POPULAR MECHANICS

# SHOP NOTES

FOR

# 1913

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EASY WAYS TO DO HARD THINGS

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OF DAILY USE
TO EVERY MECHANIC

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*Vol. IX—Table of Contents, Pages 1847-1853*

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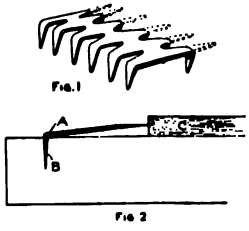
POPULAR MECHANICS, CHICAGO

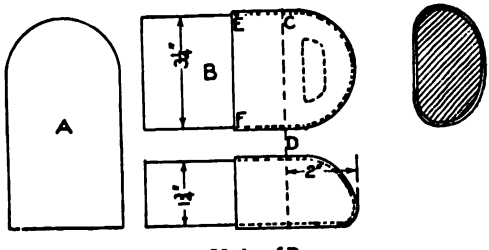
### Belt Hook Used as a Bench Stop

A very good bench stop can be made from an ordinary metal belt hook. Procure one that measures ¾ by 1¾ by 2½ in. and straighten out the points on one side as shown by the dotted lines in Fig. 1. If the points are too sharp, round them off a little with a file. Lay the hook on the bench top at the place wanted and strike the part marked A to drive the points B into the wood. Raise the points that hold the work C with the claw of the hammer.—Contributed by W. A. Lane, El Paso, Texas.




### Homemade Ear Phone

A person who was slightly hard of hearing made a phone that enabled him to hear quite well while in church or at public meetings. While the phone is visible, it is not unsightly, if carefully made. It is constructed of paper glued together over a wood form as shown at A in the sketch. The form is first covered with a thin sheet of paper carefully shaped over the rounded end and the edge is pasted to the wood at E F. The thin paper is then covered by gluing narrow strips of brown wrapping paper all over the surface as far back as the line E F.

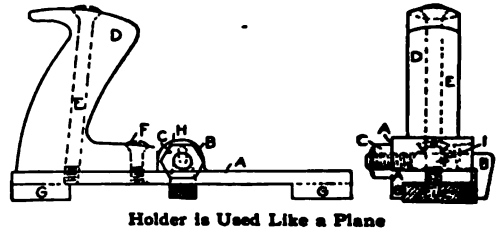



Phone Made of Paper

Cover it again and lay the strips so as to cross the first layers. Repeat the operation until there are six or eight coverings. When the paper drys, rub it down with a very fine emery cloth or sandpaper, cut it neatly on the line C D, and slip it from the mold B. A hole is cut in the flat side to fit the ear near the head. The phone is very light, and, if carefully fitted, it can be worn without annoyance or fear of falling off. The phone acts on the same principle as placing the hand behind the ear.—Contributed by J. E. Noble, Toronto, Canada.

### A File Holder for Flat Work

The tool or handle shown, when clamped to a large file, comes very close to being a planer when it is required to remove stock from a flat surface. For metal use a long file and for patterns use a short one, says a correspondent of American Machinist. A short file can be made of a 14 or 16-in. file, cut in half by grinding, then removing the tang and squaring the end, thus making two short pieces.




Holder is Used Like a Plane

The holder consists of a piece of machine steel, A, with jaws, G G, and a hub, H, through which a ¼-in. hole is drilled and reamed to receive the shank end of the jaw B. The jaw B is made of tool steel, threaded for a casehardened nut, C, and the inner surface of the jaw milled the same as the jaw of a vise. The position of the pin for holding the shank of the jaw B is shown by I. To allow a lateral motion for the jaw B in the boss H, a slot or keyway is cut to fit the pin I. A wood handle D, such as used on carpenter's planes, is fastened to the metal A, with two bolts, E and F. A section of the file is shown clamped in position.

# Homemade Derrick Crane

A simple and cheaply constructed hand-power windlass and derrick is often desired for lifting bulky objects a short distance, loading heavy articles, etc. Figure 1 shows one type of crane. The bearing of the arm of the derrick is arranged to allow it not only to rise up and down but to revolve around the center post. One of the clips is shown at A. A windlass can be attached to the post with a stationary bearing or with one like that used for the arm with the extension as at B. The diameter of the post should be about 4 in., or heavy enough for the work it is intended. The bearings of the arm and windlass are 1½ in. less in diameter. Any local blacksmith can make them and other iron fittings that are needed. The ends of the boom are supplied with parts as shown at C and D.

A boom derrick arranged as in Fig. 2 will be found of great service for loading and unloading boxes, barrels, sacks and any heavy articles stored in a basement. One man without some mechanical assistance of this kind is often unable to lift heavy articles from a cellar-way and load them on a wagon conveniently, and even if several men engage in the work they cannot remove

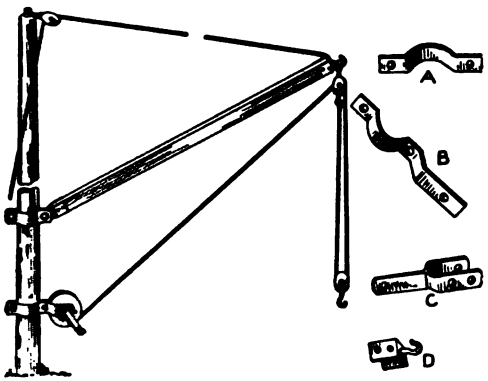



Fig. 1—Hand-Power Derrick

and load the articles as easily and speedily without the derrick as they can by its help.

Use a stout piece of timber for the derrick post, not less than 4 in. square, or a round pole, and a square piece of wood 10 or 15 ft. long for the boom. Insert a heavy iron pin in the top and lower end of the post and shrink iron

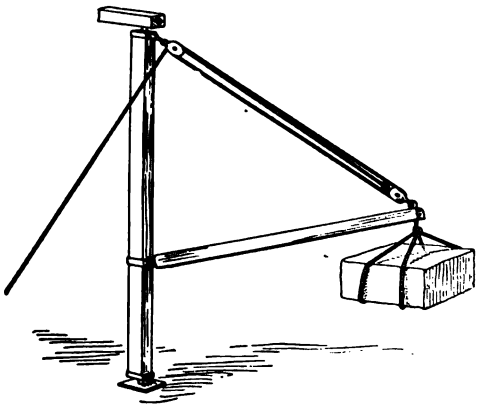


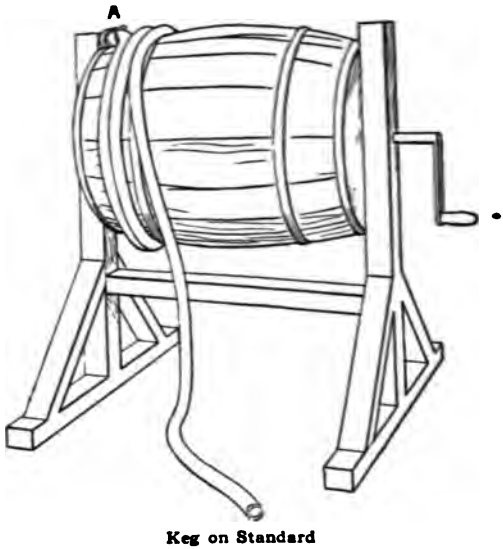
Fig. 2—Derrick Crane

bands around the wood. Hinge one end of the boom with iron straps and bolt them to the post about 5 ft. from the bottom, and on the other end put a band with eyes or hooks. If the post is round, the boom may be hinged by using a band on the post and a knuckle joint similar to the one shown in Fig. 1. These can be made of old wagon-tire iron. The top pin of the derrick post is held by a strong projecting iron or wood cleat, or one of the building timbers, and the lower pin revolves in a wood block having an iron socket or a heavy stone with a hole drilled to receive it.

The top of the post and end of the boom are connected with a rope and single pulleys or by a double-block tackle. One man with ordinary exertion will be able to handle conveniently a very heavy weight, which, when elevated by means of the boom, can be swung around to the point desired for loading or unloading. If a pulley is attached to the building near the foot of the post, the rope may be conducted over it and have a horse or windlass attached, when it is necessary to handle unusually heavy objects.—Contributed by J. G. Allshouse, Avonmore, Pennsylvania.

### A Hose Reel

An ordinary nail keg hung on a shaft as shown in the sketch makes a good hose reel. The standards are made of

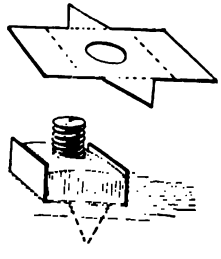



Keg on Standard

five pieces of 2 by 4-in. material braced with two ⅞-in. strips. Two nails are driven into the keg at A to hold the hose end connection. The shaft can be made of an ordinary ½ or ¾-in. rod with a crank bent on the end.—Contributed by Theodore Becker, Kansas City, Mo.

### Combined Washer and Nut Lock

Nuts and bolts on wood framework frequently come loose. A way to prevent this is to secure a suitable piece of light iron and cut it as shown in the sketch. It is then placed over a bolt and the points bent down so they will press into the wood as the nut is turned. When the nut is set, turn up the iron clips to lock it.—Contributed by W. A. Jaquythe, Richmond, Cal.

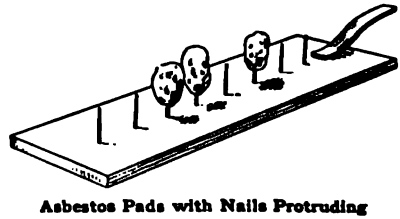


### Grinding Carburetor Valves

An expanding watch-key makes an effective tool to grasp the stem of the needle valve of a carburetor when grinding in a valve. As the stems of these valves are usually so small that it is difficult to get at them and to hold them securely, this watch-key kink is a great help in grinding in, removing and replacing valves of this class.—Contributed by James M. Kane, Doylestown, Pa.

### A Potato Baker

The potato baker I made consisted of two pieces of sheet asbestos, 18 in. long, ¼ in. thick and 4 in. wide. Over these pieces I placed a piece of tin, 18 in. long, 11½ in. wide, turning it over from the top and lapping on the bottom. Through the pad there were driven several nails on the points of which the potatoes could be impaled. The handle was made by folding a strip of tin over several times and driving brads through the end of the



Asbestos Pads with Nails Protruding

pad. Potatoes baked on this device cook through and through and are very mealy.—Contributed by Joseph H. Noyes, Murfreesboro, Tenn.

### How to Make Paracentric Keys

Probably nothing is more puzzling to the amateur or even to some locksmiths than to make a key to fit a Yale or any other similar lock when the original key is lost, without partly destroying some part of the combination or defacing some part of the cylinder.

The sketches, Figs. 1 and 2, show the cylinders of a mortise lock and rim lock, respectively. These were orig-

inally made with a slide at G to keep the springs and pin tumblers in their respective chambers, all of which are shown in Fig. 3. The present method of making these cylinders is to bore the tumbler chambers from the bottom, insert the springs and tumblers, and then plug the holes.

If one has occasion to make a key for the former, it is rather a simple matter as the slide at G can easily be removed, the springs and upper pins carefully taken out, and then, after fitting the key, all the parts can be replaced.

With the more modern cylinder it appears to be a more difficult task, but after a few trials and careful study of the following instructions, it will be found much easier than the other, and less troublesome. First procure a piece of wood 3 or 4 in. long and of the same thickness as the barrel B, Fig. 3. Remove the screw at C and hold the cylinder in the left hand with the thumb on the back of the barrel and the index and middle finger on the front. The sketch Fig. 1 shows the mortise lock cylinder, also the proper way of holding either style of cylinder. Tap the top sharply at G with a hammer handle, at the same time applying a slight pressure with the thumb. After a few blows the barrel will move out of the cylinder. Be careful not to let it move more than 1/16 in., then give it a quarter turn. Gently push out the barrel with the dowel stick and at the same time be careful not to let the tumblers drop out of the barrel. The dowel serves two purposes, viz., to push out the barrel and to keep the pins D and springs E in the cylinder as shown in the upper part of sketch Fig. 3.

Usually five or six blows will be sufficient, but do not be discouraged if success is not immediate, as a good many blows are sometimes required. Strike quite sharply as the hammer handle will not injure the lock in any way. After the barrel has been removed, take out the pins and lay them down in such a way that they can be replaced in their respective chambers without trouble. Put a blank key in the barrel, and by using the tang of a file mark through the tumbler holes for each pin. Remove the key and replace

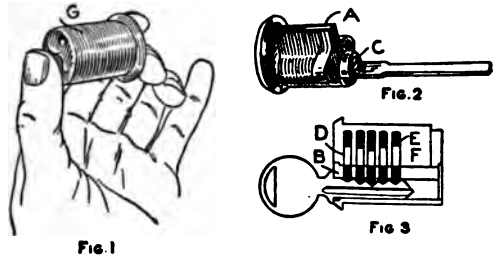



Fig. 1 Fig. 2 Fig. 3

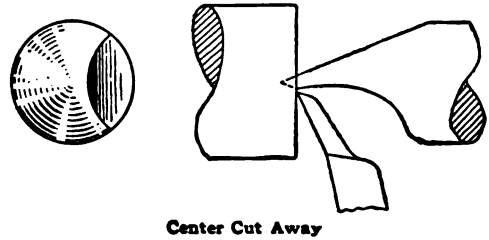
Parts of a Pin-Tumbler Lock

the tumbler pins. File V-shaped notches in the key, testing frequently so that each pin will be level with the top of the barrel. Leave the key in the barrel and carefully replace in the cylinder, finally screwing on the connecting bar.

The notches in a key for holding the pins at the proper height to permit the tumbler to turn in F are shown in Fig. 3.—Contributed by R. E. Davall, New York City.

## Lathe Center for Facing Work

A center which does not have to be pulled away from the work a little to allow the side of the tool to face into the center is shown in the sketch. It is an ordinary lathe center which has been cut away on one side to within $\frac{3}{16}$ in. of the point. The corners of the portion cut away are rounded to avoid reaming the center hole. This center has been in use several years with entire satisfaction. It requires little time



Center Cut Away

to take the full center out and insert the one-half center, when some work must be faced or recessed near the center.—Contributed by Andrew Smith, New Haven, Conn.

### Former for Pipe Hangers

It pays to have tools to make pipe hangers where they are wanted in large quantities, says the American Blacksmith. One pipe hanger and the tools with which to make it are shown in Fig. 1. These are for a small pipe and are slipped on before screwing on the coupling. The pieces are cut to the proper length and bent in the middle in the shape of a rough eye which will go into the tool. The pin is then driven in. This trues up the eye and holds it secure while the ends are bent down as shown by the arrows in Fig. 2.

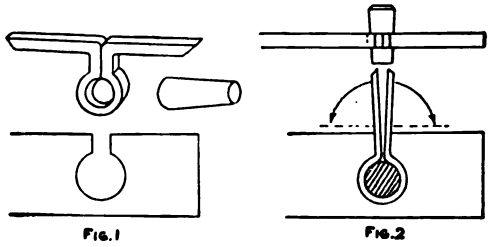


Fig. 1 Fig. 2

Former Parts

### How to Tie a Flag-Pole Rope

When fixing a flag-pole rope it is necessary to tie it right to keep the strain off the pole caused by the drawing of the rope when it gets wet. If the rope is tied as shown in Fig. 1, it will begin to draw the pole out of plumb, as in Fig. 2, and as soon as the rope gathers some dampness and gets thoroughly soaked, it is liable to break the pole as shown in Fig. 3. The proper way to tie the rope is shown in Fig. 4.—Contributed by Edward Von Kaenel, Cleveland, O.

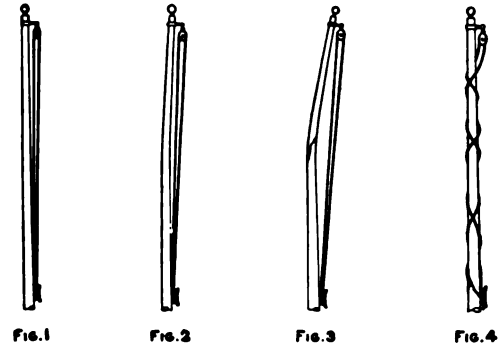
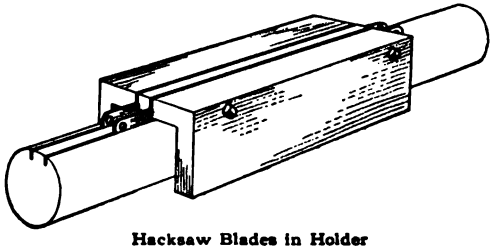


Fig. 1 Fig. 2 Fig. 3 Fig. 4

Tying a Flag-Pole Rope

### A Keyway Cutter

Anyone who has had to cut keyways in shafting while in the hangers knows how hard it is to accomplish the work without proper tools. I find that a straight keyway can be cut by using the device shown in the sketch. The edges of two L-shaped pieces of wood are bolted together with another strip of wood having the width of the keyway to be cut placed between them. Hacksaw blades are placed in each joint before the nuts on the bolts are drawn up. It will take only a few minutes' time to cut the depth of the keyway, when the metal between the saw cuts can be chipped out with a keyway cutter.



Hacksaw Blades in Holder

### Collapsible Water Pail for Automobiles

Procure an old inner tube that has been discarded and select from 3 to 4 ft. or more of the rubber that is watertight. Cut the desired length from the tube and close one end by cementing it under pressure. This is a cheap and easily made substitute for the ordinary collapsible pail, and can be packed in a small place.—Contributed by Wm. L. Hoff, Washington, N. J.

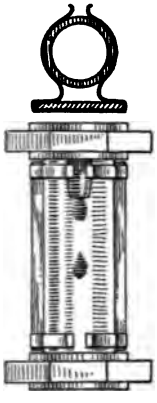
¶ Leather washers cut from a piece of old belt and put on a monkey-wrench tang, then dressed down with a block plane, make a better handle than wood.

### How to Remove Varnish from Floors

Dip an ordinary scrub brush in pure ammonia, scrub over the surface to be cleaned until all the varnish is removed, and wipe off with fresh water, using a rag or sponge. When dry, varnish or shellac, as desired. After drying, the surface has the appearance of new wood.—Contributed by H. W. Ravens, Seattle, Wash.

