handle of the three-way cock, C, is given a one-eighth turn, causing the water to flow from the water main into tank A, until the float valve closes and in



Compressing Air by Water Power

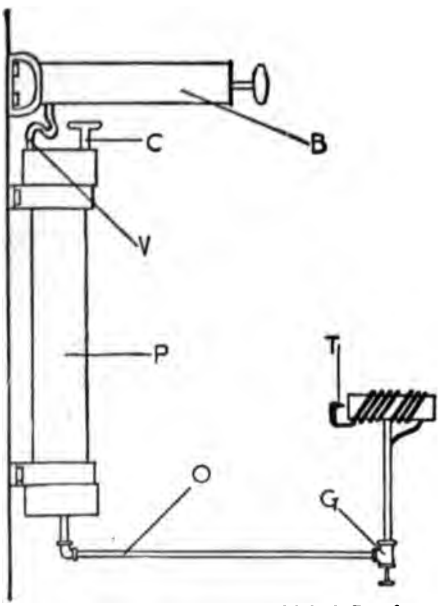
turn discharges the corresponding volume of air through check valve, E, into tank P. The handle of the three-way cock is then turned to its natural position, when the water flows from tank A, to the water tank and in turn draws in air through check valve, G, ready for another filling.

In filling tank A with 1,000 gal. of water 133 cu. ft. of free air is compressed in tank P, to about 2 lb., says a correspondent of the Engineers' Review, and by using 25,000 gal. of water per day it equals 25 fillings or the displacement of 3,325 cu. ft. of free air compressed to about 50 lb. pressure per square inch deducting necessary losses. This air is drawn out of tank P, through a reducing valve, H, under the desired pressure.

HOME-MADE GASOLINE BRAZING TORCH

A gasoline brazing torch which fastens to the wall in front of the work bench and swings back out of the way when not in use, may be made as follows:

Thread both ends of a 2-ft. length of 2-in. gas pipe In a 2-in. cap drill a hole to re-



Fastens to Wall in Front of Work Bench

ceive a single tube bicycle valve, V; drill another hole and tap it to receive a ¼-in. pipe, C, 5 in. long, on which weld a piece of iron to form a handle or T for convenience in replacing the piece after filling the tank by way of the apped hole.

Fit the 2-in. cap on the top of the 2-in. pipe. Drill and tap the cap for the bottom for a ¼-in. pipe, O, 2½ ft. long and threaded at both ends. Make the burner of a piece of bicycle tubing, says the American Machinist, with a 2-ft. length of small-sized tubing coiled around it. An angle valve at G controls the supply of oil to the burner. The arrangement of the burner causes a continuous generation of gas by the blast. Make a hole not larger than a pin prick in the cap, T, at the end of the coiled tube. Fasten a bicycle pump, B, to the wall just above the tank to use in keeping up a constant pressure in the tank.

HOW TO MEND OLD SACKS

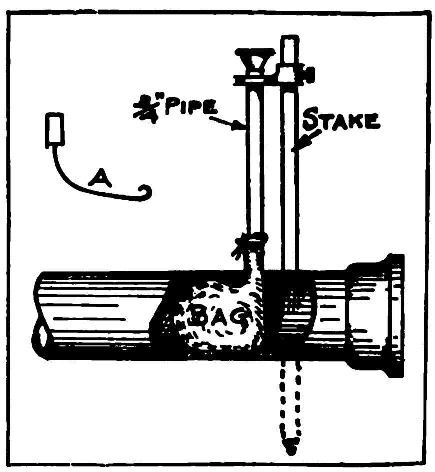
Turn the sacks and shake them well. Make some good paste and apply it around the rent, using a brush. Cover the rent with a piece of cloth, says the American Miller, smooth it on with the hand and your patch is complete.

GAS BAG FOR STOPPING MAINS

Flow of gas from the main can be stopped by means of the gas bag illustrated, a device much used by gas fitters. To make the bag use common bed sheeting, cutting it 1½ in. larger than the circumference of the pipe; sew it up, turn it inside out and then dip it in linseed oil so it will hold water.

Put the bag over the hock, A, and put it into the pipe, then remove the hook and fasten the mouth of the bag to a ¾-in. pipe as indicated. Support this ¾-in. pipe by a stake driven into the ground. Pour water through the ¾-in. pipe into the bag until it is full and stops the flow of gas.

To remove the bag grasp it at the mouth with one hand and with the other pull out the ¾-in. pipe. Pull slowly on the bag, thus forcing it to the inner or top surface of the



Stop-Bag for Gas Main

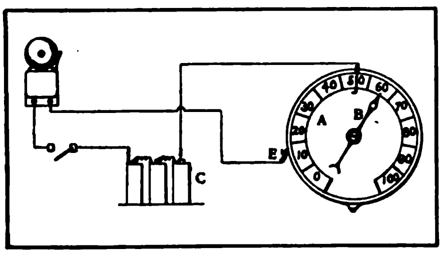
pipe and causing the water to run out. From 2 to 3 lb. can be created on the bag, depending on the height of the water column, 15 seconds being necessary to insert the bag and cut off the flow of gas.

For a 10 or 8-in. main, use a 10-in. bag; for 6 and 4-in. pipe use a 6-in. bag and for 4, 3 and 2-in. pipe, use a 4-in. bag.

TANK ALARM FOR LOW WATER

In a water supply system where the tank is located a distance of two miles from the pumping station, and where there is an alarm to notify when the tank is full, but none to tell when it is empty, a correspondent of the Engineers' Review installed a device as follows:

A is a water pressure gauge and B is the pointer. An insulated wire runs from the battery, C, to and through a hole in the top of the gauge shell. A bare end extends down low enough to allow the pointer to form a contact. This causes a current to flow from the batteries through the wire to the hand of the gauge and to the bell by means of the wire, E, which is fastened to the case of the gauge, by either soldering,

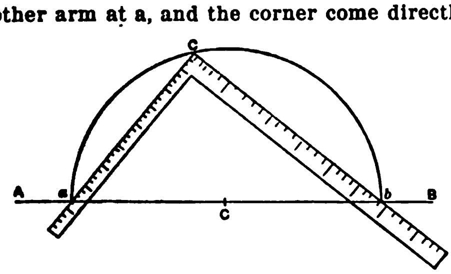


Tells When Tank is Empty

or with brass or copper screw. The switch is for cutting out the bell when the water pressure is low enough for the pointer to hit against the end of the wire.

HOW TO TEST A SQUARE

Draw any line (A-B) with any radius and use any point on the line as the center, C, describing a semi-circle, a c b. If the square is a true right angle, says the Metal Worker, one arm should meet the diameter at b, the other arm at a, and the corner come directly

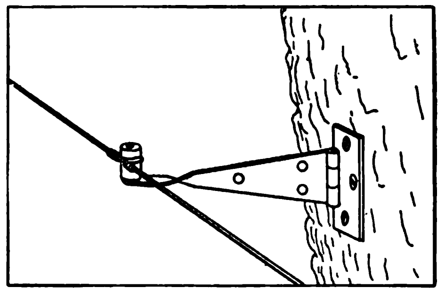


Testing a Square

on the circumference at c. If the test is carefully made any inaccuracy in the square may be detected.

FASTENING LINE WIRE TO TREES

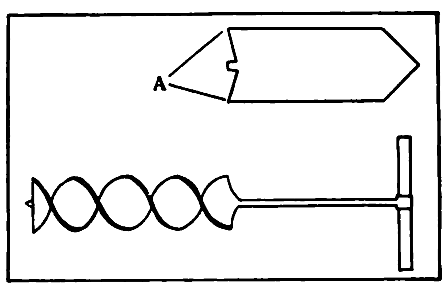
Where it is impossible to set poles for a rural telephone line, a good method of fastening the wire to the trees is as follows:


Hinge for Fastening Line Wire

Take a hinge (the longer the better and safer), nail it to a limb as illustrated. Twist the tip one-fourth turn and bolt a porcelain button to it, to which button fasten the wire. When the motion of the tree is parallel with the line, the wire will give and when it is at right angles with the line, the hinge will take up the motion and prevent the wire breaking.—Contributed by F. W. Mintzlaff, Grafton, Wis.

HOME-MADE POST AUGER

For the auger use a piece of 3x¼-in. soft steel 3½ in. long. Cut it as shown; sharpen the wings, A A, not attempting to finish the spur. Then forge a handle hole in one



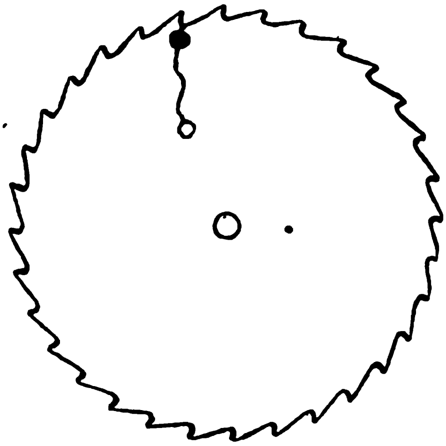
Good Post Auger

end of a piece of ¾-in. round stock 30 in. long; weld this piece to the auger blade, heat the blade and twist it in the vise (to the left). Finish up the cutting edges over the horn of the anvil and make a square point of the spur. A correspondent of the American Blacksmith, who has made fifty augers of this kind, finds them very satisfactory.

METHOD OF MENDING CIRCULAR SAW

Do not throw the cracked circular saw into the junk heap, make it as good as new by the following method:

Drill a ¼-in. hole at the crack near the teeth and another hole at the end of the crack. Countersink the hole near the teeth on both sides and insert a rivet very neatly,



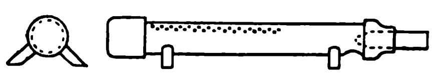
Repair for Cracked Saw

finishing the heads of the rivet down even with the saw blade. Should the crack be an extra long one, says the American Blacksmith, two rivets may be necessary.

GAS STOVE FOR WORK BENCH USE

This handy device for heating soldering irons, etc., is made of a piece of ½-in. gas barrel, 8 in. long. Cap one end and to the other fit a reducing socket having a short length (2½ or 3 in.) of ¼-in. barrel in its smaller end. The outer end of this ¼-in. barrel should take the rubber tube, the inner end being reduced by forging to leave a small hole as indicated by the dotted lines.

Cut an aperture, to admit air, on the ½-in. barrel as close to the reducing socket



Gas Stove for Work Bench

as convenient and at the cap make four rows of holes to allow the air to escape. Screw in four pins ¼ in. in diameter to serve as legs, says the Model Engineer, London. Provide a sheet iron box to stand on the bench to retain the heat and a bar of ⅜-in. round iron across the interior to support the soldering irons.

PREVENTING BLISTERS IN PHOTOGRAPHS

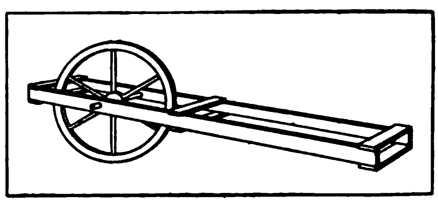
Blisters in photographic prints or plates are frequently ascribed to the hot weather, though they sometimes develop in cold weather, to the mystification of the amateur.

The cause is the difference in temperature between the atmosphere and the baths used in developing.

In summer one will work along with the atmosphere, wash water and toning bath high but uniform, and then plunge the prints in a fresh hypo bath that has become as cold as ice owing to the fall in temperature which always results when hypo is dissolved in water. The result, says Camera Craft, is a case of blisters. And the same result may be accomplished in winter, merely by having one of the baths much colder or warmer than the others.

WHEEL FOR LAYING OUT ORCHARD

This device is made of two 1x4-in. boards, 10 ft. long, and an old wheelbarrow wheel. Establish base lines on the orchard ground



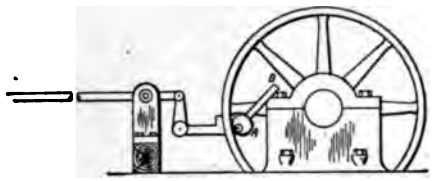
For Laying Out an Orchard

when it is ready, then draw the wheel from one tree point to a point at the opposite side of the field and so back and forth until the ground is marked one way. Then mark it the other way and where the wheel marks cross is the place for a tree. Dig a hole there, says the Rural New Yorker, and set the tree on a line each way with the marks. By this method every tree will be exactly in line.

Nitric acid of 1.2 specific gravity will darken cherry. Let stand 12 hours, then wash off the acid and dry.

TURNING A FLYWHEEL

This device is similar to one described in our April, 1906, number, but is for moving a heavier machinery load. To prevent the grip on the wheel from slipping the inside



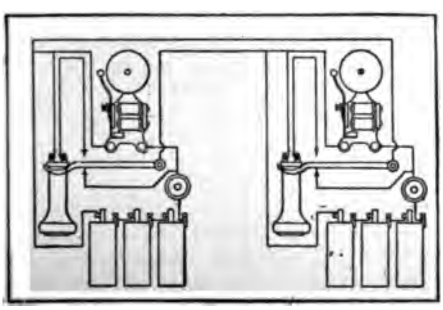
Device for Turning Heavy Wheel

jaw of the wrench was turned in a lathe and an eccentric cam, A, with a short lever, B, made. When the long arm is raised, the full throw of the eccentric is turned against the inside of the rim of the wheel, holding the jaws of the starting device firmly. With this device the engine cannot be turned backward unless the device is anchored to the floor. One man is required to adjust the eccentric, which is detachable, and another to manipulate the long lever.

A correspondent of the Engineers' Review, who uses this method of starting, has a rope transmission with 13 grooves for 1½-in. rope, and to protect the metal between them, he inserted a copper plate, long enough to lap three grooves, under the jaw of the wrench.

HOME-MADE BATTERY-CALL TELEPHONE

The wiring and connections of two battery-call telephones are shown in the accompanying sketch. No transmitters are used, the receivers being used for that purpose, and the receivers and bells are thrown in and out of circuit by means of the hooks,



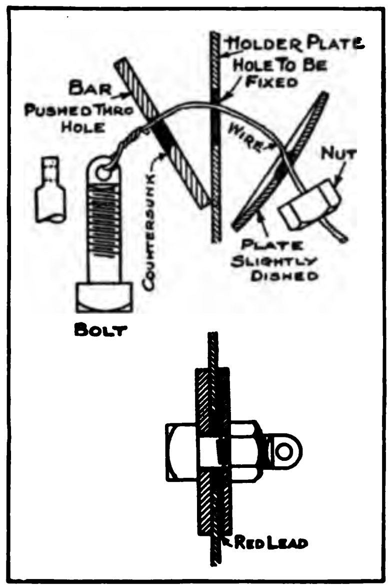
Telephone With Battery Call Bell

which hold the receivers. When the hook is down it closes the circuit at the lower contact and brings the bell in circuit, and when it is up it touches the upper contact and connects the receiver. When either push button is pressed both bells ring, as they are in multiple with both sets of batteries.

By connecting the bells and receivers in this manner only two line wires are necessary, and if a ground connection is used, only one wire will be needed.—Contributed by Richard E. Jenness, Kirkwood, Missouri.

TO REPAIR A GAS-HOLDER LEAK

File a ⅝-in. bolt flat 4 or 5 threads from the end and drill a small hole through the



Repair for Hole in Gas Holder

end. Fasten a wire in the hole, string a bar on the wire and place the whole on the inside of the holder, as illustrated. Use a steel plate and nut on the outside and make the joint with red lead.

HARDENING DRILLS FOR GLASS

Prepare a solution of zinc dissolved to saturation in muriatic acid, says Machinery, and reduce by adding an equal quantity of water. Dip the drills in this and use without tempering.

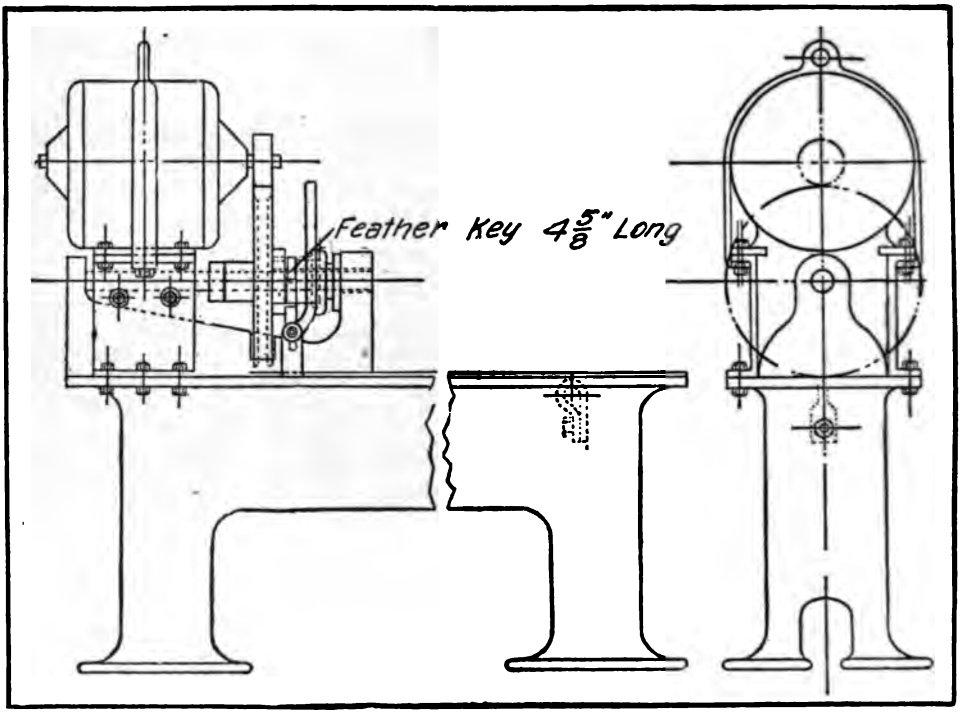
PORTABLE LATHE FOR MACHINE SHOP

A portable lathe is one of the conveniences used in the Columbus (Ohio) shops of the Pennsylvania lines. A small motor is applied to an ordinary 16-in. lathe, as shown in the illustration. By the arrangement of the switches either 120 or 240 volts can be used. A small amount of field resistance gives a considerable range of speed.

This lathe can be moved about convenient to whatever engine is being served. It is provided with two hooks by which it can be picked up by an overhead crane and placed wherever desired. There is a combined clutch and brake provided with the handle, convenient to the operator, so that when the clutch is thrown out, the brake is applied, stopping the lathe spindle but allowing the motor to run. In calipering holes for bolts the portable lathe has reduced the expense 40 per cent in the time it saves.

THE TWEEZERS FOR PICKING UP SMALL ARTICLES

Lay the object on the back of the hand—usually cleaner than the palm—and then pick it up with the tweezers. In this way, the tool gets a good grip on the object, such as a screw or pivot, says Machinery, and is not so apt to slip.



Portable Electrically-Driven Bolt Lathe

Aluminum cannot be successfully soldered. Holes may be filled with solder, but two *separate pieces* cannot be soldered together.

PROTECTING WAX FINISH

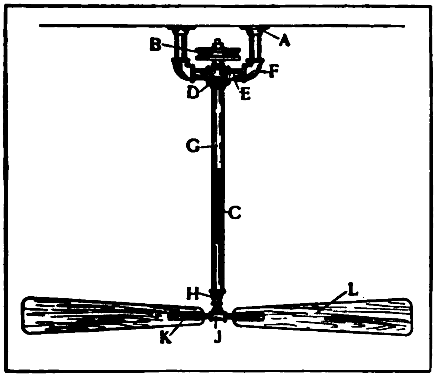
Every drop of water allowed to fall on wax finish will leave a white spot. Try protecting the wax, suggests the Master Painter, with a coat of the following: Zanzibar copal varnish, 6 parts; boiled oil, 6 parts; turps, 10 parts, all by weight. Mix together well and apply.

REMOVING BROKEN STUD BOLTS

Drill a hole in the bolt, being careful not to drill too small. Then drive a square nail set or any square tool into the bolt and screw it out with a wrench. This method is easy and rapid.—Contributed by C. I. Mitchell, Temple, Texas.

CEILING FAN MADE OF PIPE FITTINGS

A ceiling fan costs from $6 to $32.25; here is one made of pipe fittings at a total cost of 99 cents and which works to perfect satisfaction. The parts required and their cost are: Two drilled flanges, A, 10 cents; 5-in. pulley, B, 25 cents; ½-in. pump rod,



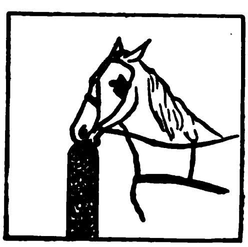
Ceiling Fan That Costs 99 Cents

C, 8 cents; cross, D, 4 cents; two nipples, E, 4 cents; two elbows, F, 6 cents; ¾-in. pipe, G, 10 cents; ¾x½-in. reducer, H, 3 cents; ½-in. tee, J, 4 cents; two couplings, K, with male connections, 9 cents; fan blades, L, made of ⅜-in. pine, 16 cents. The fan should be mounted 7½. ft. from the floor and the pulley connected by belt as shown.

I have made several of these fans, painting and gilding them, so that they compare favorably with factory-made ones in every way.—Contributed by Ora S. Harmas, Fennimore, Wis.

PROTECTION FOR HITCHING POSTS

Most horses seem to take particular delight in chewing up hitching posts if made of wood and unprotected, but when covered with tin washers fastened by nails as shown in the sketch, the most voracious animal will soon refrain from this pastime.



The tin washers referred to are the kind generally used by roofers in laying paper roofing and can be fastened with ordinary steel wire nails.—Contributed by Stoke Richards, Santa Clara, Cal.

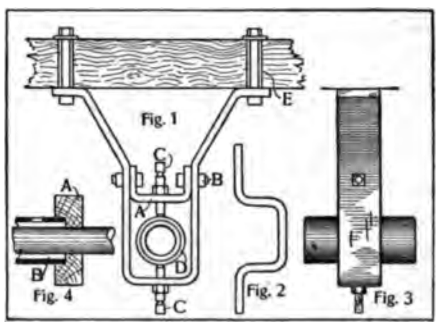
HOW TO MAKE A SHAFT HANGER

Almost any machinist who has a forge can make a good hanger, which will have all the adjustments found in an improved ball and socket hanger.

A piece of wrought iron, about ½ in. by 3 in. for ordinary size shafting, is bent to the shape shown in Fig. 1, if a drop hanger is desired, and if a post hanger is to be made, the iron frame can be of the form shown in Fig. 2. A side view of the drop hanger is shown in Fig. 3.

In making a drop hanger, a piece of iron like that used in the frame is bent over at the ends, as shown at A, Fig. 1, and fastened by means of ⅝-in. bolts, B. The center is tapped for a ⅝-in. set screw, C, which is directly over a similar set screw in the frame. Both set screws are provided with jam nuts so that they may be held from turning after being adjusted.

The bearing consists of a piece of common iron pipe, D, equal in length to four times the diameter of the shaft and countersunk on opposite sides at the center to receive



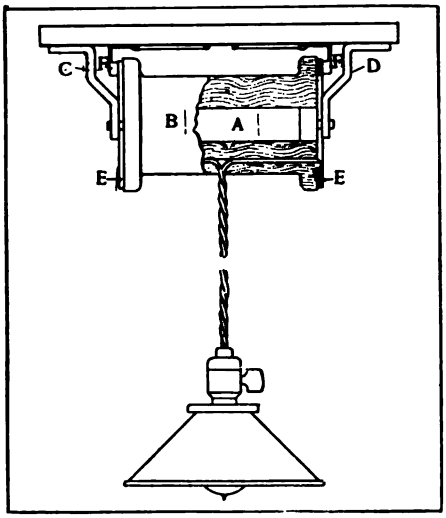
An Adjustable Hanger

the set screws, C. A hole should be bored through the pipe near each end to allow pouring the babbitt. To do this make two pieces of wood as shown at A, Fig. 4, and slip one over each end of the pipe with the shaft in the center, thus leaving a space, B, to receive the babbitt. Thoroughly smoke or chalk the shaft to prevent the babbitt from shrinking on it, and if the inside of the pipe is very smooth make a number of grooves with a cape chisel.

In fastening up the hanger make the hole E (Fig. 1) somewhat larger than the bolts, F. This allows lateral adjustment of the hanger. The vertical adjustment can be obtained by the two set screws, and if one end of the bearing should be a little high, it can be lowered by loosening bolts, B.—Contributed by Lee R. Clarke, 116 S. Eighth Ave., Bozeman, Mont.

HOW TO MAKE AN AUTOMATIC LAMP CORD ADJUSTER

Procure an old curtain roller, A, and cut off the solid end. Fasten it in the wooden spool, B, which is drilled to receive the



Automatic Lamp Cord Adjuster

wires from the incandescent lamp. Make two sheet brass brackets, C and D, one having a round hole, and the other a slotted hole to prevent the spring shaft from turning. Then make two brass rings, E E, and fasten on ends of spool. Solder the lamp wires to these rings and make two sheet brass brushes, F F, to make contact with the rings.

The lamp may then be lowered or raised the same as a window shade.—Contributed by Wm. D. Probst, 1036 Erie St., Youngstown, Ohio.

EMERGENCY GASOLINE SUPPLY FOR AUTOS

Every automobilist should carry with him a length of small rubber hose for use in case the gasoline feed pipe running from the supply tank to the carbureter should rupture. Also he should carry an extra can of gasoline—say a gallon or two gallons—the spout of the can being fitted with a cork stopper. To one end of the length of hose must be fitted a short length of small pipe. Then in the emergency mentioned, says the Automobile, all that is necessary is to stretch the loose end of the rubber hose over the fractured end of the gasoline pipe and push the other end of the hose, having the pipe, through a hole made in the cork stopper of the extra can of fuel and by propping up the can he will be able to supply the motor with gasoline during the home run.

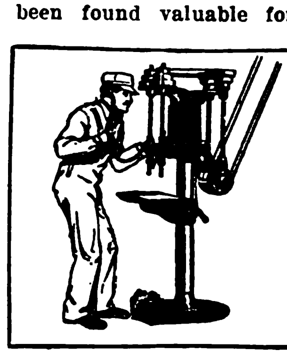
THE CAMERA AS A DRAFTING TOOL

Sometimes a perspective view of assembled castings is required when it would not be advisable to call in a skilled artist. For instance, when bids for a casting are required, the patterns being furnished, and it is desirable to send the foundry people blueprints showing the nature of the work. A good and cheap way, says the American Machinist, is to use the camera as a drafting tool.

To do this take a photograph of the pattern and make a blueprint from the negative. Outline in pencil, emphasizing points of particular importance. Then dip the print in sodium hydrate or in common lye. This will turn the blue into pale yellow and leave the pencil outline in bold relief. Then trace, free-hand, the outline on tracing cloth.

A STETHOSCOPE FOR MACHINES

When a physician examines a patient, about the first thing he does is to produce an instrument which looks like the earpiece of a phonograph, and proceeds to adjust it to his ears and apply the extremity to the various parts of the body. A modification of this instrument, which is known as a stethoscope, has been found valuable for locating troubles in machines.



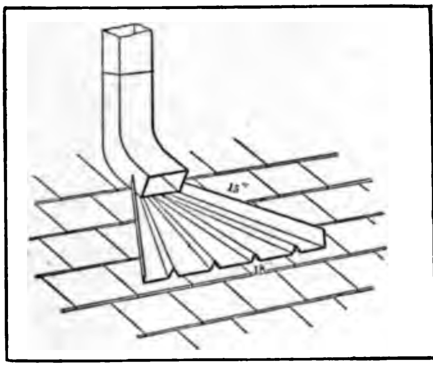
When a noise is heard which cannot be located the stethoscope can be used as shown in the sketch. The instrument in this case should have a longer hose than those used for medical purposes to allow easy access to all parts of a machine.

It should be remembered that in a machine which is not running properly sound is produced first, and then heat. Someth when the parts get hot it is too late to remedy the trouble, as they may be so badly cut that they are ruined. To detect the sound quickly before much heat is produced, apply the stethoscope as shown in the sketch, moving the free end to different parts to find the precise point the noise comes from.

An instrument of this kind, made by a correspondent of Machinery, consists of simply a piece of rubber tubing, and when the end is placed to one ear and the other ear closed with the finger the device is very effective.

A WATER SPREADER FOR ROOFS

It often happens that shingle or slate veranda roofs having only a slight pitch become worn at the down spouts, where the deluge of water in time works down through the joints of the roof covering.



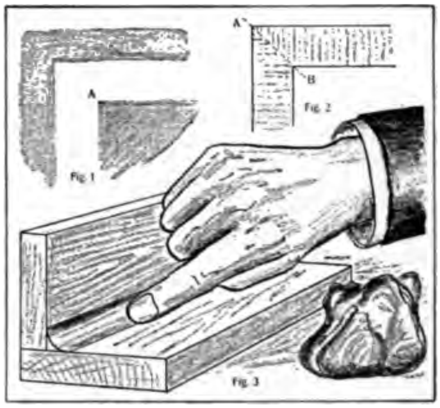
Spreader Attached to Spout

To remedy this trouble, a correspondent of the Metal Worker devised the spreading deflector shown in the sketch. It should be made of sheet copper or galvanized iron, and should be about 15 in. long by 18 in. wide.

HOW TO MAKE FILLETS FOR PATTERNS

It is a mistake to leave out the fillets on any pattern, even on hurry-up jobs, which require no finishing. The object of the fillet is not to beautify the work, but to strengthen the casting, and it is much more necessary than rounding the outside edges, which is often done on patterns in which the fillets have been neglected.