### Reflector on a Lubricator

Sometimes it is difficult to see the oil drops in the sight feed of a lubricator, owing to its position. If the choke plug becomes stopped, it will flood the glass with oil. I had a locomotive-type lubricator, triple sight feed, of the bracket type connected to three air pumps on the testing rack.



Necessity required the placing of the lubricator on a cross bar quite high, between and over the pumps. The bar was in line with the sight-feed glasses and made it possible to watch the drops for timing only at close range, as the bar behind destroyed the usual transparency of the glasses. In this case, where the feed cannot be seen because of the location, the difficulty was overcome by fastening a mirror behind the feed glass, whereby the drops may be plainly seen almost as far away as the lubricator is visible.—Contributed by F. W. Bently, Jr., Huron, S. D.

### Crane for a Cripple's Bed

The apparatus shown in the sketch may be attached to any bed and used as a swing or derrick for patients with disabled limbs, and especially for one with a broken limb when a plaster cast is used, making the disabled member heavy and painful to move. With this device the patient can move about in bed at will, unassisted, by pulling


Crane on a Bed

the small rope. The limb can be raised so as to allow the patient to turn over, sit up, or lie in any position.

The arches are made of ½-in. iron rod with a shoulder at the ends where they rest on the side rods of the bed in which holes have been bored to admit them. The end for a wood rail is shown at A, and for an iron one, at B. The arch resting across the bed has a 2-in. loop at the top into which the rod resting on the foot of the bed is hinged so that it may have a joint that can be adjusted to any size of bed.

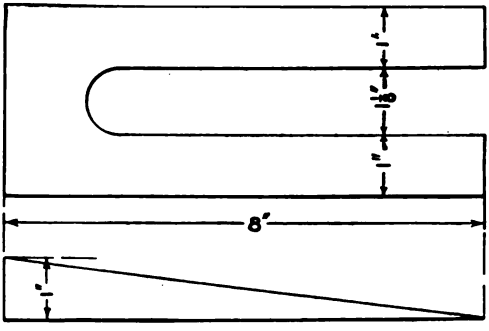
A pulley is attached in the loop at the top of the arch by a hook and a flat, notched ½-in. rod that is fastened to the cast by loose bandages so that the limb may be turned in it. This is swung on another pulley and the two pulleys are connected with a small cotton rope.—Contributed by Dr. C. A. Noland, Monroe City, Mo.

### How to Clean Steel Tapes

Cover the tape with crude oil and rub down with No. 0 steel wool. This will clean the rust from the tape without injury to the etching. If the tape is not very rusty, it may be brightened up by rubbing with powdered pumice or dry cement.

### A Bolt Remover

The bolts that become stuck in locomotive frames I easily remove with a split wedge, as shown in the sketch.

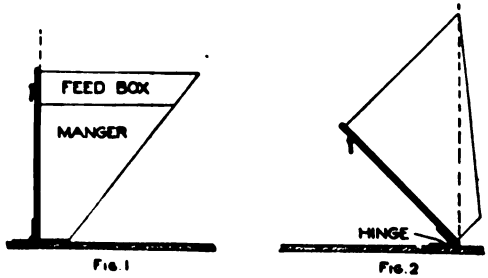



Details of Remover

The wedge can be used in removing bolts on all kinds of work. The bolt should be loosened first by pulling on the nut with a long wrench and striking the head with a hammer. The wedge is then started under the head and driven in with a hammer.—Contributed by Earl S. Goddard, Ridgway, Colorado.

### A Tilting Manger

A very handy tilting manger for the barn is shown in the accompanying sketch. In Fig. 1 is shown the manger in place, the weight being sufficient to keep the front vertical. The lower part is hinged to the floor so that it may be swung back out of the stall for placing in the feed. See Fig. 2. This also provides more room for the animal.—Contributed by C. C. Brabant, Alpena, Mich.




Manger Swings on Hinges

### One-Man Cable Test

Very few electricians and cable splicers know how to test dead cables without a helper, and as an experienced helper is not always at hand, the following method may be of value.

The example used for illustration is a small telephone cable which has been "cut in" at random on the main distributing frame. It is understood that the cable is not "code," that one side of the pair is a solid color while the other side is white. After "cutting in" the cable on the main distributing frame or box, the tip of the pair No. 1 is grounded. The ring of the pair No. 1 is connected to the tip of the pair No. 2, and the ring of No. 2 to the tip of pair No. 3 and so on through the cable as shown in Fig. 1.

The cable having been connected up

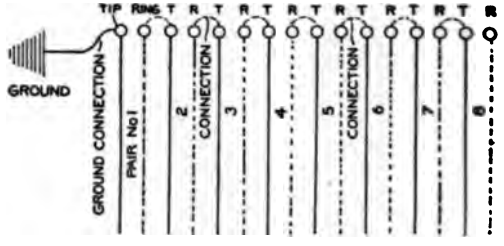



Fig. 1—Main Distributing Frame

as shown, the tester enters the manhole, opens the cable, clears the ends of the wire, and connects up as shown in Fig. 2 with a head receiver in series with a battery. The other side of the battery is connected to the ground. A search line is attached to the open side of the receiver.

Test out by touching each wire with the search line until a loud click is heard in the receiver. This will be pair No. 1. The battery lead is now removed from the ground and placed on the ring wire of No. 1. Touch the ends with the search wire as before and pair No. 2 will be tested. Place the battery wire on the ring wire of No. 2 to test out No. 3 and so on through the cable, putting each pair into fanning strips as they are tested out.

This test, while slow in changing

the battery lead on each pair, is extremely simple and thoroughly practical, if the cable is tested for opens, crosses and grounds previous to making the test. If trouble is found on the preliminary test, that pair should be left out when "bunching" on the frame and left until the last. The odd pair will be the one which is in trouble and can be placed in its proper

Fig. 2—Testing Device

position in the fanning strip when found.—Contributed by G. M. Peterson, Buffalo, N. Y.

### Lubricant for Threads in Heated Places

All nuts, cap screws, plugs and pipe fittings that are installed where they will be heated should have the threads well smeared with graphite and oil before they are screwed together. If oil alone is used, it is sometimes impossible to remove them as the oil burns out and the joints become rusty and stick.

### Protecting Freshly Varnished Floors

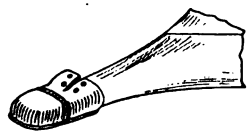
It is often necessary to walk upon freshly varnished hardwood floors and the usual thing to do is to lay boards on the sticky surface and walk on the boards. When the boards are removed some of the varnish comes with them and the spots must be varnished over again. The boards may be kept

Cleats on Board

from sticking by applying a coat of wax to the side placed on the varnish. A little paraffin, beeswax or common floor wax rubbed on the surface will be sufficient. It is also advisable to build up the boards as shown in the sketch. This will make very little surface contact with the floor.—Contributed by Philip Edelman, Minneapolis, Minnesota.

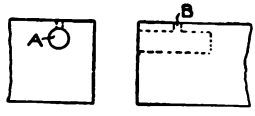
### Shoe on a Plowshare Point

When passing from one field to another it is difficult to keep the point of a plow out of the ground. By carrying a part of an old shoe this trouble may be overcome. The sole of the shoe should be cut off just below the instep. The toe of the shoe is placed on the plowshare point as shown.—Contributed by Carl Lung, Camelius, Oregon.



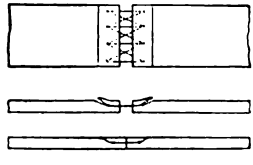
### Drilling Cotter Holes

A simple jig that is in use in our shop for drilling cotter holes in small rods has proved a great time saver. As it takes but a few moments to make it, we usually make one for each job. A hole B, the same size as the cotter, is drilled in an old piece of cast iron, near one edge and entering a hole drilled for the rod. The jig is clamped on the drill press and a drill run through the hole already drilled. With this jig a hole can be drilled through an ordinary nail. In drilling a number of pieces, the jig has the advantage of keeping the holes all the same distance from the end.—Harold M. Ilg, Lowell, Mass.




### Lacing Belts

The method of lacing a belt shown in the sketch makes a neat joint and the belt will run smoothly over the pulleys. A light score is made with a knife, ½ in. from the end and across the flesh side of the leather. If it is a 1-in. belt, about four holes ¼ in. apart are made with an awl endways through the leather,

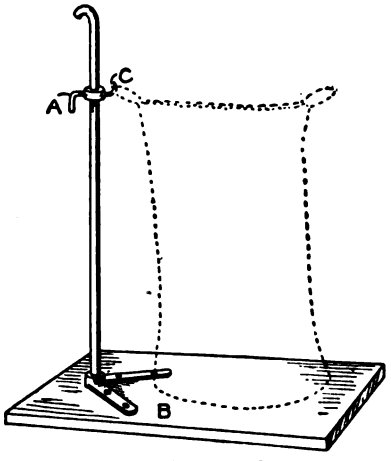


starting them in the score. Lace the belt through and through with a waxed thread and tie the ends in the score. When finished, the thread lies beneath the score in the thickness of the leather out of sight. The joint is almost indestructible, as the thread does not touch the pulleys.

This kind of lacing is particularly adapted for belts of dynamos or any high-speed machinery.—Contributed by Arden D. Whipple, Oakland, Cal.

### Holding Sacks while Sewing

A device for use in holding sacks and bags while sewing up the opening is the invention of a correspondent of

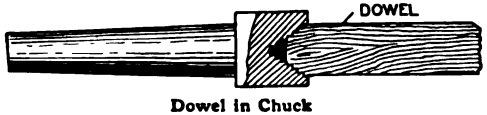



Position of Sack on Stand

American Miller. It consists of a table, B, with an upright round iron fastened to it as shown. The hook, C, is attached to a sliding collar with a set-screw (having a lever A) to hold it in place. This is to provide adjustment for long and short sacks. The sack is hooked on C to steady it while sewing.

### A Chuck for Turning Dowels

A good chuck for turning dowels or other slender pieces of wood is shown in the sketch. It is made of tool steel



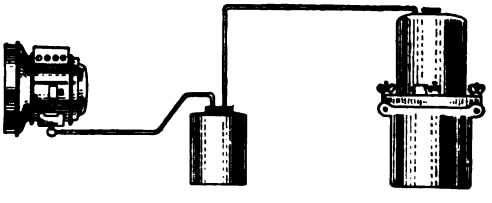

Dowel in Chuck

and is turned to fit the tapered hole in the lathe spindle. The other end is recessed at a very sharp angle taper and then a thread is cut on the taper. It is readily seen that the greater the retarding force on the stick, the tighter it drives.

The great trouble with the common spur center for turning small work is its tendency to split the wood. One manufacturer had trouble until he made this driver which has so far never spoiled a stick. This tapered internal thread is rather hard to cut unless a lathe is equipped with special attachments.

### Improving Acetylene Gas for Automobile Headlights

Wet gas is a certain cause of flicker in acetylene headlights for automobiles. Dry gas will burn steadily. For this reason, I constructed the dryer shown in the sketch. I made it from a solidly constructed 1-quart tin can having a screw top. Two small holes were punched in the cap and a 3-in. piece of brass generator tube inserted in each for about one-half its length, and



Connections from Generator to Lamps

soldered. The upper ends were bent so they would meet the rubber tubing. The dryer can be placed under the hood, seat or in the tool box.

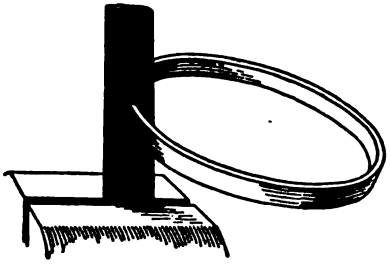
Put a small handful of carbide in the can and screw the cap on tight, then pipe from the generator to one pipe of the can and from the other to the lamps. The water in the gas which leaves the generator will be left in the can, as it cannot get out, and will drop to the bottom on the carbid be

turned into gas. All moisture is taken up by this method and nothing but dry gas can reach the lamps.

The carbide should be renewed in the can from time to time, but not very often, unless the lamps are used every night.—Contributed by Earl R. Hastings, Corinth, Vt.

### Filing Piston Rings

In filing small metal packing or cylinder rings, it is a hard task to get the ends of the split to fit close against



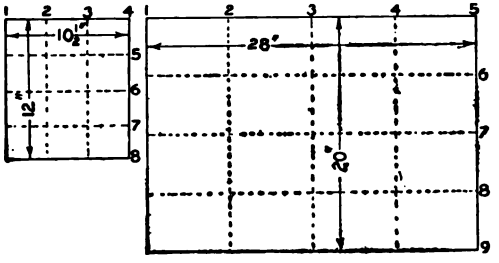
Filing Ends True

each other. If they do not come together closely, the ring will be weak, no matter how well it fits the bore of the cylinder. The sketch shows a way to file the ring so that this trouble will be overcome. The ends of the ring are grasped in the hands and worked on a file held in a vise.

### Wiping and Catching Cloths

The best size for an all-around wiping cloth for wiping lead-pipe joints is about 3 by 3½ in. with strips on the material running lengthwise as shown in the sketch. The material is cut 10½ by 12 in. and strips fastened parallel to the 12-in. edge. The piece is then folded as follows: The first division is folded to 3, and 4 is folded to 2. This makes the cloth the width of one section. Using 4 as the top edge, fold 4 and 8 to 6 and then 5 and 7 to 6. Make a few stitches in each narrow end and soak the cloth in heated tallow and paraffin.

The catching cloth should be cut 20 by 28 in. with strips running parallel to the 28-in. edge and folded as follows: The first division 5 is folded to 7 and 9 to 7 and folding at 7 brings




Size of Cloths

6 and 8 together. Then fold 1 to 3 and 5 to 3, then fold at 3, bringing 2 and 4 together. Stitch on the narrow ends and soak in the tallow and paraffin.

### Coloring Meerschaum

An easy way to color a meerschaum pipe and avoid finger marks is to use the method shown in the sketch. Cut a hole in the bottom of a bottle large enough to receive the bowl of the pipe. Place the pipe in the bottle with the stem protruding through the neck and wrap paper around the stem and seal it with wax to make an airtight joint. Place the stem of another pipe through the large hole in the bottom of the bottle and fill in with paper and seal with wax. Place the tobacco in the bowl of the protruding pipe and begin smoking through the stem at the neck

Pipes in Bottle

end. The coloring can be watched through the glass.—Contributed by Henry E. Seidell, Jr., Ft. Worden, Washington.

¶External corrosion of boilers is caused by leaking seams, rivets and gaskets. Wet ashes and soot will corrode the plate if left in contact with it.

## New Method of Setting Commutator Brushes

A new and successful method of setting brushes, which does not require expensive instruments or special apparatus, is described by a correspondent of Power. All that is required is a short piece of No. 12 insulated copper wire from which the insulation has been removed for about 2 in. from one end. This end is flattened and tapered to a point, as shown in Fig. 1. It will be found convenient to bend the end backward as indicated. When the machine is running and carrying its regular load, the wire should be brought into contact with the commutator and carefully moved toward the brush until it touches it. Usually the toe of the brush is the edge which sparks, and this edge should be tested first. If the brush spits and glows when touched with the wire, the brushes are not on the neutral line corresponding to the load on the machine.

FIG. 1

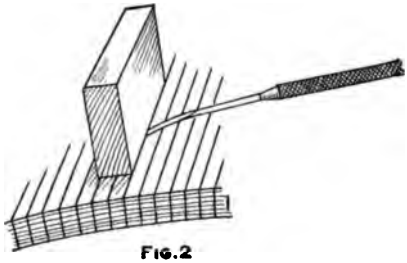


FIG. 2

Applying Wire to the Brush

Both the toe and the heel of the brush should be tested and the yoke shifted until the glowing stops. The brushes on each arm of the machine should be tested. If some spark while others do not, this is an indication that the spacing is not right. If a position cannot be found where the glowing stops, it shows there is something wrong in the adjustment or the design of the machine. Small 500-volt machines and machines having high commutator speed will always spark more or less under this test, but the sparking is very slight if the machine is in good condition, even when carrying full load.

This test is based on the fact that a copper wire, simultaneously in contact with the commutator and brush, provides a low resistance path between the two. The carrying capacity at the point of contact on the brush is low, so that if the potential is greater than it should be, enough current flows to heat this point to incandescence.

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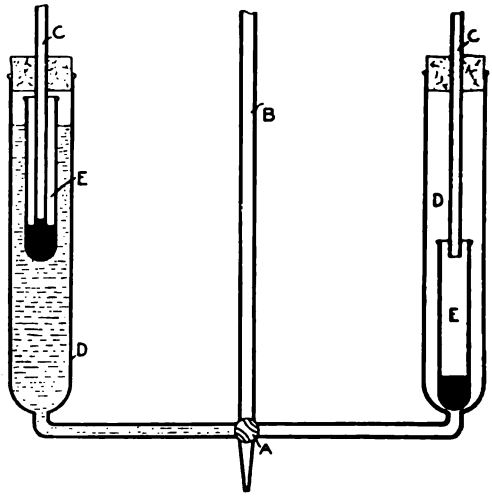
## Measuring Liquids Automatically

In an analytical laboratory a certain amount of salt solution was used from time to time and as the operator did not care to take the time to stop and measure it out, he devised the apparatus shown in the sketch. All of the parts were made of glass, but could just as well be made of other material.

The flow of the liquid is controlled by a four-way valve, A, located at the intersection of the three tubes of which B is the tube from the source of supply. The air tubes C C are fitted tightly in the corks and also the corks in the tubes D D. The last named



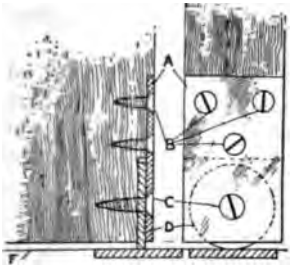

Measuring Tubes with Valve

tubes resemble large test tubes. Inside of the large tubes D D are small test tubes E E, each containing about a teaspoonful of mercury.

When the four-way valve A is in the position shown, the liquid from the supply pipe enters the tube at the right, which forces the test tube upward until it is in the position of the one shown at the left when the mercury seal stops further progress. While this is taking place the left tube, which has been previously filled in the same manner, is emptying into whatever receptacle placed beneath. The quantity of liquid is regulated by raising or lowering the tubes C C.—Contributed by W. F. A. McIntyre, New York City.

### Preventing a Door from Sagging

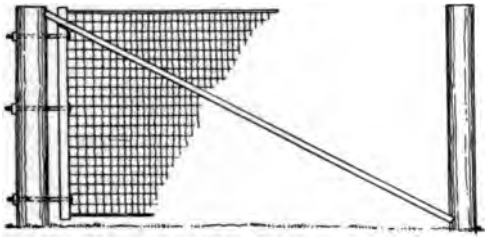
The sketch shows how I fixed a sagging door to keep it from sticking at the bottom. I cut out the corner of the door to receive a piece of metal, A, and a washer, D. The metal A was drilled and countersunk on the top end for three 3/16-in. wooden screws B, and a ⅜-in. hole drilled on the lower end to admit a larger screw, C, to hold the washer in place. The metal and washer were fastened to the edge of the door as shown, and a piece of metal set in flush on the threshold to support them. This is a good preventive for a door that is liable to freeze and stick at the bottom.—Contributed by Geo. Madsen, Chicago.




¶The lost motion in the steering gear of an automobile has led to many accidents. The wear will be detected by the wabble of the front wheels when passing over a rough road.

### Keeping Poultry Wire Taut

Poultry netting will not always remain stretched the same as when first stapled to the posts, and for this reason

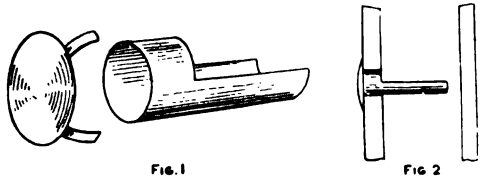


Stretcher Attached to Post

I made a tightener as shown in the sketch. The end of the netting was clamped between two boards, each 1 by 3 in. and as long as the netting is wide. Three ½-in. bolts, each 12 in. long, were flattened on one end and attached to the board at equal distances apart. The bolts were run through holes bored in the end post. The netting can be tightened at any time by turning up the nuts.—Contributed by Carl Lung, Cornelius, Oregon.

### Soot Scoop for a Chimney

After removing the heating stove for the summer, the flue opening is covered with a round disk of metal having spring arms to hold it in place. The disadvantage of this device is that the soot gathers in the opening and falls out if the cap is slightly drawn away from its place. It is best to fasten the ends of the arms into the end of a piece of stovepipe and cut a portion of its top out as shown in

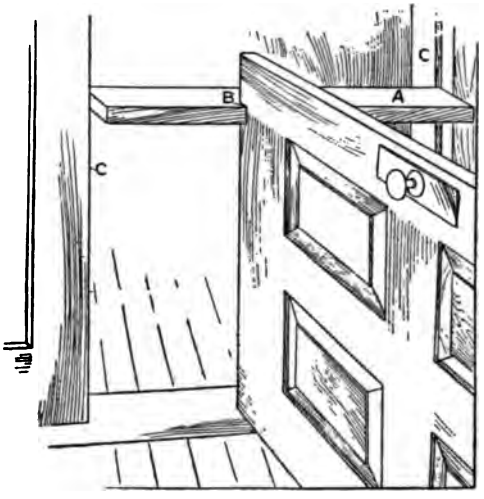



Scoop for Catching Soot

Fig. 1. This provides a scooplike device, Fig. 2, that will catch all the soot and retain it when taken from the flue opening.

### Holder for Jointing Doors

The sketch shows a good method of holding a door while planing the edges. When the time comes to fit the doors




Door in Holder

in a new house, begin with the widest door. Fit a board, A, in between the door casings CC, and cut a notch, B, in the center. The board A can be easily removed for testing the door in the opening. After the widest door is in place, fit the board to the next largest door opening, and so on until the smallest door is finished. This will make it possible to use only one board, A, as it can be cut down to fit between the casings of the smaller openings.

### A Shrinking "Kink"

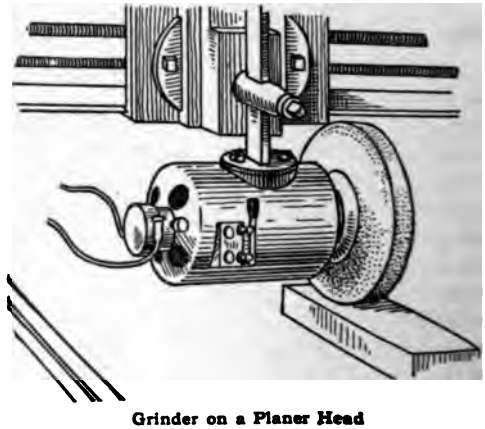
When shrinking a pulley, collar or ring on a shaft, it is well to have a shoulder to shove the ring up against for a positive stop. There are, however, cases where it is impossible to provide such a stop and where it is more a case of luck than anything else that the ring cools at the right spot, longitudinally, on the shaft. Lathe dogs are good for this purpose. The dog should be set so that when the ring butts up against it, it will be in the right location. But be careful not to put on a and find, after shrinking, that it is a prisoner between two rings or collars. More than one man has had to help himself out of such a hole by sawing the dog in two. Where such a thing occurs and the dog cannot be placed otherwise, use a regular split dog. It might be used in any case, for then no sawing or removing of newly shrunk pieces would be necessary.

### Surface Grinding on a Planer

One factory, not large enough to warrant the purchase of a large surface grinder, says Factory, fitted up a small electric motor so that it could be used in a shaper or planer. In the factory a number of dies were made for the toy industry, the surface of the dies sometimes measuring 24 by 30 in. The small dies were machined on a shaper, the large ones on the planer, and after they had been hardened, there was no way to finish the surface.

To meet the requirements, the manager of this factory bought a ½-hp. motor and fitted it with a shank so it could be placed in the tool holder of the shaper or planer. The shank was welded to the plate and bolted to the motor as shown, then placed in the tool holder just the same as a regular cutting tool.

After setting the motor to the proper



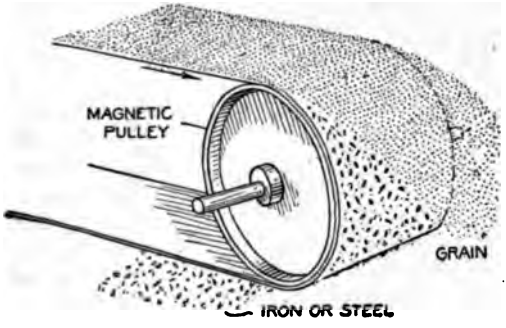
Grinder on a Planer Head

angle, the current was supplied to it by attaching a plug to the nearest lamp socket. The feed could be adjusted to

grind by setting the shaper or planer just as you would set it for the same purpose for an ordinary cutting tool.

### Magnetic Separator for Grain

A magnetic separator for removing iron and steel from grain was recently described in an English journal. The separator consists of a steel pulley magnetized by a current of electricity run through coils placed within the rim. The belt conveyor running over the pulley carries the grain in the usual manner, but as the iron or steel particles reach the magnetic field, they are kept in close contact to the belt until



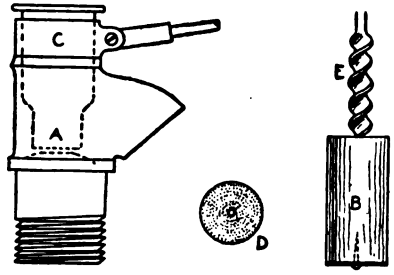

Separating Iron Particles from Grain

after it leaves the pulley on the under side. The sketch clearly illustrates the operation.

### Grinding Valve Seats on Flush Tanks

Sometimes the interior valve seat A on a water closet flushing tank becomes corroded and rough after the tank has stood empty for a while and the seat requires grinding. In the absence of a lathe and proper tools, a simple tool for grinding such and similar interior valve seats, which are not accessible with ordinary tools, may be made by whittling a piece of hard wood, B, to such a diameter as to snugly fit the bore of the valve casing C, cutting it about 2 in. long. Tack a couple of pieces of emery cloth, D, to the end of the wood, or leather will do, with emery powder and oil used as an abrasive.

Place the valve seat casing in a vise and turn the wood plug with a brace, the bit E having been previously set into the wood far enough to turn it. In cities where meters are used, the

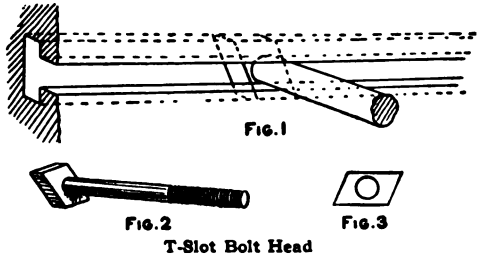



Grinder Made of Wood

amount of water flowing through for flushing may be cut down considerably by bending the float lever down sufficiently to cut off the supply valve when the flushing tank is about one-half full.

### Bolt for T-Slot in Machine Tools

An ordinary square-headed bolt must be slid in from the end of a slot on machine tools, and if an intermediate fastening is necessary after the end bolts are placed, it is impossible to put an extra bolt in without removing the work. A bolt having a diamond shaped head should be made for this emergency. Such a bolt is shown in place in Fig. 1 and the shape of the



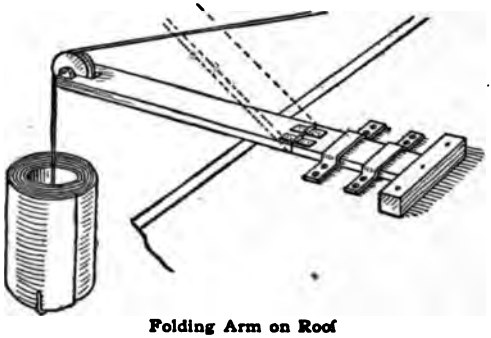

T-Slot Bolt Head

head in Figs. 2 and 3. The shape of the head prevents it from turning in the slot when the nut is tightened.—Contributed by Chester Purdy, Ghent, O.

¶A solution of 1 dr. sodium carbonate in 1 qt. of milk is a good cleaner for motor gloves.

### Hand Hoist for Roof Workers

The sketch shows an important practical contrivance devised by a correspondent of Metal Worker to eliminate the friction produced when hoisting



Folding Arm on Roof

material up the side of a building, with the rope sliding along the edge of the roof. The dimensions given are: Roof piece, 3 ft. long, and the projecting part, 2 ft. long, 1½ in. thick and 6 in. wide. Two extra heavy strap hinges are used.

The projecting part is notched out at the end just enough to allow a heavy sheave wheel to pass in so that the axle can have sufficient support. The axle is held in place by straps bent to fit over it and screwed to the board by four wood-screws.

Instead of nailing the arm to the roof on every occasion of use, thereby filling it full of nail holes, two band-iron straps are permanently fastened to it by means of wood-screws. These straps are bent to the shape of the board, as shown, and nails are driven through the holes in the straps to the roof. As most of the stress is a backward push against the arm, it is well to nail a cleat to the back of the board.

The mode of operation is to lower the rope, and if it is a roll of tin being hoisted, to hook the rope on the tin as shown. By steady hauling, it will be found that the tin will be raised with surprisingly little exertion. This hauling is continued after the roll of tin strikes the wheel, for the main feature of having the arm hinged is to act like the boom of a derrick and raise the roll back on the roof.

### Uses for Old Emery Wheels

Broken emery wheels should not be thrown away. There are many uses for them about the house or home workshop. Take pieces of different grades and grits; have a chunk as coarse as No. 40, a piece of No. 80 and a piece of No. 100 or 120, if possible. Every machine shop has broken wheels that can be had for the asking or at a nominal price, and they will save many a quarter in sharpening pocket knives, table hardware, scissors, pruning shears, hatchets, etc. For carpenters' tools, of course, a piece of grindstone is better than the machine-shop emery wheel, but soft, fine grades of the latter will do in a pinch. Automobilists will find a piece of emery wheel a pretty handy thing in their tool box for touching up commutator parts while on the road.

---

### A Special Lathe Dog

Work being done on a lathe sometimes is continuously, or for quite a length of time, of the same nature. In removing the work from the centers for fitting or trying, much time is lost in removing the dog and again tightening it in place. A small piece of ¼-in. sheet iron or steel, cut and slotted as shown, and bolted to the faceplate through one of the slots will save much time. The work is driven as

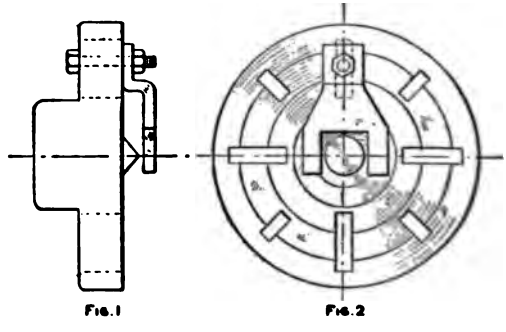


Fig. 1 Fig. 2

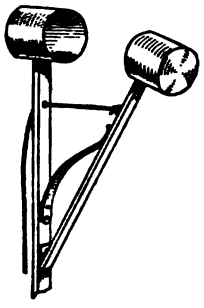
Dog Attached to Faceplate

well as with a dog and can be instantly removed and replaced without the time taken to remove a dog. A little time

spent in making a few of these with different sized slots will save the busy lathe man much time and trouble. For a rod bolt machine, it cannot be surpassed.—Contributed by F. W. Bently, Jr., Huron, S. D.

### An Apple Picker

Apples for packing or for keeping any length of time should be carefully picked from the trees so they will not be bruised. As the climbing of the trees made the picking a tedious job, I devised a picker as shown in the sketch.



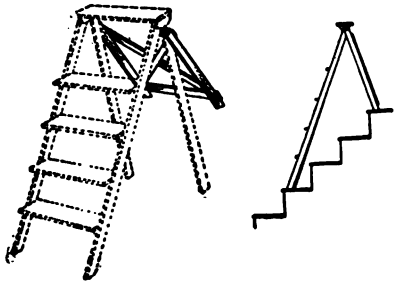
I took a pine stick, 12 ft. long, 2 in. wide, and ⅞ in. thick, and hinged a 2-ft. length of the same material to its side so that the ends were even, and placed an old-fashioned half-round tin cup on each strip so that their openings would register. A row of holes were punched around the edge so that a soft pad could be sewed in each cup.

A stout cord was attached to the short piece and run through a hole in the long piece allowing end enough to equal the length of the long strip. A piece of heavy clockspring was placed between the strips to keep them apart. The operation is obvious.—Contributed by W. D. Gay, Essex, Iowa.

### Short Legs for a Stepladder

Make an attachment of the same stock and quality as the back support of the ladder and fasten it to the ladder as shown in the sketch. Use carriage bolts of the desired diameter and length, with the head on the inside and countersunk; put a washer and a nut on the opposite side and rivet the end of the bolt slightly so the nut will not come off. Use a good sash cord between the short legs and the main part of the ladder to keep them from spreading.

The length to make the attachment is easily determined by placing the ladder closed on any ordinary stairway

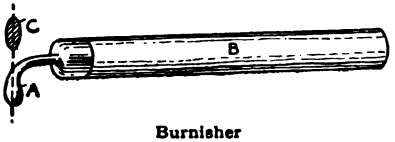


Legs Attached to Ladder

and measuring for the short legs. This attachment can be used on almost any stepladder.—Contributed by J. C. Polin, St. Paul, Minn.

### Removing Dents from Automobile Brass Fixtures

Very often the automobile owner brings a brass lamp or a horn into the shop to have the dents removed. This is a very easy job, if a burnisher as shown in the sketch is used. The burnisher should be made of tool steel and highly polished after being hardened. A good many of the dents may be removed by placing a block of wood inside the article and tapping the outside with a wood mallet, but after this there still remain the fine wrinkles. These can be removed with the burnisher. Place a solid substance on the under side and with a little pres-




Burnisher

sure of the tool on the opposite side, the dents can be rubbed out. Tools of any desired shape can be made to fit the job in hand.

¶Do not throw away a leaky hot-water bottle or bag. Heat clean white sand in the oven and pour it into the bottle. Sand will remain hot longer than water.

# Systematic Oiling of Automobiles

THOMAS P. HALLOCK

Working on the principle that an ounce of prevention is worth a pound of cure, I have devised an automatic reminder of the time and place to oil and grease my automobile that it may be kept in perfect running condition. The simplicity of my system is, I believe, its best recommendation and it could well be used in large garages—especially where motor trucks are kept—to prevent carelessness or forgetfulness on the part of chauffeurs and mechanics.

The extreme importance of proper lubrication of the many parts of the motor car is emphasized by the fact that one of the trade journals recently accounted for 14 locations for greasing and 28 locations for oiling a single type of car. During the course of one year, the author contended, 1,227 applications of oil and grease—in a regular succession of dates—ought to be made in these places.

I have found that the danger of running dry at any particular spot where oil should be applied does not lie so often in carelessness as it does in forgetting—though to forget is unquestionably evidence of lack of care in the business man of today. Next best to a perfect memory is a perfect system of memory aid. I could not decide to my satisfaction that the 1,000 or more applications of oil and grease would be faithfully given my car throughout the year, so I sought to simplify the problem by devising a schedule of oiling locations for certain dates in each week and month.

I took a large calendar and pasted at the top a diagram of my car, furnished by the manufacturer. On this diagram I marked—some manufacturers provide their diagrams already marked—each point where lubrication ought to be applied, and by a system of red and blue lettering I denoted whether oil or grease was the proper lubricant for this particular spot.