This will be more clearly understood by referring to Fig. 1, which shows the cavity left in the sand after a pattern without fillets has been drawn from the mold. It will be noticed that a sharp edge is left in the sand at A, which is easily washed away by the molten metal, thus making a dirty, porous casting. The corner opposite A offers no protruding edge and, as far as a



Making a Putty Fillet

clean casting is concerned, requires no rounding, but, as will appear later, it is well to round it for other reasons.

Fig. 2 shows the casting which would be produced by pouring the mold shown in Fig. 1. When the molten iron cools it crystallizes, the lines of crystallization being at right angles to the surface as indicated by the vertical and horizontal lines. The effect of this crystallization is the same as would be produced by gluing a number of very thin pieces of wood face to face, and then gluing the ends together at the beveled corner. It is evident that the weakest point would then be at the corner. This is exactly the case with the iron. If sufficient force is applied to a casting of the form shown in Fig. 2, it will invariably break along the line of A-B, although the section of the metal at that point is greater than at any other.

It is a curious fact that rounding the pattern at A (Fig. 2) will strengthen the casting and, as would naturally be expected, the addition of a fillet at B will further increase the strength. The rows of crystals will then swing round from a common radius much as in the position of soldiers when making a turn. Thus instead of the rows of crystals meeting on a line as at A-B they will arrange themselves in wedge-shaped segments, thus leaving the metal more homogeneous.

Having thus seen the necessity of fillets in patterns, there are doubtless many who would be interested in a quick, easy method of making them. This is shown in Fig. 3, the only tools necessary being the hands, and the only materials a lump of putty and a dish of turpentine.

Dip the index finger in the turpentine

rub along the part which is to receive the fillet. Then roll a piece of putty out long like a lead pencil and lay in the corner. Dip the finger in the turpentine again and then rub on the putty as shown. If a large fillet is wanted, use the thumb and if a very small one is required, the little finger can be used. Pressing on hard also reduces the size of the fillet. After thus forming the fillet allow it to stand about an hour, when it will then be ready to shellac. When the pattern is finished the fillet cannot be distinguished from the best leather fillets and if properly applied will last as long as the pattern.

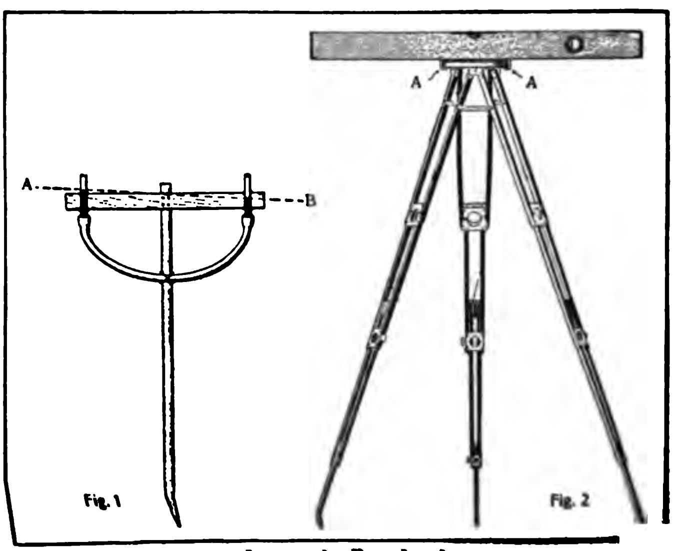
HOW TO CASEHARDEN IRON OR SOFT STEEL

Procure a quantity of old boots and heat same in a sheet iron box until thoroughly charred. Place the articles to be casehardened in the box and cover them with the charred leather. Reheat and keep at a dull red heat for an hour or more and then plunge the contents in cold water or brine.

If a blue color is desired, the articles after being treated as above should be ground and polished and then placed in a pan of sand. Apply heat and when the desired color appears drop the articles in cold water.

HOW TO MAKE A FARM-LEVEL

A serviceable farm-level which does not cost over 50 cents to make is shown at Fig. 1. The level should be 4 or 5 ft. high with a crossbar 3 ft. long at the top. To the ends of the crossbar tie small glass tubes and connect them with a piece of rubber tubing 4 or 5 ft. long, which fill with colored water up to the line A B. When the instrument is set so that line A B exactly corresponds with the upper edge of the crossbar, the latter will be level. This instrument is as accurate and nearly as convenient as a level costing $15 to $25, says the Yearbook of the Department of Agriculture. A more expensive and more convenient farm-level may be made by fastening a 30-in. carpenter's level to the head of an ordinary camera tripod, using two right-angled screw hooks as at A, Fig. 2. The level will cost about $1.25.



Inexpensive Farm Levels

HOW TO REPAIR A LEAKY HANDHOLE

A leaky handhole located in the rear end of the boiler, where the plate had been allowed to leak until the head of the boiler had corroded away so that it could not be kept tight, was repaired by a correspondent of the Engineers' Review as follows:

A steel ring ⅜ in. thick and 1½ in. wide was procured from the boiler shop and put on. To do this the ring was bored for ½-in. rivets and corresponding holes were drilled in the boiler head and countersunk on the inside, in order to bring the heads even with the plate and leave a clear place for the packing. The countersinking was done by placing the drill chuck in a piece of ¾-in. pipe and running it through the front handhole; and by fitting the countersink in the chuck and the outer end of the pipe in the ratchet, one man did the turning while the other kept the countersink in the hole, and from running out of center.

When driving the rivets, a cupped piece of pipe was used to hold them in place in the same way, until they were headed. Then by the use of a gasket that did not require "following" the job was completed satisfactorily.

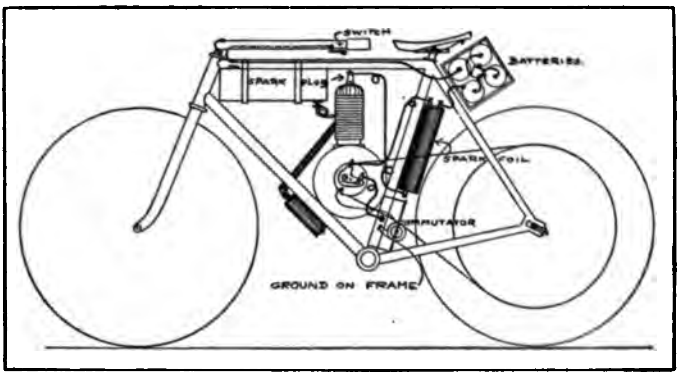
THE CONSTRUCTION OF A HOME-MADE MOTORCYCLE

At the present time motorcycles are playing a great part, not only for a pastime but for practical use as well, and it is the earnest desire of most young men to own one. As I have had practical experience in this line I feel able to lay before the readers of Popular Mechanics a general outline with illustrations showing the construction of a practical machine.

In designing a home-made machine it is well to follow the lines of a regular motorcycle as much as possible, the location of the motor, transmission, etc. The first consideration is that of finding a suitable frame, one that is of heavy construction, with reinforced joints and with a slight or no drop to the crank hanger.

There are several bicycle motors with all necessary attachments on the market which sell for $45.00 to $65.00, according to horsepower. Included with the other attachments is the metal driving-pulley rim which is to be attached to the left side of the rear wheel, which must also be fitted with a coaster brake. This metal rim is provided with legs or clamps which are to be bolted fast to the wooden rim. A spring saddle will be found much more comfortable than the ordinary bicycle saddle and will add but little to the expense of the outfit.

The motor is to be clamped to the front slanting bar, for which clamps are provided; care must be taken to have the engine driving pulley in a true line with that of the rear pulley rim. The belt should be stretched on and the idler wheel put in place, then wheel the bicycle along the floor and note if the belt runs straight and true, if not, shift the engine until the pulleys are in line.



Arrangement of Apparatus and Wiring

The gasoline tank is clamped to the horizontal bar on top and with small pipe connecting it to the mixing valve or carbureter. The battery box and spark coil are located by clamps on the rear slanting bars, directly behind the seat. The electric wiring should be carefully executed, placing a switch on the grip of the handle bar, by which the circuit can be opened or closed by the thumb or forefinger. This gives immediate control of the engine, and is very necessary, especially when riding in crowded thoroughfares where it is vitally important to stop quickly. The writer has narrowly escaped serious injury in a collision, due to a defective and poorly insulated switch, by which he was unable to break the circuit.

The battery box is made to hold 4 dry batteries, from which the current passes through the switch and commutator and thence to the induction coil, from which it leaps to the spark plug in the engine cylinder. A diagram of this wiring is given in the sketch.

After making all these connections and everything else is in place, place the rear wheel of the motorcycle in a rack which raises it from the floor and start the motor to see if all is in working order. There is always a lot of final adjusting to be done after the machine is assembled and should be done as each occasion arises. First, test the spark by closing the circuit with the switch and after disconnecting the spark plug wire, hold it about ¼ in. from any part of the plug and slowly turn the rear wheel until the spark leaps across the space, th revolution of this wheel causing the com mutator on the engine to make and bre the circuit, which induces the spark.

spark is seen, then there is a defect in the wiring at some place.

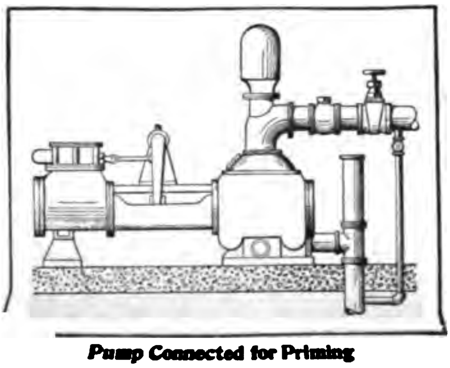
When this feature is in working order, mount the machine, turn on the gasoline supply, open the throttle half way, place the spark advance lever at a little more than midway, open the compression cock (if one, or if the motor has an automatic valve lift, no attention is required to this) and placing the feet on the pedals start the motor and rear wheel in motion. Do not try to start the motor by slow pedaling, as in most cases a rapid revolution is necessary to obtain the first explosions after which the compression cock is closed and the engine will speed up at once. As soon as it does, regulate the speed with the spark advance lever which will be found to govern the speed absolutely. If the motor does not catch a few explosions at first, regulate the spray valve until it does, as that is the vital point for a perfect mixture.

It is well to experiment with the engine in this way until one is familiar with the levers before taking it on the road, after which, with some final adjustments to the belt, etc., no trouble should be had.

To complete the machine in regard to appearance, mud guards may be added; heavy tires and long straight handle bars will add greatly to its good looks.—Contributed by Prentice P. Avery, Ridgewood, N. J.

PRIMING A STEAM PUMP

A pump which was used for fire protection purposes only and which was required to be under steam pressure at all times, made the engine room so hot that the steam was shut off. One day at an unexpected visit of the inspector, the engineer succeeded in turning on the steam without being observed, but though the pump started up he could tell it was getting no water. Fortunately, the inspector did not ask to see the pump throw a stream. After his departure the engineer made an examination and found that the foot valve on the suction pipe leaked and the pump had "run down."

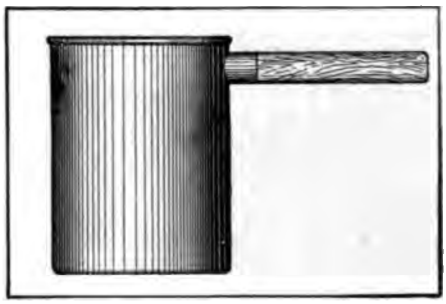


Pump Connected for Priming

To prevent trouble of that kind occurring again, says the Engineers' Review, he piped up a connection from the service pipe to the suction as illustrated. With this arrangement, if the pump ran down again, it would be an easy matter to prime the suction pipe.

HOME-MADE COOKING UTENSIL

As handy a dish as one can have for the kitchen is made from an empty coffee can. Take a piece of tin about 1 in. by 3¼ in., roll into a tube and solder, making a tube



Inexpensive and Convenient

1 in. long and 1 in. in diameter. Now whittle out a soft wood stick 5½ in. long, to fit the tube tight. Secure the two by driving a small nail through both, filing off the end of nail. Now solder the end of the dish near the top. You can handle this utensil over a stove without burning the hands. When the dish is worn out, unsolder and put on a new dish.—Contributed by T. L. Reed, La Porte City, Iowa.

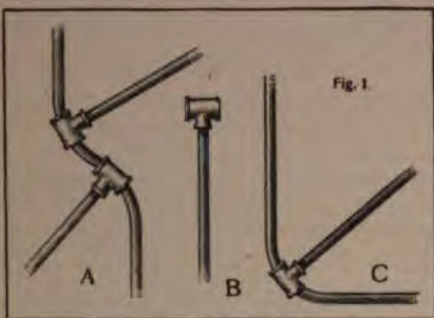
CASE-HARDENING CAST IRON

Pulverize equal weights of saltpeter, prussiate of potash and sal-ammoniac and mix them together. Prepare a dipping solution by adding to each quart of cold water 1 oz. prussiate of potash and ½ oz. sal-ammoniac. Heat the cast-iron pieces red hot, says Machinery, roll them in the powder, then plunge them into the liquid.

Oiling of smoothly polished castings, such as cylinder heads of steam engines, more than doubles the loss of heat by radiation. —Kent.

GOOD METHODS FOR BENDING PIPE

A "hicky" (B, Fig. 1) is a useful device for making bends in small pipe, up to ¾-in. To make a hicky, bullhead a 1¼x1-in. tee on the end of a piece of 1-in. pipe, 4 ft. long.



Bending Pipe with "Hickies"

Then lay the pipe to be bent on the floor, or leave it in place, slip the tee on the hicky over the pipe to a point near where the bend is to be made. Start the bend with a slight pressure on the lever, then move the hicky along the pipe a little and apply pressure again. Repeat this operation until the bend is made as desired (C, Fig. 1). To make an offset, use two hickies (A, Fig. 1), holding the first bend in position with one and using the other to make the offset.

For bending pipe up to 2 in. a good method is shown at Fig. 2. Lay two 10-ft. planks up against a horse or window-sill, placing them 3 ft. apart. Nail a piece of 4x4-in. timber to the under side of the planks, and provide another piece, which leave loose so it can be moved back and forth as desired, says the Metal Worker. Insert one end of the pipe to be bent under the lower 4x4-in. piece and adjust the other

To Bend 2-In. Pipe and Up

4x4-in. piece to the point on the pipe where the bend is to be made. Then apply strength to the projecting end of the pipe to make the bend.

HOW TO CONVERT A LEAD PENCIL INTO A WIRE GAUGE

An article in the July number of Shop Notes describes a method of finding the resistance of any copper wire by means of the slide rule. The method there given is entirely correct, but as a wire gauge is required to determine the size of the wire and a slide rule needed for the necessary calculations, and as many persons possess neither of these instruments, I thought the following method would prove acceptable.

The only device required by this method is a common lead pencil on which is marked off two spaces: one 1 in. long and one ½ in. long. To obtain the resistance per 1,000 ft. of any size wire first remove the insulating covering for a distance of a foot or more, depending on the size of the wire, and then wind the wire on the lead pencil as shown in the sketch. Count the number of turns per inch using the 1-in. space for large wire and the ½-in. space for fine wire. When

Lead Pencil Used as Wire Gauge

the number of turns per inch is determined, square that number and point off two decimal places and you then have the resistance per 1,000 ft. at 20° C.

When the resistance is known the number of feet per pound can be found by multiplying by 32. Of course all these results are only approximate, but they are sufficiently accurate for practical purposes.—Contributed by A. Willatowski, 165 Alexander St., Atlanta, Ga.

FILLING TIRES WITH SAND

When it is impossible to inflate the punctured tire of your auto, try filling it with sand, if any is available. The sand will cushion the tire in a measure and keep the dead weight of the machine off that w

DRILLING OVERHEAD HOLES

Anyone who has ever had occasion to drill holes in a ceiling, or any other place where the job has to be done overhead, knows what tiresome work it is. A strong man will feel exhausted after holding his arms overhead for five minutes without doing any work and when the work of feeding and turning the drill is added, it is almost impossible to continue working for more than three or four minutes at a time.

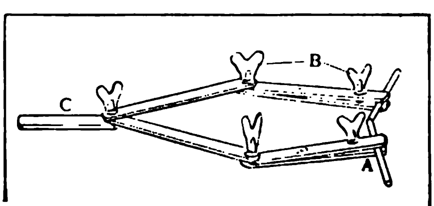
Simple and Easy

Having had occasion to do some overhead drilling, I found that the men's labor could be greatly reduced by means of the device here illustrated, which consists of simply a board, which acts as a lever, with the fulcrum at the round of the ladder. The board to work well, should be in a horizontal position and if the round is not in the right place, it may be changed by moving the lower end of the ladder, or if this will not produce the desired effect, a few blocks of wood placed between the brace and the board will bring the board to a horizontal position. The pressure should be applied to the board as far from the round as possible, thus increasing the leverage.

When the ladder is inclined too much it is hard to reach the handle of the brace. In that case the brace can be placed on the other side of the ladder and the board can be raised by placing your shoulder below it. —Contributed by A. J. Saxe, Engineer, Railway Exchange Building, Chicago.

CLAMP TO HOLD WIRE WHILE SOLDERING

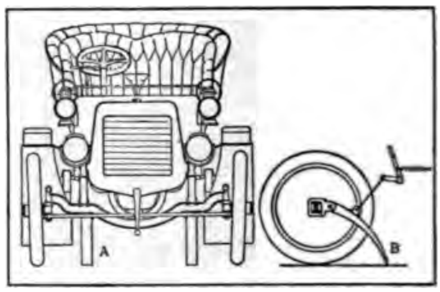
This clamp may be made any size and of almost any material, soft iron being preferable, however. It is used for holding wire or small metal pieces while soldering or brazing. The hand screws, B, should be somewhat harder than the arms and clamps. The machine is very flexible and rods can be held at any angle by adjustment. A indicates the vise jaws, and C the handle. It is of especial convenience in soldering as one or both hands may be free to spread the solder or flux.—Contributed by David R. Shearer, Lenoir, N. C.



Clamp for Use in Soldering

DEVICE TO PREVENT AUTOMOBILES FROM BACKING

In hilly localities it is often advantageous to equip an automobile with the device shown in the sketch. A large ratchet lever, A (shown in detail at B), is pivoted from the axle with the point suspended in the air normally, but capable of being lowered when desired, thus preventing the machine from backing.



To Prevent Auto from Backing Down Hill

TO REMOVE STAINS FROM NEGATIVES

A good formula for removing stains from negatives is as follows:

Iron sulphate	3 oz.
Sulphuric acid	1 oz.
Water	3 oz.

Another method is to allow the plate to soak several days in a solution of hypo.

MARKING CORRECTIONS IN BLUEPRINTS

The simplest and best way to mark corrections in blueprints is to use a saturated solution of common sal soda for a writing fluid and do the writing with an ordinary new and clean steel pen. The marking will stand out clearer and whiter than the lines of the print.—Contributed by M. L. Schiaffino, 2 Belen St., Guadalajara Jal, Mexico.

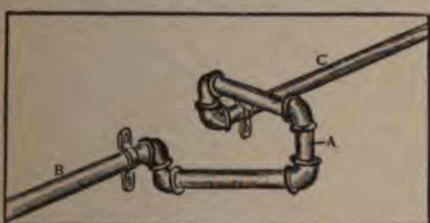
SHOP NOTES

LAYING OUT AN ANGLE WITH SCALE AND DIVIDERS

To lay out any angle without other tools than a scale and dividers, strike an arc with a radius of 3.58 in. and count every $\frac{1}{16}$ in. on the arc a degree. For many purposes a radius of $3\frac{9}{16}$ in. will do, the error being one degree in 360.

EXPANSION JOINT SUBSTITUTE

As long steam pipes change their length a considerable amount, due to the expansion and contraction which takes place during changes of temperature, an expansion joint is needed to take up this motion, which would otherwise break a fitting or cause a



Expansion Joint Made of Pipe and Fittings

leak. When an expansion joint is not available, however, the device here shown will prove an excellent substitute. The nipple, A, is of such a length that the center lines of pipes B and C will coincide. Four common ells and two street ells will be the only fittings required, the cost of which will compare favorably with an expansion joint.—Contributed by Frank J. Borer, 230 Rankin St., Elizabeth, N. J.

CEMENT FOR WOODWORK

The following cement will be very hard when dry, and will adhere firmly to wood: Melt one ounce of rosin and one ounce of pure yellow wax in an iron pan, and thoroughly stir in one ounce of Venetian red until a perfect mixture is formed. Use while hot.

ANOTHER QUICK REPAIR FOR LEAKY PIPE

To repair a leaky pipe with the pressure on, simply wrap the inner tube from a bicycle tire around the leak, stretching the rubber tightly and winding around the pipe in a manner similar to that employed by physicians in bandaging a limb. Continue in this way until the leak stops, and then tie a knot in the rubber. This repair will often hold for years, and it only takes a few minutes to apply it.—Contributed by F. D. Munger, Oconomowoc, Wis.

WATER MUFFLER FOR GASOLINE ENGINE

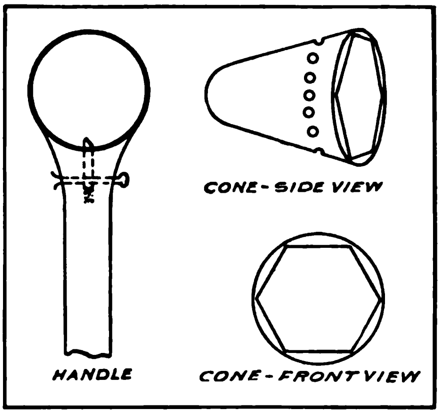
A pail of water makes a very simple but most effectual muffler for a gasoline engine. The illustration shows how it is used. The pail is partly filled with water and the end


Cheap Gas Engine Muffler

of the exhaust pipe is carried below the surface, thus causing the exhaust to bubble up through the water.—Contributed by Walter Weber, 643 W. 46th St., Chicago, Ill.

INEXPENSIVE AND USEFUL RATCHET WRENCH

The ratchet wrench illustrated was originally designed for use in car repair work for removing nuts from the bolts of split gears, but is also useful for removing square or hexagonal nuts so located that they are hard to get at.



Details of Ratchet Wrench

A cone-shaped device takes the place of the jaws in the ordinary form of wrench. This cone on the interior is hollowed to the form of a hexagonal pyramid which will fit most of the nuts generally in use. The cone fits into a circular opening at the end of the handle. A small steel pin inserted in the handle and held in place by a split key serves as a ratchet and engages with small indentations in the surface of the cone, says the Electric Railway Review. The wrench will work either right- or left-handed, depending on which side of the opening in the handle the cone is inserted. It is said that this wrench can be made for about 75 cents.

HORSEPOWER OF A GAS ENGINE REDUCED BY HIGH ALTITUDES

A gas engine giving 10 hp. in Chicago will give only 8 hp. in Denver and if moved to the summit of Pike's Peak would give only 5 hp. This is due to the difference in atmospheric pressures of the places mentioned.

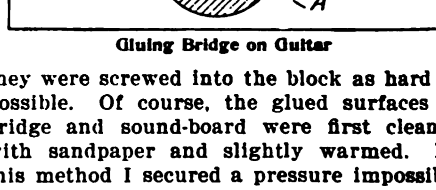
Other conditions remaining the same, an engine while consuming the most gas will give the most power. By consuming, in this case, is meant actual combustion and not simply the wasting of gas which occurs when the mixture is too rich.

In Denver, where the atmospheric pressure is less than in Chicago, the amount of air taken into the cylinder during each cycle will be correspondingly less and will therefore be unable to support the combustion of as great a quantity of gas. The amount of compression is reduced as well and this also results in loss of power.

FASTENING ON A GUITAR BRIDGE

The method I adopted for gluing on a guitar bridge I believe is original and a valuable kink for those players placed in a similar position. Soon after purchasing the instrument the bridge became detached, there being a tremendous strain exerted by the strings, and it was returned to the dealer to be repaired. He glued it on and in addition put in two screws with nuts, one at each end of bridge; yet it again came off soon afterward. As the dealer ran a first-class repair shop, I decided that it would be useless to go elsewhere, but to try the job myself.

I cut off about 6 in. of the largest diameter hardwood curtain pole I could find and planed a flat surface about ¾ in. wide. Into this I drilled six holes a trifle smaller than the root diameter of a $\frac{1}{8}$-in. wood screw having a round head, and at a distance apart corresponding to the holes in bridge. This block, A in sketch, was inserted in the sound hole of the instrument and placed under the string holes. Placing a strip of wood, B, drilled with corresponding holes, under the heads of the screws,

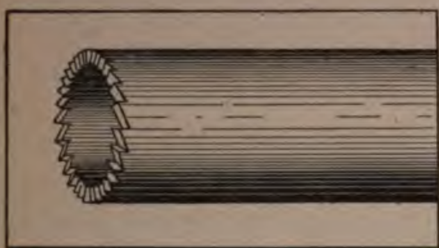


Gluing Bridge on Guitar

they were screwed into the block as hard as possible. Of course, the glued surfaces of bridge and sound-board were first cleaned with sandpaper and slightly warmed. By this method I secured a pressure impossible by any other means adaptable to the conditions, and costing practically nothing. Of course, any block of hard wood would answer the purpose, but curtain poles happened to be plentiful at the time.—Contributed by R. E. Bates, Mansfield, Mass.

HOW TO DRILL BRICK, CEMENT, STONE, ETC.

Seeing an article in Shop Notes describing a method of making a drill for small holes in brick and cement, reminded me of a drill for making larger holes, which I have used



Drill for Brick

with great success in perforating walls over a foot thick.

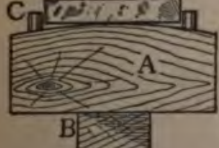
All that is needed is a piece of ¾-in. gas pipe with the end cut off square and cut with teeth as shown in the sketch. The teeth may be cut with a three-cornered file, and should be of a liberal number and all the same length so that each tooth will do its share of cutting.

In using this drill strike light, quick blows with a machinist's hammer, at the same time revolving the pipe.

If a very deep hole is to be drilled, use a short pipe at first to get the hole started, finishing with a longer piece, and if the teeth become very dull, remove the drill and sharpen with a file.—Contributed by Stoke Richards, Santa Clara, Cal.

DEVICE FOR FILING FLAT

In filing flat—a very difficult operation—the device illustrated will be found convenient. The illustration is an end view.

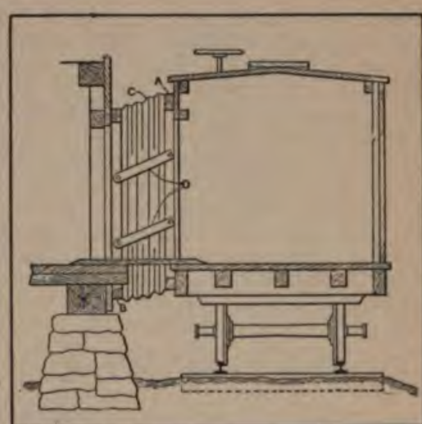


A block, A, of metal or wood and slightly rounded on the top is caught in the vise by the part B. Pins, C, hold the piece to be filed on the rounded top as shown. The file is worked backwards and forwards on the work, says the Model Engineer, London, and the rounded top allows the job to rock to accommodate the motion of the file, and no difference how the file is pushed about, one is always filing flat.

COLD WEATHER VESTIBULE FOR SHIPPING ROOMS

In transferring freight from the shipping room to a box car in winter so much cold air enters with the opening of a door that it is often uncomfortable to work in the room. One company, says Machinery, got around this difficulty by devising a handy vestibule which folds up bellowslike against the side of the building when not in use. The device is shown in the sketch.

A light rectangular framework, B, surrounding the shipping door is fastened to the outer wall. A similar framework, A, is connected to this by two swinging arms, D, on each side, and between these two frames is fastened the tube, C, of heavy close-woven duck, or some other similar material. When the box car is in place, the weight of the outer framework, A, acting on the arms, D,



The Vestibule in Place

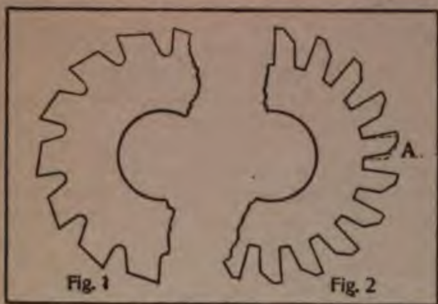
tends to hold it firmly against the side of the car, thus forming an enclosed passageway between it and the building tight enough to prevent the wind from entering to any great extent.

TO CLEANSE MERCURY

Put a 10 per cent solution of nitric acid in an iron ladle and add the mercury. Place the ladle over a blacksmith's forge, says Machinery, until the nitric acid boils. The dirt will rise to the top and the mercury, perfectly clean, remain at the bottom. Do not let the mercury boil, the fumes are poisonous.

HOW TO MAKE A MILLING CUTTER WITHOUT BACKING

The ordinary milling cutter, shown in Fig. 1, has the teeth backed off, or, in other words, cut away for clearance between the tooth and the work at all places except the cutting edge. This is a condition that is



Backed and Unbacked Milling Cutters

necessary in all machine tools, and is usually very difficult to obtain. This is especially true of milling machine cutters where the backing is usually done by hand in a special lathe, or in very expensive machines used by tool manufacturers.