Then I made a schedule giving the name of each location prefixed with the red or blue letter which had already been assigned, and my key was complete. My next move was to begin with the first oiling date in the year, which I chose as Jan. 7. In the space where the figure representing this date was printed, for instance, I marked the following letters:

| Red | Red | Blue |
|---|---|---|
| B | S | A |
| C | U | M |
| F | W | R |
| G | Z | LA |
| J | AA | |
| L | CA | |
| P | GA | |
| Q | HA | |

This presented quite a bewildering appearance, but to me it meant quite clearly that on this date I should apply oil and grease as follows:

**Red—Oil**

B—Steering-knuckle bolts
C—Front-wheel bearings
F—Fan-bearing oiler
G—Starting-crank bearing
J—Valve-rod guides
L—Shock-absorber studs
P—Commutator oiler and greaser
Q—Crank-case filler and oil tank
S—Magneto oil cups and wells
U—Brake-pedal bearing
W—Brake and gear lever ratchets
Z—Brake fittings and connections
AA—Plate clutch housing
CA—Gear and brake lever shaft bearings
GA—Shock-absorber bearing studs
HA—Differential housing

**Blue—Grease**

A—Front-wheel hub caps
M—Steering-cross-tube greasers
R—Steering-case greasers
LA—Rear-axle outside greasers

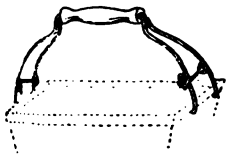
Certain of these same operations must be repeated daily, others weekly, and still others semiweekly and monthly, but, no matter how often my attention is required to each particular lubricating location in my car, I am sure to be reminded by my faithful calendar.

Since systematic lubrication is unquestionably an insurance on the life of my car, I have not counted the short time lost that I spent in marking my calendar. Exactly the same system,

prepared to fit the requirements, could be used in a garage where several different types of cars were kept, and the results would entirely warrant the adoption of this practice.

### Detachable Peach-Basket Handle

A peach basket is rather an awkward thing to carry because it has no handle. A handle that will do for all sizes and kinds of baskets can be made as follows:

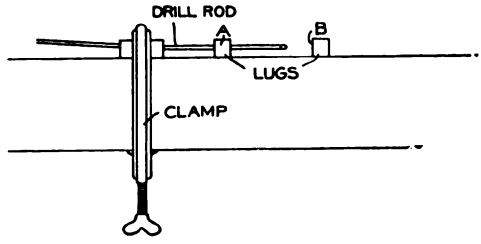


Procure the wood part of an old bucket bail and two pieces, each 3 ft. long, of galvanized wire and place them through the wood handle, allowing the ends to project evenly on both sides. Bend the ends as shown. Make two wire hooks and attach the ring of the hook in the ring of one wire and hook it in the ring of the other wire. This will spread the wires and give them stability while in use. When not in use the hooks can be unfastened and the handle brought into a smaller space. The turned-up ends of the long wires hook under the outside rim of the basket.—Contributed by Frank S. Henry, Hadden Heights, N. J.

### Drilling Projecting Lugs

It often happens that one must drill holes that are so close to other parts, or have projecting parts in the way, as to make it impossible to get the chuck of the drill press or breast drill directly over the hole to be drilled. The usual way is to drill the hole on an angle and finish straight with a file, or to drill a larger hole than is necessary. Frequent examples of such holes are pin holes for doors on the side of machinery and other hardware products.

An alternate method is to use a length of drill rod formed into a drill point at one end and gripped in the chuck at the other. This is illustrated in the drawing, where A and B are the lugs on a casting to be drilled for a

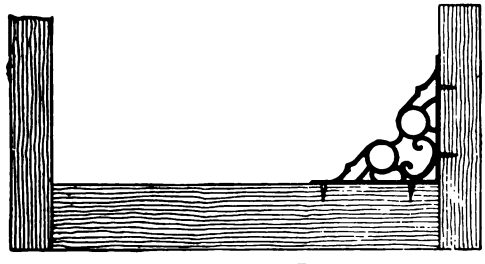



Grinding the Drill Rod

door hinge. Here a block is held on with a clamp and used for a guide for the drill rod. This block is first drilled the size of the rod and then countersunk at one end—the end the drill enters from the chuck. Sometimes two blocks are necessary. The drill should be supplied with lubricant at this point. Feeding must be done with care and not too fast or the rod will buckle.

### Bracket Brace for a Sagging Door

Screen doors sagging on the opening side which causes them to rub on the floor as they are opened and shut may be repaired in the following manner: On the opposite side from the hinge and in the lower corner of the frame, place a small ornamental bracket which will not mar the appearance of the door and yet make it



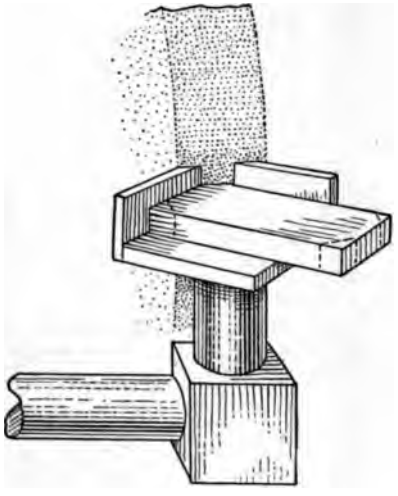
Bracket in Door Frame

perfectly rigid. Before placing the bracket, drive a small wedge under the door to hold it in the correct position.

¶Graphite should not be used on an engine timer as it will short-circuit the current.

### Corner Grinding Tool

Several thousand rectangular pieces made in brass and steel had to be finished with the corners cut on an angle of 45 deg. as shown by the dotted lines



Tool Attached to Grinder

in the sketch. The way the corners were removed was by grinding, and the fixture used for holding the pieces to secure the proper angle consisted of an arm from the bracket for supporting the rest, both forming part of the ordinary grinder outfit.

A special rest was made by an upright having a surface square in shape and turned with one corner to the wheel. Two sides were attached to the square. A piece was placed on the flat surface and pushed against the turning wheel. The sides guided the pieces so that all corners were ground true.

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### Fluids for Drilling or Filing Glass

Several fluids are used in the operation of drilling or filing glass, of which vaseline oil and a solution of camphor in spirits of turpentine are the most general. A French scientist recommends a solution of 30 gr. of camphor and 1/5 of a fluid ounce of sweet almond or olive oil in 7 fl. oz. of benzine. This mixture will not deteriorate, renders filing and drilling easy, and can be removed from the glass by simp ping the latter into benzine.

The vaseline oil is objecti because it leaves the glass greas the solution of camphor in spi turpentine, because of the disagr smell.

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### Repairing Broken Cogs in Pat Gears

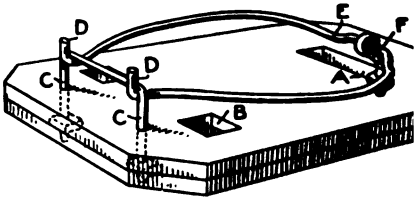
A good way to repair broken c small wood spur or bevel-gear pa without putting in new ones is tc stiff paste of litharge mixed with wax. Drive some brads part wa the place to be built up, keeping heads slightly below what will finished surface, and apply the mi When this gets hard, it can be s with a knife or chisel and sandpa If a coat of shellac is applied to cog, it will not stick in the sand.

---

### Horseshoes for Marsh Land

Fit up the ordinary horseshoe toe and heel, throwing the heel out, says the Blacksmith and V wright. Make the bottom of the shoe of two thicknesses of ½-in wood, crossing the grain of the to prevent splitting. Slots A are cut for the toe and heel ca rest in. This will prevent the shoe from slipping around o horse's foot.

Make a staple of ⅜-in. roun and thread each end about 3 in.



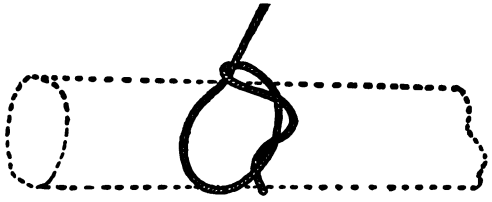

Marsh Land Horseshoes

The width of the staple will d on the width of the shoe. The is fastened to the board by ins the ends through holes bored

Bend another piece of ⅜-in. round iron E in the shape shown to fit around the horse's foot about 2 in. below the hair. The ends DD are bent up to fasten into the staple. Forge an eye on a bolt to fit over the rod E and attach to the board at F.

### A Timber Hitch

One of the most useful and easily tied and untied hitches or knots made with a rope is shown in the sketch. This tie is used extensively by sailors, but is little known among landsmen. It can be used for hoisting timbers, logs, boxes, barrels and in fact any



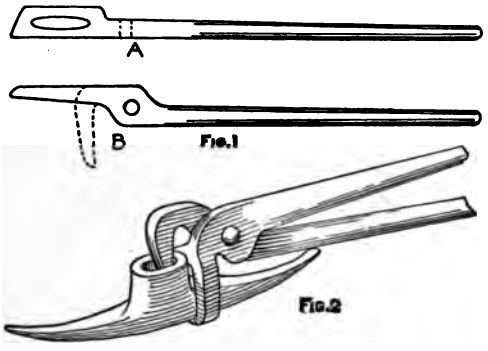
Hitch on a Log

article that a loop can be placed over. —Contributed by L. A. Gardner, Oakland, Cal.

### Tongs for Handling Picks

In piecing picks with steel, when they have become too short and are worn down, a common pair of tongs will not hold them steady, and they will slip back from the taper on the pick while it is being hammered, says the American Blacksmith. A pair made like those shown in the sketch will give satisfaction, as it will hold the pick firmly and securely, no matter how much hammering is done on the metal.

The lower part of the tongs in the jaw part is first made in a ring (A, Fig. 1), which should be large enough when closed together to form a rectangular opening through which the end of the pick will pass all the way up to the eye. This is bent down at right angles and the other part, B, is forged as in the ordinary pair of tongs, after which it is bent down to go inside of the eye of the pick. The manner of holding a pick is shown in Fig. 2. The



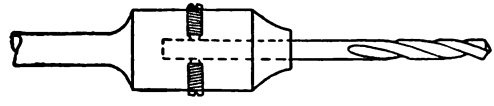

Pick Tongs

smith who has much of this kind of work to do will be well pleased with a pair of these tongs.

### Holder for Broken Drills

The accompanying illustration shows a design of a holder for broken twist drills. The hole is bored the size of the drill and setscrews with rounded points are placed opposite each other. These enter the flutes of the drill and make a positive drive. The other end of the holder is turned to fit the chuck.

These holders soon pay for their making. In one instance, a new high-speed drill, costing $2, was broken off by carelessness right at the end of the flutes. If it had not been for the holder made for the drill, it would have been worthless, as when broken it would not run true or positive enough for the



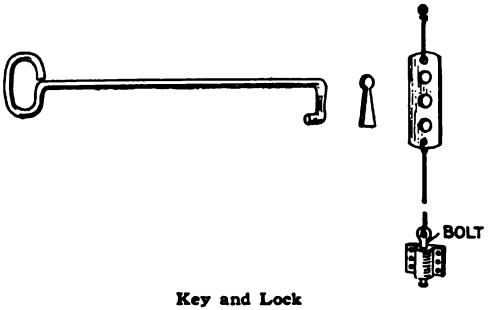
Drill in Holder

work. Fitted with the holder it ran every day for over three months.—Contributed by Donald A. Hampson, Middletown, N. Y.

¶Noseglasses can be held firmly to the nose by the use of powdered rosin. This is flesh colored and the heat will make the glasses stick so no ordinary wind will dislodge them.

### Homemade Lock and Key

The illustration shows a simple fastening for a door that will keep out intruders better than the ordinary lock. The common locks are so much alike




Key and Lock

that a key may be found that will turn them. The fastening can be used on a door of which the key is lost, or as a double safeguard in locking the door. It may be made by attaching a bolt to the bottom of the door with a cord and a thin piece of wood with three or four holes in it that are near the keyhole as shown in the sketch.

A piece of $\frac{3}{16}$-in. wire is bent as shown for the key. It is made long enough to reach through the keyhole and past the block of wood. It is then pulled back so that the point will enter one of the holes in the wood. A turn of the key lifts the bolt. A more elaborate lock can be made of brass and corded wire. One turn of the cord around the screw head keeps the bolt from the keeper when not in use.—Contributed by Bert Hillyer, Chrome, New Jersey.

### Cleaning Brick Walls

A solution of about 2 oz. of muriatic acid to 5 gal. of water makes a good wash for cleaning brick walls. This wash should be applied and the wall scrubbed down with a wire brush made for this purpose. Care should be taken to keep the solution from touching the hands or clothes.

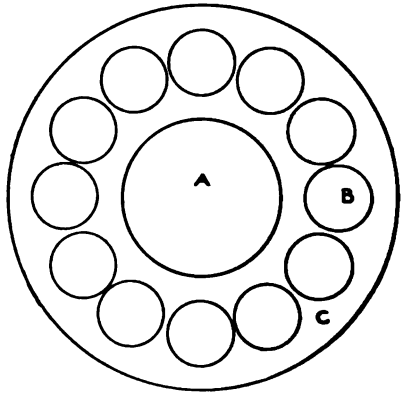
¶The main bearings of a lathe should be loosened when they run hot.

### Thumbscrew on Lathe Dogs

For quick work on small things to be turned in a lathe, a thumbscrew put in place of the usual setscrew on a lathe dog is much more convenient. Only light chips can be taken, of course, as the leverage is not enough to tighten for a heavy cut. Small drills, reamers and counterbores are quickly put in and taken out of the lathe, and much time is saved, if there is a large number of pieces to be worked.—Contributed by Andrew Smith, New Haven, Conn.

### Boring Large Holes with an Expansive Bit

Anyone having used an expansive bit by hand to bore a large hole finds it a difficult job, as the material taken out by the cutting edge on the regular screw feed requires more power than can be applied to the brace. A good method is as follows: If a hole 3 in. in diameter is to be bored, set the bit to 3 in. and fasten it in the brace so that the cutter is in line with the handle of the brace. Lay out the circles A and C and bore a series of holes B with a ½ or ⅝-in. bit to remove a part of the wood between A and C. Set the expansive bit in place and




Material Removed by Boring Small Holes

stand with the grain of the wood and turn with a slow steady pressure.—Contributed by W. A. Lane, Dallas, Texas.


## A Water Heater

In places where the bath room adjoins the kitchen, and the gas stove and tub are in close proximity a simple and cheap bath-water heater may be arranged as shown in Fig. 1.

Make a cone-shaped coil similar to an old-fashioned beehive of ½-in. copper pipe. The base should be 8 in. in diameter to fit detachably over the stove burner. At the ends insert a garden-hose connection and solder in tightly. Connect the coil to the sink faucet with a piece of garden hose of the right length having the usual connections at each end. Use a similar piece of hose to connect the top of the coil with the bath tub. An efficient and continuous flow of hot bath water may be secured with this coil.

A piece of galvanized iron is shaped as shown in Fig. 2 and set over the coil to utilize all the heat and confine the gas flame within the coil. Slip hose connections would answer as well as metal connections, if a close fit is

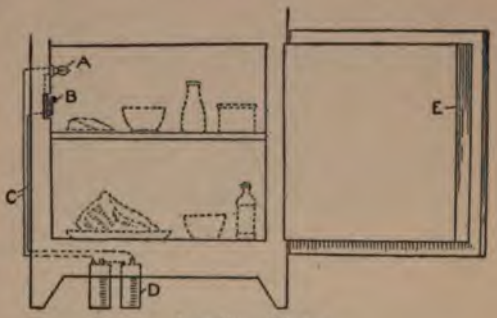

Fig. 1 Fig. 2

Copper Coil and Iron Cover

secured. The water should be turned on before lighting the burner. A decreased flow will give hotter water.—Contributed by Victor Labadie, Dallas, Texas.

## Lighting Interior of Refrigerator

The place for the refrigerator in my home does not permit enough light to enter when the door is opened to




Location of Lamp

plainly see the articles within. This made it necessary to have a light of some kind, and I rigged up a very practical little device to light the interior when the door is opened. The lamp is a miniature, flashlight-type globe set in a miniature socket, fastened with screws on the wall inside of the refrigerator, where it will not be in the way.

The switch is an ordinary one-pole type, which is fastened to the refrigerator just inside the door with the handle projecting so that it will be pushed open by the shoulder on the door when this is closed. This prevents leaving the lamp burning thoughtlessly. The wires are carried through the wall or floor and connected to a battery of two dry cells beneath the refrigerator. —Contributed by Clarence G. Myers, Waterloo, Iowa.

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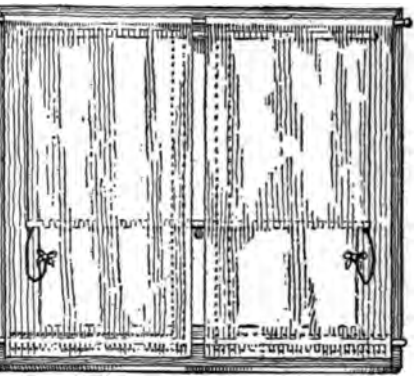
¶Filing babbitt is made easy by using a rod having a standard thread, newly cut. This will not fill up like an ordinary file.

### Painting the Inside of a Rain Pipe

While painting the rain pipes on a house I thought of a way to paint the inside of the pipes. I procured a sponge large enough to fit the inside of the pipe and fastened a weighted cord to it. I then dropped the weight through the pipe and forced the sponge a few inches into the pipe, making a cavity large enough to hold paint. Fill the cavity with paint and pull the sponge by the cord slowly through the pipe. Place an old pail at the bottom to catch the surplus paint. This method will apply a coat of paint to the inside of the pipe that will preserve the metal as well as if painted with a brush. — Contributed by Ed. Borchik, Cleveland, O.

### Emery Cloth Used in a Hacksaw Frame

The illustration shows an emery-cloth holder for polishing small places or round edges. It consists of a hack-saw frame and emery cloth. The cloth is cut ½ in. wide and the length of the saw blade. Punch a hole in the cloth ½ in. from each end. Procure some eyelets from a shoe store and rivet them in the holes. The cloth is shown at A in the sketch and one of the eyelets at B. The cloth is kept taut by the thumbscrew in the same way as drawing up the hacksaw blade. Strips of emery cloth in the various grades can be prepared and kept ready for use in the frame. — Contributed by Oscar Carlson, Tacoma, Wash.



Emery Cloth in Frame


Fig 1

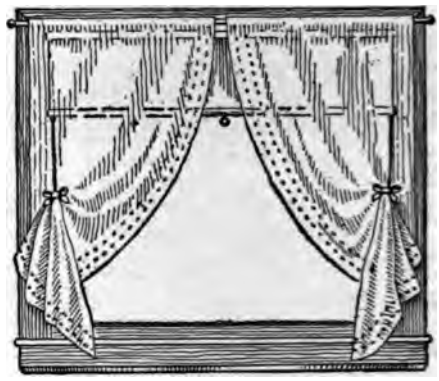


Fig.2

Curtains Tied to the End of the Shade

### Lace Curtains Drawn Back with the Shade

An easy and convenient way of drawing back lace curtains is to attach them to the window shade as shown in the sketch. On bright days sufficient light will enter the room for reading when the shade is within 18 in. of being closed as shown in Fig. 1. On dark days, even with the shade to the top of the sash, I find the light insufficient, unless the lace curtains are drawn back, also. I accomplish the whole process by just raising the shade.

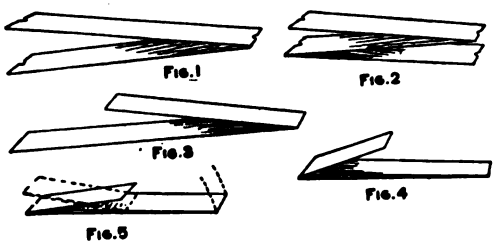
Attach a small screweye to the end of the bottom slat. Connect it with some part of the lace curtain with a cord in such a way that it will allow the shade to be closed entirely, and when raising the shade higher than shown in Fig. 1 it will draw the curtains back as though they were draped, as shown in Fig. 2. A bow of ribbon, artificial flowers or any other suitable ornament, may be placed where the cord is attached to the curtain.—Contributed by M. O. Henning, Swissvale, Pa.

### Marking Divisions on Circumferences of Shafts

A method of finding certain equal divisions on the circumferences of shafts, body bands of gas and electric fixtures or on any cylindrical surface where dividers are not at hand or cannot easily be used, is shown in the sketch.

Cut a piece of paper about ½ in. in width, or smaller if necessary, and a little longer than the length of surface to be divided. Put the paper around the cylinder and cut it so that the ends just meet when the paper is pulled snugly to the surface, then fold and cut for the various divisions as follows:

To find the point diametrically opposite, fold as in Fig. 1 and cut notches

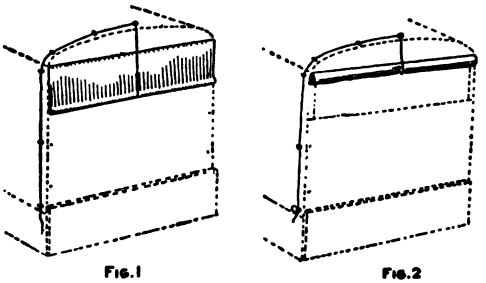



Strips of Paper Folded

out at the ends, then place the paper on the cylinder and mark the division in line with the fold or break on the surface through the holes. For three divisions fold the paper as shown in Fig. 2, and for four divisions, fold as shown in Fig. 1 and then double. For five divisions, fold as shown in Fig. 3 by lapping the end over two-thirds the way, then folding the single end back over the double part, Fig. 4, then doubling in the center, Fig. 5. With a little practice one can make these papers quite perfect with almost any number of divisions.—Contributed by G. T. Nelson, St. Paul, Minn.

### Curtain Ventilator for a Van

When passing a large van one day I saw it was fitted with a clever curtain ventilator, evidently homemade, that could be raised and lowered at will from the side of the wagon. The usual curtain on the back end extended to within 6 or 8 in. of the top. Above this was hung a small independent

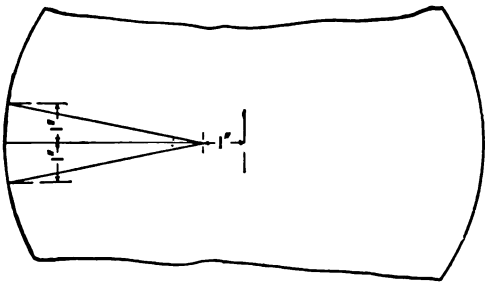



Ventilator on Van

curtain having an iron rod fitted in the hem so as to cause it to hang without flapping, and also to make it drop when the elevating cord is released. The cord is run through screweyes turned into the side of the van, as shown in Fig. 1. The curtain is shown drawn up in Fig. 2.—Contributed by Jas. M. Kane, Doylestown, Pa.

### How to Cut a Cone-Shaped Kettle Cover

Cut the metal 1 in. larger in diameter than the hoop after the edge is turned. Mark a line starting 1 in. from the center and extend it to the edge. Mark two other lines starting from the same point and extending each to a point 1 in. on each side of the center line as shown in the sketch. Cut out the gore and turn the edge tapering from

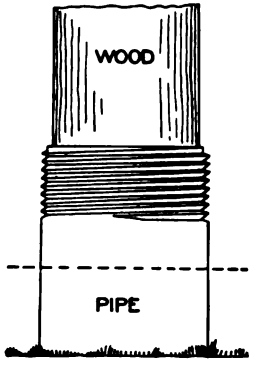


Size of Gore to be Cut

the circumference to the center on a hatchet stake. No edges are to be allowed.—Contributed by S. C. Shipman, Steubenville, O.

### Removing Obstruction in a Well Casing

When putting down or driving the ordinary tubular wells it often happens that the pipe must pass through a stratum of soft sticky soil or clay.




The strainer or point on the bottom end of the pipe will become completely sealed up, thereby preventing the entrance of the water into the pipe, which naturally prevents the pump from raising the water.

Ordinarily it is the custom to pull out the pipe and clean the strainer to remedy the trouble, but having had trouble of this kind recently, it occurred to me that the obstruction might be removed without withdrawing the pipe.

When I found that the point was sealed, I procured a round piece of wood that would fit the inside of the pipe snugly, the wood being about 1 ft. in length. The pipe was filled with water to the point shown by the dotted line in the sketch, then the wood plunger was placed on top of the water and struck a sharp blow with a hammer. The obstruction was completely removed. The wood must be held or else the suction of the water will draw it into the pipe.—Contributed by E. S. Sheperd, Wichita, Kans.

### Producing Marble Effects with Paint

Prepare the colors to be shown in the marble, using varnish for the vehicle and japan colors, reduced in turpentine, making glaze colors or varnish stains. Put in the ground color with lead and turpentine and allow it to dry, then apply different glaze colors so as to give a mottled, variegated effect. No care need to be taken for this part of the work, as the crudest efforts give the best results.

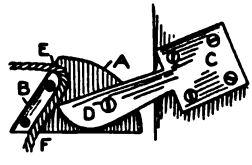
Dissolve a lump of potash the size of a pea in 1 oz. of kerosene, and while the glaze coat is fresh, dash small drops of this on the painted surface. This will separate the colors and blend them into very pretty marble effects.

By the exercise of a little taste and ingenuity surprising effects can be obtained. If spar varnish is used, it can be rubbed down and a coat of clear spar put on as a protector.

I have in my yard a pair of large garden urns made of plaster-of-paris marbleized to a malachite green, and these have stood the weather for four years.—Contributed by Wm. G. Browning, Los Angeles, Cal.

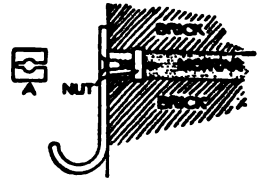
### Clothesline Holder

The holder consists of a stationary piece, C, fastened to the post, on which the piece A is pivoted on the screw D, the piece A having a block B fastened to its edge as shown. The clothesline E is passed over the block B and drawn as taut as necessary, then it is gripped between the block B and the pointed end of C.—Contributed by H. Frisch, St. Louis, Mo.




### Substitute for an Expansion Bolt

A very effective, simple and cheap method of fastening anything on brick walls where expansion bolts are not at hand is as follows: Take a common nut, ⅜ in. square, and cut it almost through with a hacksaw as shown at A. The size of the nut is governed by the thickness of the joint between the

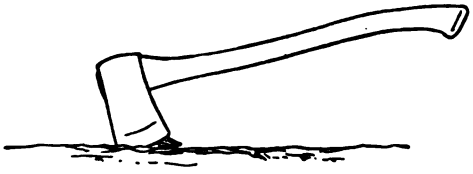


bricks or the size of the hole made in the wall. The size of the hole in the nut should be about the same diameter as the wood screw at a point about ¼ in. from the end.

After making a hole in the mortar between the bricks, the prepared nut is inserted and the screw driven into it. The screw will spread the parts of the nut and firmly hold it between the bricks. Be sure to have the cut in the nut parallel with the two bricks between which it is wedged.—Contributed by Gilbert A. Wehr, Baltimore, Maryland.

### Removing a Stuck Ax

An easy way to remove an ax stuck in a log is to use the method shown in the sketch. A small chip is placed under the cutting edge of the ax on the handle end and a pressure on the



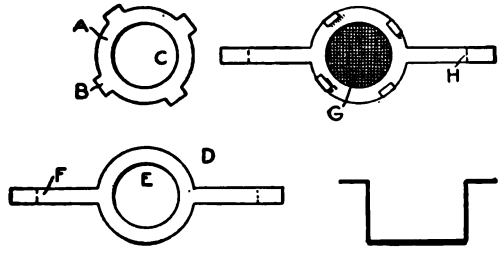
Ax in the Wood

handle will easily withdraw the blade. When the ax is stuck so that the entire edge is in the wood, raise the handle until a part of the edge is out above the surface.—Contributed by Fremont Leland, Chester, Conn.

### Sink-Drain Strainer

Bath, sink and other drain pipes clog easily where the opening is left entirely open. A little device can be made at home to keep the drain pipes clean, and its cost will be practically nothing.

The illustration A shows a piece cut from tin having four projections B and an opening C. Another piece is cut as shown at D with projections F and an opening E the same size as the one at C. A small piece of screen is placed over the opening E and the projections B bent over the edge as in G. The long projections F are bent in the shape shown in the last sketch. The diameter of A and D should be a trifle less than the inside diameter of the drain opening.

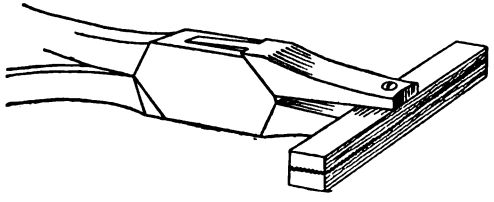



Parts of Strainer

Set the strainer in the opening of the drain and it will keep out all dirt that is apt to stop in the pipe. The wire screen can be easily replaced if it becomes worn.—Contributed by Maurice Baudier, New Orleans, La.

### Stretcher for Covers

The ordinary way of stretching a piece of leather, canvas or other like covering is to pull the edges with the fingers. This will make an uneven surface, as the material cannot be drawn very tightly or at every part of the edge. The tool described herewith will be found quite useful for the home or shop. It is made of a pair of long-nosed pliers provided with a pair of notched clamps which are fastened with machine screws. In using the tool the edge of the cover is gripped between the clamps and then tightly



Notched Clamps in Pliers

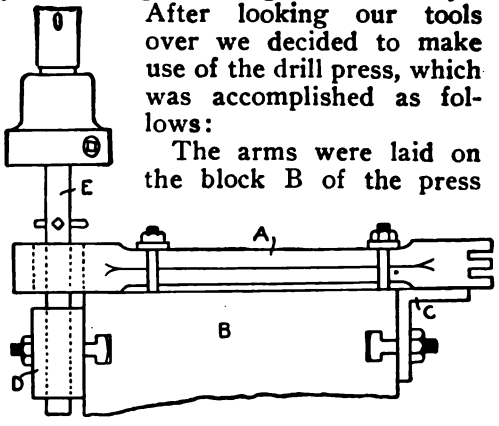
drawn and held while tacking the cover.—Contributed by Wm. Grotzinger, Baltimore, Md.

¶Approximately every 2 ft. of elevation is equal to 1 lb. pressure per square inch of water in pipes.

### Boring in a Drill Press

Having some cast-iron arms to bore out for bushings, we naturally turned to the lathe, but found the pieces were just too big to swing over the ways. After looking our tools over we decided to make use of the drill press, which was accomplished as follows:

The arms were laid on the block B of the press




Boring Bar in Drill Chuck

and fastened down. One end was flat, the cross section was of irregular form, and under this the knee or angle plate C was bolted. This served to locate the arms at once and leveled them up by this surface so that all were duplicates. To the other side of the block was bolted a casting, D, having a 1-in. hole through it. A boring bar, E, was provided, placed in the chuck of the drill press, and the chuck centered over the hole D. The castings were then trued up by the bar and the boring begun. The job was done as well as in the lathe and almost as quickly.—Contributed by Donald A. Hampson, Middletown, N. Y.

### Preventing the End Grain of Wood from Checking

Blocks of wood stored for use in turning are usually coated on the ends with oil to prevent cracks and checks during the drying-out process. A most desirable substitute for oil is paraffin melted and poured lightly over the ends. This is clean and not greasy to handle, answers every requirement and has found favor with the best woodworkers.

### Cleaning Brass Fixtures

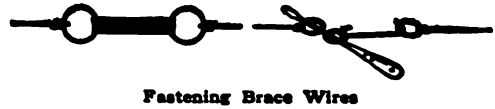
Brass rules used in a printing office, or brass fixtures of any kind, can be cleaned with acetic acid. This is the best and cheapest cleaner obtainable and is a harmless substance to use. Acetic acid is strong vinegar and can be purchased at any local drug store. The action against fly specks is hastened by the addition of salt to the acid. This substance is not harmful to the hands and can be used without injury while most other cleaners are harmful. The brass should be wiped with a dry cloth after the acid has removed the tarnish. The acid is also excellent for washing grease from glass articles, especially fly-specked windows.—Contributed by Loren Ward, Des Moines, Iowa.

### Smooth Edge on a Drawing Board

Fasten a strip of smooth oilcloth of any color over the front edge of a drawing board with small tacks well driven down so that all the slivers and rough spots on the wood are covered. The oilcloth is smooth and does not wear the clothing, which makes it unnecessary to wear an apron.—Contributed by W. E. Morey, Chicago.

### Substitute Turnbuckles for Aeroplanes

A very inexpensive way to fasten brace wires on gliders and aeroplanes is shown in the sketch. The device takes the place of turnbuckles. The



Fastening Brace Wires

rings that are attached in the line can be purchased from any local harness shop or hardware store. A wire loop with a ring and a screwdriver is used to draw the ends together as shown in the first part of the sketch. A piece of copper wire is then used to connect the rings as shown complete in the second part of the sketch. This sub-

stitute turnbuckle has been used with success on gliders carrying two men. —Contributed by Don Mac Kean, Alameda, Cal.

### Thread-Cutting Dies

Thread-cutting dies cannot be expected to cut cleanly and well without rake. This rake or lack of it makes quite a difference between a cutting die and one that only scrapes the metal off. The cutting edge of each "land" of the die should be made an acute angle with a line passing through the center of the work and through the extreme point of the cutting edge. Avoid dies that cut both ways. Such dies do not cut cleanly or easily when either face is to the work and they must of necessity drag the idle cutting edges over the work and dull them. One set of bolt dies that had the cutting edges parallel to the center line, or rather if continued would form the centerline, never cut so well as might have been expected. They were ground out so that the cutting edge had rake and after that they always cut nicely.

### Preventing Work Chattering in a Lathe

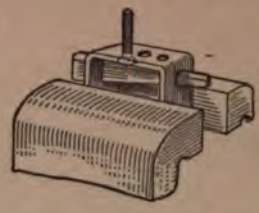
A simple method to prevent chattering in lathe work is as follows: The chatter marks may be removed by grinding the tool at an angle so that its broad edge will keep from falling into the old chatter marks.


The line AB in the sketch represents the cutting edge of the tool as the first cut was taken, and the line CD is the slant that the tool should be ground so that its cutting edge will cut across the chatter marks.

¶Jumpers and overalls used when working about acid can be made impervious by rubbing the goods carefully all over with a piece of beeswax or paraffin, and ironing with a warm smoothing iron.

### Holding Screws while Filing

A clamp for holding screws while filing the ends can be made of a ¾ by ⅛-in. strip of steel about 6 in. long and a metal wedge. The strip of steel is bent U-shaped and notches are cut for the wedge. Holes are drilled in the top for different-sized screws. The manner of using the clamp is shown in the sketch. —Contributed by I. B. Spittel, Baltimore, Md.



### Gaskets for Automobile Transmission

Cut from a piece of good, smooth and medium-weight brown paper the shape of the gasket and soak it in cylinder oil. Place the gasket in position and draw the parts together. If this method is properly carried out, an oil-tight joint, one that will hold for a considerable length of time, will be secured.—R. B. Hollaway, Lydon, Vermont.

### Cutting Brass Tubes

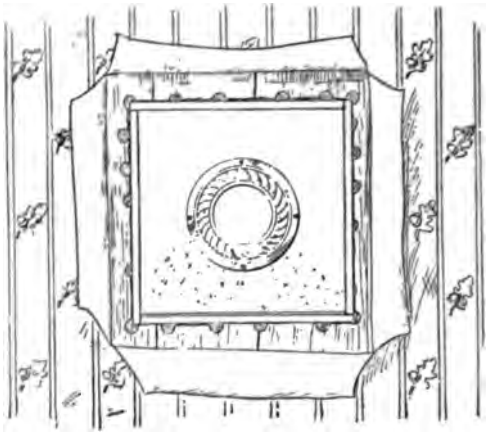
When cutting brass tubes by hand, use the back of the hacksaw blade held in the ordinary frame. This cuts very fast and works fully as well as a regular tube-cutting saw on very light tubes. Tubing will collapse when held in a vise unless it is filled or held in circular jaws. To put a piece of round steel into the tube is good, and it need not fit closer than $\frac{1}{32}$ in., for the elasticity of the tube will make up for the difference. Stock within this limit is usually at hand.

For flaring the ends of brass tubes, punches and dies are usually necessary, but if the flare does not have to be very great or too accurate, it can be accomplished by the use of a punch, or punches, alone.

¶Always use a lead or soft-faced hammer to drive out arbors.

### Protecting a Wood Partition Around a Stovepipe

The sketch shows a very satisfactory method of protecting a thin board partition through which a stovepipe is passed. A square, 14 in. each way, is



Asbestos Filling

marked on the wall where the pipe is to pass through and the wallpaper cut with a sharp knife in such a way that it will turn back and expose the boards. Bore sufficient holes on the lines of the square to enable one to cut it out with a keyhole saw or ordinary handsaw.