To obviate the necessity of backing, the cutter can be made as shown in Fig. 2. Then when it is tempered the teeth will spring back, as shown exaggerated at A, and give a slight clearance at the backs of the teeth.—Contributed by L. G. Harren, 14 Barnett St., New Haven, Conn.

SPARK PLUG EFFICIENCY

A spark plug that emits a long-distance spark outside the cylinder, will not always do the same within the cylinder in the middle of a highly compressed charge, says the Automobile. It may be weak or fail entirely at the critical time. The vigorous spark is the effectual one.

ONE MAN TO CARRY LONG LADDER

One man can carry a long, heavy ladder with ease by using the device illustrated herewith. Little blocks slide along a shaft for adjustment to the ladder's width and into these blocks the ends of the rails fit. Then by taking the other end of the ladder, one can wheel it to any point desired. The wheel should be made of a piece of plank.

INFLATING AUTO TIRES

For the proper inflation of auto tires a good registering pump is necessary. Press the valve in with the pin in the cap to make sure it does not stick. Raise the pump piston to the top of the cylinder and push all the way to the bottom, says the Automobile, giving full steady strokes. Each time the plunger descends the gauge pointer will fluctuate more or less beyond the center of equilibrium, according to the rapidity of the stroke. To find the constant pressure, a full, slow stroke should be given, and near the end the plunger should be held stationary, equalizing the pressure in the pump and tire. The gauge pointer will then slowly find its balance and remain stationary, pointing to the figures of the real pressure in pounds.

If the tire is inflated with air at 68° F., the increase of pressure by reason of the temperature of the air in the tire being raised by frictional heat will not be sufficient to cause it to burst.

TO PRESERVE HEADS OF STEEL TOOLS

When the head of a cold chisel or other tool becomes flattened as shown at A, do not continue using it but heat to a dull

Effects of Crystallization

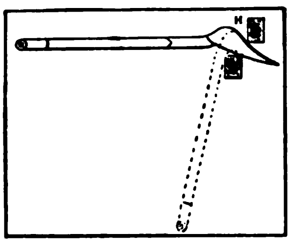
red and then dress the head as shown at B. Simply grinding the head, without heating, will not be satisfactory, as the steel is usually crystallized at the flattened end and it is necessary to heat it in order to restore its original life and strength. For this reason the heads of steel tools should be heated occasionally whether flattened or not.—Contributed by Hiram Stitt.

CEMENT FOR SLATE

Switchboards and other articles made of slate, which have become cracked, can be repaired by using a cement made of slate dust and a solution of silicate of soda. If this is worked thoroughly into all the cracks and given a smooth surface it will hardly be noticed when dry and will not crumble or break.—Contributed by Raymond W. Johnson, Wade Park and E. Madison Aves., Cleveland, O.

HOME-MADE ASH-HOE

A worn-out firing scoop makes a light and convenient ash hoe, says a correspondent of the Engineer's Review. Heat the scoop red hot at the point indicated at H in the illustration, having previously prepared a place for bending, as shown. Bend, bringing the handle into the position indicated by the dotted lines, and let the scoop cool. Remove the old shovel handle and replace it with a long hoe handle, which rivet in place.



COLORINGS FOR CEMENT BLOCKS

For red sandstone add 22 lb. of an aggregate iron oxide, called mineral paint, to each barrel of the dry mixture of cement. For lighter shades use less of the coloring matter.

To get a brown shade add Germantown lampblack to the above. For a pleasing gray use the lampblack alone, 2 lb. to the barrel of cement.

A good blue is produced by using 19 lb. of ultramarine to a barrel of cement, and for green use 23 lb. of the ultramarine.

For yellow use 23 lb. of yellow ochre to a barrel of cement; use the same quantity of brown ochre to procure a good brown.

In using these coloring materials mix in a dry state till no streaks are visible, then add water and mix and tamp as before. While the blocks are moist the color will be much darker than when they are dry, it must be remembered.

Always use the least amount of coloring possible to give a good shade, warns the American Carpenter and Builder, as most of the pigments used are of a clayey nature, ill-adapted to stone making.

WHEEL STAND FOR THE SHOP

When working with wheels, washing, painting, or striping them, a wheel stand is a handy device to have in the shop.

To make a wheel stand cut off an old ⅝-in. axle, B, 18 in. from the shoulder and bend it 1½ in. from the shoulder, leaving the front round, a little higher than the collar so the wheel will not run off. Make the other end to fit 6 in. into an iron pipe, A, 8 in. long.

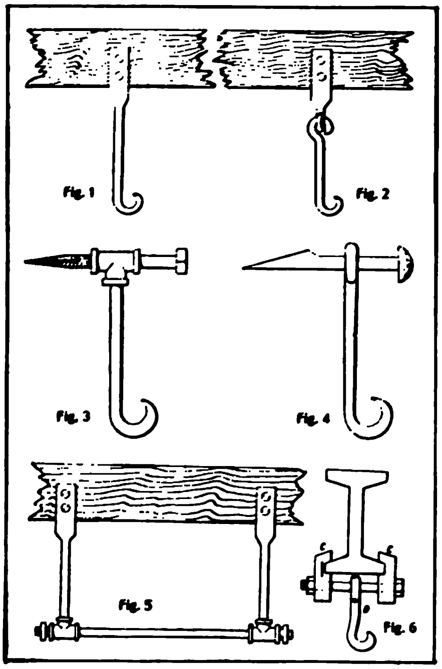
Home-Made Wheel Stand

Make the feet of four pieces of old 1-in. tire, C, 18 in. long. Swage 2 in. of one end of each foot to fit into pipe A from below and bolt together with $\frac{3}{16}$-in. stove bolts. Take two pieces, D, 23 in. long, and swage and bend them off 1½ in. at both ends to fit against the legs. Rivet them together where they cross at the center. This will leave the round side of the tire up, says the Blacksmith and Wheelwright. The straight piece, E, can be substituted for B and used for face striping spokes. The paint glass may be laid on the end of the hub for convenience.

The electrical conductivity of distilled water is 6,754,000,000 times less than that of copper.—Culley.

HANGERS FOR SUPPORTING PIPE

For supporting pipe do not use a hanger like the one shown in Fig. 1; it is liable to bend off at A, being affected by the expansion and contraction of the pipe. This defect, says the Engineers' Review, can be



Several Forms of Pipe Hangers

overcome by the method shown in Fig. 2. Two simple hangers that give good satisfaction are shown in Figs. 3 and 4, while where several pipes of small diameter are run together, the hanger shown in Fig. 5 is good. Hooks like those shown at C C in Fig 6 can be used where I-beams instead of wood joists are used. A hook should be made at the top of the binding bolt at D.

CEMENT FILLING FOR COMMUTATORS

The shellac and plaster-of-paris cement commonly used for commutators soon deteriorates as a result of the heat. A better cement, and one which will not carbonize, can be made by mixing plaster-of-paris and a solution of silicate of soda.—Contributed by Raymond W. Johnson, Cleveland, O.

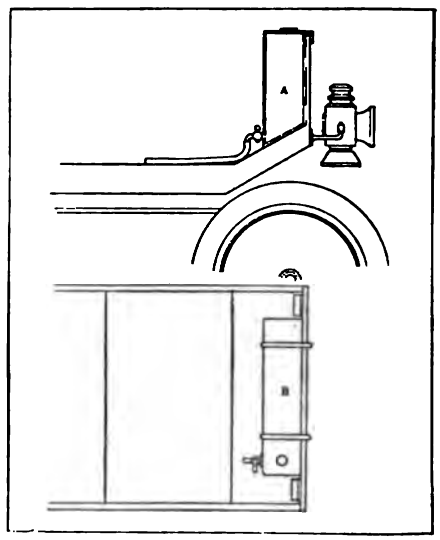
The popular notion that hot water freezes more quickly than cold with air at the same temperature is erroneous.—Trautwine.

SOLDERING ALUMINUM

For soldering aluminum make a solder of 80 per cent tin and 20 per cent zinc, using stearic acid as a flux. Tin the surface of the aluminum with this solder, moving the copper bit backwards and forwards over the metal and flowing the solder, says Machinery. The film of oxide that prevents the ready soldering of the aluminum can then be cleaned off and the metal soldered with either the above-named solder or tinsmiths' solder.

GASOLINE STORAGE TANK FOR STEAM AUTOMOBILES

Owing to the reduction in price of steam runabouts, there are at present a great number in use all over the country; one fault is the limited storage capacity of the gasoline tank, which furnishes fuel for about 25 to 30 miles. To reduce the possibility of running short of gasoline on the road, I have designed and constructed with great satisfaction a tank to hang on the inside of the dashboard, between the gauges. The same should be constructed of copper with crimped edges, and hung on iron bands bent



Storage Tank for Automobile

as per the drawing. Have a screw filling cap on top and a tap with short hose on the bottom. The tank can be filled and emptied in its position on the dashboard by use of the hose.

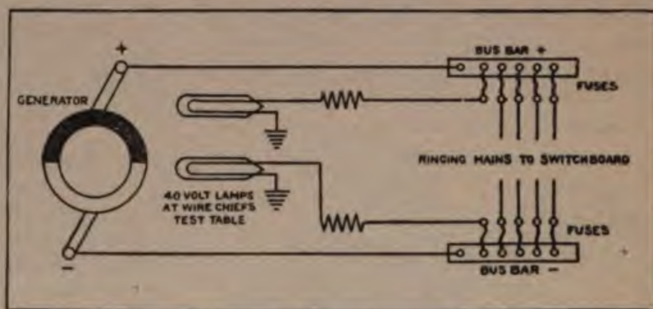
In the drawing A is an elevation and B

a plan view of the tank in position.—Contributed by Prentice P. Avery, Box 311, Ridgewood, N. J.

VOLTAGE INDICATOR FOR SELECTIVE RINGING GENERATORS

Constant voltage of the ringing generator is an important matter in exchanges where selective ringing is used on subscribers' lines. A good indicator for showing the variation in voltage is made of lamps placed so as to be constantly under the observation of the wire chief, says the American Telephone Journal. The indicator may be installed as follows:

Connect two switchboard lamps, one to the positive lead and the other to the negative lead as shown in the sketch, inserting the resistance between the lamp and the ringing main. Mount the lamps on the wire chief's test table so that he will see them every time he looks up. As he becomes accustomed to making observation he will be able to detect the slightest variations in pulsations or brilliancy of the lamps. Two 40-volt lamps connected in this way through a 400-ohm resistance have been burning steadily for two months and are as bright as ever.



Indicator Lamps Connected

BRACKET FOR USE IN BENDING WOOD

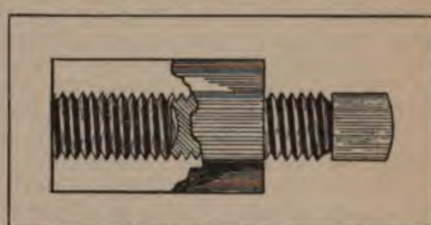
The best woods for bending are ash, hickory, white oak and elm. Ash after being subjected to a steam bath is very pliant and is used extensively for handles. The tight bark or pigment hickory is the best species of this wood for bending, though select parts of three others—peccanut, mocktanut and shellbark—are used also. White oak when treated by steam bends readily and the bending qualities of elm when given the same treatment are said to excel all others.

Bracket in Use

In the bending process, the wood does not stretch, but contracts, says the Wood-Worker, and to force the contraction it is necessary to support the side the strain is on and hold the ends from giving. Fig. 1 shows a device for this purpose. It is a piece of strap iron with an iron bracket riveted on each end. Fig. 2 shows how it is fitted to the piece of wood to be bent and Fig. 3 shows the timber after bending, the outside of the curve being of the same length as before and the inside shorter.

HOW TO REMOVE OLD STUDS

While repairing a pump in the plant where I am employed, I had occasion to remove and replace numerous studs on the same.



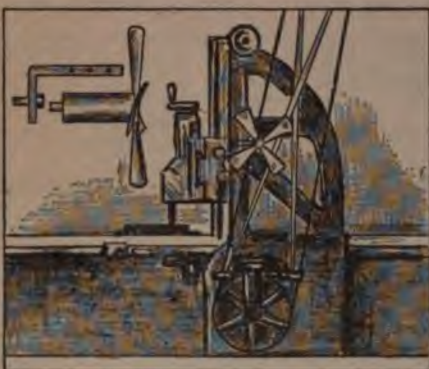
Device for Removing Studs

When there is no shoulder on the stud, a common way to remove it is to use two nuts and by jamming one against the other the stud may be turned by working a wrench on one of the nuts. But in the case of the pump this method could not be used, as the studs, which were all ⅝-in. diameter, were so close together that there was no room to work a wrench.

I then made the device shown in the sketch. A long nut is made out of hexagon steel and tapped to fit the studs. A set screw is then placed in the nut, and when this is screwed up tight against the end of the stud, the friction of the nut is greater than that of the casting which holds the stud. A wrench may then be used on the long nut, which projects above all the studs, thus allowing a complete revolution of the wrench.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

VENTILATING FAN FOR THE SHOP

Make a fan of galvanized iron, screw it to a wood pulley and drive a brass tube through the center of the pulley. Tool a piece of cold rolled ½-in. stock, cut a thread on each end and bolt it to a piece of iron,



Home-Made Ventilating Fan

which in turn bolt to the planer gib. Drill several holes in the iron so the fan can be set over when raising or lowering the head. In the case illustrated the belt is at an angle. This fan could be applied to any power-driven machine, or all of them could be supplied with fans.—Contributed by A. Churchill, 832 E. 32nd St., Portland, Ore.

A SIMPLE HOME-MADE JACK

In putting a new base under a dynamo a jack was necessary for lifting the machine, and the one illustrated was improvised. A ¾-in. bolt 8 in. long, threaded its entire length, and a nut and a piece of pipe were the materials used.

The head of the bolt was placed on the floor beneath the dynamo. Then, by screwing upon the nut, the dynamo was lifted a

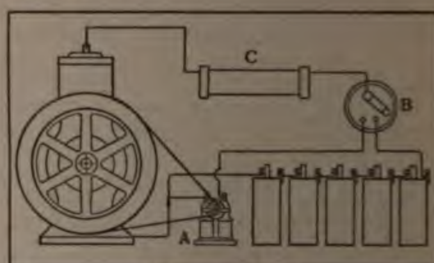
Handy Jack

certain amount, and blocked in position. The jack was then raised higher by placing blocks beneath the head of the jack, and the dynamo was again lifted. This mode of lifting was continued until the dynamo was raised sufficiently high to permit of inserting the new base and the removal of the old one.

For the nipple a piece of 1-in. pipe was used, says the Engineers' Review, and stood the strain nicely. A washer between the nut and the nipple improves the jack, and the head of the bolt should rest in a countersunk plate to keep the bolt from traveling.

WIRING FOR GAS ENGINE

It is often difficult to start a gas engine which is ignited by a dynamo and for this reason batteries are used in connection with the dynamo. In the wiring diagram shown in the sketch A is the dynamo, B a two-point switch, and C the spark coil. This wiring is intended for use with make and break engines and will not do for jump-spark engines.



Wiring for Gas Engine

To start the engine place the switch on the right-hand point. This throws the batteries in the circuit, and allows starting the engine with very little effort. Then after the engine has run a few seconds the switch can be turned to the left-hand point, thus throwing out the batteries. With such small demands the batteries will last a long time. —Contributed by H. H. Fountain, 207 9th St., Brooklyn, N. Y.

Greasing the molds, or painting them with coach varnish twice a month will keep cement blocks from sticking. Use the best grade of black coach varnish.

In 1905 the copper product amounted in value to $137,498,727. This is the largest product of copper ever recorded in the United States.

TAR ON THE HANDS

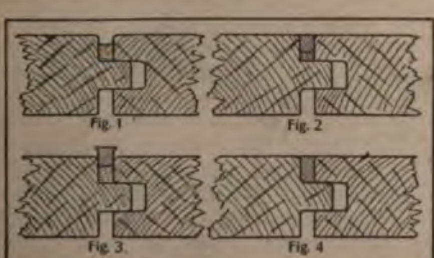
An exchange recommends rubbing the hands with the outside of fresh orange or lemon peel, and wiping dry immediately. It is astonishing what a small piece will clean. The volatile oils in skins dissolve the tar, so that it can be wiped off.

HOW TO PUTTY CRACKS IN FLOORS

Some of the readers of Shop Notes may have had trouble in filling cracks in floors, previous to painting. It seems that no matter how tightly the putty is pressed in with the putty-knife, it will rise out of the cracks and project above the surface of the floor a few days after the paint has been applied, thus producing a very undesirable appearance.

This is usually caused by the presence of dust in the cracks and by applying too much pressure to the putty. As it is almost impossible to fill the cracks without applying considerable pressure to the putty, it becomes necessary to remove the dust or dirt. The necessity of this operation is illustrated in the accompanying sketch. Fig. 1 shows a crack in the floor with a quantity of dust at the bottom. This dust is compressed by the application of the putty, as shown in Fig. 2, and as the compressed dust is somewhat elastic, it tends to expand to its original volume. This results in raising the putty from the cracks as shown in Fig. 3.

In order to prevent this defect, run the pointed end of a file or other pointed object



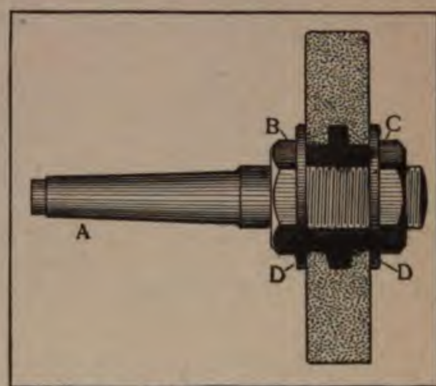
Correct and Incorrect Methods of Puttying Cracks

through all the cracks, thus removing all the dust. Then apply turpentine to the cracks by means of an oil can. This soaks into the wood and causes the putty to stick better, at the same time softening the putty and allowing it to fill all parts of the cracks as shown in Fig. 4. Cracks puttied in this way will remain filled for years and will be practically invisible.

EMERY WHEEL HOLDER FOR LATHE

Having a lathe and emery wheel, but not a wheel holder, I devised the following center for holding the wheel in the lathe:

My emery wheel is 1 in. thick and has a 1-in. hole, so I turned a piece of soft steel



Center with Emery Wheel Attached

1 in. in diameter and 6 in. long to fit the center hole in the lathe, as shown at A in the cut. The other end was threaded for the nuts, B and C, one of which, B, was pinned to the shaft. Both nuts were supplied with washers, D D, as shown.

If desired, a straight piece of steel may be used in place of the tapered piece, but it will then be necessary to either use a chuck or make center holes in each end and use a dog.—Contributed by Donald Reeves, Oak Park, Ill.

STRENGTH OF WOODEN TANKS

The hoops on a wooden tank determine its strength. Flat hoops are less satisfactory than round. Round hoops do not rust so quickly, and are not weakened so much by a little rust as are flat hoops; also, when the tank swells, they are not apt to burst, but sink into the wood, instead.

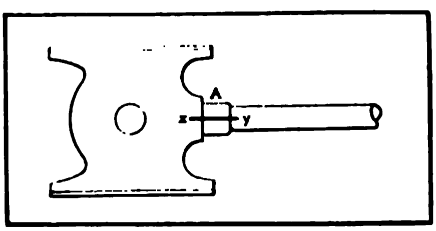
Cypress, cedar or white pine, free from imperfections and thoroughly dry, are the species of wood advised by the fire insurance authorities for cylindrical wooden tanks. Michigan pine, free from sapwood, is most durable where the tank is exposed to freezing.

STEP LADDER FOR STAIRS

An ordinary step ladder cannot be used on stairways, but by adding the attachment here shown it can be used in that position with perfect safety. Fasten on an extra pair of legs somewhat shorter than the original legs and arrange so that either pair may be used when wanted. Hooks and eyes may be used on the long legs to hold them against the ladder when using on a stairway, thus making the device easier to move up and down stairs.—Contributed by John Weldon, 433 Columbia St., Brooklyn, New York.

LOOSE PISTON ROD INDICATOR

It sometimes happens (in fact, quite often) that when a piston rod is screwed into the crosshead it will work loose and commence backing out while the engine is running. The clearance is often very small and generally the first hint the engineer gets of something being wrong is a gentle tap, tap, tap of the piston on the cylinder head. In cases where an engine gives this kind of trouble, the expedient illustrated in the sketch will prove useful, says a corre-



Loose Piston Rod Expedient

spondent of Power. Here A is a jam-nut and X Y is a black stripe of paint, say, ½ in. wide, drawn across the crosshead boss, the jam-nut and along the side of the piston rod. This stripe can be seen quite plainly while the engine is in motion, and if the or nut commences to turn, the broken will be noticed immediately.

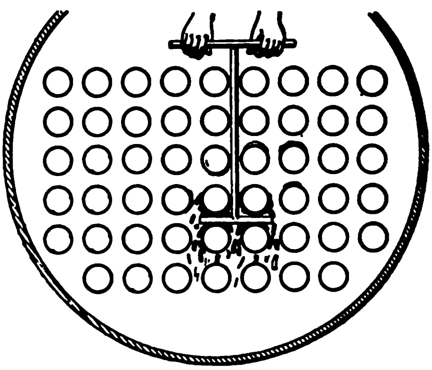
READING THE WEIGHT OF AN ANVIL

The figures on an anvil indicating its weight form a puzzle to many a smith and mechanic who has not learned how to read them. The figures state the number of gross hundredweight of 112 lb., quarters of hundredweight and the extra pounds, says the American Blacksmith. For instance, the figures 2-1-18 on an anvil mean two hundredweight of 112 lb. each, or 224 lb., plus one quarter hundredweight, or 28 lb., plus extra pounds, 18, amounting in all to 270 lb.

DEVICE FOR CLEANING BOILER TUBES

A simple and good device for cleaning scale from boiler tubes may be made as follows:

To a piece of ¾-in. rod, 18 in. long, weld an angle or cross bar at either end, the bottom piece to be 8 in. long and made square



Scale Cleaning Device

to cut the scale, says the Engineers' Review, and the upper piece 12 in. long to serve as a handle.

In using the tool, the bottom or shorter end is shoved down between the tubes and is then used auger fashion. By so doing, the bottom bar is turned crosswise to the tubes, which pushes the scale out from both rows of tubes on either side. By moving along the tubes one is able to clean the entire lot in a very short time. This device removes the scale from the top and bottom tube at the same time, letting the scale fall to the bottom of the boiler, where it can be easily removed.

In tapping out nuts or cutting thread with a die, use good lard oil.

TEMPORARY REPAIR FOR A LARGE PULLEY

A novel method of making a quick repair for a large pulley was used in a large textile finishing plant, where a pulley 84-in. diameter and 36-in. face suddenly broke, at

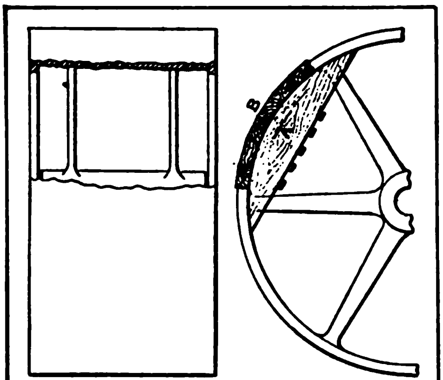


FIG. 1 FIG. 2

Repair for Pulley

a time when the plant was behind in orders, and simply had to run in the shortest possible time. None of the supply houses in the vicinity could furnish a new pulley of the required size, so the master mechanic had to make a temporary repair, which is described by a correspondent of the American Machinist as follows:

The piece of pulley rim broken out was approximately the section between two sets of arms, and was roughly from 2½ to 3 ft. across, as shown in Fig. 1. As the rest of the pulley seemed to be in good condition, he had the carpenters get out some 3x12-in. ash, and prepare four pieces to fit the inside of the pulley rim as at A, Fig. 2. These were placed on each side of the arms, and each pair well bolted together, clamping them firmly to the arms. Some pieces of 4-in. ash were then sawed 36 in. long, and bolted to and across the pieces of 3x12, allowing the bolts to pass down between the pieces, countersinking the heads and using nuts and washers underneath. B, Fig. 2, shows the pieces in place. In the meantime a small engine had been moved into a convenient position for driving a section of this shaft, and the pulley and the cross slide from the shop planer had been rigged to hold the tool for turning, so it was a matter of a few minutes only to turn off the section of wood down to the size of the pulley.

Then the nearest coupling was loosened, and the pulley and section of shaft removed to some convenient horses for balancing. It took 136 lb. of lead to do this, and as it was run in between the pieces of 3x12 ash, there was little fear of its getting loose.

After erection, the main belt was replaced and the plant ran on the same as usual for over two months before it was removed to be replaced by the new pulley, and even then it seemed just as good as the day it was repaired.

HOW TO FORGE A GOOD WRENCH

The directions for forging this wrench, as given by a correspondent of the Blacksmith and Wheelwright, are as follows: First take a file or good buggy spring, according to the size of the wrench wanted, as in Fig. 1. Forge this down 1 in. or 1½ in. from the end, as shown in Fig. 2. Then forge a T on each end and keep the corners round (Fig. 3). Then turn each T on the horn of the anvil and bring one end around a trifle farther than the other, as in Fig. 4. In finishing trim off the ends and square up to suit the nut (Fig. 5). In this way

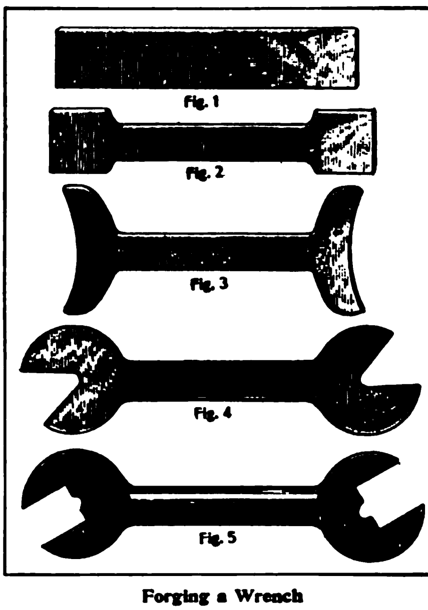


Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5

Forging a Wrench

the grain of the steel is forged around each prong, thus making it a good, strong wrench. Never punch a hole and cut it as this will make the prongs cross-grain

CEMENTING A WATCH CRYSTAL

Anyone can cement a loose watch crystal in place and so avoid the necessity of going to the jeweler's with it. Remove the bezel from the case, place the crystal in position and melt enough sulphur flour to run in around the glass. Heat the bezel and crystal over an alcohol lamp until the sulphur runs down in the groove and around the glass, then let it cool. When cooled, remove all the sulphur that remains outside the groove. This makes a water and dust proof joint and also holds the crystal firmly.—Contributed by M. D. Schaefermeyer, Hayden, Colo.

THE RAIL-SPLITTER'S KIT

A rail-splitter's outfit, such as was used by Abraham Lincoln, is shown in the accompanying illustration. The kit consists of several ironwood wedges (tough wood with a fine grain); a couple of iron wedges to start the splitting process, an ax and a "beetle." The "beetle" (shown in the background) is usually made by the rail-splitter himself, says Wood Craft, and is used for driving the wedges.

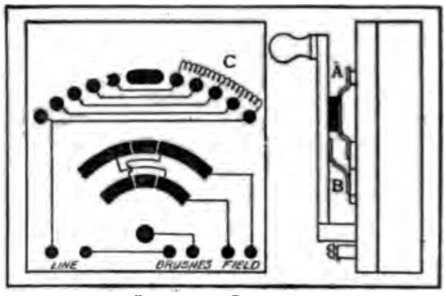
In splitting rails, the ax is struck into the end of the log and the two iron wedges

For Splitting Rails

are then driven into the opening made. As the opening extends along the length of the log the wooden wedges are driven in until at last the log is in two parts. These large pieces are cut up into smaller ones in the way.

HOW TO MAKE A REVERSING RHEOSTAT

A reversing rheostat for changing either the direction or speed of a motor by the operation of one handle can be made by following the diagram shown in the sketch. A and B are copper contacts, A being insu-



Reversing Rheostat

lated from the handle and B connected to it. The resistance coils, C, give the necessary resistance for decreasing the speed.

When the handle is in the center the motor will not move, but when moved to either side the motor will revolve, the direction of the revolution being changed by swinging the lever over to the opposite side.—Contributed by Donald Reeves, Oak Park, Ill.

POWER FROM WINDMILLS

While windmills, as far as we can determine, have very rarely been used for compressing air, there is no reason, however, why they should not be adapted to this purpose. A windmill with a 12-ft blade is commonly rated at 2 hp., and one with a 16-ft. blade is rated at 4 hp. If this power were utilized for compressing air, the results obtained would be as follows:

2 hp. will compress 9.6 cu. ft. of free air per min. to 100 lb. gauge.
2 hp. will compress 11 cu. ft. of free air per min. to 80 lb. gauge.
4 hp. will compress 19 cu. ft. of free air per min. to 100 lb. gauge.
4 hp. will compress 22 cu. ft of free air per min. to 80 lb. gauge.

The above results were calculated on the assumption that 15 per cent be allowed for friction in the air compressor, but as stated by a correspondent of Browning's Industrial Magazine, the allowance for an apparatus of this kind should probably be greater.

It is not considered practicable to use wind power for the generation of electricity.