Place a piece of asbestos board that is about ⅛ in. thick in the space where the boards were removed. The asbestos can be obtained at any hardware store. Fasten the board on all sides with eight small pine strips, each about ⅜ in. thick and of a length to make a neat double frame which can be held secure by a few nails or screws. Turn the wallpaper back and paste in place, or put on new paper around the frame, if the old paper has been damaged. Cut a round hole, a little larger than the stovepipe, in the asbestos before fastening it in the partition.

Procure a couple of tin stovepipe collars and lay them down together evenly and punch four or more small holes in their rims. Fasten the collars, one on each side of the asbestos board, over the hole with roundhead stove bolts. The stovepipe joint is run through the collars. This will make an arrangement that will be a safe one, and, if well done, a neat appearing job in a situation where it would be impossible to use a chimney ring.—Contributed by J. G. Allshouse, Avonmore, Pa.

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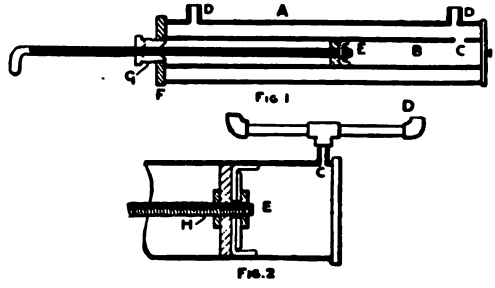
### Pressure-Gauge Tester

Every engineer, stationary or marine, can easily make the pressure-gauge tester shown in the sketch. The cost for the material will be small, and, although not so elaborate as the factory-made article, it will give first-class results.

The main body A is a piece of brass tubing, 12 in. long and 1½ in. in diameter. Two holes are drilled on one side, one at each end, and fitted with two ¼-in. pipe couplings, DD, which are soldered in place. Another brass tube B, 12 in. long and 1 in. in diameter, having a hole in it at C, is fastened with the tube A on a solid disk, I. A 1½-in. washer, F, with a hole the same size as the inside tube is soldered on the other end of the tubes. The hole in the washer is threaded to receive the bushing G, which has a bolt with a long thread to fit its internal threads. An iron washer and a good cup leather is attached to the end of the rod at E.

Fill the tubes with water and place a test gauge on one of the openings D and a gauge to be tested on the




Details of the Tester

other opening D. Before filling with water, the piston E should be at the washer end F. Turn the rod to make a pressure on the water. The number

of pounds pressure can be raised as desired.

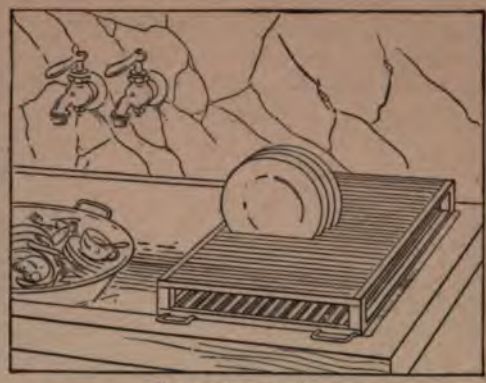
In Fig. 2 is shown a single tube tester which is very simple. Its construction can be understood by the sketch. As high as 300 lb. pressure can be obtained with a few turns of the rod.—Contributed by Jas. E. Noble, Toronto, Can.

### Ink Well for a Lettering Pen

The sketch shows an ordinary drawing-ink bottle filled with cement up to the neck, leaving a very small space at the top for ink. The advantage of this well, which is for use with the lettering pen, is that the pen need be only dipped in the ink a short distance, avoiding the smearing of ink on the pen holder, as is usually the case. The cement filling makes a heavy paper weight of the bottle, which will not easily tip over. The stopper should be cut as short as practicable so that it will not limit the ink space. While the capacity is small, it is sufficient for ordinary work, as the lettering does not require much ink.—Contributed by J. J. O'Brien, Buffalo, N. Y.

### Drain Board for a Sink

The simple drain board shown in the sketch is a great kitchen help. It consists of two frames of pine strips each 1 ft. wide and just long enough to fit across the sink. Nail the cross strips far enough apart to allow a plate to stand upright. Reverse the frames so that the strips in one frame will be at right angles to those in the other. Make four uprights about 2 in. high to support the corners and keep the two frames apart. In washing dishes place them on this drainer and pour boiling water over them. No other drying is necessary. The end of the board nearest the wall may be hinged and when not in use it is hooked up out of the way.



Plates between Slats

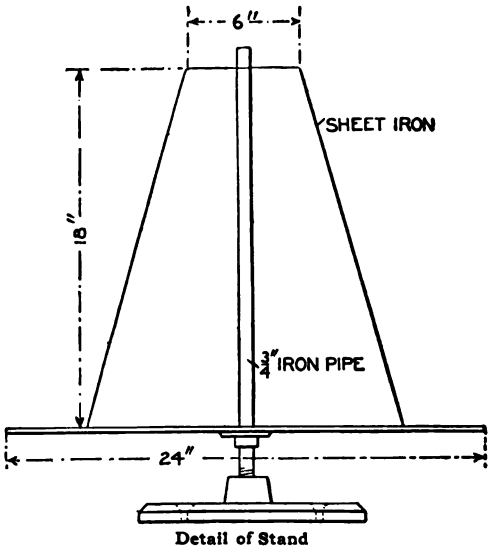
### Ladder Props

It is often necessary for the owner of a house or garden to do some work that requires a ladder. Most ladders are heavy and hard to handle. The illustration shows a light ladder that can be placed anywhere alone or against uneven surfaces. The two props, which extend to the ground, are detachable and can be set up at any angle. The hooks are easily made by any blacksmith and riveted to the poles. They are set under any rung and, when climbing the ladder, it will stay where it is placed. The climber need not fear falling headlong, even though he may stand on the top rung. When gathering fruit, this ladder can be set against any limb without danger of breaking the branches.—Contributed by Lou Kostelak, Stamford, Conn.

Props on the Ladder

### Stand for Holding Coiled Wire

A stand for holding coiled wire in various sizes is shown in the sketch. The stand is suitable for the shop or



Detail of Stand

salesroom. Such a stand will hold a coil of wire and keep it from becoming tangled as the wire is used or sold.—Contributed by Peter J. Theisen, Denver, Colo.

### How to Prevent Motorcycle Belts from Slipping

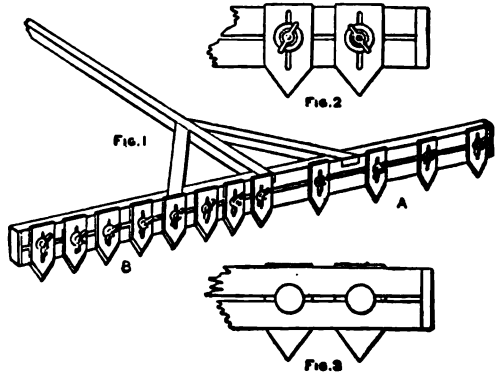
Having had considerable trouble with flat belts slipping on motorcycle engine pulleys owing to dust and dry surfaces, and after trying various kinds of dressing and building up the metal surface with friction tape, leather, rubber, etc., to increase the friction, I used the following method with better results: A strip of canvas was cut to fit in between the flanges of the driving pulley, thoroughly soaked in good glue, and wound tightly on the pulley surface until it consisted of six layers. After this dried, it gave excellent results. The band wears well and increases the friction between the surfaces, and it also allows the driving belt to run with less tension.—Contributed by Geo. Forest, Crystal Lake, Illinois.

### Test of Humidity in Living Rooms

The French Journal de la Santé (Sanitation or Health Journal) gives the following simple test for determining whether or not the humidity of a building unfits it for habitation. Place a known quantity, say 2 or 3 lb., of newly slaked lime in the suspected apartment, closing the doors and windows hermetically as in disinfecting it, and after 24 hours weigh the lime again. If it has increased in weight one per cent or more, the apartment should be pronounced insanitary.

### An Adjustable Garden Marker

The adjustable marker is made on the same principle as the ordinary garden rake or marker with the exception of the teeth, which can be set at any distance apart (Fig. 1). The part holding the teeth consists of two strips of wood, 3 ft. long, 1½ in. wide, and ⅝ in. thick, fastened at the ends so that they will have a space between them for bolts. The teeth or markers are fastened with ⅜-in. bolts having washers and thumbnuts. These are shown in Fig. 2. The opposite side of the strips with the bolt heads is shown in Fig. 3. The teeth can be set from ¼ in. to 3 ft. apart. The teeth are shown set 4½ in. apart at A and 2¼



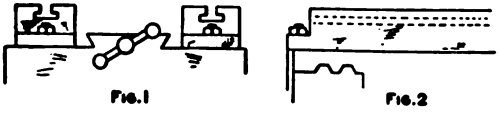
Sliding Markers

in. at B. The markers not in use can be raised up so the points will be on a level with the lower edges of the bottom strip.—Contributed by E. R. Zehner, Easton, Pa.

### Lathe Parallels

For boring, facing and special lathe work, a pair of parallels such as shown in the sketch is quite useful. Reference to the sketch shows that the parallels are provided at each end with a foot through which bolts are passed to secure them to the lathe carriage. A T-slot is cut in the top to provide a way for clamping the work to the parallels quickly and securely. If both parallel castings are planed up alike, work set on them which must be bored parallel to a given face is directly in line with the cut of a lathe.

When a large number of pieces of the same kind are to be machined, it will pay to make a special plate to fit them and bolt it to the lathe parallels. Cylinders, bearings and work too large to




Parallels on Lathe Carriage

swing on a faceplate may be bored and faced with this aid.—Contributed by Donald A. Hampson, Middletown, New York.

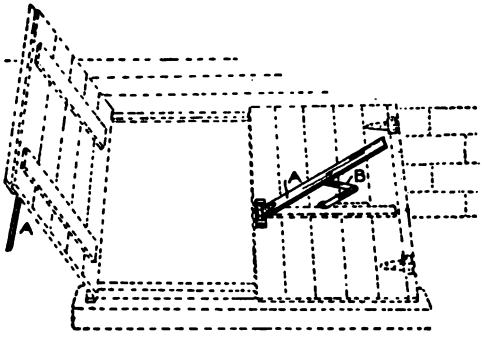
### Keeping Vermin out of Beehives

Mice and ants can be kept from entering beehives by setting the hives on the bottoms of inverted quart bottles whose necks are set in the ground. Be sure to keep the grass or weeds cut close to the ground about each hive.—Contributed by Paul Woodward, Rodney, Iowa.

### Cellar-Door Support

The illustration shows a self-opening and self-closing support for a cellar door. One-half of the door is shown opened and resting on the support A. The other one-half shows the support fastened in place. It is very simple to make and attach.

Use a strip of wood for the support, 7/8 by 2 in., with the required length to allow the door to rest at the height wanted when open. Fasten two blocks with screws, one on each door as shown, and attach a support to each

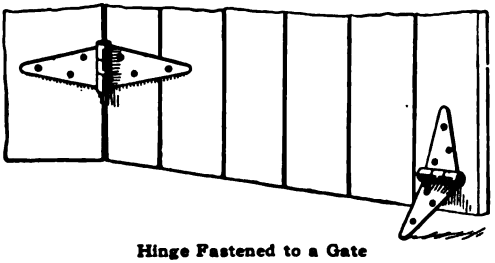



Folding Support

block with a tee hinge. The folding bracket B is easily made of a piece of hoop iron. The support will lay flat on the door when it is closed but will open up to the right position for a support as soon as the door is opened. —Contributed by W. A. Proctor, Cleftondale, Mass.

### Hinge Stop on a Gate

An ordinary gate or barndoor can be kept partly open or held in any position against a wind or draft by the use of a stop as shown in the sketch. The stop is made from an ordinary hinge which has only one wing fastened to the lower part of the door or gate. The loose wing catches on the floor, ground



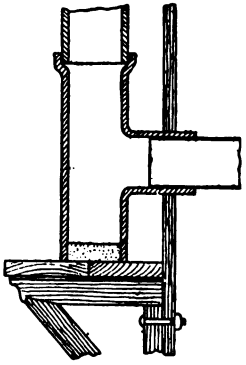
Hinge Fastened to a Gate

or cement walk. When not in use it is turned up against the gate.—Contributed by W. E. Cleveland, Chicago.

¶After cutting a taper on a lathe, do not forget to reset the tail stock.

### Fireproof Chimney for Frame Houses

In a mining camp where many fires were caused by defective chimneys the one described herewith was adopted as the best and safest kind for a frame house. It finally became compulsory to have every frame house equipped with this chimney. This style of chimney is inexpensive and the parts can be purchased in almost any little country place.



A bracket is made and fastened to the outside of the wall on which a tee joint of terra-cotta sewer pipe is set and a bottom of cement put in on the boards. The tee opening extends through the wall and is used for the stovepipe opening. The chimney is then built up as high as desired with sewer pipe, the joints being well cemented.—Contributed by W. A. Lane, El Paso, Texas.

### Testing Lubricating Oils

Place one drop of each oil to be tested on a piece of glass so that the drops will be in a line at one end. The glass should be about 30 in. long with a width sufficient to hold the number of drops without their mixing. Raise the end on which the drops were placed, about 6 or 8 in., to form an inclined plane. The oil will run down this plane. An oil having a light body runs and dries quickly, but an oil that has both a body and a free flow will be readily detected by this test. An oil may have a good body and yet may have a tendency to gum badly, which quality will also be detected on the glass. The oils should be protected from dust while these tests are being made.

### Furniture Polish

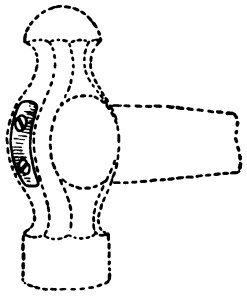
The following formula makes an excellent creamy furniture polish:

| | |
|---|---|
| Animal oil soap | 1 oz. |
| Solution of potassium hydroxide | 5 oz. |
| Beeswax | 1 lb. |
| Oil of turpentine | 3 pt. |
| Water enough to make | 5 pt. |

Dissolve the soap in the lye with the aid of heat; add this solution all at once to the warm solution of wax in the oil, says the Druggists' Circular. Beat the mixture until a smooth cream is formed, and gradually beat in the water until the whole is completely emulsified.

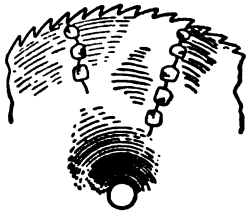
### Fastening Hammer Handles

The illustration shows a method used by a correspondent of American Blacksmith to keep hammers from coming loose on handles. The hammer is first set on the handle and then it is wedged as tightly as possible. Two ⅛-in. holes are drilled in the end of the wood and two large wood screws driven into the holes. The screws never come out and the hammer head does not come loose.



### Electric Welding of Metal Saws

The installation of a cold-metal saw in a factory called for an operator, and the man selected was unskilled in the use of the machine. The saws used were ¼ in. thick and 3 ft. in diameter. Three of the saws were broken by the workman. One of the saws had a crack 4½ in. in length from the cir-



cumference. This was placed on an electric welding machine and a piece about the size of a silver quarter broken from a $\frac{1}{16}$-in. thick metal saw placed on each side of the crack. These welds were made about 1 in. apart. The current was used on the fourth power. The surplus metal was chipped off and the surface ground.

Another saw had six cracks all running toward the center from the outside. They were all treated in the same manner. This method was used after an unsuccessful attempt to join the break by brazing. — Contributed by John B. Roberts, Pittsburg, Pa.

### Adjustable Mirror

A flat piece of iron, A, Fig. 1, 6 ft. long, ½ in. thick and 1 in. wide, is attached to the wall or window casing with a screw. The mirror B is attached

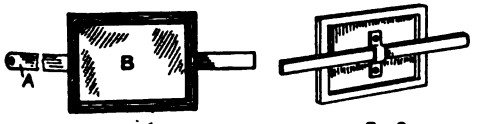



Fig. 1 Fig. 2

Mirror Slides on Bar

to the iron bar by a clasp on the back as shown in Fig. 2. The object of such a device is to adjust the mirror to accommodate different heights. This device will be found quite convenient where there are small children. —Contributed by Milton O. Freeman, Ghent, O.

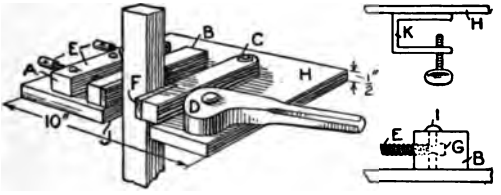
### Cementing Brass to Glass

An elastic cement for holding brass to glass can be made by mixing together with a gentle heat 5 oz. of rosin and 1 oz. of beeswax, then stirring in 1 oz. of dry Venetian red slowly, after which take from the fire and let cool. This is used as a cement.

Stains on gold and silver can be removed by immersing in a solution of cyanide of potassium, ½ oz., rain water, 1 pt., and brushing off with prepared chalk.

### Vise for a Drill Press

When a number of bars of a uniform size are to be drilled, the vise shown in the sketch is a great time saver, as

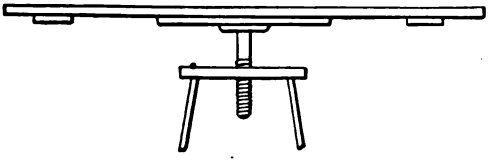



Quick Acting Vise

one movement of the lever D tightens or releases instantly after setting the jaws B and C to the right size by the screws E which turn in the piece A. The pieces A, B and C should be 8 in. long and 1½ in. square. The pieces B and C are fitted with steel jaws F. The piece A is riveted to the base plate H. The ends of the screws E have grooves turned in them to admit a part of the rivet I so that the jaw B may be moved either way with the screw. The clamp K is attached to H so that the whole device can be quickly fastened to the drill table. — Contributed by J. W. Vener, Boston, Mass.

### Revolving Drawing Board

In lettering certain kinds of work on an ordinary drawing board the draftsman must move around the board to do credit to his work. He either walks around the board or moves it to get at the work. If the drawing board is attached to a revolving stool, as shown in the sketch, the board can be turned

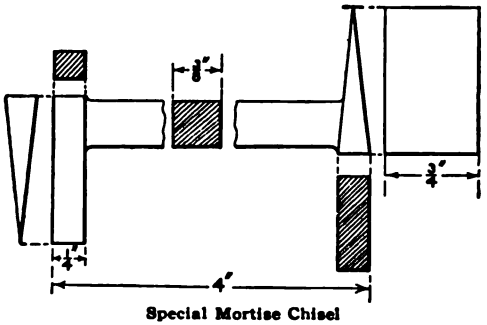


Drawing Board on Revolving Stool

to any angle desired, and also elevated or lowered to a convenient height.— Contributed by F. E. Robertson, College Station, Texas.

### Chisel for Cutting Mortises in Cabinet Drawers

When fitting locks in drawers on cabinet work, it is necessary to cut a mortise in the rail above the drawer



Special Mortise Chisel

end to receive the bolt of the lock. If the drawer is not a very deep one, the work becomes difficult, as the space between the rails is too small to work an ordinary wood chisel. The sketch shows the dimensions and shape of a tool that will do the work. It is made of tool steel and sharpened like a chisel.—Contributed by F. O. Andersen, San Francisco, Cal.

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### Making Brass Letters in Steel

The letters, name or numbers are cut in the steel surface with acid or steel letter punches and the indentation filled with brass. This is accomplished by heating the prepared steel red-hot in a brazing furnace, forge or kitchen range, and flowing spelter in the indentations. Use borax as a flux and a piece of brass wire for the spelter. The wire can be handled much easier than the regular brazing spelter. Be sure to braze a good thick coat of brass on the lettered surface. After cooling, the surplus brass is filed away from the top of the article and the steel surface polished. The indentations will be filled with brass.

Tools may be marked in this manner. If used for paper weights, the steel surfaces must be lacquered after polishing to keep them from tarnishing.—Contributed by D. O. C. Kersten, Detroit, Mich.

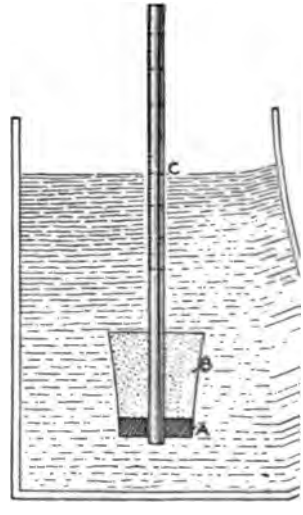
### Automobile Cooling Alcohol Mixtures Kept at Proper Strength

According to law, denatured alcohol is the "grain alcohol of commerce rendered unfit for beverages." The freezing point of this alcohol is about 160 deg. F., says the Automobile. When added to water in various proportions, it lowers the freezing point of the water. An approximation of the freezing points of various proportions of water and denatured alcohol is given in the following table:

| Proportion of water in gallons | Proportion of denatured alcohol in quarts | Freezing point in deg. Fahr. |
|---|---|---|
| 1 | 1 | 10 |
| 1 | 1.5 | 5 |
| 1 | 2.5 | −20 |
| 1 | 4 | −35 |

In order to maintain the solution at proper strength, it may be necessary from time to time to add one or other of the constituents to keep the proper proportions. If it is safe to employ a mixture holding 2.5 quarts of denatured alcohol to the gallon of water, it is advisable to maintain this proportion.

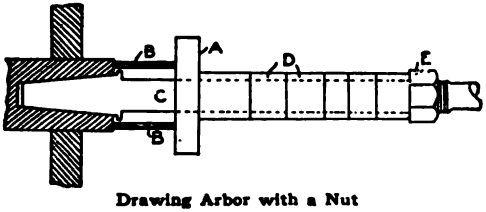
A very simple way of observing the relation of alcohol to water is to mix, say, 2½ qt. of denatured alcohol with one gallon of water and then by means of a weighted float with a stem on it find out how low the float sinks in the solution and mark this point on the stem as shown at C. With a good-sized cork, B, a long slender stick of wood and a washer, A, it would be possible to make a measuring instrument in five minutes that will serve every purpose. Calibrate the instrument by finding



out how low it will sink into the solution, and mark the place. After this, all that has to be done is to draw off some of the solution from the radiator in a bucket and drop the instrument into the liquid, noting how low it will sink. If it does not sink down to the mark, add alcohol until it will; if it sinks below the mark, add water to float it up to the same.

### Removing a Milling-Machine Arbor

The arbor of a small milling machine had become so firmly lodged in the taper hole that it was impossible to drive out with a hammer from the back, so I had to use some other method to loosen the shank. I stripped the arbor of all its bushings and put on a cutter,




Drawing Arbor with a Nut

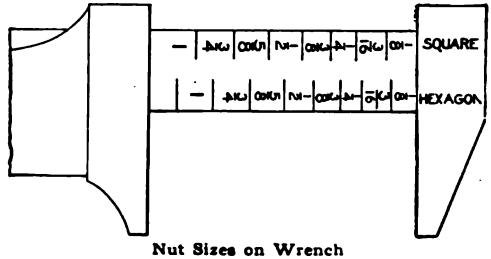
A, then placed two pieces of steel, B, of equal length, between the cutter and the end of the spindle, one on each side of the arbor C. The pieces of steel were long enough to hold the cutter some distance from the shoulder of the arbor. The arbor was filled to the end with bushings, D, and the nut, E, screwed on them. The pressure removed the arbor with ease. Be careful to use a cutter heavy enough to stand the pressure.—Contributed by C. H. Rauschenberg, Greenville, Pa.

### How to Bend Tubing or Pipe

Heat the piece where the bend is to be made to a good red heat, then put it in a vise or other convenient place and bend while a stream of water is turned on the inside of the bend. Pipe can be bent in almost any angle in this manner without kinking or breaking.—Contributed by Irl R. Hicks, Hallsville, Mo.

### Scale on a Monkey Wrench

A scale stamped on the side of a wrench provides a means for setting the jaws so they will slip on a square

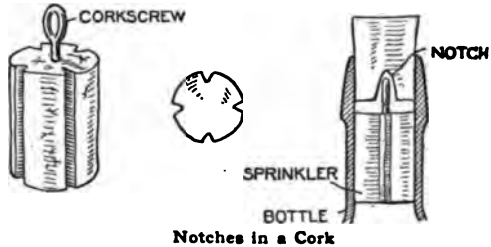



Nut Sizes on Wrench

or hexagon nut without fitting it to the facets. This makes it quite handy for turning nuts in dark and unhandy places. The scale may be marked after setting the jaws on standard square and hexagon nuts of the different sizes. The fractions designate the size of the bolt in fractional parts of an inch.—Contributed by Cecil Richards, Wheeling, W. Va.

### A Sprinkler Bottle Stopper

A sprinkling stopper to fit any size bottle can be made by cutting four long notches in a cork as shown in the sketch. Force this notched cork well down in the neck of the bottle after first turning in a small corkscrew so that it can be easily withdrawn when the bottle is to be refilled. Cut a notch




Notches in a Cork

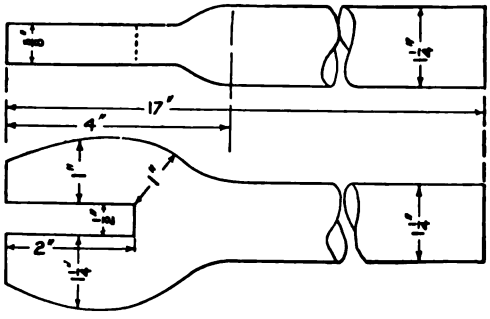
in another cork so as to allow it to fit over the corkscrew. This last cork is to close the bottle when it is not in use.

¶Do not flood the bearings of a magneto with oil, a few drops once a month is sufficient.

### A Pipe-Ripping Tool

The sketch herewith illustrates a very handy tool for ripping wrought-iron pipe. It can be made by any blacksmith at very little cost.

This tool was originally intended for




Details of Ripping Tool

breaking 3-in. wrought-iron pipe which contained a cable. The old method of removing the cable was to saw a piece off the side of the pipe and slip the cable out. The ripping tool is held against the open end of the pipe, which enters the opening in the jaws freely. A hard pull upward on the handle will tear a large piece free. One man can rip more pipe in a half hour with this simple tool than he could saw in a day. Such a tool is also of value to plumbers, steam fitters and electricians.—Contributed by G. M. Peterson, Buffalo, New York.

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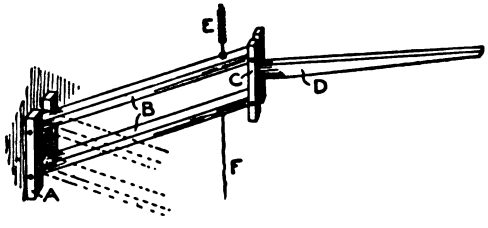
### Overhead Clothes Rack

The accompanying illustration shows an overhead rack that is designed to lift up out of the way articles placed




Rack above One's Head

upon it to dry, thus economizing room and using wasted space. The rack can be placed over the range in a kitchen to receive the tea towels and dishcloths and as they are directly above the heat that rises from the stove, they will dry in a few minutes.

The base A is 1 in. thick, 3 in. wide and 8 in. long, mortised 1½ in. deep by $\frac{5}{16}$ in. wide on each end. The piece C is 1½ in. thick, 2 in. wide and 8 in. long, mortised in the same manner as the base, with the addition of a central mortise, 3 in. long, ½ in. wide and 1½ in. deep, to accommodate the end piece D. The two pieces B are ½ in. thick, 1 in. wide and 30 in. long with a $\frac{7}{32}$-in. hole bored 1 in. from each end. The piece D is ½ in. thick by 3 in. wide at one end and 1½ in. at the other, and 36 in. long.

To assemble and hang this rack, first screw the base to the wall at the desired place and about 6½ or 7 ft. from the floor. Fasten the pieces B into the mortises in A with a $\frac{5}{16}$-in. by 3¼-in. bolt in each. Insert the piece D into the central mortise of the piece C and nail on each side and back with small nails. Fasten the loose ends of the pieces B into the mortises in C with $\frac{5}{16}$-in. by 1¾-in. bolts and fasten a screweye in each of the pieces B, as shown in the sketch. One end of a spring taken from an old shade roller is attached to the upper screweye and the other end is fastened to a screweye turned into the ceiling, after first drawing the spring up with sufficient tension to hold the rack at the desired place. A cord is attached to the lower screweye so that the rack may be pulled down to place the clothes on it for drying.

If it is desired to hang the rack over the center of a stove or table, simply hinge the piece A to the wall with a small pair of butts, then as the rack is pulled down it can be swung around to the side of the stove or table and brought within easy reach.—Contributed by H. J. Tinsley, Lancaster, Ky.

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¶Automobile tires should be inspected after every long run and the cuts attended to immediately.

### Fumigating School Books

Many times children are found in school who are suffering from some contagious disease and who are not sick enough to stay at home. They are a source of danger as well as the books and other articles which have been used by them. I devised a way to fumigate these articles whereby they can be disinfected at once and at very little cost.

The device consists of a can—an empty carbide can is very good for this purpose—with a screw top and a place for a candle in the bottom. A carbide can is about 2½ ft. high and 15 in. in diameter. The top of one of these cans can be screwed down tightly to keep in the gas. Formaldehyde candles are used for fumigating. The candles are set in a small tin about 1½ in. in diameter and ½ in. in height. These can be obtained at a slight cost and each one is sufficient to fumigate 1,000 cu. ft.

A hole is cut in the bottom of the large can so that it will admit the upper part of the candle. The books are then placed in the can, which is raised off the floor enough to permit the lower part of the candle to touch the bottom of the fumigator. The top of the can is not put on until the gas begins to issue forth and it is then screwed down firmly. The candle is allowed to burn about one minute, or until the can is well filled with gas The gas is allowec to act on the books and other articles for about 7 hours. This insures perfect and complete fumigation. The odor of formaldehyde is sometimes unpleasant, but this can be overcome by sprinkling household ammonia over the articles after they are removed.—Contributed by George Thomas Palmer, M. D., Springfield, Ill.

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¶A thick, soft painter's brush is better than waste for removing dust from an automobile engine.

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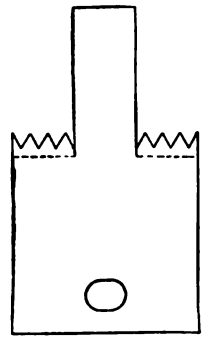
¶Calipering the front end of a hole does not show that it is bored straight.

### Door Lock for Travelers

A very simple and effective lock for the inside of doors can be made of two pieces of sheet steel or galvanized iron cut in the shape shown in the sketch.



The teeth are about ⅛ in. long, and the metal is bent at right angles on the dotted line. The oval hole is made large enough to admit an ordinary lead pencil. The lock is applied by pushing the teeth of one piece into the door casing and the other directly opposite in the door. Close the door and put a pencil or nail through the holes and it will be impossible to open the door from the outside —Contributed by A. Lester Shipton, Watertown, Mass.

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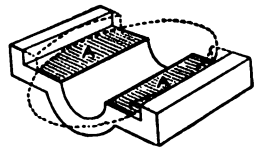
### Planer Work in a Lathe

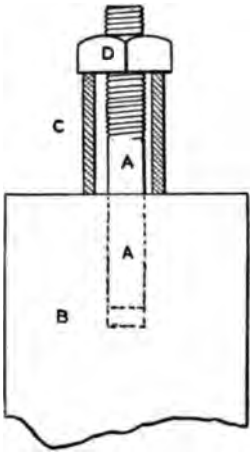
Quite a variety of small machines were made in a shop equipped with a lathe, drill press and grindstone. The lathe, naturally, did most all the work including some planer work. The sketch shows a box having cast edges to guide the cap. These were made in quantities. The portion marked A is the seat for the cap, which had to be machined flat. They were put in a four-jawed chuck in the lathe and faced out as far as the dotted line. This cut out more than three-quarters of the face and a boy chipped out the corners.



Keyways, both internal and external, may be cut by mounting the work and hand-feeding the carriage. Fairly good flat surfaces can be produced by clamping the work to the faceplate and hand-feeding the carriage, using the coarse feed screw each time to take a deeper cut.

### Removing a Pin from Cast Iron

My foreman told me more as a joke than otherwise to pull out a ½-in. cold-rolled steel pin, A, which had been driven 1 in. without lubrication into cast iron, B. Thinking I must do it, I tried to turn it with a pipe wrench and only succeeded in roughing the pin in the hole. I then used a method as follows that removed the pin without much work. I cut a thread on the pin with a ½-in. die and then put a collar, C, on it and ran a nut, D, on the threads. A hard pull of a 12-in. wrench on the nut removed the pin.—Contributed by Roy E. Coram, No. Chelmsford, Mass.




### Coloring Concrete

The latest report of the National Association of Cement Users recommended only certain mineral pigments that should be used for obtaining tinted mortars for concrete or stucco surfaces. These pigments are given in the following list:

| | |
|---|---|
| Grey | Lampblack, manganese dioxide |
| Slate | Lampblack, manganese dioxide |
| Red | Red iron oxide |
| Bright Red | English red oxide |
| Brown | Brown roasted iron oxide, brown ocher |
| Yellow | Ocher |
| Blue | Ultramarine |
| Green | Chromium oxide, ultramarine green |
| Violet | Violet oxide of iron |

The amount used should be small, owing to the danger of impairing the strength of the resulting mortar. The limit should be 5 per cent by weight to that of the cement. Even this amount of certain colors which differ little from that of cement, such as yellows and reds, does not produce a marked change from that of neat cement. Lampblack is best for darkening, and to lighten the color, use lime. The coloring constituents can be used dry or in a paste, but it is most convenient for mixing to use the dry form, which should be thoroughly mixed with the dry mortar before adding water.

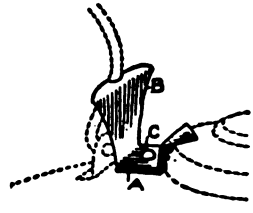
### Glass-Cleaning Solution

Glass tumblers, tubing and fancy bottles are hard to clean by washing them in the ordinary way as the parts are hard to reach with the fingers or a brush. The following solution makes an excellent cleaner that will remove dirt and grease from crevices and sharp corners. To 9 parts of water add 1 part of strong sulphuric acid. The acid should be added to the water slowly and not the water to the acid. Add as much bichromate of potash as the solution will dissolve. More bichromate of potash should be added as the precipitate is used in cleaning.

The chemicals can be purchased cheaply from a local drug store, and made up and kept in large bottles. The solution can be used over and over again. If a large jar is filled with the solution, articles of glass can be dipped in it for a few minutes and then washed in clear water.—Contributed by Loren Ward, Des Moines, Iowa.

### Kettle Cover Holder

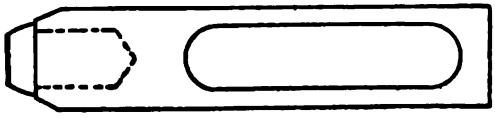
A cover if not hinged to the kettle will fall off when the kettle is tilted for pouring, and this is not only a source of annoyance every time any of the contents of the kettle is poured out, but often results in a bad scald or burned fingers. This annoyance can be prevented by making and attaching to the kettle top the little device shown in the sketch. It is made of



two strips of metal, one soldered to the kettle top and the other riveted to it. When the handle of the kettle is raised it forces the clip over the cover.

### Steady-Rest Jaws with Babbitt Ends

In using the steady rest on lathe work, I have always had a lot of trouble with the jaws cutting into and marring the work, especially brass work, says a correspondent of American Machinist. I tried fiber, rawhide and other materials with little or no success, as they all wear away in a very short time; so,



Babbitt in End of Jaw

finally, I tried drilling out the ends of the jaws and filling the hole with babbitt, as shown in the sketch. This method works to perfection.