HOW TO MAKE A SUN DIAL

As sun dials are coming into use again, it might interest the readers of Shop Notes to know how they are made. In making a sun dial it is very important that the angle of the screen or upright piece (see Fig. 1), should be equal to the latitude of the place

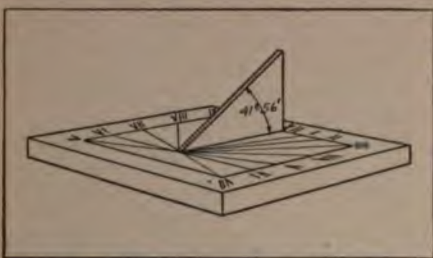


Fig. 1--Sun Dial for Latitude of Chicago

where the dial is to be used. A sun dial which will give the time accurately in one locality, will therefore be inaccurate when moved either north or south any considerable distance. For instance, the dial shown in Fig. 1, which is designed for use in Chicago, would be unsuitable for New Orleans, but if moved straight east or west its time-keeping qualities would not be disturbed.

The latitude of any place can be found by consulting suitable maps. The correct angle for Chicago is 41° 56′ or practically 42°, and for New York it is 40° 43′. The object of making the angle of the screen equal to the latitude, is to have the edge of the screen parallel with the earth's axis, a condition absolutely essential in an accurate dial. It is therefore necessary that the dial, after being made, should be placed in an exactly horizontal position and also that the screen should point directly north and south, the large end being placed toward the north. The screen should also be set exactly perpendicular to the face of the dial.

The material of the dial may be metal, well-seasoned wood, or any other substance which will not warp or change its shape, and it can be made with a round or square base, as may be desired. In marking the divisions of the hours there are two general methods; one in which the divisions are determined by trial and the other in which they are calculated by mathematics and geometrical constructions.

In the former method the dial is placed in the sun in the correct position and the edge of the shadow marked at the end of each hour. It is necessary to take a reading each hour because the spaces are not all equal, as in a clock, but are shorter at noon and longer in the evening and morning, as shown in Fig. 2. While the consecutive hour spaces are not equal they are all symmetrical from the 12 o'clock mark in the center. Thus the space from 12 to 1 is equal to the space from 11 to 12; 10—11 is equal to 1—2; 9—10 equals 2—3, etc. This rule may be applied in checking the results to see that they are accurate.

The latter method, although more ingenious, is not practical, as the theoretical results obtained by calculation are subject to sources of error such as refraction. It is well known that the sun is visible for some time after it has set, this phenomenon being due to the bending of the rays as they pass obliquely through the atmosphere, and the theoretical division of the spaces on a dial will therefore be inaccurate.

The correct divisions of the hours being

Fig. 2--Dial Spaced for Latitude of New York

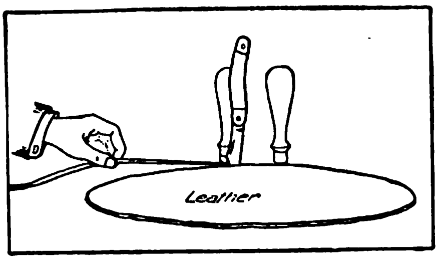
obtained, they may be either painted or scratched on the surface of the dial, which will then be complete. If desired, the half and quarter hour divisions may also be marked, although they may be readily calculated by the eye when not so inscribed.

To soften putty on glass and frames of windows, paint it over with nitric or muriatic acid. In an hour's time it may be easily removed.

CUTTING A BELT

A driving belt 8 ft. long, for a lathe, was cut out of a piece of leather 6 in. square by a mechanic by the following method:

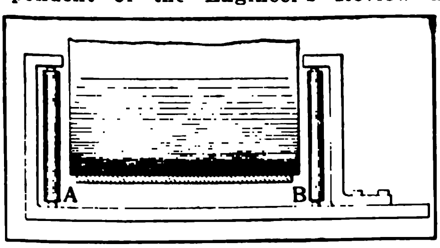
The corners were cut off, leaving the leather circular. Then he cut around the circumference for about 1 in. to the required width of the belt, and fixed a bradawl in a bench, with a knife opposite, at a distance of the width (⅝ in.) of what he wished the belt to be, and another bradawl to steady the cut through, as indicated in sketch, and placing the end of the belt which he had cut between knife and bradawl, drew the whole belting between this space, the knife cutting the belt to an even width.



Cutting a Small Belt

GUARD FOR BELT

To prevent a belt from swinging and striking the frame of the generator, a correspondent of the Engineer's Review attached a guard as shown in the illustration. The guard is made from ½x1½-in. iron; the rollers, A and B, are made of ¾-in. pipe and are set with about ½ in. clearance on each side when the belt is standing.



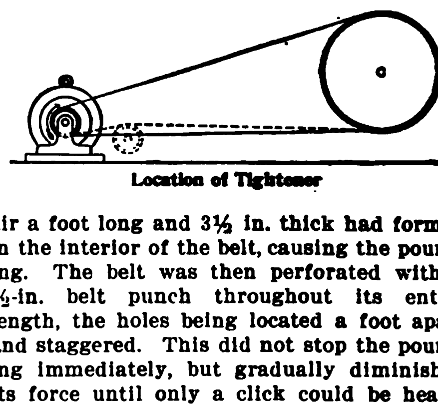
Guide for Belts

For filling holes in castings, use a metal made of 9 parts lead, 2 parts antimony and 1 part bismuth. This metal expands in cooling.

AIR CUSHION IN BELT

In a plant where a 57-k. w. generator was used as a motor to drive a line of shafting, the paper pulley on the motor being 16 in. by 12 in.; the pulley on the line shaft, 72 in. by 12 in., making 190 r. p. m.; the belt of five-ply rubber of good quality and the distance between centers about 17 ft., a pounding occurred at a certain point at each revolution of the belt, increasing in force each time. It was not convenient to stop the motor, and though the belt was not loose, a tightener was applied as indicated in the sketch, in the hope of stopping the pounding, but without success.

At noontime, when the motor was stopped, examination showed that the outer layers of canvas and rubber were detached for almost the entire length of the belt, while the edges still held together, and a cushion of air a foot long and 3½ in. thick had formed in the interior of the belt, causing the pounding. The belt was then perforated with a ½-in. belt punch throughout its entire length, the holes being located a foot apart and staggered. This did not stop the pounding immediately, but gradually diminished its force until only a click could be heard, says a correspondent of Power, and for many days after one could feel the air being forced out through the holes at one point.


Location of Tightener

The heat of one pound of coal will convert from five to eight pounds of water into steam in ordinary locomotive practice.

TO KEEP CONTENTS OF WOODEN PAILS FROM TASTING OF THE WOOD

Water or anything else for "internal use" kept in a wooden pail is apt to taste of the wood. To prevent this, says the Practical Carpenter, fill the pail with boiling hot water and let stand until the water is cold; then empty the pail and wash the inside with a solution of soda in lukewarm water, with a little lime added, after which scald the pail and rinse carefully.

SACKHOLDER FOR VEGETABLE PICKERS

A sackholder which I improvised last year, when something of the kind seemed a necessity, is shown in the accompanying illustration. I raise many acres of winter vegetables and employ many pickers, and

Tripod Sackholder

the holder saves time and labor. When the sack is full, a pull on one leg of the tripod lets the whole weight of the sack on the ground, and it may then be easily unhooked from the filler. In large acreage, there should be one holder at each side of the patch.—Contributed by Chas. H. Sebree, Monrovia, Cal.

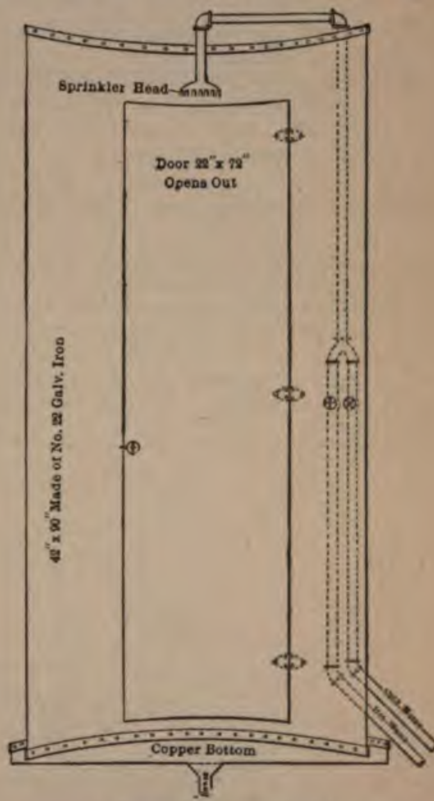
HOW TO MAKE POISON FLY PAPER

Take 1 lb. quassia chips, put them into 2½ qt. water and let stand for 24 hours. Then pour off the liquid and boil it down to 1 qt. Now put the same chips used before into 1½ qt. water and boil down to 1 pt. Pour off the liquid while warm and put in 10 oz. dark brown sugar. When the sugar is dissolved, mix the two liquids. When cool, soak pieces of blotting paper in the liquid for a minute, then take them out and drain and dry them. The paper can be laid away for use at some future time, if desired. To use, place a piece of the paper in a small plate, put a little water on it and set it wherever convenient. —Contributed by F. S. Cummings, 289 Forsyth Av., Detroit, Mich.

DETAILS OF HOME-MADE SHOWER BATH

The home-made shower bath for factories described in Shop Notes for June, 1906, interested so many people and elicited so many inquiries that we publish the accompanying sketch giving further details of its construction.

The bath consists of a cylindrical casing 42 in. in diameter and 90 in. high, made of No. 22 galvanized iron. The casing is intended to rest in a copper tray or bottom



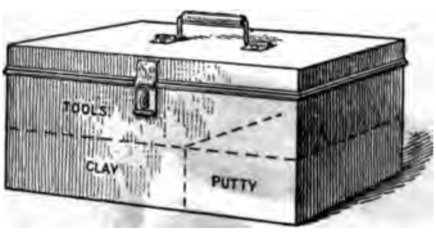
Convenient Shower Bath

which is connected with the sewer and prevents water from overflowing upon the floor.

At the top of the casing is a shower head with hot and cold water connections. In the side of the casing is a door 22 in. x 72 i· which opens out.

CHEST FOR STOVE JOBBER'S KIT

For carrying the stove jobber's kit a small metal chest, such as illustrated, is most convenient and suitable. The top part is for the tools, comprising one brace with chuck and drills, center and rivet punches, cold chisels, screwdriver, hammer, pliers, hand snips, files and a small trowel.



A Handy Kit

The bottom, says a correspondent of the Metal Worker, has spaces for fire clay and stove putty and compartments for wire, stove bolts and similar supplies.

PORTABLE FORGE FOR THE SHOP

The accompanying illustration shows a portable forge, which was designed and constructed in one of the large railway shops, where it has proved to be very useful and convenient.

Either coal or charcoal can be used for fuel, says the Railway Review, and by making slight alterations and adding a suitable tank, oil may be used.

The top frame, a plan detail of which is shown in the illustration, should be made of ¼-in. sheet steel, but the hood may be made of lighter material. The device is intended for use in shops where compressed air is used, which can be supplied by means of nipples permitting a coupling direct to the compressed air connections.

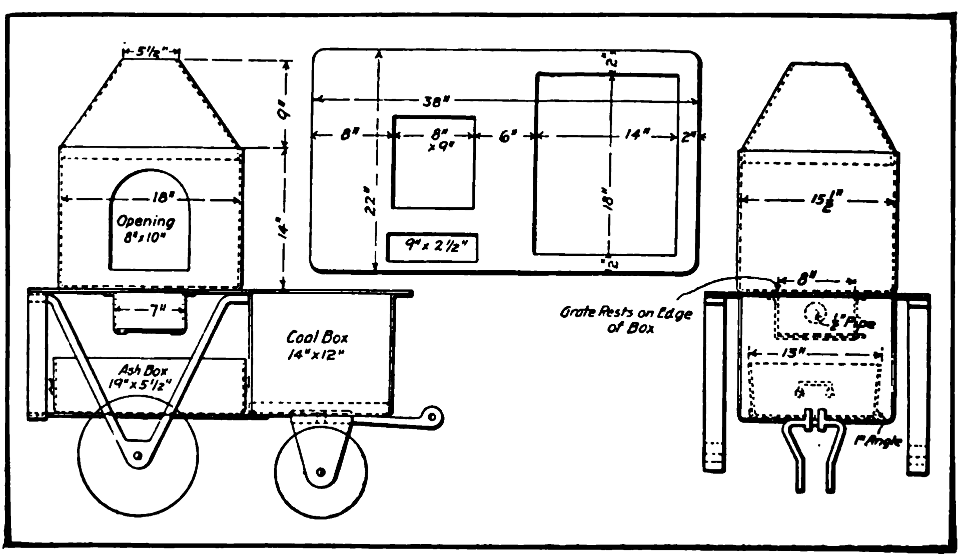
FASTENING STEEL TOOLS IN THEIR HANDLES

When the steel tool comes out of its handle, fill the handle with powdered rosin and a little rottenstone, says the Practical Carpenter, then heat the tang of the tool redhot and push it into the handle. When cold the tool will be held firmly in place.

TO REMOVE DISCOLORATION FROM IRON AND STEEL

When iron or steel has been colored blue by exposure to heat, try rubbing it lightly with a sponge or rag dipped in sulphuric, nitric or hydrochloric acid, until the discoloration is removed. Then wash the metal, dry by rubbing, warm it and give a coat of oil so it will not rust.

When boilers leak along a seam or about a flue, try putting a pint of cornmeal in the boiler.

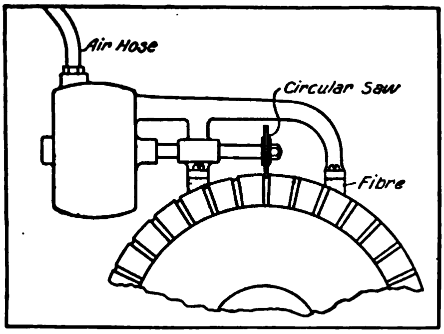


Home-Made Portable Forge

SHOP NOTES

UNDERCUT COMMUTATORS

It has been found to be good practice to undercut the mica, to the depth of about 1-32 in. between the commutator bars on all of the larger types of both direct and alternating current commutator type railway motors. It is claimed of commutators so treated that the heating from poor commutation, which in the untreated commutator is caused chiefly by unequal wearing of mica



For Undercutting Commutator Insulation

and copper, is reduced to a minimum, also that it is not necessary to use as heavy a spring tension, which cuts down brush friction and its consequent heating. It also reduces the breakage and chipping of carbons by cutting out the hammer effect which is produced by running over a roughened surface with a 7- or 8-lb. spring tension.

The method adopted by one of the largest manufacturers is clearly shown in the illustration, and needs but a few words of explanation. The armature which is to have its commutator under-cut is set up on a couple of horses, and the tool (see sketch) is started in the groove at the inside end of the commutator.

The tool consists of a small air motor with an extended shaft and an outboard bearing. On the outer end of the shaft is placed a small circular saw, about 1-32 in. by ¾ in. Two blocks of fiber, cut to the arc of the commutator, are riveted to the outboard bearings, to act as guides, also as gauges to prevent the saw from cutting too deeply

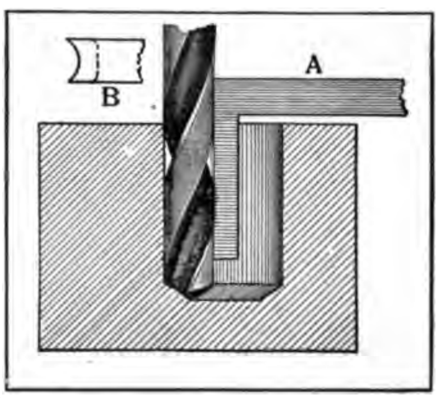
After the mica is under-cut the commutator is cleaned up and polished in a lathe; then the armature is subjected to a bar to bar resistance test. A current is applied to the winding on any two adjacent bars and the voltage read; comparative readings are then made on all of the bars around the commutator, 1-2, 2-3, 3-4, 4-5, etc.

A good substitute for the air motor would be a heavy flywheel with a pedal arrangement and a flexible shaft, similar to a dentist's drill, only larger.—Contributed by G. D. H.

TO DRILL CAVITIES OF ANY DESIRED SHAPE

This may be easily done by employing a steel finger, A, shown in plan at B. The finger is made of tool steel, hardened, and is made concave along the edge, to fit the radius of the drill. To make the cavity, first drill a hole the required depth and then move the work along and drill again, using the steel finger to guide the drill and prevent springing or breaking it. Continue in this way until the desired shape is obtained.

The manner of holding the finger in position is not shown in the cut, as each problem presents different conditions and requires individual treatment. In my work a cylindrical piece requires a cavity in one end, so I made a collar to fit the cylinder

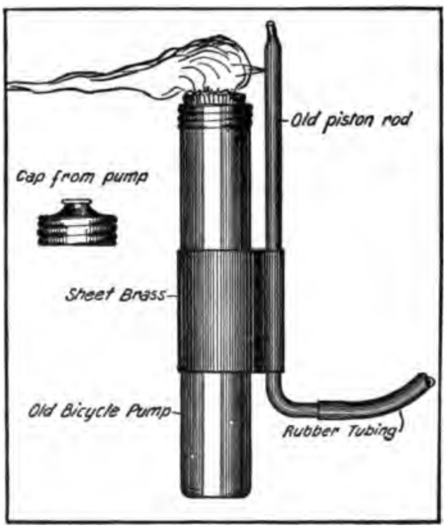


Drilling an Oval Shaped Cavity

and then fastened the finger to the collar with a cap screw. The finger was enlarged and slotted to receive the cap screw and thus allowed the necessary adjustment. But the manner of fastening the finger, A, can be changed to suit the work, and if not objectionable can be fastened to the work itself.—Contributed by L. G. Warren, 14 Barnett St., New Haven, Conn.

HOW TO MAKE AN ALCOHOL BLOW-TORCH

A good alcohol blow-torch suitable for soldering and experimental work can be made from an old bicycle pump and a piece of rubber tubing. Cut the handle and piston off the small tube and pinch one end of the tube together with a vise or a pair of pliers. If not then airtight it should be soldered. Drill a 1-32-in. hole about ½ in. from the



Home-Made Alcohol Blow-Torch

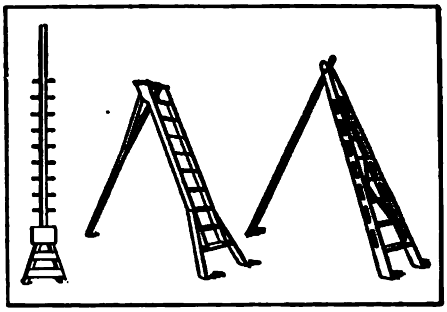
end, or if you have no drill that small, use a brad and small hammer.

Bend a piece of sheet brass to fit the cylinders snugly and solder the tube to it as shown. Then attach the rubber tubing to the lower end of the brass tube. Fill the cylinder with a piece of torch wick and pour alcohol in the top. Then light the wick and adjust the blast tube to give the desired form of flame.

Solder a small piece of tin over the hole in the cap and use it as a cover for the torch when not in use. This prevents the alcohol evaporating.—Contributed by B. Washington, Bar Harbor, Maine.

FRUIT PICKING LADDERS

An ordinary ladder is not suitable for fruit picking, as it cannot be placed near the edges of the tree where the fruit is most abundant. A step ladder is a little better, but is usually very unstable, as one leg is



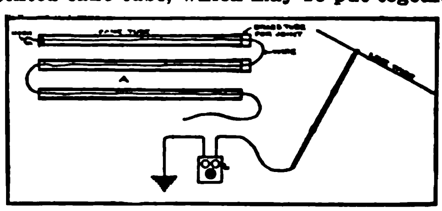
Ladders for Picking Fruit

usually off the ground. The ladders shown in the accompanying illustration, from the Rural New-Yorker, are the kind generally used for fruit picking, although the single pole ladder at the left is considered dangerous by many. The middle one is perhaps the most preferable, as it has a wide base and wide steps.

DEVICE FOR RURAL TELEPHONE INSPECTION

Telephone linemen, who frequently have occasion to call the home office or one of the stations, will find the following device very useful and convenient. This contrivance, which was designed by a correspondent of the American Telephone Journal, has been found to make the inspector's work more easily accomplished than if he carried climbers and put them on and climbed up a pole each time he wished to make a test.

The device consists simply of a triple jointed cane tube, which may be put together



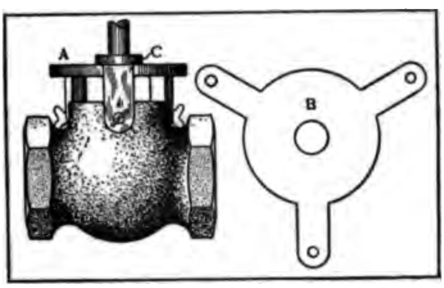
Extension Cane Pole for Tapping Wires

in the same way as a fish pole. It carries a wire or lamp cord through the center, terminating in a hook and fastened in a plug at the upper end. The wire at the l end may be terminated in suitable snaps for fastening to a telephone or test box. If it is used on a grounded line a ground rod and mallet may be carried, and still the work of connecting to a line and talking is easier than is possible for a person who has to hold tightly to a pole without cross arms. Of course, a double cane would be necessary for a metallic line. This device may be carried in a buggy or on a horse's back, and as it weighs but a few ounces and can be put together in a few seconds, it has given very good results in actual service.

TO REPAIR LEAKY VALVES

When the brass seats of globe and angle valves become worn so that they leak badly the device here illustrated will be found useful. Remove the bonnet from the valve and clamp on the iron piece, A, which is made by cutting out a piece of sheet iron or steel as at B, and bending the three legs down and tapping to receive the three thumb screws.

A bushing, C, will be required, and should



Valve Grinding Jig

have a hole just large enough to admit the valve stem. By making a number of bushings of different sizes the device may be used on different sized valves.

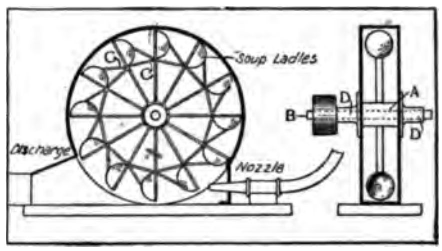
To grind a valve, replace the bonnet with the jig as shown and put a little emery dust and oil on the valve seat. Then turn the stem, first in one direction and then in the opposite direction, at the time applying vertical pressure to make the emery take hold. Valves ground in this way are just as good as new and unless very badly worn or cut by the steam can be easily and quickly repaired.—Contributed by Scott H. Phillips, Fairmount, W. Va.

The world's annual production of raw silk is 61,000,000 lb., of which China produces one-half and Japan one-fourth.

HOW TO MAKE A WATER WHEEL

Make a wooden hub, A (see sketch), and bore to fit the shaft, B. Fasten a number of soup ladles to the hub, as shown, and connect with metal strips, C C. These may be obtained from the handles of the ladles, if of sufficient length, and should be firmly soldered together.

The outside casing may be constructed of wood or heavy galvanized iron and should



Home-Made Water Motor

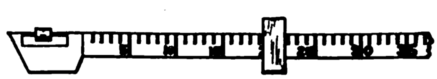
be strong enough to support the bearings, D D. These may be made of pieces of pipe with flanges screwed on the ends, the pipes being then poured with babbitt, or they may be made from castings of a wood pattern made specially for the purpose.

The nozzle may be constructed of heavy galvanized iron, well soldered together and fastened to the base, as shown. If the wheel is well balanced and the bearings carefully made a motor of this kind will run up to 3,000 revolutions per minute.—Contributed by Lee R. Clarke, Bozeman, Mont.

RENUMBERING SCALES

A novel method of renumbering scale beams, which through continual use and exposure to smoke, dust or other substances, have become very indistinct, is described by a correspondent of the American Miller as follows:

You can always have nice, visible white figures on your scales without employing an

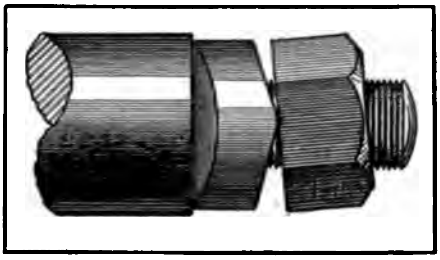


Plain Numbers on Scales

expert painter to renumber them, simply by taking a piece of common white chalk and rubbing it over the numbers on the beam. You can make your one-half pound marks blue and the pound marks white by employink chalk of those colors.

AN UNIVERSAL WASHER

All machinists know that when a nut is tapped out of true and then screwed up tight, the strain will all come on one side of the threads. In the case of milling machine arbors and other devices requiring great accuracy, the threaded portion is liable



Washer for Inaccurate Nuts

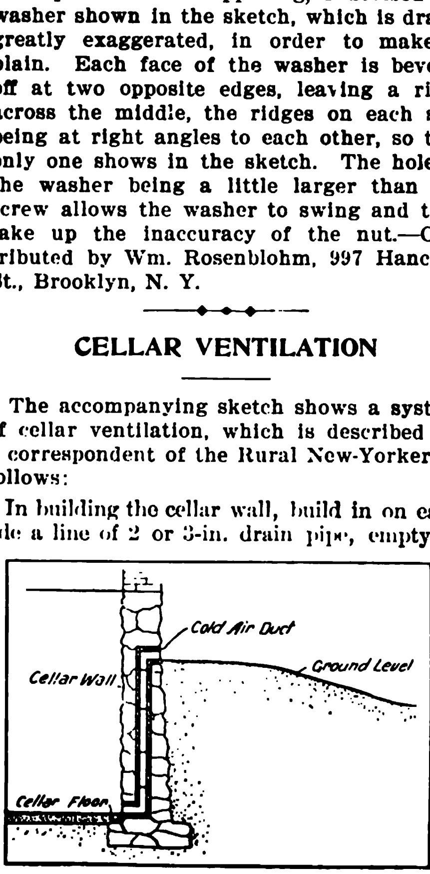
to be damaged, either by being sprung, or by having the threads stripped.

To prevent this happening, I devised the washer shown in the sketch, which is drawn greatly exaggerated, in order to make it plain. Each face of the washer is beveled off at two opposite edges, leaving a ridge across the middle, the ridges on each side being at right angles to each other, so that only one shows in the sketch. The hole in the washer being a little larger than the screw allows the washer to swing and thus take up the inaccuracy of the nut.—Contributed by Wm. Rosenblohm, 997 Hancock St., Brooklyn, N. Y.

CELLAR VENTILATION

The accompanying sketch shows a system of cellar ventilation, which is described by a correspondent of the Rural New-Yorker as follows:

In building the cellar wall, build in on each side a line of 2 or 3-in. drain pipe, emptying



Section Through Ventilating Duct

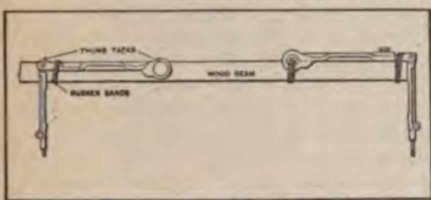
into the cellar just above the floor, and into the open air just above the ground level. During the summer these can be left open, and the cool air of early morning will flow in, and the cellar will be cool and pleasant all day. During the winter they can be closed except when it is desirable to ventilate or air the cellar, which can be done better and with less danger of frost by opening these ducts than it can be by opening windows.

REPAIRING WASHED OUT TRESTLE

One of our readers, Geo. W. Crumb, of Bloomfield, Mo., formerly president of the Missouri Southwestern Railroad (now a part of the 'Frisco system), tells how, a few years ago, he had to repair a washed out trestle approach to a river bridge on his small line, using 40-ft. piling, a pendulum driver mounted on a flat car and operated by a detached portable engine, drum and ordinary drop head. He says: I discovered that the piston head of the driver engine was so worn that it wasted a large part of the steam and power and that its boiler was unsafe. No machine shop was accessible. To obviate these difficulties, I disconnected the pile-driver engine from its boiler and connected it, by 50 ft., or more, of pipe to the boiler-head of the locomotive. To make it elastic and allow for the "slack" between the locomotive tender and the driver car, I put in a flexible joint, over the coupling (draw-head made with six "ells"), three short nipples and two pieces of pipe, 4-ft. long and a union, making, with the union, four joints, the 4-ft. pieces of pipe extending upward and joined at the top, thus allowing plenty of lost motion, or "slack." Then I put a suitable sheave in a heavy strap shackle, attached it to the top of the trip shackle for the hammer and passed the hammer hoisting rope down from the driver head under the special sheave and back to the gallows head, where it was made fast. This, of course, doubled the pull of the pile-driver engine and made it ample for the 2,000-lb. hammer. The flexible joint worked with very little leakage. The piling was delivered a thousand feet from the washout, at the side of the track, each stick being pulled in front of the leads by the driver engine and the hoisting line raised in the clear and the whole train was then run to the washout (1,000 ft.), adjusted, the piling placed between the leads and driven from 12 to 15 ft. Within two days, in midwinter, in a continuous snow and rain storm, with six men, we drove four bents (16 pieces of piling), put on caps, stringers and ties and ran the train across the break, the piling being all driven in a swollen stream. Of course, large railroads are always prepared for such emergencies.

A SHORT-ORDER BEAM COMPASS

A friend of mine, having need of a beam compass in a land where there was none,



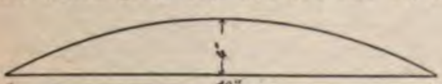
Beam Compass Made From Ordinary Compass

hit upon a scheme as illustrated by the sketch, writes a correspondent of Machinery. He dismantled the compass belonging to his drawing set and fastened the needle-point end firmly to a stick about one-half inch square, and of the desired length. This fastening was accomplished by first notching one side of the stick to admit the hinge of the compass leg, so it might lie squarely on top, and tying it with stout cord. The pencil leg was fastened by a thumb-tack through the eye, another on top to prevent "back-lash," and some rubber bands. This part, by the way, was placed at the side and not on top of the beam. The radius was easily adjusted by removing the two thumb-tacks and sliding the pencil leg to the right location. Once constructed, the compass worked as well as an expensive beam compass.

LAYING OUT SEGMENTS

When it is necessary to saw out a lot of segment pieces, such as are used over door and window frames, says the Wood-Worker, proceed as follows:

Suppose the segments are to be 48 in. long with a rise of 4 in.: Square one-half the length (24 in.), which gives 576; square the rise, which gives 16; add 576 and 16, ob-



Laying Out Segments

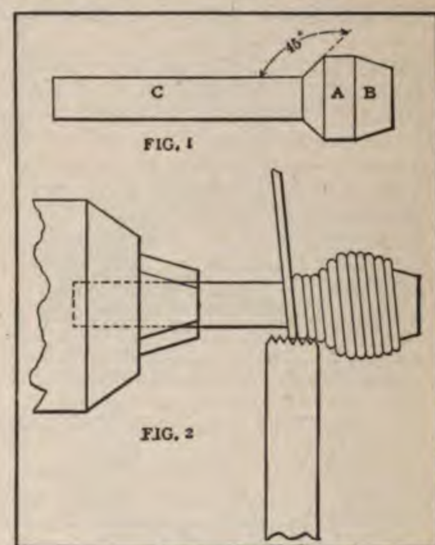
taining 592; divide 592 by twice the rise (2×4=8), *which gives 74 in.*, the radius. *This rule may be used in any case.*

WINDING LONG SPRINGS

There are many methods of winding springs in a lathe, but in the following plan, which has been used successfully by a correspondent of the American Machinist, the length of the spring will be limited only by the length of the wire:

The only thing to be made is a mandrel, Fig. 1, the length depending on the size of wire; for No. 20 B. & S. gage, 1½ in. is long enough. The diameter of the small part, C, to be the same size as an ordinary mandrel for winding the same size spring, the angle to be about 45 degrees, the larger diameter, A, to be as large as possible without giving a permanent set to the spring, and its length to be three times the pitch of the spring.

The end, B, is tapered so as to let the spring slide off easily. It will generally be



Spring Winder for Long Springs

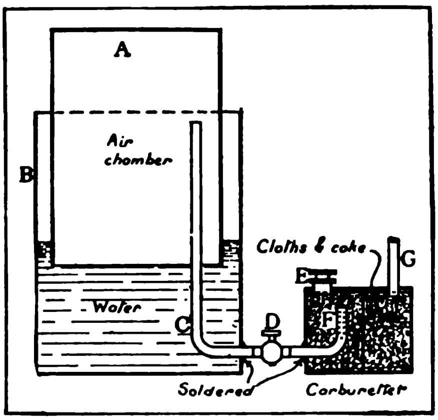
found that each problem will require some "cut and try" on account of the variations of the temper in the material of which the wire is constructed.

To wind the spring, place the mandrel in a lathe chuck. Select a thread chaser of about the pitch of the spring you are to wind, place it in the tool post in a position to bear evenly on the mandrel. Wind the small straight part of the mandrel full of wire by hand with the free end toward the point. Push the spring thus made over the larger part of the mandrel till you have but 3 or 4 turns left on the small part. Bring up the chaser so as to engage these turns and start the lathe (see Fig. 2).

The pitch of the spring will be modified by the distance between the chaser teeth, the bevel of the mandrel and the angle of the bevel. The shorter the distance between the chaser and the bevel and the steeper the bevel, the closer the spring will be wound.

A HOME-MADE GAS GENERATOR

A gas generator, suitable for use in a country residence, is described by a correspondent of the Model Engineer and Electrician as follows: The generator is designed for producing gas from gasoline by forcing air through a chamber containing the gasoline, thereby saturating the air with



Small Gas Generator for Illuminating

gasoline fumes and making a combustible gas.

The gas made in this way is too rich to be an explosive mixture, i. e., the amount of air contained in it is insufficient to support combustion, but if the gasoline becomes nearly exhausted an explosive mixture is then formed and the flame from the burner is liable to strike back and ignite the mixture in the generator. As the amount of gas contained in the generator is very small, the effect of such an explosion would probably be of little consequence, but it is well to take all precautions and keep the carburettor well filled with gasoline.

The burners used with this device must be of the incandescent type. The ordinary fish-tail burners are useless; they would burn without shedding any light. With burners with mantles the light produced is equal to electric light.

The generator may be described as follows: A and B are two dust bins; B is 4 in. larger in diameter than A. A is put open end downwards into the water in tank B, care being taken to get them water-tight and air-tight. About 1 in. from bottom of B is a piece of tube, ⅜ in. diameter, with a bend as shown at C, and runs the same height as dust bin. A tap at D (this regulates the air from chamber to carburettor, and also gas from carburettor to burners). If it does not make enough gas, all that is required is to put a weight on top of A. The drawback of the apparatus is that when all the air is used the tank A has to be pulled up and the burners lit again. The tube F in the carburettor is perforated with holes. The carburettor is a biscuit tin with a few sponge cloths hanging down from wires soldered to the top of tin. It is then filled up with coke the size of walnuts; this helps to soak up the gasoline. E is a plug for filling and G is the supply to burners.

ELECTRICALLY PRODUCED STEEL

The enormous amount of energy that is now going to waste in the unused water power at Trallhatta, Sweden, will soon be converted into electrical energy, to be used in the production of steel in the large mill about to be constructed there. The plant will be operated under the Kjelin patents, in which the ore is reduced in large electric furnaces. As the ore deposits are very extensive and the available water power enormous, the steel will no doubt be produced at a great profit. The first plant will be from 10,000 to 15,000 hp. and will turn out about 500,000 tons annually.

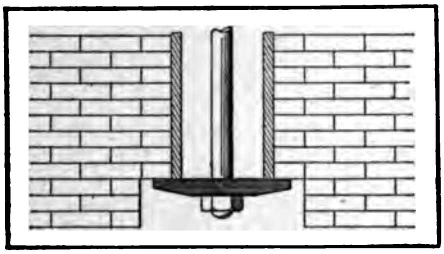
VENT NECESSARY IN WATER MUFFLER FOR TWO-CYCLE GAS ENGINE

The water muffler described in Shop Notes for October will work all right with a 4-cycle engine, but if used in connection with a 2-cycle engine it may happen that the partial vacuum produced in starting would draw water into the cylinder and cause trouble. To prevent this, drill a small hole in the pipe above the water level.—Contributed by D. H. Reeves, 645 Iowa St., Oak Park, Ill.

At Portland, Oregon, recently, 25,000,000 ft. of lumber was loaded: 20,000,000 ft. on vessels for foreign ports, and 5,000,000 ft. for home ports. That city is said to be the greatest lumber port in the world.

REMOVABLE ANCHOR BOLT FOR ENGINE FOUNDATION

The anchor bolts generally used for engine foundations cannot be removed and for that reason cannot be renewed when broken. The accompanying sketch shows a new form of anchor bolt which was used successfully by a correspondent of the Engineers' Review.

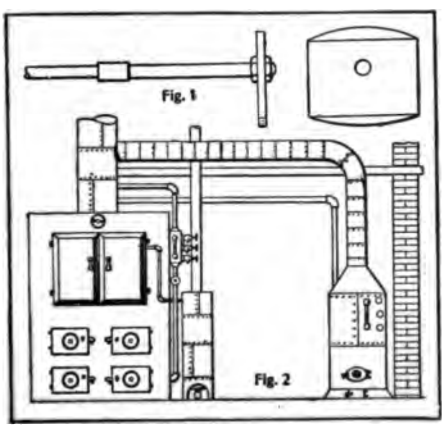


Lower End of Anchor Bolt

In this case a different method of putting in the anchor bolts was employed than usual. The bottom of the bolts were not secured firmly in the foundation, but spaces were provided for them, and they were put in place after the foundation was furnished. This method of placing anchor bolts is a good one, as it allows for removing them in case one becomes broken at any time after the engine gets to running, without damaging the foundation.

HOW TO CLEAN A BOILER

A very useful and efficient boiler cleaning hoe can be made as shown in Fig. 1. The bottom is made to conform to the curve of the boiler shell and is made just large enough to pass through the front manhole, says a correspondent of the Engineers' Review.



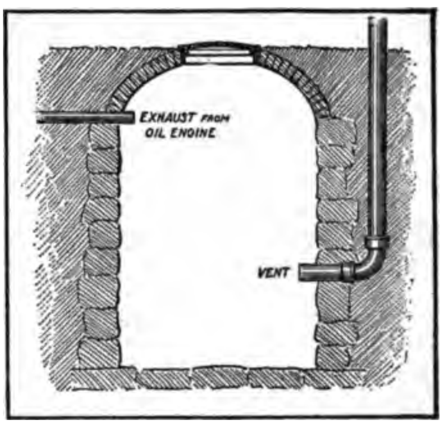
Boiler Cleaning Hoe and Auxiliary Boiler

A small boiler to assist in cleaning a large one will soon pay for itself in time when the large boiler comprises the plant. Fig. 2 shows such an auxiliary boiler for cleaning. The boiler should have the steam piped to the feed pump of the large boiler, and a feed line from the same piped to the small boiler. On cleaning day let the water out of the large boiler and open it up. Have about 40 to 50 lb. steam pressure in the small boiler and attach a hose to the discharge pipe of the feed pump, and proceed to wash out the boiler.

It can be seen that with an arrangement of this kind the engineer or fireman can wash a boiler out clean under a good pressure.

DISPOSING OF OIL ENGINE ODORS

Offensive odors from oil engines can be disposed of by turning a portion of the jacket water into the exhaust line and conducting it into a cesspool, says a correspondent of the Metal Worker.



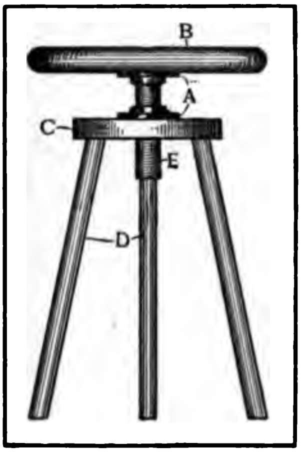
Destroys Offensive Odors

Make the cesspool about 8 ft. deep by 5 ft. in diameter, of field stone, with a brick arch and a cast-iron rim and cover, as illustrated. Between 2 and 3 ft. above the bottom of the cesspool take a 5-in. pipe out of the side and carry it up a distance of 10 or 12 ft.

To avoid the treacherous back kick when starting the motor the automobilist should learn to crank with his left hand, which throws the hand and arm out of the path of the recoiling crank.

HOME-MADE REVOLVING STOOL

The materials required for this handy revolving stool are: A piece of hard wood 1½ in. thick and cut out in a circle for the top, B; a piece of hard wood 1½ in. thick, octagonal in shape, for a base, C, for the legs and flange; three legs, D, 17 in. long, sawed from an old rake handle; a piece of 1-in. pipe, E, 8½ in. long with a 1-in. thread on one end and a 6¾-in. thread on the other end; two flanges, A, to fit the threads on the pipe; eight stove bolts, 2 in. long, to hold the flanges to the top and base, and three 3-in. screws to hold the legs in the base.

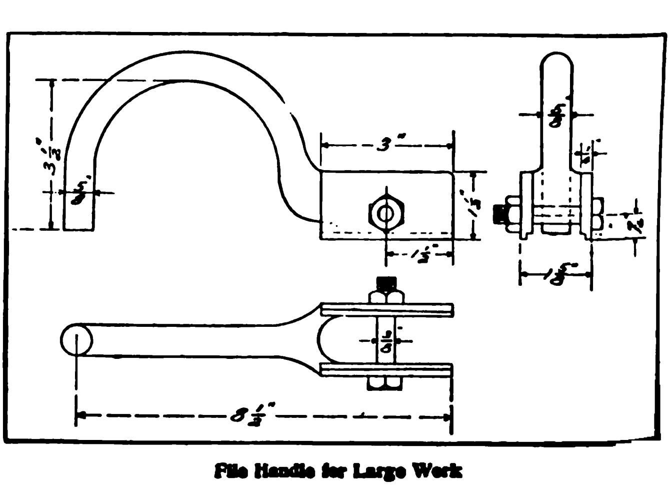


Home-Made Stool

Countersink the holes for the heads of the stove bolts and the screws. When all the parts are put together sandpaper the wood until smooth and apply a coat of varnish. The stool will cost about 30 cents.—Contributed by Godfrey Aman, Dolgeville, New York.

HOW TO MAKE A CLAMP HANDLE FOR A FILE

In filing large work, such as elevator guides, connecting rods for large engines and other surfaces which are longer than the file, it is necessary to provide means for holding the file without lifting any portion of the file from the work. Such a device is shown in the accompanying illustration, where the dimensions are given for a file 1$\frac{3}{16}$ in. wide. A file is placed in the clamp and the nut tightened, and it is then ready to use.—Contributed by John Weldon, 92 Columbia St., Brook- N. Y.



File Handle for Large Work

WHY BRICKS ARE MADE SMALL

How much easier it is to criticize than to do better! We view the results of another's life labor and seem to discern at once some chance of improvement, which has evidently been overlooked by the expert, who has given all his time and energy to the problem.

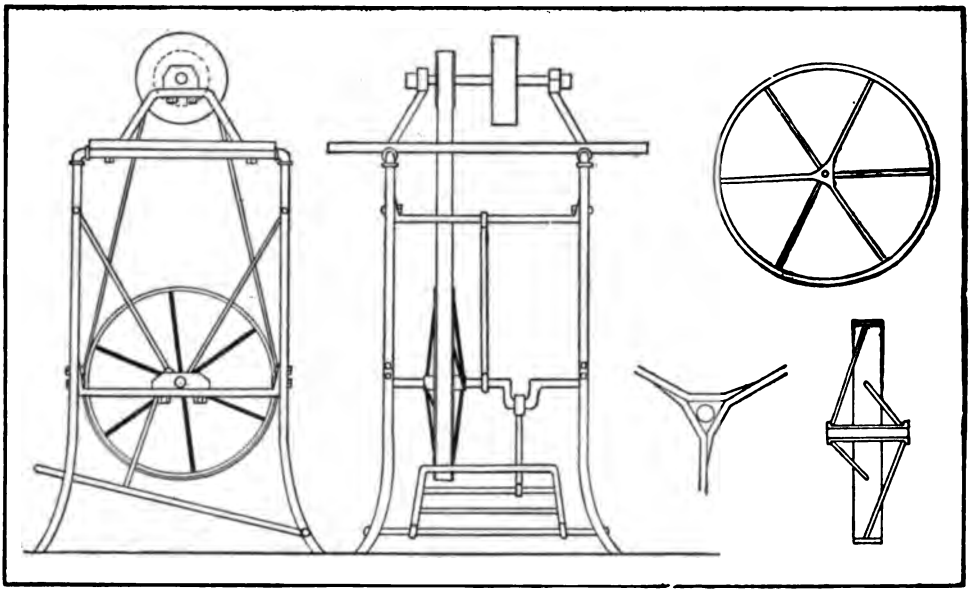
A recent example of this tendency is illustrated in the proposed large size building brick. Instead of the ordinary standard size brick, which is only 8 in. by 4 in. by 2¼ in., a brick 3 ft. long, 8 in. wide, and 2¼ in. thick has been suggested. It has been pointed out that bricks of this size would require less labor in laying; would make stronger and better walls, and among other advantages, would be immune against earthquakes.

Brick manufacturers discovered many years ago that there are many advantages and disadvantages to be found in either large or small bricks, and after a careful study of all the conditions, decided to compromise on a brick which should have as many advantages and as few disadvantages as possible. This investigation resulted in the adoption of the present standard size, which is 8 in. by 4 in. by 2¼ in.

There are many reasons why the large brick mentioned above would not be practical. In the first place it would be almost impossible to handle a "green" brick of that size, without bending and stretching it, and the process of burning would be more difficult, and would invariably result in warping and distortion. Bricks of that size would not conform to the standard size window boxes, door frames, and other building material.

A HOME-MADE FOOT-POWER EMERY WHEEL

The accompanying engraving shows a foot-power emery wheel stand which I made and am using in my shop for grinding small tools such as cold chisels and drill bits, says a correspondent of the American Blacksmith. I used ¾-in. gas pipe for the legs and top pieces, and four ¾-in. elbows. The pipes were threaded and screwed into the elbows and the legs were then bent as shown in the engraving. I then used ½-in. pipe flattened at the ends and arranged them as leg braces, putting them together with ¼-in. bolts. The top of the frame is 14 in. square from center to center of elbows and is bolted on a 14 by 18 in. board for the table. The brackets which hold the shaft for the emery wheel are made of 1 by 1¼-in. iron and are bolted on top of the table. The shaft for the emery wheel is a piece of ⅝-in. round stock with a 2 by 1¾-in. piece shrunk on and used as a pulley. A 2½-in. washer is also shrunk on this shaft as a wheel flange. This is turned up in a lathe. The small wheel shaft runs in two small boxings on the top of the brackets. The large wheel, or fly-wheel, is 26 in. in diameter with a rim 2 in. wide and ½ in. thick. The spokes are of ½-in. rods and are arranged as shown in the engraving. They are six in number and each set of three are welded in such a manner as to leave a triangular shaped hole into which a piece of ¾-in. pipe 5 in. long is fitted. For the crank shaft I use a ¾-in. rod, and after drilling a ¼-in. hole through the hub of the wheel and shaft, fasten them together. Any practical craftsman can make an emery wheel stand with little or no cost. An emery wheel suitable for this stand would be about 8 in. in diameter by ½ in. thick. If a suitable belt or fly-wheel can be secured from some discarded farm implement it will save the trouble of making one. This is a very handy tool, and will often save time in starting up the engine or using the old grindstone.



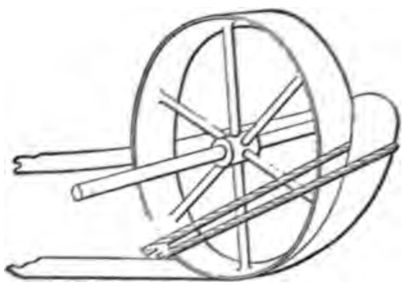
Emery Wheel Made of Pipes and Fittings

Although the height and size of this stand may be altered to suit various conditions, the following is about right: Height of stand, 38 in. Dimensions at top, 14 in. square; stock for legs to be ¾-in. gas pipe. Leg braces: ½-in. gas pipe bolted with ¼-in. bolts. Treadle is made of 1¼ by 2-in. stock bolted firmly together. The large wheel is 26 in. in diameter.

The Government is to make a test of Chinese labor for digging the Panama canal. In the test 2,500 Chinese will be employed. The work is said to be too hard for the large number of Jamaicans now employed, and a sufficient number of Spaniards cannot be secured immediately.

TO PUT A BELT ON A RUNNING PULLEY

In many shops it is the practice to throw on the belts while the machinery is running rather than lose eight or ten minutes by shutting down. Where the belt comes on at the top of the pulley it can usually be thrown on from the floor by two men using stout poles having spurs in the end and a



Method of Putting Belt on Running Pulley

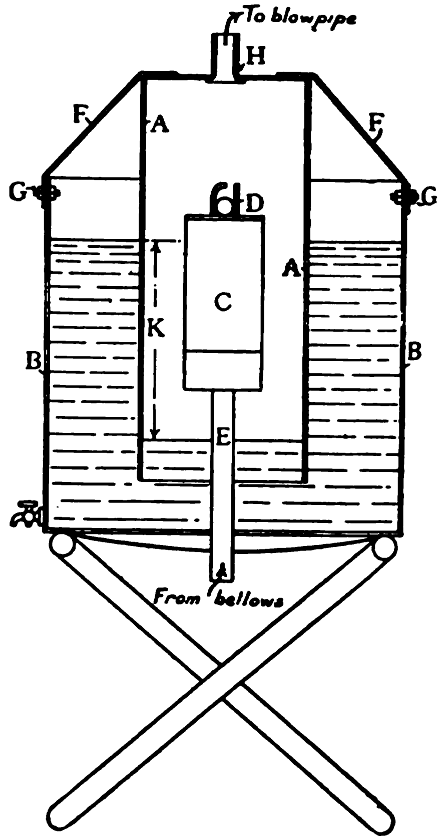
finger on the side, says a correspondent of the American Machinist. One man holds the belt up on the face of the pulley and the other catches the edge of the belt with the pole finger and pulls it on. Where the belt runs on from the other side of the pulley, or in cases of very tight belts, the following plan is better:

Take a piece of common bale rope up on the ladder, slip it around the belt and bring the two ends even as in the sketch. Steady the belt with one hand while the man on the floor pushes it up onto the pulley with one of the poles, then with the other hand pass the two ends of the rope twice around the shaft close to the hub of the pulley and in the direction of the rotation. Be careful and keep clear of set screws by keeping just a little tension on the rope. Step down a step or two on the ladder and grasping the ends of the rope in one hand, give the man on the floor a signal for a concerted effort, and with a pull the belt is on and the rope may be removed if it has not already removed itself. Under no circumstances should the rope be wrapped around the hand; be content to merely grasp it firmly. If it catches on the side of the belt, you won't have to be told to let go. Clean shafting and a cool head are required for the successful performance of this operation.

When throwing on a belt, if the pulley or belt is wet, wipe both fairly dry before attempting to throw the belt. If the belt is of rubber, with the rubber partly worn off, get it back on the pulleys as soon as possible, as if wet it will draw up several inches in a short time.

STEADY FLAME VARIABLE BLAST APPARATUS

In keeping a steady blast with foot bellows and a blowpipe the india-rubber diaphragm generally used does not always give the best results, especially in maintaining a small flame. The apparatus illustrated is an excellent substitute and by its use the strength of the blast can be regulated with ease to suit a full jet of gas, says the Model Engineer, London, or the smallest flame required for fine work, and will not change, no matter how much work is expended on the bellows.



Variable Blast Apparatus

To make the device, invert a long tin can, A, in a larger tin, B; through the bottom of B pass an upright pipe, E, and make the joint tight. To the top of E solder a small tin, C, by its lid. To the bottom of C sweat a piece of sheet copper with a $\frac{5}{16}$-in. hole in the middle of it. The edges of this hole should be knife-sharp. Make the ball-valve, D, a ½-in. steel ball and seat it in the hole in the copper with a smart tap of the hammer. Sweat three brass wire guides into the copper and bend one of them over to keep the ball from being blown off its seating. Test the valve by filling the tin with water and holding the ball down tight to its seating, to keep the water from running out. If the valve is tight, proceed by soldering tin C into its lid at the top of E. Solder four straps of sheet tin, F, onto A and fasten them to the top edge of the large tin, B, by four small bolts, G.

In operation, water is poured into B, and when the bellows are not worked, it partially fills A. As soon as air is blown in, it expels the water from A, and a steady blast is delivered to the blowpipe through the pipe H. This blast depends for its strength on the head of water, K, due to difference of water level in A and B, and this difference can be varied at will by pouring more or less water into B.

The blast cannot be stronger than the pressure due to the head of water, K, as any superfluous air pumped in only bubbles harmlessly out from under A and escapes.

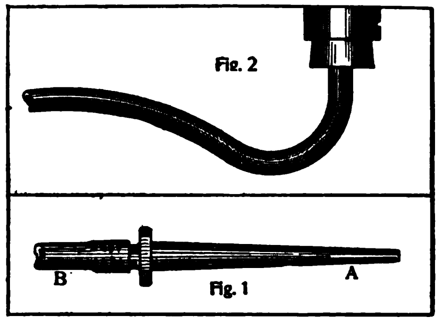
It is advisable to have the difference between the tins A and B large enough, or the escaping air blows the water over the edge of B. A large square biscuit tin answers perfectly. The whole should be mounted on a camp stool, with a hole cut in the seat for the pipe E to pass through.

WASHING PHOTOGRAPHIC NEGATIVES AND PRINTS

The customary process of washing negatives and prints is tedious and consumes considerable time. A correspondent of the Photographic Times describes an easier method which he has used with excellent success.

Fasten a small oil can nozzle (A, Fig. 1) to a long piece of rubber tubing, B. Fasten the other end of the tubing to the hydrant as in Fig. 2, or to the bottom of a small tank elevated above the table on which the washing is done.

After the plates or prints are rinsed, turn on the water and spray them with the fine stream. Plates may be held in the hand or the rack, but prints should be placed on a pane of glass and turned frequently. All traces of hypo, which would cause the pictures to fade or turn yellow easily if allowed to remain, can be removed in this



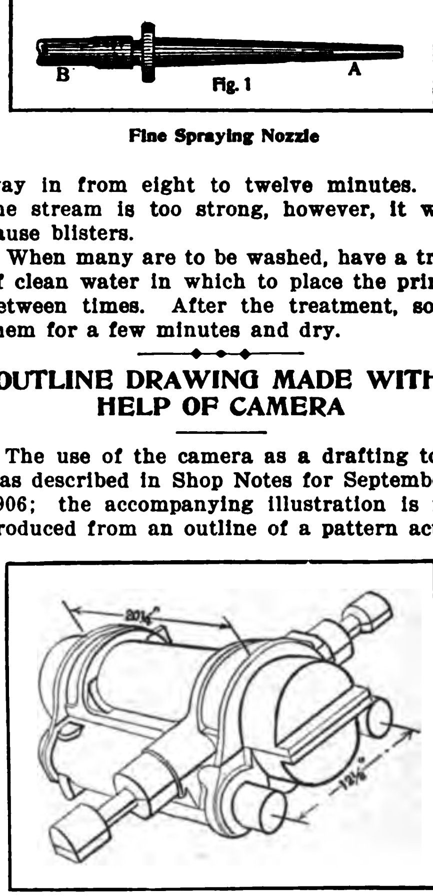
Fine Spraying Nozzle

way in from eight to twelve minutes. If the stream is too strong, however, it will cause blisters.

When many are to be washed, have a tray of clean water in which to place the prints between times. After the treatment, soak them for a few minutes and dry.

OUTLINE DRAWING MADE WITH HELP OF CAMERA

The use of the camera as a drafting tool was described in Shop Notes for September, 1906; the accompanying illustration is reproduced from an outline of a pattern actually made by the process, and shows what accurate results may be obtained in this way at small cost.



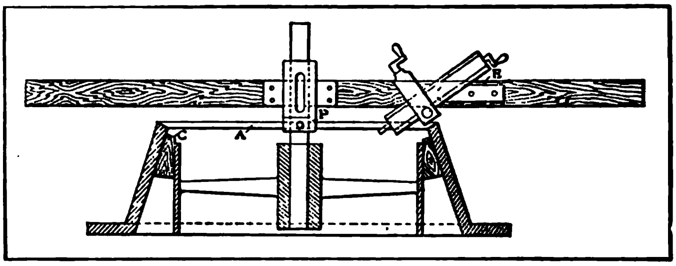
Made by a Camera

At a mild red heat, good steel can be drawn out under the hammer to a fine point; at a bright red heat, it will crumble under the hammer, and at a white heat it will fall to pieces.

FACING A LARGE CASTING BY HAND

The illustration shows how a large furnace hopper for a blast furnace was faced by hand. In describing this operation, a correspondent of the American Machinist says:

The boring mill in our shop having only a 10-ft. swing, we had to rig up for the job. We found a large pulley, which we keyed into the inside with wooden keys, C. A piece of shafting was then obtained and secured in the bore of the pulley. A collar, P, was put on this and an old bearing to which was attached the beam. We then secured an old slide rest to the beam at E. With two men to turn the beam and feed the tool in by hand, the job was done in about half a day. The hopper was in six sections bolted together, and as the surface of A was very rough, we had to take several cuts.



Finishing a Casting by Hand

TRIANGLE FOR DRAWING SCREW THREADS

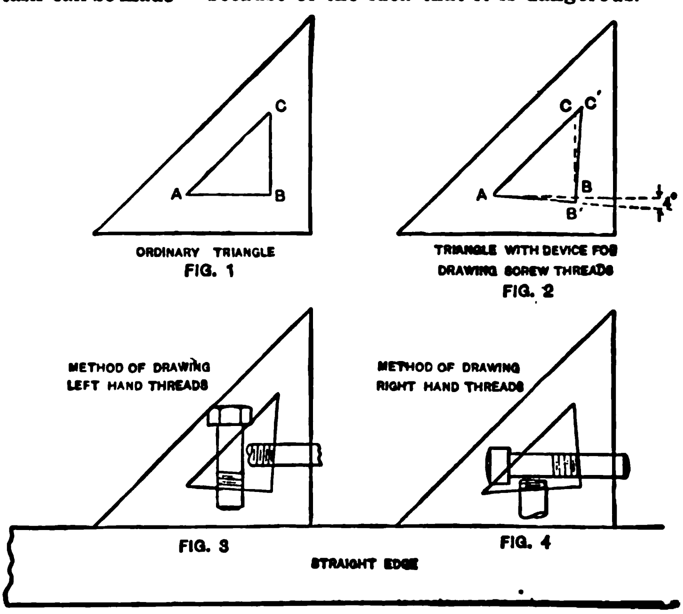
Drawing screw threads is often rather difficult for the draftsman, but by the use of the triangle illustrated, the task can be made much easier and the threads more uniform.

This triangle is made of an ordinary 45-degree celluloid triangle, like that shown in Fig. 1. Make the lines A B' and B' C' on the triangle, as shown in Fig. 2, scribing them with any sharp instrument and at an angle of about 4 degrees with the horizontal. With a sharp knife cut the celluloid away almost down to the lines, says Machinery, and finish off to the lines with a fine file, making smooth, straight edges. Either horizontal or vertical threads may be drawn without changing the position of the triangle, and right or left-hand threads are drawn by simply turning it over.

Low brass is more likely to fire-crack than is high brass; the amount of it used is comparatively small, says American Machinist, and is confined to drawn or spun articles which cannot be successfully made from high brass.

A safe way of discovering a leak in a gas pipe is suggested by a fireman. It is to use a small brush and ordinary lather. The escaping gas will blow bubbles, however small the leak may be, and will thus show the exact place.

Zinc dust, when properly packed, is not liable to spontaneous combustion, as is generally believed, according to a German scientist. Wetting of the material is without danger, and ignition and explosion only occur in the presence of air. Many steamship owners refuse to transport zinc dust, because of the idea that it is dangerous.

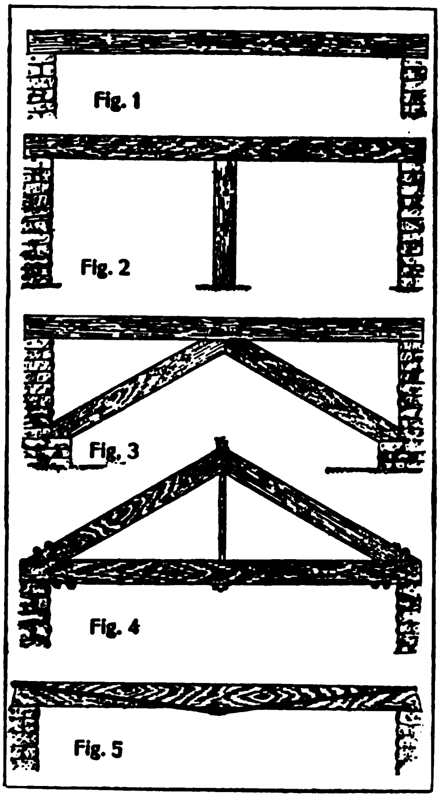


Triangle for Drawing Screw Threads

THE OBJECT OF TRUSSES

Readers of the articles on strength of materials will understand that the span of a beam may be so large that a single beam could not be had of sufficient size to hold the load without bending too much, says the Practical Carpenter.

Such a case is shown in Fig. 1, which can be remedied by supporting it with an upright post or column in the middle, as shown in Fig. 2; this would practically make two short beams of the long beam and consequently greatly increase the strength of the long beam.



In cases where a post would not be admissible in the center a support may be had by using two braces as shown in Fig. 3. Here the pressure instead of acting downward on a post acts downward in a diagonal direction, transferring the pressure to the walls or other supports of the long beam. A little thought will show that these braces (used for the same purpose as the center post in Fig. 2) are subject to compression the same as the post.

When the load on the long beam is concentrated at the center or evenly distributed the pressure on each of the braces is the same.

In many cases a clear opening is desired and no braces can be used underneath, but the same support can be had by placing the braces above the beam and suspending from them a rod holding up the center of the beam as shown in Fig. 4.

It makes no difference if a weight is placed directly on top of a board or if a string is tied to the board and the weight suspended by the string, the pressure on the board is just the same.

In Fig. 4, instead of being supported directly on the braces, the beam is suspended from the braces by means of the rod; hence the pressure on the braces is just the same as in Fig. 3 (that is, with the slight addition of the weight of the rod itself).

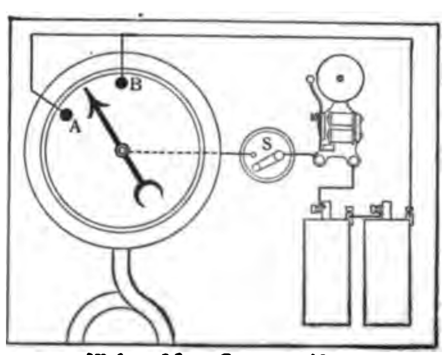
Fig. 4 shows the simplest form of a truss, but all trusses are on the same principle of transferring the load to the support.

In the truss shown in Fig. 4 the load is placed on the beam, but when used for roofs the load is placed on the slanting braces or rafters, as they are called.

Where the span is comparatively short, the beam may be trussed as shown in Fig. 5. Here two iron rods ¾ or 1 in. in diameter are placed on the beam as shown—one on each side. A piece of flat bar-iron, about 3 in. wide and ½ in. in thickness, with ends turned over about ¾ in., forms the middle support for the beam. When the nuts are tightened the tendency will be for the middle of the beam to go upward, thus counteracting the downward bending.

ALARM FOR STEAM GAUGE

This is a handy device for firemen, as it will sound an alarm when the pressure becomes either too high or too low, thus obviating the necessity of constantly watching



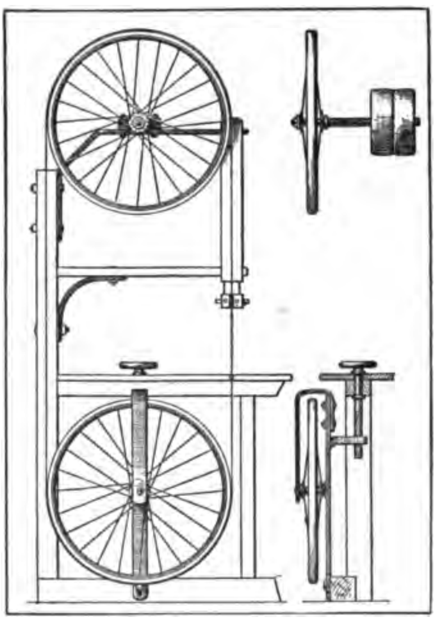
High and Low Pressure Alarm

the gauge. An ordinary door bell outfit will supply nearly all the parts necessary for constructing this alarm, except that a switch, S, should be substituted for the ordinary push button.

The contacts, A and B, are placed at the two extremes of the permitted pressure variation and are connected to the bell circuit as shown. The switch, S, is closed normally, but when the alarm is sounded it may be opened until the required pressure is obtained.—Contributed by Robert Glaubke, Malott Park, Ind.

A HOME-MADE BAND-SAW

A good, practical band-saw, as made by a correspondent of The Blacksmith and Wheelwright, is shown in the illustration. The frame is made mostly of wood and braced with iron and the wheels are from an old bicycle. The tires are 1¼-in. solid rubber. The top wheel is fixed on a shaft having



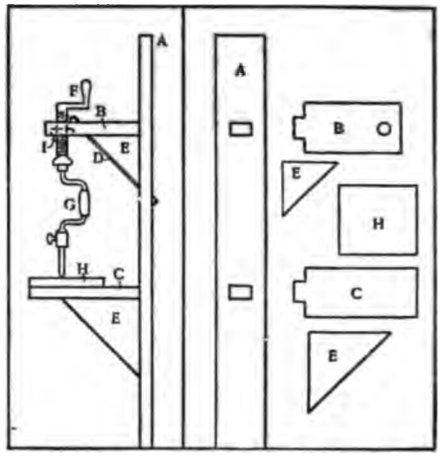
Home-Made Band-Saw

a tight and loose pulley, while the bottom wheel is fastened in an iron fork, which can be raised and lowered by the screw and hand wheel.

Cordite used in the cartridges was found to be the cause of the bursting of several rifles during target practice of the Canadian militia.

HOW TO MAKE A DRILL

A serviceable drill can be made of old lumber and pipe at very little cost. The parts used in its construction are as follows: A, piece of lumber (2 by 8 in.); B and C, pieces of wood set into A; D, iron rod to strengthen frame; E E, wooden brackets supporting B and C; I, set nut set into B; F, piece of old pipe or iron

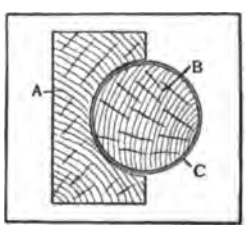


Home-Made Drill

threaded to set gauge nut; G, old brace or made of pipe fittings, with a set screw, K, to hold the drill; H, table to which the work is fastened.—Contributed by F. B. Ewing, Santa Clara, Cal.

TO SANDPAPER A CORE BOX

In the accompanying sketch, A is the core box, B a cylindrical piece of wood, turned a little smaller than the diameter of the required core, and C is a piece of sandpaper glued on B. The wooden cylinder, B, is fastened in the lathe and revolved at high speed, the core box being then brought up against it, as shown.



If there are any shoulders in the core box the cylinder should be shaped accordingly and a separate piece of sandpaper g to each section.—Contributed by D Reeves, 6453 Iowa St., Oak Park, Ill.

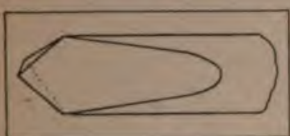
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

OLD DRILLS USEFUL

The shanks of broken or worn-out drills may be easily restored to usefulness by grinding down the end, as shown in the sketch. The drills thus formed are very useful for



drilling brass, white metal or other soft material.—Contributed by W. J. S., Emsworth, Pa.

TO FROST WINDOWS

Make a strong solution of epsom salts in hot water and while hot wash it over the glass with a brush. When cool the salts will be deposited on the window in crystalline form, beautifully frosting the window.

Be careful to entirely cover the window with the liquid and do not let it run or the pattern will be spoiled.

ELECTRICALLY OPERATED PLATE BOX

Owing to the great number of undeveloped plates and films which were being spoiled by the careless opening of the plate box, the following device was constructed and is now in successful operation.

Fig. 1--Plate Box for Dark Room

The plate box (Fig. 1) was provided with a home-made latch operated by an electro-magnet. When the photographer desires to open the box he presses a push button within easy reach of the box, which com-

Fig. 2--Wiring Diagram

pletes the circuit and energizes the magnet, thus allowing the lid to be raised. If, however, the window or either of the two doors should be open the current would not be complete and the box could not be opened.

This is accomplished by using ordinary burglar alarm contacts in both doors and window and connecting in series as shown in the wiring diagram (Fig. 2). It will be seen that the opening of either door or window will open the circuit and prevent operating the magnet by the push button.—Contributed by Wm. F. Groose, Photographer, Oconomowoc, Wis.

IMPROVED SOLDERING FURNACE

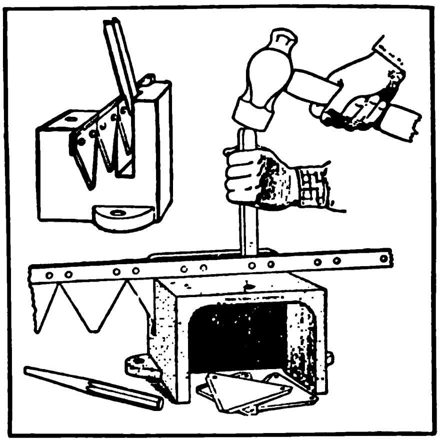
Any one who has had any experience with this style of soldering furnace will at once see the advantage of using a bicycle foot pump (attached as shown) over the old rubber bulb with its slow, weak action, leaky valve, and short-lived rubber tube.

A bicycle valve may be soldered on the air valve and the hose connection screwed into that, or the bicycle connection may be removed and the hose simply slipped over tube on tank plug.—Contributed by Ora S. Harmas, Fennimore, Wis.

DEVICE FOR REMOVING REAPER KNIVES

The accompanying illustration, reproduced from the Implement and Machinery Review, shows a device designed to quickly remove worn or damaged sections from reaper and mower knives.

It is a special appliance of much utility,



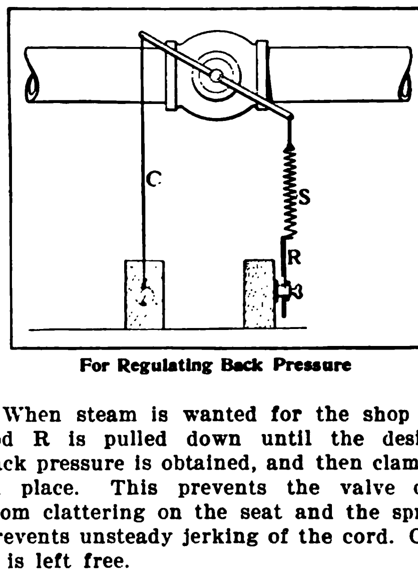
Removing Blades from Sickle Bars

one of its chief recommendations being that by using this tool it is impossible to bend or injure the knife-back. By placing the knife-bar in the block any man or lad should be able readily, by means of the hand tool and a hammer, to remove twenty sections in five minutes. The tool should be held with the shoulder resting on the top of the section over the rivet, so that it may not slip between the section and the block. The simplicity of the tool should commend itself, for there are no screws, bolts, or springs, and it does not require any adjustment. A blow with a hammer, and the rivet is cut through. Its universality is another good point about this new tool, for it is by no means restricted in its sphere of action, since it will remove any section from either a light or heavy binder or mower.

DEVICE FOR REGULATING BACK PRESSURE

A clattering valve on the valve seat as the engine cut off and exhausted caused a correspondent of the Engineer's Review great annoyance; also there was difficulty in regulating the pressure to send the right amount of steam through the factory at the best operating pressure. He remedied the matter as follows:

A long lever was arranged on the valve stem and to one end a cord and spring, S, were attached; a hollow piece of round brass tubing 2 ft. long was soldered to the lower end of the spring. This tubing passed through a clamp as shown, which was made of a piece of brass, cast square and drilled out with a hole somewhat larger than the brass rod. A thumb screw was put in on one side, and to the end of the screw a piece of brass was fitted and filled out concave to fit the rod. The ends were turned over at the top and bottom of the body of the clamp to prevent it from falling out. The concave piece was for the purpose of protecting the rod from the end of the thumb screw. A cord, C, was attached to the other end of the lever on the valve stem, also, for the purpose of fastening the valve open when the exhaust steam was not wanted for heating purposes.



For Regulating Back Pressure

When steam is wanted for the shop the rod R is pulled down until the desired back pressure is obtained, and then clamped in place. This prevents the valve disk from clattering on the seat and the spring prevents unsteady jerking of the cord. Cord C is left free.

DRAUGHTSMAN'S CENTER

A brass thumb-tack with a centerpunch hole in the center of the top will prove valuable when the center of several concentric circles becomes so worn and enlarged that future work will be inaccurate.

The thumb-tack may then be placed in the worn center and the compass used from the hole in the top.—Contributed by John Weldon, Brooklyn, N. Y.

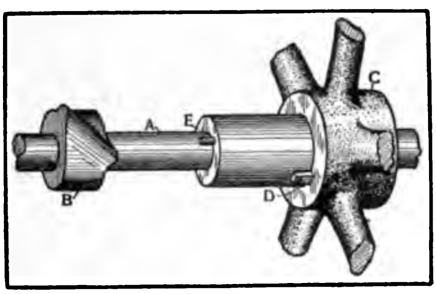
MAKING AND COOLING A 105-TON CASTING

The pattern for a big casting recently poured at Milwaukee was 32 ft. long, 11 ft. wide and 10 ft. high, and ten patternmakers were kept busy four months in making it. The casting was an engine bed, weighing, when completed, 105 tons. It was poured from nine ladles, 108 tons of metal going into the rough casting. Fifteen days were allowed for cooling, but at the end of 20 days the heat given off could be felt at a distance of several feet.

POUNDING IN ENGINE

A sharp metallic pounding in a four cylinder engine was found to be due to accumulated carbon in the combustion chamber causing preignition and loosening of the spark-timing mechanism, says a correspondent of the Motor Age.

Ignition was by contact spark, and the spark timing was changed by shifting the inlet valve and ignition camshaft—which performed both functions—along its axis. The arrangement is shown roughly in the sketch, in which A is the camshaft, B one of the ignition cams and C the hub of the two-to-one gear. This gear was keyed on a bronze sleeve, D, which turned in a bearing and in which the shaft slid lengthwise. A feather, E, established the connection between A and D.



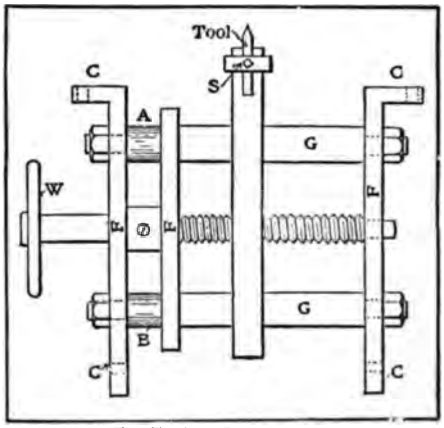
Arrangement for Ignition

On taking things apart it was found that the feather was exceedingly loose in both A and D, and it was inferred that the springs of the inlet valves exerted so much force on A as to cause it to jump rotatively back and forth when the valves opened and closed. A tight feather, which was let deeply into A, cured part of the trouble, and scraping the carbon from the combustion chambers cured the rest of it.

HOME-MADE RIG FOR TRUING COMMUTATORS

An easily made device for truing commutators and one strongly recommended by a correspondent of Power is shown in the accompanying illustration.

This device was used to true up the rectifying commutator on a large alternator,



For Truing Commutators

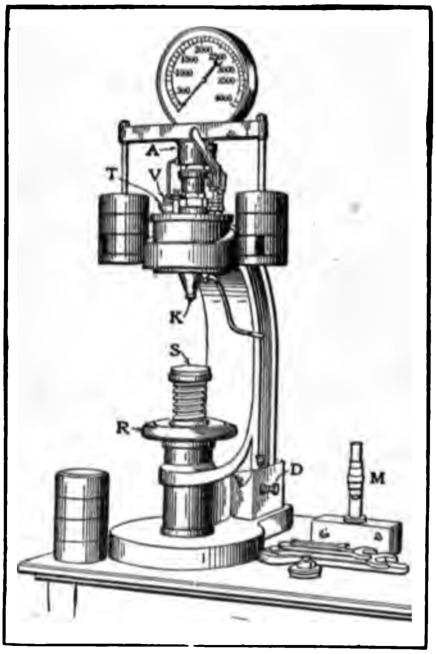
the hole in the brush-holder yoke being used to line up by. The device was clamped in position by inserting the rod A in the brush stud hole, and then bracing the corners C C C C of the frame to foundation, brush yoke and bearing bolts, respectively, with ½x2-in. wrought iron, to insure rigidity. The toolpost guide bars, G G, were made of ¼-in. key steel, turned and threaded at each end for the four nuts shown. The toolpost was made of 1¼x3-in. Swedish iron planed smooth, and with two true, square holes to receive the guides, G G, and work free without lost motion. The tool was of lathe-tool material and attached by inserting in a slot on top of the post and tightening the set-screw, S. The frame, F F F, was made of ½x3-in. wrought iron planed smooth and true. The guides were turned down at A and B to take the two collars, which fitted holes in brush-holder yokes of two sizes of dynamos, the whole device being made reversible. The tool was fed by the long screw, turned by the hand-wheel, W.

It is estimated that London sends up into the air 1,000 tons of soot each year. The natives claim that fully a million tons come down.

MACHINE FOR TESTING HARDNESS

One of the most important properties of cast iron is its hardness. An iron which is too hard is brittle, weak and more difficult to finish and the results are inferior to those obtained when soft iron is used.

In order to determine the degree of hardness various machines have been designed, some of which depend on the impact of a sharp-pointed object or the effects of scratching, and others on the effects of an ordinary twist drill. In the last named machines a given size drill with a constant pressure applied will make a hole of a given depth in a certain number of revolutions, the number of revolutions determining the hardness of the iron or other material that is being tested.



Hardness Tester

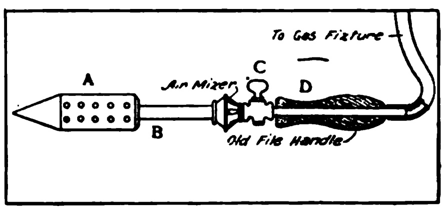
The machine which is herewith illustrated, by courtesy of the American Machinist, is one which was recently invented by a Swedish engineer, and is regarded by leading technicians as the most reliable machine of its kind that has ever been devised. In this machine the degree of hardness of any substance is measured by the amount of indentation caused by the pressure of a hardened steel ball on the sample to be tested. The pressure is obtained by means of a small hydraulic press, operated by a hand pump, and connected to a gauge which indicates the amount of pressure that is being applied.

A small auxiliary cylinder A, supports a beam on which are suspended a number of weights. These weights are changed to suit the material to be tested, and when the pressure passes a certain point they are raised, thus preventing any excess over the desired amount.

When a sample is to be tested it is placed on the end of the screw S, and the wheel R is then turned until the sample is brought against the steel ball K. The necessary pressure is then produced by working the pump, after which the sample is removed and placed under the microscope M, which has a lens engraved with a scale which is always visible, and thus allows measuring the exact size of the indentation. In order to get the most accurate results the surface of the sample should be polished. After obtaining the exact size of the indentation produced by a given pressure the hardness can be obtained from a table which gives the value in standard degrees.

HOW TO MAKE A SELF-HEATING SOLDERING IRON

A good self-heating soldering iron, having nearly all the advantages of an electric soldering iron, can be easily made by using the devices shown in the accompanying sketch. A is the copper head of an ordinary soldering iron, and is drilled with ⅛-in. holes on the sides as shown. It is also drilled to receive the ¼-in. pipe, B, which is screwed into the air mixer. The stop cock, C, can be omitted if desired, but is very handy when the gas fixture is high and not easily reached. A ⅛-in. pipe, D, is pushed through an old file handle drilled for the purpose, and connects with the hose as shown. The air mixer can be taken from an old Wellsbach light.



Self-Heating Soldering Iron

When the gas is turned on and lighted and the air mixer properly regulated, a blue flame surrounds the copper and keeps it at just the right temperature.—Contributed by Edw. J. Snyder, Buffalo, N. Y.

ACETYLENE TESTER FOR EGGS

An acetylene lantern has been discovered by a poultry dealer to be ideal for egg-

Testing Eggs

testing purposes. The lantern, which gives a clear white flame of great brilliancy, was first used on an incubator full of eggs by a correspondent of the Poultry Journal as an experiment. A piece of black enamel cloth with a hole in it was fitted over the lens and the eggs in turn held before the lens in the manner illustrated. The intense white light rendered the eggs nearly transparent, so that at the end of the third day of incubation the fertile ones were easily detected, the minute blood vessels showing distinctly.

CLARIFYING RAIN WATER

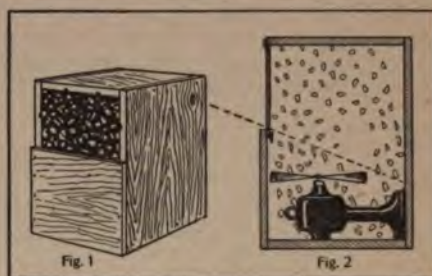
Many people catch their rain water in barrels placed under the eaves spout. In a long dry spell the roof will become dirty, and the first rain will fill the barrel with dirty water. If the rain is long continued it may clear itself, but will not if the shower is of short duration. In the latter case the barrel will be filled with dirty water.

To clear the water quickly extend the spout within an inch or two of the bottom of the barrel. The incoming water will stir up the water in the barrel, so that it will clear itself in one-eighth of the time ordinarily required. This also applies to cisterns, but the smaller the cistern the quicker the clarifying process.—Contributed by T. L. Reed, La Porte City, Iowa.

To make the elevator pump run smoothly, dissolve a package or two of good washing powder in the water contained in the open tank of the elevator system.

MYSTERY DEVICE FOR SHOW WINDOW

Mechanical devices have always proved attractive when used in show windows and usually increase the amount of sales sufficiently to pay for the cost of making in a very short time. One of these devices, which was recently described in the Keystone, consists of a wooden box with a piece of glass in the upper half of the front and a fan motor on the inside. Numerous bits of tissue paper are kept in motion by the fan, thus giving the appearance shown in Fig. 1. It will be necessary to place the device back in the window far enough to

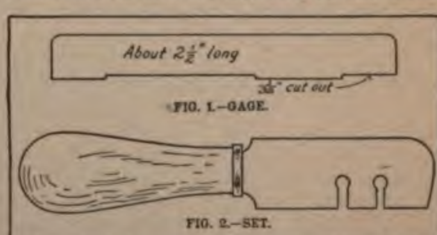


The Mystery Solved

hide the fan and keep the angle of vision above the dotted line shown in Fig. 2. An enclosed, dust-proof motor is the best for this purpose, but any ordinary motor can be used by encasing it in a frame of wire netting.

SAW SETTING TOOLS

These tools will be found very convenient for use in spring-setting small rip saws, and can be easily made, says the Wood-Worker. The gauge (Fig. 1) can be made out of a broken scroll saw blade, one of the beveled

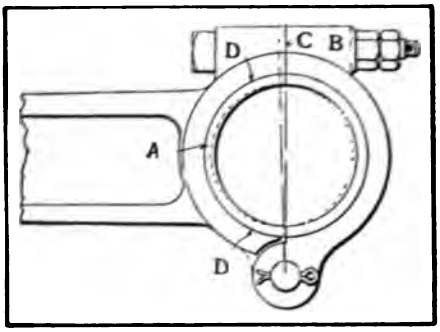


For Setting Saws

back kind of, say, 15-gauge thickness. Mine is filed away 1-32-in. for set of saw. The set (Fig. 2) can be made from a large worn-out flat file. Cut two slots, for thinnest and thickest saws.

REFITTING CONNECTING ROD

About the worst form of connecting rod to refit after it has worn out of round is that with the hinged cap shown in the



Refitting Connecting Rods

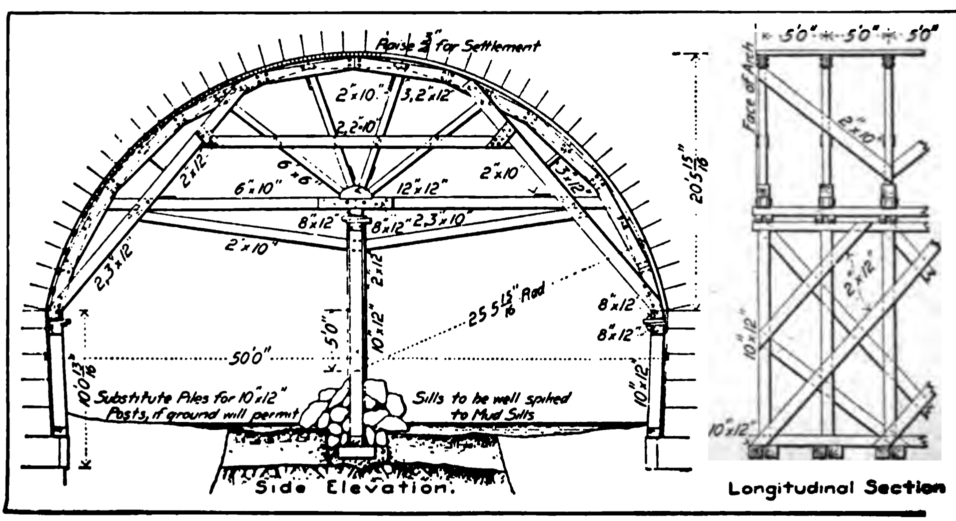
sketch, says Motor Age. The reason for this is easily understood by reference to the dotted lines, which show, slightly exaggerated, the wear which may take place in the brass, A, and the corresponding movement required of the cap to take it up. It is evident that whatever wear A has sustained double its extent must be filed off from the upper portion of B of the cap to produce a fit on the crankpin, and, moreover, the surface, C, must be filed slightly tapering instead of parallel. It is next to impossible, always undesirable, to attempt to refit a crankpin bearing by putting a liner between the brass, A, and its seating. The reason lies in the fact that the pressure per square inch on these bearings is so great that it is impossible for a brass so treated to stay around after it has been run. Paper is the only lining that can be used, and the paper will crush more or less under the pressure and allow the bearing to squeeze out of shape. For this reason the only way a crankpin bearing can be refitted without replacing the worn brass is to close in the cap to make the bearing round, and then to scrape the brass as true as possible. This is a short operation after the parts are removed, and requires little skill.

CENTERING LARGE ARCHES

The accompanying illustration shows the centering of a segmental arch of 50-ft. span, which was designed by a correspondent of the Engineering News.

Owing to the stream becoming rather wild at times, it was desirable to place as little obstruction as possible in the bed of the stream. A truss was considered with supports at each abutment only, but as the cost was excessive, and there were doubts as to its rigidity (the angle of main supports being so flat, due to rise of arch), and not caring to use iron rods, it was discarded in favor of the plan herewith. The centering shown is well bolted, so that it can be moved, the section used being one-third of the whole length of arch.

Possibly some of the readers have had occasion to solve a similar problem lately for segmental arches of 50-ft. span or over, in which case it would be interesting to learn something of the design and what the

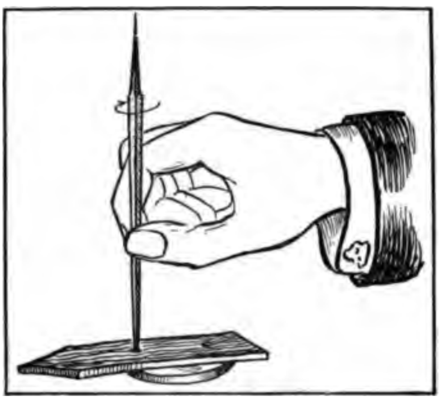


Centering for an Arch of 50-Ft. Span

results were, as some of the stresses in centering for arches are so indefinite it is difficult to proportion the whole economically.

TO DRILL SMALL HOLES IN GLASS

The following method of drilling holes in eyeglasses, which can also be used for drilling other glass articles, is described by a correspondent of the Optical Journal as follows:



Drilling an Eye Glass

Take an old three-cornered file and grind it to a point, being careful not to draw the temper, and make the point sharp as can be with a moderately long taper. Now break off the point by pressing the file with one of the flat sides against a piece of steel or your vise. This will leave the end slightly rough, with three cutting corners. Now slip a strap over the lens where you want to drill the hole and insert the point of the file through the large hole in the strap and rotate the file, using a moderate pressure. When about half way through the lens reverse and drill from the other side, as the lens is apt to chip or break if you drill all the way from one side.

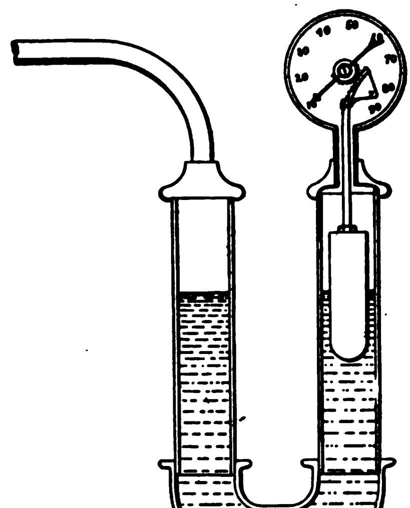
Moisten the drill with benzine to which a small quantity of oil has been added, or turpentine. If worst comes to worst, and neither benzine nor turpentine is handy, moisten the tip of the drill liberally by wetting it on the tongue.

To enlarge the hole use a reamer or a small round file moistened as above. If you use the file turn it backward. Drills may be made in other shapes, as grinding the end of a broken round file to an edge like a chisel or like an ordinary drill. If made chisel edge be sure that the corners are sharp. When the three-cornered drill gets dull grind a new point and break off as before.

HOME-MADE DRAFT GAUGE

Screw two pieces of 1-in. pipe about 8 in. long into a 1-in. return bend, and put a reducer on the top end of each pipe, reducing it to ¼ in. Remove the plunger from a small bicycle pump and solder a piece of copper on the top of the pump, making it airtight. This is to be used for a float, as it drops down in one of the 1-in. pipes nicely.

Remove the pressure spring from a small steam gauge and attach the gauge to one end of the pipe as shown in the illustration. Solder a fine stiff brass wire to the center of the float, letting the wire extend up



U-Tube and Gauge

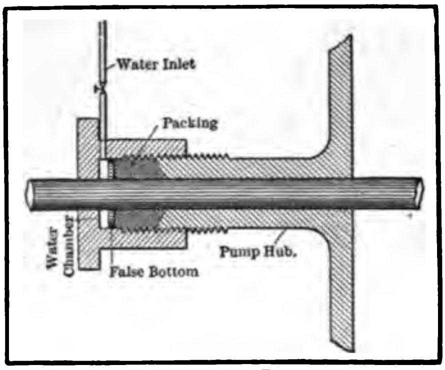
through the reducer to which the gauge is screwed and connect the upper end of the wire to the bottom corner of the triangular ratchet of the gauge. Fill the U-tube with machine oil until the float raises enough to turn the hand back to zero, says the Engineer's Review.

Screw a piece of ¼-in. pipe in the other reducer and run to the side of the smoke-box. As the draft tends to create a vacuum, the oil in the ¼-in. pipe raises on the side connected to the smoke flue, and lowers on the gauge side. This causes the float to drop, thus pulling down on the ratchet, and turns the hand upward. Oil is a good liquid to use, as it neither freezes nor evaporates.

HYDRAULIC STUFFING BOX

A short time ago I was called upon to operate a centrifugal pumping plant, says a correspondent of Power. The equipment consisted of a 10x30 Corliss engine and a 10-in. pump with boilers and accessories, which outfit was to throw 4,500 gal. per minute to a height of 50 ft., 12 ft. of which was suction lift.

Trouble commenced upon the first day. The pump was speeded so high that the stuffing-box could not be kept tight and cool at the same time. The speed could not be reduced, and the packing burnt out repeatedly. Water and oil applied in the ordinary manner failed to overcome the trouble.



Water-Packed Pump

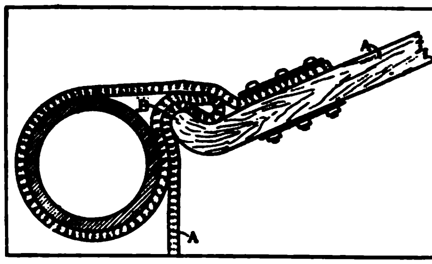
After several days of heart-breaking delay I had the gland taken off and a false bottom inserted on the air side of the packing, leaving a chamber about three-eighths of an inch deep. This chamber was tapped for a quarter inch pipe, a valve was put on at the gland, and the pipe connected into the main discharge of the pump. This practically made a water-packed pump; the packing was left loose and the pump forced to take water instead of air. We had no more trouble with the gland and the packing lasted almost indefinitely.

I hope that this may be of value to some other victim, as I know of nothing so contrary as a centrifugal pump that is taking air. The accompanying sketch is self-explanatory.

An unloading coal record was recently made at Escanaba, Mich., when 4,200 tons of hard coal was taken out of the steamer " in 10 hours, with two hoists.

FRICTION PIPE WRENCH

A simple friction wrench for manipulating polished brass and nickel plated pipe is shown in the accompanying sketch and is constructed of the handle, A, a piece of oak wood 1 in. thick, 3 in. wide, 14 in. long, with end of same rounded as shown at B; a piece of canvas, C, so folded as to make three thicknesses and the same width as



Pipe Wrench for Polished Work

handle and about 18 in. long, so that it will encircle all ordinary work. It is fastened about 3 in. from end of handle by means of two brass plates 3 in. square and five countersunk bolts as shown.

To use the wrench pass the canvas around the pipe or other cylindrical object and tuck the folded end between the canvas and wood, as shown in the sketch. Then, when the handle is pulled down, the canvas will tighten around the pipe and under all ordinary conditions produce sufficient friction to turn it.

The use of this wrench will not mar the surface of the work, nor bend the pipe, because the compression is distributed evenly over nearly the entire circumference.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.

STEAM SOFTENS CLINKERS

Clinkers in the ashpit can be softened and the grates preserved by the introduction of steam, either alive or exhaust, says the National Engineer. Also, the fire, it is claimed, will burn with a longer flame than where dry air is used.

USING A NEW FILE ON BABBITT

When using a new file, on babbitt or aluminum, rub it with a piece of chalk or soapstone. This fills the teeth of the file so the chips cannot stick in them and cut scores in the work.—Contributed by Wm. Ed. Jackson, Tarrytown, N. Y.

LAMPLIGHT PHOTOGRAPHY

When two or three lamps carefully placed in the right positions are used, splendid negatives can be made by lamplight, says a correspondent of the Photographic Times.

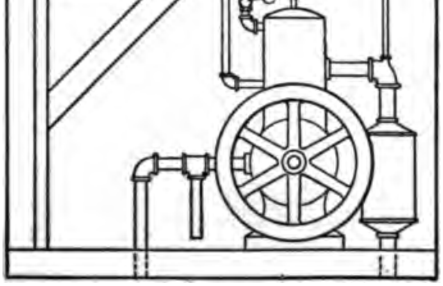
Two 20-cp. oil lamps placed in front and to each side of the sitter at a distance of about 4 ft. will give excellent results. The exposure should be from two to four minutes, according to the plates and lens.

CIRCULATING DEVICE FOR GAS ENGINE

Very often a gas engine, having no pump, will become over-heated after running for a few minutes, especially if the tank is not very large or is made of wood. The reason is, that as soon as the water gets warm it does not circulate as fast or cool the engine as well as when it is cold.

The simple device here illustrated, which consists of ordinary pipe and fittings, will effectually cool the engine without the use of a pump and without reducing its power.

A small pipe, A, connects the exhaust pipe with the water outlet, B, at a point above the check valve, C. At each explosion of the engine there will be a discharge into the water pipe, thereby forcing the water into the tank, where the consumed gas separates and escapes through the pipe, D.—Contributed by E. H. Klipstein, 116 Prospect St., East Orange, N. J.



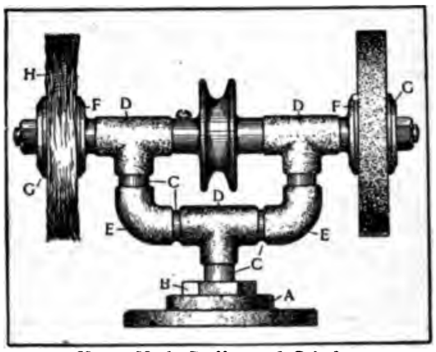
Simple Cooling Device for Engine

LUBRICATE LAG BOLTS

Put a bit of tallow into the hole bored for a lag bolt and it will go easier. The bolt squeezes the tallow ahead of it and greases the hole as it advances.—Contributed by Wm. Ed. Jackson, Tarrytown, N. Y.

HOW TO MAKE A BUFFER AND GRINDER

The materials necessary for making this machine are a pipe flange, A; a bushing, B; five ½-in. nipples, C; three ½-in. tees, D;



Home-Made Buffer and Grinder

two ½-in. ells, E; two collars, F; two washers, G; a number of cloth discs, H; a small emery wheel; piece of ½-in. shaft; pulley with set screw, babbitt, and sal ammoniac.

In order to prevent the fittings from turning loose, apply a solution of sal ammoniac and water to the threads before screwing up. This will rust the two pieces together and prevent loosening. If the threads are greasy so that the sal ammoniac does not adhere, heat slightly and then dip in sal ammoniac.

The tees which form the bearings should be drilled on top for the double purpose of pouring the babbitt and making an oil hole. In pouring the babbitt it will be necessary to cover the ends of the nipples to prevent the melted metal running down inside the base. This may be done by using a small piece of asbestos. Be sure that the shaft is lined up in the center of the bearings before pouring the babbitt.

The emery wheel is fastened to the shaft by a nut and washer as shown and the buffer is fastened in the same way. To make the buffer cut a number of circular pieces of cloth, H (almost any kind of cloth will answer), and cut a hole in the center of each piece large enough to receive the shaft, assemble all the pieces of cloth concentrically and sew them together near the center.

Then place the buffer on the shaft and screw the nut up tightly.

A GOOD SOLDERING ACID

A soldering acid which can be used to tin and solder cast iron is made by dissolving zinc in muriatic acid and burning the gas generated by the chemical action.

Place the acid in a stone jar having straight sides, something like a closed-circuit battery jar. Add plenty of zinc (you cannot put in too much) and immediately throw a lighted match into the jar. There will be a slight, but harmless, explosion. Have a good supply of matches and if the fire goes out, light it immediately. Keep this up until the acid has ceased to boil, then filter to remove remaining zinc and the matches.

Do not make this acid within doors, as it will rust and tarnish everything metal the room contains.

I have tinned iron castings and wiped lead joints on them with this solution for several years and it is the one and only one I have found to do the work satisfactorily. The acid is good for all soldering purposes, excepting electrical, which is excluded because the preparation is an excellent conductor.—Contributed by V. J. Davis, 314 Fargo St., Buffalo, N. Y.

India has 28,295 miles of steam railroad, of which about half is 5 ft. 6 in. gage.

DIFFERENCE BETWEEN A 2-CYCLE AND A 4-CYCLE GAS ENGINE

The accompanying illustration shows the working cycles of both 2-cycle and 4-cycle gas engines. Although more complicated in construction, the principle of the 4-cycle engine is the simpler of the two and will be described first. The explosive mixture of gas and air is first drawn into the cylinder by the downward movement of the piston, as shown in Fig. 1. The inlet valve, which is shown open, is operated mechanically in some engines, but in the simplest engines it operates automatically, being opened by the partial vacuum in the cylinder.

When the piston reaches the bottom of the stroke, the inlet valve closes so that when the piston returns to the top the mixture will be compressed, as shown in Fig. 2. The electric spark or other ignition device then explodes the mixture, which expands and forces the piston down, as shown in Fig. 3. This is the power stroke of the engine and it is here that the flywheel receives the necessary momentum to carry the engine over the other three cycles.

In Fig. 4 is shown the exhaust stroke in which the upward movement of the piston forces the burnt gases out through the exhaust valve, which is opened mechanically in all 4-cycle engines.

In the 2-cycle engine an airtight crank case is used, in which the explosive mixture of gas and air is stored and partially compressed, previous to ignition. The working cycle is best understood by starting at the compression period (Fig. 5) where the upward movement of the piston compresses the mixture in the cylinder, at the same time drawing in a new supply through the check valve at the inlet.

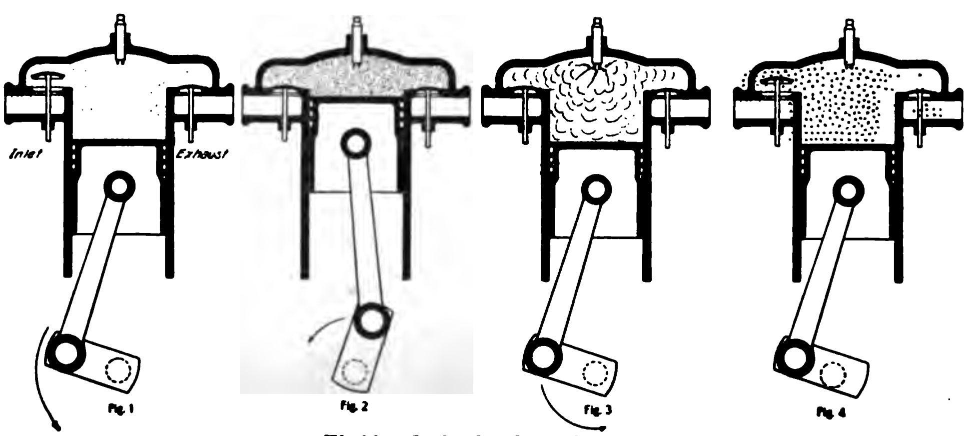
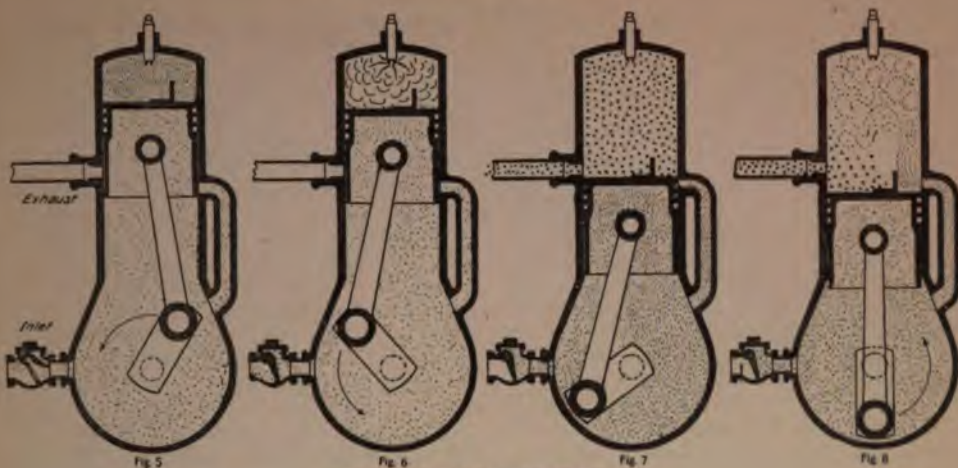


Fig. 1 Fig. 2 Fig. 3 Fig. 4

Working Cycle of 4-Cycle Engine



Working Cycle of 2-Cycle Engine

When the piston nearly reaches the top the spark or other ignition device explodes the mixture (Fig. 6), which expands and forces the piston down, thereby partially compressing the mixture in the crank case. The expansion continues until the exhaust port is uncovered by the piston, as shown in Fig. 7, which allows the burnt gases to escape.

The piston in finishing its downward stroke uncovers the inlet port, as shown in Fig. 8, and allows the partially compressed mixture to fill the cylinder, thereby driving out the remainder of the burnt charge. In this view the function of the small vertical plate on the top of the piston will be clearly understood. If it were not for this plate the entering mixture would shoot across the cylinder and out through the exhaust port, but with the plate in position the gases are deflected and forced into the upper part of the cylinder, as indicated.

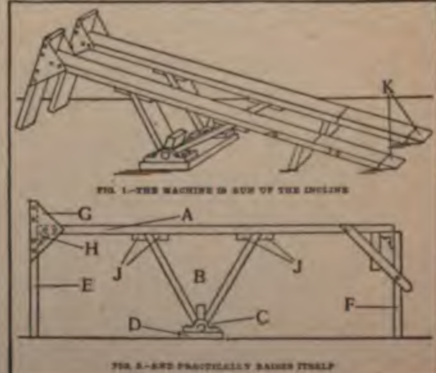
WHY BOILER MAN-HOLES ARE MADE ELLIPTICAL

In a certain technical college, when the question, "Why are man-holes made elliptical, and not circular?" was put to the class in examination, the majority answered by describing the shape of a man's head or body, or in some other manner going into the details of the human anatomy. The others answered that the reason for making them elliptical is that the covers may be placed on the inside, an operation which would be impossible with a circular man-hole.

A DEVICE FOR RAISING AUTOMOBILES

The accompanying illustration shows a device which was constructed by a correspondent of the American Blacksmith and used with great success in repairing automobiles.

In choosing material for building, nothing but the best should be used, as a breakdown, liable to occur from faulty material or construction, is likely to result in serious injury to the repair man. The platform consists of two good, strong planks, A. These rest on two V-shaped supports, B, which in turn work on hinges, C, which are secured to the base board, D. The end supports consist of a stationary board, E, at one end and a hinged leg, F, at the opposite end. The leg at F is attached to the main plank by means of a heavy hinge. When the machine is in proper position, this leg is turned under



Automobile Raising Device

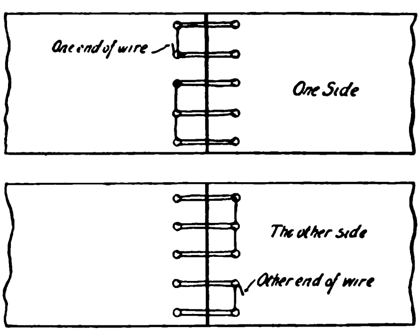
the platform and held in position by means of a rod and thumb screw.

The stationary support is attached to the plank by means of a three-cornered plate, G, and a bracket, H. The V-shaped supports are attached to the planks by means of the blocks at J J. The three-cornered plate on each side of each V support takes up the wear at this point and likewise helps to strengthen the support. Should it be necessary, a cleat or two may also be used to strengthen this support. However, this will not be necessary if good, stout stock is used. To facilitate running the machine up on the platform, a small wood block is attached to the floor at K, Fig. 1.

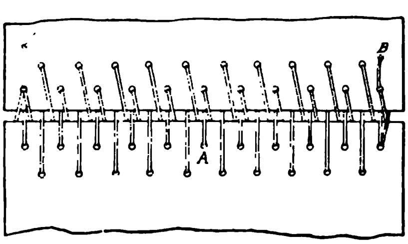
To place a machine on the platform, place the device in the position shown in Fig. 1 and run the machine up the incline. After reaching a certain point, the device will come to the second position when the hinged leg may be swung under the platform and bolted rigidly to support the machine.

WIRE BELT LACING HINGE JOINT

Some mill men have an idea that wire-lace is all right in some places, but can not be used where both sides of the belt run to a pulley, as on some feed belts or bottom



WIRE BELT LACING



LACE LEATHER JOINT.

cylinder planer belts that run over a pulley on a counter. That this is a mistaken idea you will readily see if you lace your belt alike on each side, like sketch, writes a correspondent of the Wood-Worker. This is a 2-in. feed belt. Lace the larger sizes same way. Be sure you cut out the small grooves on both sides of the belt and hammer the lace down good and tight. Then you have a job that will last.

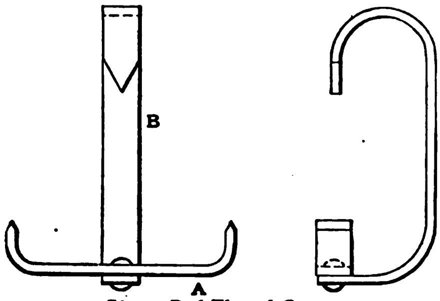
With apologies to those who know, and for the benefit of some who may not, I give a rough sketch of a very satisfactory joint made with rawhide lace leather. Start at A, which is half way across belt, and lace both ways. Punch very small hole at B and draw lace end up tightly, to cut off. Then with your knife cut a gash half through the lace close up to the belt. Cut lace end off, say ¼ in. from the notch, or gash, and hammer end down flat. This will make a good, smooth joint which will last a long time; but if you once get to using good wire lacing, and put it in right, you'll not want any more rawhide lace leather. If you doubt its being strong enough, make it double; that is, lace back across belt again after going once across.

GAUGE FOR PISTON-ROD THREADS

In repairing modern high-speed automatic cut-off steam engines in sizes up to 24-in. diameter of cylinders, a correspondent of the American Machinist experienced considerable difficulty in fitting new pistons and piston rods—particularly in getting the right pitch for the screw thread. In most of these engines the piston rod is secured to the crosshead by a thread on the rod fitting into a tapped hole in the crosshead and with a lock nut behind the boss of the crosshead to make all rigid. To get around this difficulty the piston-rod thread gauge illustrated was devised and it was found that by its use a fair fit could be made every time on the first trial.

To make this gauge, take a piece of 1x1¼-in. flat iron, A, bend its two ends up about ½ in. and file to form two V edges of 60° or the same angle as the threads, in order to fit fairly to the old thread. The distance between the two ends should be about equal to the length of the thread in the crosshead, in order that these V's may approximately represent in the gauge the first and the last thread in the crosshead.

Bend up another piece of the same flat iron as shown at B and rivet it to the middle of A, bringing its free end over and into line with the two V edges and at such distance from them that when a V-point is filed on the free end of B, the old thread will slip in between the three points. Finish piece B by bending and filing the point until a good caliper fit is secured. The gauge so made not only will give the diameter of the thread at one point, but will give the effective diameter at points where it is important that it should be known, and also provides a means of gauging the new thread,

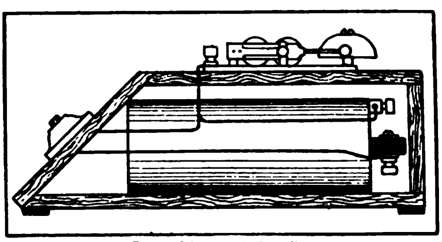


Piston Rod Thread Gauge

which may or may not be of the exact pitch of the cld one, but which if made to this gauge will screw in every time and make a fair fit, which is all that the repair man either expects or desires—and, in fact, is all that the builder did in the first place.

HOW TO MAKE A PORTABLE BELL OUTFIT

Make a box with one beveled end, as shown in the sketch, and mount an ordinary electric door bell on the top and a push button on the beveled end. One or two dry batteries will furnish enough current to ring the bell. The outfit may be used at

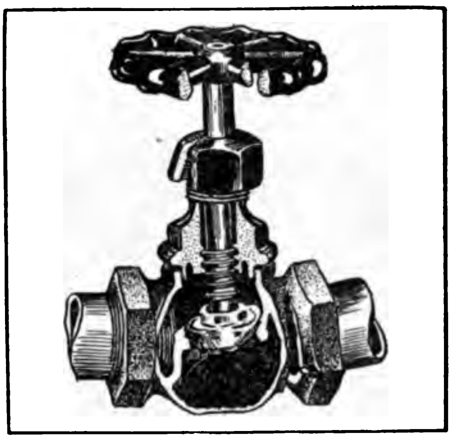

Portable Bell Outfit

the table or for invalids' use, and I have often used mine to imitate the triangle effect in our orchestra.—Contributed by Arthur L. Schacha, 4732 Broadway, Cleveland, O.

A man of average strength can develop .1 hp. with his arms or .4 hp. with his legs for 10 hrs. a day.—Trautwine.

THE ABUSE OF VALVES

Many steam fitters and engineers, upon discovering a leak in a valve, immediately condemn its workmanship instead of trying to learn the true cause of the trouble. Undoubtedly there are cases in which valves defective in construction escape detection until they have been in service for a time; but in most cases the criticism that is directed to the manufacturer does not belong to him, and affects his reputation unjustly. When valves that are thus returned as defective have been received by the maker, and carefully examined and tested, it is found, in the great majority of cases, that the leakage was plainly due to the abuse and carelessness of the persons who installed them.


Effects of Improper Installation and Operation

In discussing this subject, the Valve World gives the following directions for installing and operating valves to obtain the best results.

1. Don't allow any cement or dirt to lodge on the valve seat. Failure to observe this precaution is responsible for more leaky valves than all other causes combined and the trouble can be easily avoided by applying cement to the pipe only and in small quantities, thus preventing any cement getting inside the valve. Remove all the loose rust, scale, or dirt inside the pipe that is to be installed by standing it on end and striking with a hammer and, if convenient, after the pipe is in place, open all the valves and blow live steam through the line.

2. Don't cut threads on the pipe longer than standard, as an extra long thread will allow the pipe to strike the partition, as shown in the cut. This will spring the s

and make it slightly oval shape, thus making a good fit with the disc impossible.

3. Never apply a pipe wrench on the opposite end of a valve from the end that is being screwed on the pipe, and never clamp a valve in a vise sidewise. This should be particularly observed with the lighter class of valves as it is almost certain to spring the valve and hence cause a leak.

4. Don't try to fix a leaky stuffing box by tightening the stuffing nut with a long wrench, when the trouble can be remedied by renewing the worn-out packing.

5. Avoid undue strains on valves to be installed by placing offsets in the line, when necessary to take up expansion, and don't allow the valves to bear the weight of unsupported pipe.

6. When a valve leaks don't undertake to tighten it by using some kind of a lever on the wheel. The wheels are so proportioned that sufficient power can be obtained by using the hand alone and any dirt on the seat is only pressed in by the application of powerful leverage upon the stem.

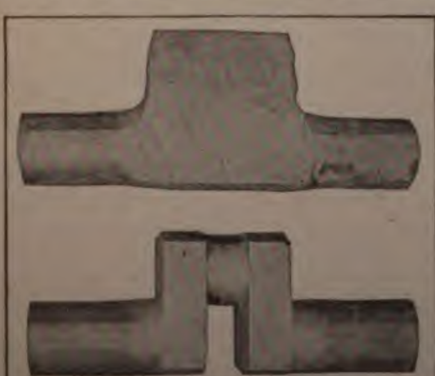
It is far better to remove the dirt from the seat by unscrewing the centerpiece or bonnet. If it is found impossible to remove the bonnet or centerpiece by ordinary methods, heat the *body* of the valve just outside of the thread with a blow-torch, or any other available means that can be applied to the body and not to the centerpiece. Then tap lightly all around the thread with a soft hammer. This method never fails, as the heat expands the body and breaks the joint made by the litharge or cement.

MACHINE FOR FINISHING CRANKSHAFTS

The method of manufacturing crankshafts in general has always been unsatisfactory. A large mass of metal must be removed from the center of a forging to form a crankshaft. This work has always been done by drilling holes across the web and then cold-sawing to meet the holes and breaking out lump from the throw; a rough square pin resulting. It was then necessary to center the pin and shaft and balance the forging with jigs so that the pin could be turned up in a lathe. To finish the cheeks of the crank, a powerful milling machine has generally been used.

The machine shown in the illustration, which will turn up a finished crank from the rough forging, is provided with a patent universal vise for roughing out and a stationary vise for finishing the crankshafts. The vises are easily adjusted to different sizes of crankshafts and will hold the work in a horizontal position for finishing the cheeks, as shown, or in a vertical position for finishing the shaft and crank pin.

By the use of this machine a rough forged crank can be finished all over in one hour and thirty minutes. This remarkably fast work is made possible by the crank being held vertically in the machine, thereby avoiding the rise and fall of the weighty lump of the forging when same is turned in horizontal position.



Rough and Partly Finished Work

Crankshaft Machine

TO FIND THE HORSEPOWER PRODUCED OR CONSUMED IN ANY MACHINE

The standard horsepower is equivalent to 33,000 foot pounds per minute, or 550 foot pounds per second, i. e., one horsepower will lift 1 lb. 33,000 ft. in one minute, or 550 ft. in one second. If the weight is increased and the distance proportionately decreased, the power required to lift it will remain the same. Thus, one horsepower would raise 1 lb. 33,000 ft. in one minute, or it would raise 1,000 lb. 33 ft. in one minute, or 330 lb. 100 ft. in one minute.

It therefore follows that the pull or force of any machine multiplied by the distance through which the force acts in one minute divided by 33,000 lb. will give the horsepower. Thus, in turning up a casting on a lathe having a cutting speed of 20 ft. a minute and producing 200 lb. pressure on the cutting edge, the power consumed will be $200 \times 20 \div 33{,}000 = .121$ hp.

If the cutting speed and cutting force were unknown, the horsepower could be found as follows: Stop the lathe and connect a spring balance to the belt. Then turn the lathe by pulling the balance and note the number of pounds required. Measure the circumference of the pulley and count the number of revolutions per minute. Now, supposing the speed to be 100 revolutions per minute and the belt tension 20 lb. on a pulley of 2 ft. circumference; then the power consumed would be, $2 \times 100 \times 20 \div 33{,}000 = .121$ hp.

Of course, these results give the theoretical horsepower and do not include the loss occasioned by the transmission, although the extra power required to start the lathe when using the balance will partly compensate for this, as it takes more force to start it than to keep it in motion.

In some machines the force is not uniform. Thus, in a steam engine the pressure on the piston at the beginning of the stroke is several times the pressure at the end of the stroke and even with the pressure remaining constant the force applied to the shaft would be variable, as it would diminish to 0 at the dead center.

The usual method of finding the horsepower of a steam engine is as follows: An indicator is attached to the engine cylinder while running, for the purpose of recording on a piece of paper the exact pressure in the cylinder at all positions of the piston. The indicator consists of a small cylinder, provided with a piston, which is held down by a spring and connected by a lever to a pencil. The pencil moves on a revolving paper and traces the record of the pressure.

As stated before, there is a considerable difference between the maximum and minimum pressures, so the mean effective pressure is computed from the indicator card and this pressure times the area of the piston times twice the length of the stroke in feet times the number of revolutions per minute divided by 33,000 will give the indicated horsepower.

Thus, a 10-in. by 12-in. engine running at 125 r.p.m. with 65 lb. mean effective pressure would give $65 \times 78\frac{1}{2}$ (area of piston) $\times 24$ (stroke $\times$ 2) $\times 125 \div 33{,}000 = 463.8$ hp.

To Obtain the Horsepower of a Lathe

In some machines the problem of figuring the power is presented in the primitive conditions that determine the value of a horsepower. Thus, a bucket elevator capable of raising material 100 ft. at the rate of 2,000 lb. a minute would require $100 \times 2{,}000 \div 33{,}000 = 6.1$ hp.

Stated in a general way the horsepower of any machine equals power times motion divided by 33,000, in which the power is in pounds and the motion in feet per minute.

A gale blowing 80 miles an hour exerts a pressure of nearly 32 lb. to the square foot

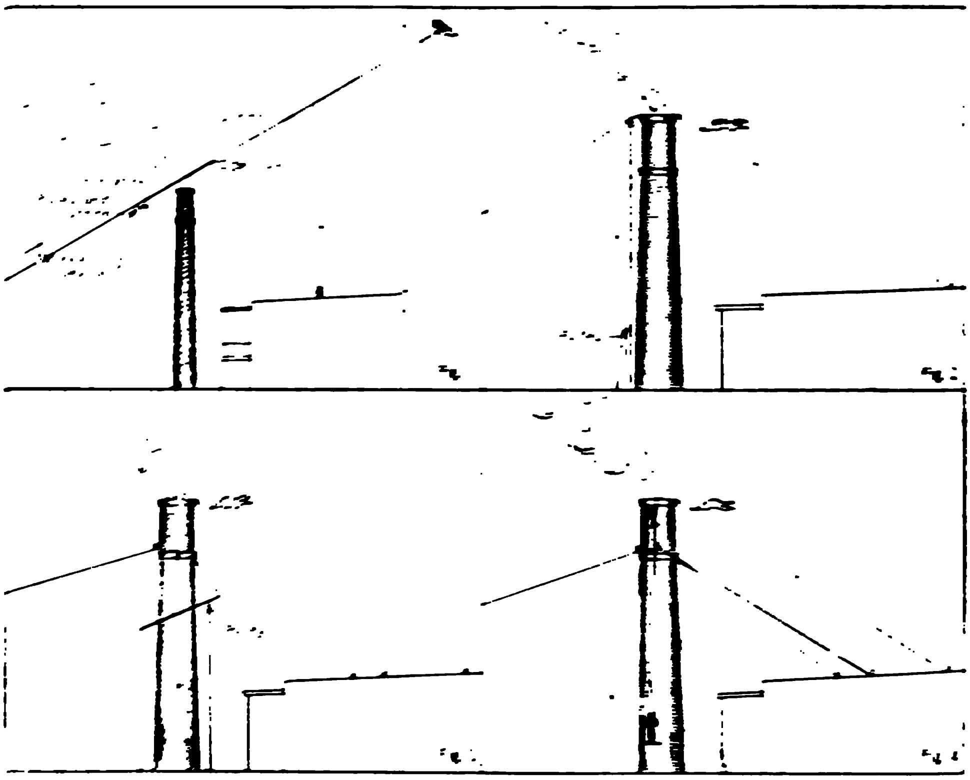
CLIMBING TALL STACKS WITH AID OF KITES

[illegible]

By [illegible]

[illegible]

After the correct position of the wire was obtained the kite was hauled down and the cord fastened to the roof of a building, as shown in Fig. 2. A climbing device was then sent up, which consisted of two wings attached to a frame, supported from the kite string by means of small grooved wheels. This allowed the device to be blown along the kite string in the manner of a "messenger" and was so arranged that the contact with a trigger near the chimney top caused



[illegible] the cost of erecting a scaffold ran up into [illegible] and would take too much time, [illegible] use one of my [illegible] for the purpose of hoisting and attaching a suitable block and tackle.

As one of the requirements of the undertaking was to obtain access to the top of the chimney without discontinuing its use, it was found necessary to interpose a 25-ft. section of iron wire in the kite string to prevent the intense heat of the chimney from burning it. A flag was placed at the farther end of the wire, as shown in Fig. 1, in order to furnish a guide for locating the position of the wire, which was nearly invisible.

a ball of string to drop to the ground, leaving a double string suspended to the pulley and allowing the elevation of a larger pulley and rope as indicated.

The large pulley was hoisted a short distance above the collar of the chimney, which was 14 ft. from the top, and the ropes were then brought around each side of the chimney and fastened to the roof of the adjoining building.

This produced a fairly strong support, but not strong enough to bear the weight of a man, and still lacking 14 ft. of the top. A strong wood and iron hook was accordingly made and provided with a pulley at the hook end and a piece of rope attached to the other end, for the purpose of raising the hook and making it catch over the top of the chimney. After the hook was caught on the top, a man was hoisted up and the work of painting and repairing continued in the usual manner.

Although it is often required to reach the top of a chimney in this way the future possibilities of kite-flying are by no means limited to this operation.

The operation of painting and repairing the roofs of church steeples has always been a serious problem and an expensive undertaking. If possible, the top is lassoed from the highest window, thus allowing a man to climb to the top of the spire and attach the necessary tackle, but when there is no window near the top it is necessary to break a hole in the roof. This has often been done in the past, but will probably be superseded by the use of kites in the future. Kites have also been used for stringing telephone wires and have proved very valuable for that purpose.

TUNNEL STERN MOTOR BOAT

American boat builders are following the English practice of tunnel-stern construction, which enables the use of a good sized propeller in a craft of small draft. The illustration shows a boat built the past season for use on Lake Michigan and for exploring trips on rivers. The dimensions are: Length, 50 ft.; breadth, 10 ft. 6 in.; extreme draft with fuel and stores aboard, 14 in.

The dining room, 14 ft. by 10 ft., is forward, with folding berths; the engine room and cook's galley with berth for engineer come next, while the after-end has two staterooms. The bridge deck at the forward end is shaded with an awning and will accommodate a large party. The power is a 4-cylinder gasoline engine. The American Shipbuilder says:

While the yacht is not intended for speed or rough weather service, she made the trip across Lake Michigan in fairly heavy weather and behaved admirably, at the same time making good speed. This type of boat is between a cruising motor-boat and an out and out houseboat, having a part of the speed of the former and the good accommodations of the latter. Such a craft is well adapted for summer use on our great rivers or along the sheltered waters of the coast or the Great Lakes.

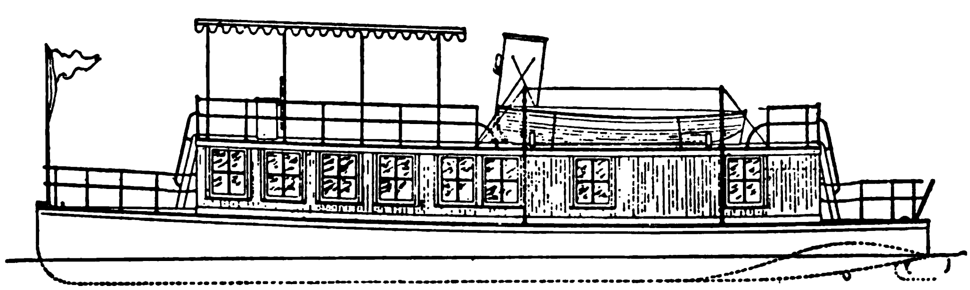
NOVEL USE OF RURAL TELEPHONE

A Kansas thresherman, who operates a large crew and several machines, has made use of the rural telephone lines in a way which will prove suggestive with others. The nature of his work calls for a change of location every few days. The first wagon to pull up and move is the office, which is equipped with a telephone. Immediately on arrival at a new place wires are run from the field to the nearest rural telephone line, and connection made. It is then an easy matter to order supplies, repairs, and whatever is needed, from the nearest town.

Arrangements are also made in the same way with the farmer to whom the outfit intends to move next, and help is secured from as many nearby farms or villages as may be required. The actual saving in money to a single contractor during one season amounts to a large sum, and saves hundreds of miles of driving, to say nothing of the increased comforts and convenience.

QUICK SETTING PLASTER OF PARIS

To accelerate the setting qualities of plaster of Paris, add a pinch of potassium sulphate to the water. This hastens the setting without injuring the plaster in any way.—Contributed by Dr. Carl Fossum, Wells Block, Aberdeen, So. Dak.



Draft Only 14 in.—Crossed Lake Michigan

THE MANUFACTURE OF DENATURED ALCOHOL

What it is Made From--How Produced--Government Restrictions--Expert Chemist's Advice to Prospective Manufacturers

By Carl Shelley Miner

Probably no piece of legislation in the last decade has created such wide-spread interest, and even excitement, as the Free Alcohol Bill. The public has demanded information about every phase of it. The daily papers, trade journals and magazines have found the subject good copy and have filled their columns with stories, the most notable characteristic of which has been a vast optimism in regard to the future of this "new industry," the manufacture of denatured alcohol. The impression has gone abroad that alcohol may be profitably manufactured from almost any sort of vegetable material, in almost any place, by almost anybody. Wildly exaggerated statements as to the yields from various materials, probable prices and extent of markets have been made, and the result has been to induce a sort of alcohol madness in the public. About one in every ten men has a plan for manufacturing denatured alcohol, and all of them want information to help them plan definitely. This magazine has received scores of letters of inquiry about the process of manufacture, availability of materials and, in fact, every other phase of the whole question. It is in the hope of answering as many as possible of these inquiries that this article is written.* I shall try to enumerate the materials from which alcohol may profitably be produced, to describe briefly the process of manufacture, and to give the prospective manufacturer an idea of the essentials to be most considered in making his plans.

NOT A NEW INDUSTRY.

One thing should be thoroughly understood, that the manufacture of denatured alcohol is not a new industry. The Free Alcohol Bill did not open the market to a new product; it merely enlarged the market of an old one. The manufacture of denatured alcohol is only the manufacture of alcohol. The process of denaturing is no more complicated than the process of putting cream into coffee. The government decides on a suitable denaturing agent, probably wood alcohol, and the manufacturer mixes it with his product under the supervision of a revenue officer. In view of this fact, it is obvious that the man who enters this field must be prepared to meet the organized competition of the distillers. Worse, it is even rumored that Standard Oil is to take over the large distilleries and attempt to control the alcohol market. However, the raw material is so abundant and so varied that no such thing as cornering it is possible. Roughly speaking, any material containing starch or sugar is a source of alcohol. Many processes have been patented for producing alcohol from cellulose, which includes wood fiber, straw, leaves, etc., but none of them have been successfully operated, although it is said that a company in the south is now producing alcohol from sawdust. It is, however, safe to say that this method will not affect the alcohol market for many years.

SOURCE OF ALCOHOL.

The great source of alcohol in this country is corn, and there seems to be little reason for believing that it will not continue to be. On this account, it will be taken as a type, and the process of manufacturing alcohol from it will be described, and then the variations from that process, necessary for the use of other materials will be discussed. The first step in the process is to change the starch of the corn into sugar, for it is only after this change that the fermentation which produces alcohol can take place. The corn, in either a whole or ground state, is mixed with a little water, and heated by steam, sometimes under pressure, sometimes with the addition of a small amount of acid, until the starch is thoroughly gelatinized, which means that the starch cell is completely disintegrated, so that the malt used to transform the starch into sugar can act more readily. A thick paste is formed, such as the housewife uses for a starch pudding. The mass is then cooled to about 140° F., and some barley malt, made to a cream with a little water, is added. The diastase

*Should any of our readers wish information which this article does not furnish, the author will be very glad to answer any letters addressed to him, at the Bryant-Miner Laboratories, 353-357 Dearborn street, Chian unorganized ferment contained in the malt, acts on the gelatinized starch, transforming it into maltose, or malt sugar, and dextrin. It is important that this process shall be carried on under exact temperature conditions, for, on this point depends the relative amounts of maltose and dextrin formed, and it is very important to produce as much maltose as possible, in order to get a satisfactory yield of alcohol. When a small amount of the solution, tested with iodine, shows that the starch has all been acted upon, the solution is cooled to about 70° F. For this purpose air, water, or a combination of the two, may be used.

When the proper temperature has been reached, a little yeast is added, and the solution is allowed to ferment. It seems scarcely correct to say "allowed" here, for the fermentation must be carefully controlled, and it is here that the experienced manufacturer has the great advantage. He has found, by careful experiment, the most satisfactory conditions for producing the largest yield of alcohol. The yeast he uses is a pure culture which produces more alcohol and fewer by-products, fusil oil, etc., than ordinary yeasts. In some cases, he even employs a zymotologist, yeast expert. If he uses a pure yeast culture, he keeps his fermentation vats, and the room containing them, scrupulously clean, to prevent the introduction of wild yeasts. Since alcohol is lighter than water, the progress of the fermentation may be kept track of by means of a hydrometer, an instrument for showing the weight of the liquor.

FERMENTATION AND DISTRIBUTION.

The fermentation is usually completed in from 30 to 40 hours. By this time the sugar and much of the dextrin, has been converted into alcohol and carbon dioxide. The carbon dioxide gas given off during the fermentation is occasionally collected, under pressure, in large tubes, and used for soda fountains, etc., but this has not proved very profitable, and is very seldom done. The liquor now contains from 8 to 12 per cent of alcohol which must be separated from the solid unfermented materials and from the water and the by-products of fermentation. The separation is effected by distillation. The alcohol boils at a lower temperature than the water, and begins to distill over first. The process is not simple, however, for mixtures of liquids are hard to separate even when their boiling points lie far apart, as in the case of alcohol and water. At a temperature a little higher than the boiling point of alcohol a mixture containing much alcohol and very little water distills over, but, as the temperature increases, the amount of alcohol in the distillate gradually decreases, and the amount of water increases, until the boiling point of water is reached, by which time the alcohol has all distilled over, leaving the solid matter, some water, behind. The solid material is either dried and sold for cattle food, or is fed to cattle at the distillery, in a wet state. The distillate is now much richer in alcohol than the original solution, but is not yet marketable. Formerly, it was redistilled until it was of the desired strength.

The modern distiller, however, has a rather complicated form of still which produces 95 per cent alcohol by a single distillation. This still is too complicated to admit of description here, but its principle is the condensation of the vapors within the apparatus, and their re-evaporation by hot ascending vapors, so obtaining repeated distillation in a single still. The distillate is an alcohol of 90 to 95 per cent strength.

Such, in brief, is the method of manufacturing alcohol from corn. There are, of course, many details which it is impossible to consider in an article of this length, but this description covers the essential points of the process. The yield will average about 2½ gal. of 95 per cent alcohol, and approximately 15 lb. of feed from a bushel of corn. This feed is worth, roughly, 1 cent a pound, so that the alcohol can be produced at a cost of 14 cents a gallon for raw material, when corn is 50 cents per bushel. The expense of production will vary with the size of the plant, price of labor, etc., so it is variously estimated at from 2 to 5 cents per gallon.

POTATOES, MOLASSES AND BEETS LARGELY USED.

In Germany, potatoes are largely used for the manufacture of alcohol and the process is almost identical with the process for corn. In this country, unless the price of potatoes drops materially, they can not compete with corn as a source of alcohol.

Molasses and the residues from beet sugar are much more likely to be profitable for this purpose than potatoes. Much of the molasses is manufactured so far from trade centers, that freight charges make it—or at least the lower grades of molasses—a waste product. This material may be easily fermented and gives a good quality of alcohol. Alcohol from this source is manufactured in Cuba for from 12 to 15 cents a gallon. Porto Rican molasses is already being imported into this country so as to be profitably used as a source of alcohol. The process of manufacture is simpler than in the case of corn, for the fermentable material is sugar, and no preliminary malting is necessary. It is sufficient to thin the molasses until it contains from 16 to 20 per cent of sugar and add the yeast.

Fruits, and many kinds of vegetable waste, can be turned into alcohol, but at present most of them can be more profitably used for other purposes. Any of the cereals, many starchy materials such as cassava, rice waste, etc., are sources of alcohol, but on account of their price, it seems unlikely that they will be used in its manufacture.

ADVICE TO PROSPECTIVE MANUFACTURERS.

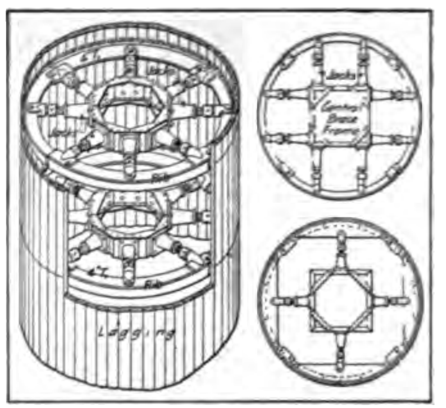
The man who is preparing to manufacture denatured alcohol must take many things into consideration. First, has he the raw material, containing starch and sugar at a sufficiently low cost? Take corn as a basis, and calculate whether the starch or sugar in the material in question costs more or less than the starch in corn, considering that starch contains 60 per cent of starch. If the material is anything out of the ordinary, so that its composition is not known, have it analyzed, not only for its value as a source of alcohol, but also for the value of the residues that will remain after the alcohol has been distilled. If the material proves suitable, then, is it available in sufficient quantity? The revenue authorities have decided to license no distillery that produces less than 250 gal. of alcohol per day. Questions of markets, transportation, etc., must, of course, be considered. Most important of all, is the probable price that alcohol will bring, and that is quite impossible to prophesy. The demand for denatured alcohol is not going to be as large at the start as many suppose. The papers have recently published an interview in which Commissioner Yerkes is quoted as saying that alcohol is very little used in Europe for power and light. If this is true in countries where denatured alcohol has long been available, it seems probable that it will be some time before it will successfully compete with gasoline as a source of heat or power in this country. There are, however, many other uses to which it may be put, which have been overlooked. Such a one is the manufacture of artificial silk, which in France makes a market for an enormous amount of alcohol.

The possibilities of this business of manufacturing alcohol are so great that very many people will probably rush into it without looking into the matter carefully, but there is no doubt a great chance for the man with small capital who wants to engage in manufacturing and who is willing to give his best efforts to bringing his process to the highest degree of efficiency.

EXTENSION JACKS FOR CAISSONS

The old method of making caissons has several disadvantages. The large steel hoops used for supporting the sides are very difficult to put in place and the increased size of the shaft which is necessary with this form of support, often leads to settling of buildings or other structures in the immediate vicinity.

To overcome these objections, a leading Chicago engineer has designed the extension jacks shown in the accompanying illustration. By using these jacks the shaft may be excavated even a trifle smaller than the desired size and the jack screws being then screwed out compress the earth around the sides thereby preventing any displacement or settling. In filling the caisson with concrete each jack may be readily slackened and shifted upward or if necessary the jacks and ribs can be left in place.



Caisson Supported by Jacks

Experiments with railroad jag spikes (spikes whose sides are jagged or notched) proved that they can be extracted with less force than the ordinary plain ones.

TREATMENT FOR THOSE SHOCKED BY ELECTRICITY

[Through the courtesy of the United Gas Improvement Co. of Philadelphia, we are enabled to reproduce the text and illustrations from their unique pamphlet on the treatment of persons injured by electric shock; which they have issued for the benefit of the many systems in which the company is interested.—Editor.]

To give proper assistance to persons shocked by electricity, it is necessary to have on hand the following materials, contained in the company's emergency kit for electric shock cases, as shown in Fig. 1:

(a) A bottle of aromatic spirits of ammonia;
(b) A bottle of ordinary ammonia, with sponge attachment;
(c) A package of bi-carbonate of soda (ordinary baking soda);
(d) A tin cup;
(e) A pair of tongue pliers;
(f) A towel;
(g) A package of antiseptic cotton;
(h) A roll of antiseptic bandaging;
(i) A roll of adhesive tape.

In case of electric shock instantaneous death or only temporary unconsciousness may result. The treatment in both cases is as follows, and it should be carried out in every instance, even though the person is apparently dead, for he might be only temporarily unconscious:

TREATMENT:—*Send for a doctor at once,* in the meantime acting as follows: Carry the patient immediately into fresh air. Place him on his back on a flat surface, with a coat rolled (not folded) under the shoulders and neck, in such a way as to allow the head to fall backward enough to straighten the wind-pipe, as shown in Fig. 2; at the same time open the shirt wide at neck and loosen the trousers and drawers at waist, and have an assistant rub his legs hard.

The sleeves and trouser-legs should be rolled up as far as possible, so that the rubbing may be done on the bare skin, and the shirt and undershirt should be torn down the front so that they may be thrown back, leaving the chest and stomach bare, as shown in Fig. 10.

Open his mouth, forcing the jaw, if necessary.

If the jaw is rigid it can be forced open

Fig. 1--Emergency Kit

by placing the forefinger back of the bend of the lower jaw-bone, and the thumbs of both hands on the chin, pulling forward with fingers and pressing jaw open with thumbs, as shown in Fig. 3.

Place something (piece of wood shown in Fig. 1) between the teeth to keep the jaws open and to prevent the patient biting his tongue, using something large enough to prevent any danger of his swallowing it accidentally; grasp the tongue with the tongue-pliers, as shown in Fig. 4, having an assistant hold it out while you are helping the patient to breathe, as described below.

In the absence of tongue-pliers, the tongue may be grasped between the index and second fingers, after they have been covered with a handkerchief.

Clear froth from the mouth by putting in

Fig. 2--First Position of Person Under Treatment

Fig. 3--Method of Opening Jaw When Rigid

your forefinger as far as possible and bringing up the froth with a scooping motion. Have the assistant who is holding the tongue slowly pass the bottle of ammonia, with sponge attachment, under the patient's nose about once a minute when the patient is breathing in, and when his arms are being extended above his head, as shown in Fig. 10.

While you are preparing the patient as just described, an assistant should force the air out of the lungs by pressing the *base of the ribs* together about once every four seconds, as shown in Fig. 5. Do not press vertically, but press on the patient's side (palms of hands over lower ribs) in such a manner as to force as much air out of the lungs as possible.

After the clothing has been loosened, the jaw forced open, as shown in Fig. 4, the froth cleared from the mouth and the tongue grasped, begin artificial breathing at on as follows:

ARTIFICIAL BREATHING.

Kneel far enough behind the head of t patient to prevent interference with the m holding the tongue. Bend the patient's ar so that the hands meet on the chest; gra the patient's forearms firmly, as close possible to the bent elbows.

1. Firmly press the patient's elbow against the sides of his body so as to dri the air out of the lungs, as shown in Fi 6; then

2. Raise the arms slowly with a sweepi motion until the patient's hands meet abo

Fig. 4--Method of Inserting Block in Mouth

(or behind) the patient's head, as show in Fig. 7; then

Fig. 5--Forcing Air Out of Lungs

Fig. 6--First Movement in Artificial Respiration

3. While you have the patient's arms stretched out in line with his body, give them a slow, strong pull, until you have expanded or raised his chest as high as it will go, as shown in Fig. 8; then

4. Bring the arms, with bent elbows, down against the sides, and press them firmly as before, as shown in Fig. 6.

This action should be continued about fifteen times a minute until the patient begins to breathe. You must guard against a tendency to make these motions too fast; they must be done slowly. A good plan is to count four slowly—"one," as the pressure is given on the sides, as shown in Fig. 6; "two," as the arms are being extended above the head, as shown in Fig. 7; "three," as the strong pull is given, as shown in Fig. 8; and "four," when the arms are again being bent and returned to the sides, as shown in Fig. 9.

Do not let your hands on the forearms slip away from the elbows; the best result comes from grasping close to the elbows, as shown in Fig. 9.

The operator must appreciate the fact that this manipulation must be executed with methodical deliberation, just as described, and never hurriedly, or half-heartedly. *To grasp the arms and move them rapidly up and down like a pump-handle is both absurd and absolutely useless.*

Each time the arms are pulled above the head and the chest expanded, the assistant who is holding the tongue should pull the

Fig. 7--Second Movement in Artificial Respiration

Fig. 8--Third Movement in Artificial Respiration

tongue out and downward, and another assistant should, from time to time, slap the chest with a towel or cloth wet with cold water, as shown in Fig. 10.

When the patient is breathing by himself, the process of artificial breathing can be stopped, but the process of pressing the sides *every other* time he breathes out, should be started as follows:

Do not press vertically, but press on the patient's side (palms of hands over lower ribs) in such a manner as to force as much air out of the lungs as possible, Fig. 5. You can carry out this pressing action most successfully, if, on beginning, you move your hands in and out with every breath, pressing very lightly, until you have established a rhythmical motion of your hands in unison with the patient's breathing; then you can begin to press hard at every other out-going breath.

The object of doing this is to strengthen his breathing. By making the pressure every other time he breathes out, you give

Fig. 9--Fourth Movement in Artificial Respiration

Fig. 10--Positions of Assistants

him an opportunity to take a breath himself, and this natural effort to breathe is in itself strengthening to the action of the lungs.

Continue this pressing action until the man is conscious and breathing well by himself.

The rubbing of the legs and arms should continue as long as the artificial breathing, or pressing action, is necessary, and the holding of the tongue, and the passing of the bottle of ammonia with sponge attachment under the nose, as long as he is unconscious, as shown in Fig. 5.

After he becomes conscious, give him a half-teaspoonful of aromatic spirits of ammonia in a third of a glass of water. After you have brought him around, surround him with bottles of hot water.

Beer bottles are easily obtained, and should be filled with hot water and covered with a paper or cloth to prevent burning the flesh. Hot bricks, also covered, or gas bags filled with hot water will answer as well.

Then cover him with a coat and watch him. See Fig. 11.

In performing artificial breathing, if the patient does not show any signs of coming to life promptly, you should not be discouraged, but should continue the motions regularly for *at least one hour*, summoning such assistance as you may need. Cases are known where patients showing no signs of life after an hour's work have still recovered, and their recovery was due entirely to the faithful persistence of the person in charge.

Persons shocked by electricity need *fresh* air; therefore, bystanders should not be permitted to crowd around a

Fig. 11--Treatment After Patient Becomes Conscious

patient, and no one should be allowed to approach him except those carrying out these instructions.

The recovery of a person unconscious from electric shock may be hastened by the use of oxygen, which should be administered at the discretion of the doctor.

BURNS CAUSED BY ELECTRICITY

Electric shocks are often accompanied by various types of burns, which should be treated as follows:

Have the injured attended by a doctor as soon as possible. In the meantime cover the burned surface with cotton, saturated in a strong solution of bi-carbonate of soda and water (as much soda as the water will absorb), and then wrap with light bandaging. In the absence of soda, carron oil may be used in the same manner.

Even apparently slight burns should be treated by a doctor, as the injuries are likely to prove more serious than those resulting from ordinary burns.

Should the articles contained in the company's emergency kit for electric shock cases not be on hand when needed, after sending for a doctor, every effort should be made to revive the patient, by following the course of movements described until the doctor arrives and the necessary articles are secured.

POINTS FOR INVENTORS

1. When you have made an invention, show a drawing or model of it to two friends in whom you have confidence, and have them sign the drawing or write their names on the model. Don't lose or destroy the drawing or model, for some day it may be needed as evidence.

2. Select a good patent attorney, pay him $5 to find out whether your invention is new and patentable, and have him send you copies of the patents which he finds most closely resembling your invention.

3. If there are real differences between your invention and those shown in the patents sent you, and your invention is better than the others, apply for a patent as soon as possible. If, on the other hand, the differences are slight or superficial, and do not add to the commercial value of the article, don't waste any money in getting a patent.

4. If you cannot afford to apply for a patent, give an interest in your invention to some good business man who will furnish the necessary money to get the patent and build a satisfactory model or sample of your invention.

5. After you have applied for a patent and made a model or sample, prepare either to manufacture and sell your invention yourself, or to sell the patent to some one who will do so. Find out what it will cost to manufacture the invention in quantities, what such things usually sell for to jobbers, retailers and the public. This information is valuable in negotiating the sale of the patent and should be full and accurate.

6. Don't expect to make a fortune from your patent at once. If you cannot sell for cash, sell on a royalty, provided the buyer is reliable and responsible.

7. Don't sign any contracts without first submitting them to your patent attorney, and be governed by his advice.

8. If there are any other points about which you want advice or information write to us and enclose a stamp for reply. Send for our booklet containing suggestions on "What to Invent" and "What to Avoid."

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