### Spark Gap for Testing

An adjustable spark gap to be used in testing and timing automobile engines can be made as follows: Take a piece of fiber, ⅛ in. thick, ½ in. wide and 1¾ in. long. Bore a $\frac{3}{16}$-in. hole near each end and fit with a bolt or connection taken from an old dry cell. Put the nuts on a piece of 18-gauge copper wire, about 1 in. long, and fasten them down. Attach a large ter-

Adjustable Spark Gap

minal on one end to slip on the spark plug, and fasten cable to the other end. The spark gap is adjusted by bending the ends of the wires closer or farther apart.—Contributed by C. R. Poole, Los Angeles, Cal.

¶While automobiling give the engine a rest by advancing the spark and nearly closing the throttle. It is not good practice to run on full throttle for long periods.

### Holder for Starting Screws

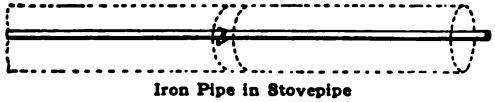
The tool shown in the sketch is for holding screws when starting them in tapped holes. It consists of a wood

Screw in Holder

handle having two pieces of clock-spring, ⅛ in. wide, bent at the points, as shown, to spring into the slot of a screw. The manner of using the tool is obvious.—Contributed by Henry Hertiner, Amarillo, Texas.

### Fastening Stovepipe Joints

While putting up a stovepipe recently I found that I did not have any place to fasten the guy wires. In their stead I used a 1-in. iron pipe, which I placed in the stovepipe, and fastened each joint with a rivet. A small piece of wire, wrapped a couple of turns around the iron pipe and run through holes in the stovepipe, will hold the

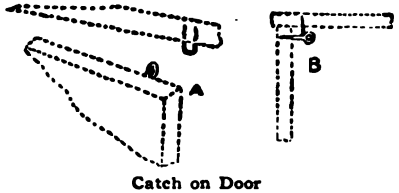


Iron Pipe in Stovepipe

parts together as well as the rivets.—Contributed by Victor Maene, Bustleton, Pa.

### Catch for a Small Door

An easily made and very effective catch to hold any small door, as in a washstand, sideboard, etc., is shown in the sketch. It is simply a small screw-eye and an upholstering staple attached as shown at A. The manner in which

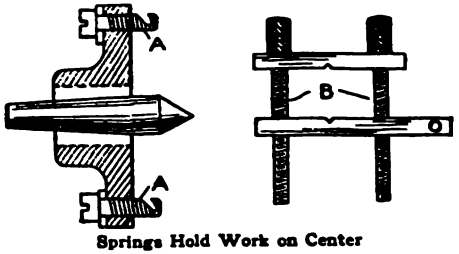



Catch on Door

they hold the door is shown at B.—Contributed by Jos. L. Schreick, Portsmouth, O.

### Holding Work on the Center of a Lathe

All that is necessary to use is two fillister head screws, A A, with two coiled springs of even tension. File a




Springs Hold Work on Center

groove in each screw, as shown in the sketch, put one spring on each screw B of the small lathe dog, and when in position it can be readily hooked on the screws in the driving plate, thus holding the work back securely.—Contributed by Arthur W. Andrews, Brooklyn, N. Y.

### Coloring Brick

Brick owes its color to the presence of iron in the clay from which it is formed. Usually 5 or 6 per cent of oxide of iron (ferric oxide) will give a deep red color to brick, a higher percentage giving a deeper color. The presence of carbonates of lime and of magnesium will modify the color.

### Sharpening a Nail Set

A nail set will become worn in time so that the face will be flat as shown at A. This will allow it to slide off the head of the nail when it is struck with a hammer. If the edge is hammered down, it will form a concave


End of Punch Hammered Over

as shown at B. When hardened, it will work as well as a new one.—Contributed by Albert Hahn, Chicago.

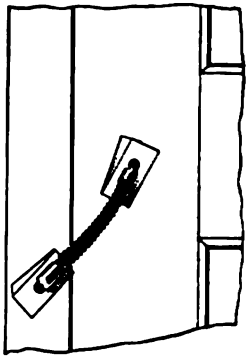
¶An ordinary curling iron makes a very good finger stretcher for kid gloves.

### Reflector for an Automobile-Trouble Lamp

A handy reflector for a trouble lamp for automobiles can be made by taking a funnel and putting it over a light bulb and fastening it with insulation tape to prevent a short circuit. We have used this reflector in the shop, and find it cheaper to go to the hardware store and buy a funnel than to buy a reflector at an automobile-supply house.—Contributed by Thos. J. Becker, Kansas City, Mo.

### Increasing Efficiency of a Coil Door-Spring

The efficiency of an old-fashioned coil door-spring can be increased by applying two blocks of wood as shown in the sketch. The blocks are cut triangular-shaped. One is fastened to the door and the other to the casing. The spring is applied as shown. This will curve the spring backward a little when the door is closed, and cause the spring to exert constant pressure against drafts on the door.



The manner of holding the spring does not increase the tension, but applies the pressure when the door is closed.—Contributed by Victor Labadie, Dallas, Texas.

### Operating Air Pumps

Many engineers start the pump, set it at its normal speed and let it run regardless of the load. The result is that the air pump does a great deal of unnecessary work, and, at times, it is pumping steam to a greater extent than air. This often can be quickly checked by slowing down the air pump materially without any appreciable effect upon the vacuum.


### Combination Fishing Sleigh and Boat

During the winter there is a great deal of fishing done through the ice on Lake Erie. In the neighborhood of Buffalo the strong current of the Niagara River causes treacherous breaks to occur in the ice, often marooning parties of fishermen with their dog sleds five or ten miles from shore on ice floes.

During the past winter a few sleds were made up as shown in the sketch with a small flat-bottom boat, instead of the ordinary box, mounted on top. With this arrangement the fisherman, when he comes to a break in the ice,

Boat on Runners

takes his dog team aboard and launches his sleigh-boat and rows to the next ice floe.—Contributed by James O'Brien, Buffalo, N. Y.

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### Cleaning Tufts in Upholstered Furniture

A handy device to clean the dust out of the tufts in upholstered furniture can be made as shown in the illustration. Procure an ordinary round paint-brush and attach a half of a common spool so it will turn loosely on a screw turned into the end of the handle. Near the brush, on the handle, fasten a whole spool with brads. Make a bow of an old umbrella rib and a stout cord. Before fastening the cord it is given a couple of turns around the spool.

Hold the half spool, A, in one hand,


Brush on Spindle End

and the end of the bow, B, in the other, and push it back and forth. This causes the brush to revolve very rapidly, loosening the dirt and throwing it out.—Contributed by Joseph L. Schreick, Portsmouth, O.

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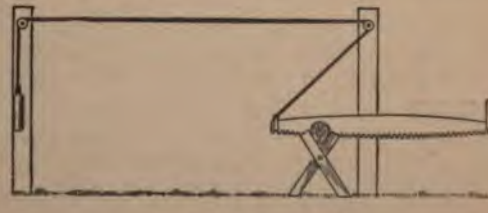
### One-Man Crosscut Saw

The illustration shows how I rigged up a large crosscut saw to cut large logs without the aid of another person. The opposite end of the saw is kept from digging too deeply into the wood by a rope run over two pulleys on posts and a weight tied to its end. The weight should be in proportion

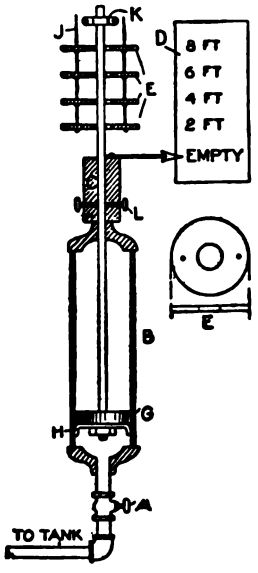


Balance for Saw End

to the weight of the saw end.—Contributed by Fremont Leland, Chester, Connecticut.

### Water-Level Indicator for a Tank

A pressure gauge is sometimes used to take the place of a water-level indicator on a tank. This method is not always reliable, as on high-pressure gauges the movement of the indicator hand is so slight, even for a difference of 2 ft. in the depth of the water, that it is hardly noticeable. The level indicator shown in the sketch is a homemade affair which can be placed in a pump room. The indicator has length enough to register any depth of water, and the size of the cylinder makes it less liable to stoppage from sediment.




The cylinder B is of cast iron, which can be bought cheaply. A pump cylinder with the guide rod will answer the purpose nicely. The pipe at the bottom is connected to the delivery pipe from the bottom of the tank or to the pipe from the pumps that enters the bottom of the tank. It is optional with the builder to use the globe valve A. The piston consists of a cup leather, H, and an iron washer, G. The piston rod has a guide, K, at the top and a lead weight, C, which is just heavy enough to balance the weight of the water from the bottom of the tank. The weight is held in place with the thumbscrews L. Small lead or iron weights, E, are hung on the cords J. The heft of these weights must be determined by testing. As the water rises in the tank, the weight C rises with the piston until the first weight E is reached when it comes to a stop until the water is raised high enough in the tank to raise the extra weight, and so on for each succeeding weight. The indicator board and pointer are shown at D.—Contributed by Jas. E. Noble, Toronto, Ont.

### Emergency Bolts

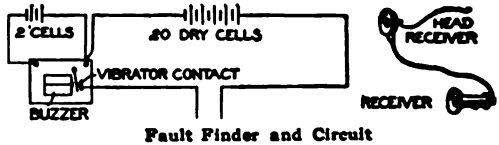
It is impossible to carry with any traveling machine, such as an automobile or any commercial machine, a sufficient number of bolts of the right length to replace any bolt that may be broken or lost. In making a temporary repair of this nature I found it quite handy to thread a piece of rod having a diameter that will answer the purpose for the majority of the bolts in the machine, for its entire length, say, 10 in. or any convenient length.

When any bolt is lost, a new one that will serve temporarily may be made by cutting off a suitable length of rod and placing a nut on each end. Almost any bolt may be replaced in this way, in fact the rod may be bent to make a U-bolt if desired.—Contributed by Thos. L. Parker, Wibaux, Montana.

### Homemade Fault Finder

The sketch illustrates a homemade fault finder which will readily locate grounds, crosses and shorts in an aerial cable. I have used such an apparatus for several years and have yet to see it fail to do its work.

In using this apparatus, connect the two leads to each side of the pair of crossed or short-circuited lines. If



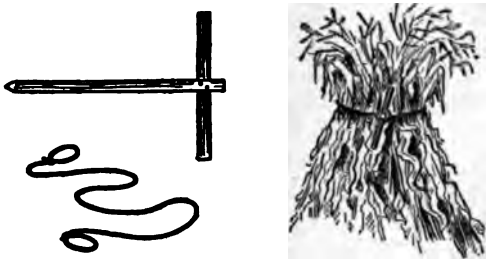

Fault Finder and Circuit

lines are grounded, connect the wires to one lead while the other lead is connected to the sheath. The helper now puts on the head receiver and rides out

on the cable in a "buggy," holding the large bipolar receiver against the cable sheath until he loses the "buzz." The buzz stops as soon as the receiver passes the trouble. The cable should be cut where the buzz is lost and the trouble cleared. The large receiver should have the cap and diaphragm removed.—Contributed by G. M. Peterson, Buffalo.

## Tying Fodder

A very useful device as an aid in tying fodder can be made of two pieces of wood, one about 2 ft. long and the other about 18 in. long, formed into a cross and firmly fastened together, and a piece of rope 9 ft. long with an eye



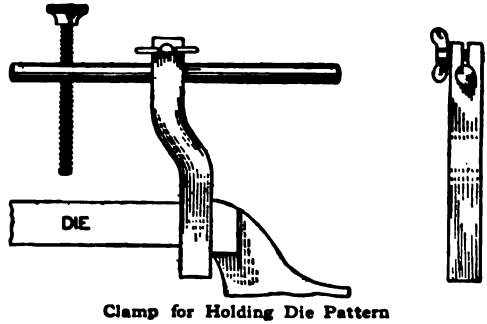
Aid in Fodder Tying

in each end. The long piece of the cross is stuck into the fodder shock and one loop of the rope placed over one end of the cross. The other end of the rope is passed around the shock and the loop placed over the other end of the cross. A few turns of the cross will draw the fodder together for tying. —Contributed by R. H. Workman, Loudonville, Ohio.

## A Die Clamp

The accompanying sketch shows a simple die clamp I made and am using to good advantage. A piece of ½-in. square steel was cut 4½ in. long and bent to shape as shown and a $\frac{5}{16}$-in. hole was drilled and reamed so that a 5½-in. length of drill rod would have a sliding fit.

The top of the square piece is split to clamp the drill rod and a small thumb screw fitted on one side. The ends of the rod are rounded off neatly. A hole is drilled and tapped ¾ in. from one end. A 4-in. screw having a

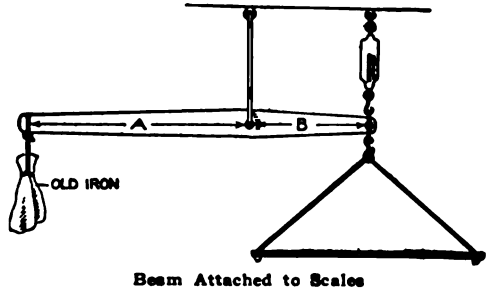



Clamp for Holding Die Pattern

knurled head and threaded the entire length is turned into the threaded hole. The rod can be extended as far as any ordinary vise will open. This is a very handy tool for holding down work on a plate to be marked out for a die.—Contributed by J. A. Kottmann, Ansonia, Conn.

## Beam Attachment for Spring Scales

Spring scales weighing articles up to 50 lb. can be used with a beam attachment for weighing any number of pounds within a reasonable limit. The beam is attached to an overhead support with a screweye, the pivot being in such a place as to make the length A twice the length B. Bags of old iron weighing 25 lb. each are used on the end of the beam. If an article weighs 110 lb., it will require two

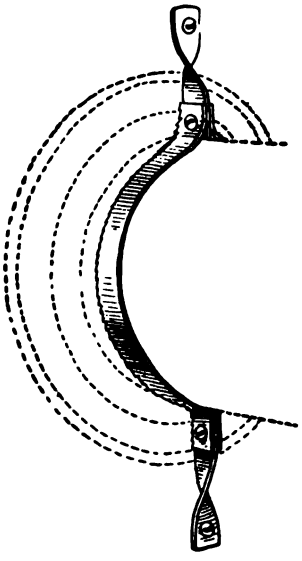



Beam Attached to Scales

weighted bags and the 10 lb. will be registered on the dial of the spring scale.—Contributed by Joe V. Romig, Allentown, Pa.

### Securing a Stovepipe in a Flue Opening

A simple method of preventing stovepipes from sliding too far in flue openings is shown herewith.



Take two hacksaw blades and cut them off to such a length that they will overlap an inch or so at the end when bent over on opposite sides of the pipe. Two flat strips of iron, about 4 in. long and twisted through a right angle, two short stove bolts for securing the saw blades to the strips through holes drilled or punched in their ends, and two screws for fastening the free ends of the strips to the walls are also required, the method of installation being clearly indicated in the sketch. By screwing up the stove bolts, the saw blades will tightly grip the pipe, the natural spring of the blades serving always to give a good grip which will never permit the device to work loose as long as the bolts hold.

This makeshift device is far more sightly and serviceable than ceiling wires and if carefully made will last a lifetime.—Contributed by Victor Labadie, Dallas, Texas.

### Black Acid-Proof Stain

A stain made up by the following formula has been in use for some time in our laboratory for staining the tops of tables. It produces a soft black color which no reagents affect. Neither lye nor acids discolor it. Tables treated with this stain should be wiped off about every two months with a cloth moistened in boiled linseed oil.

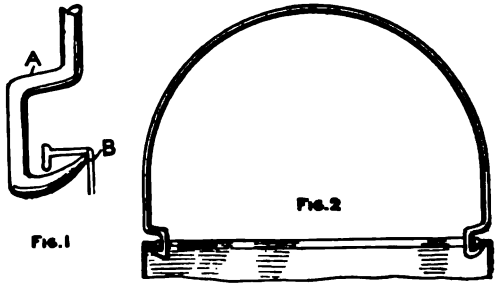
Take 1¼ lb. of copper sulphate (blue vitriol) and 1¼ lb. of potassium chlorate, and add sufficient water to make 1 gal. of solution. Boil and stir to dissolve completely and label No. 1. Mix 1 pt. of muriatic acid in 1 pt. of aniline oil. Add the acid to the oil slowly and in small quantities. Add sufficient water to make 1 gal. of solution and label it No. 2.

Apply a coat of No. 1 and allow it to dry, then put on a coat of No. 2 and let that dry. Wash well with soap and water and allow to dry. Then apply another coat each of No. 1 and 2, allowing time for each coat to dry. Wash again, dry and apply another coat of No. 2 and let it dry. Wash and rinse the surface well and let it thoroughly dry and apply two coats of boiled linseed oil.—Contributed by A. W. B., Rockville, Ind.

### A Paint-Pot Bail

A convenient bail for attaching to a paint can having a ridge around the inside top for the airtight cover to fit into may be made in the following manner:

Procure a piece of No. 8 steel wire, 16 in. long, and bend it at both ends as shown in Fig. 1. The part A is to prevent the bail from falling down into the paint when the can is set down.




Bail in Top of Pot

The only point of contact, B, should be filed down from the under side as shown. Bend the wire into the shape of a bail as shown in Fig. 2 and leave

the two ends far enough apart so that they must be sprung together slightly when putting the bail in place. When not in use the bail is easily removed and the airtight lid replaced.—Contributed by J. R. Montague, Niagara Falls, Ont.

### Preventing Anchor Chains from Breaking

Chains which are subject to shocks, especially those used for anchor chains and hawsers, break, not from the steady strain which is applied to them, but from the sudden shock. To overcome this trouble, insert a spring where most convenient by hooking the ends of the same into the links of the chain as shown in the sketch. This leaves the spring independent of the holding of the chain. The material, resistance

Spring in the Chain

and length of the spring, also the number of links to skip are determined according to the nature of the work and size of the chain.—Contributed by H. A. Hobelman, Baltimore, Md.

### Keeping Kettle Handles from Heat

Two methods to prevent a kettle handle from touching the side of a hot vessel are shown in the sketch. One method is to bend an elbow or shoulder in the piece of metal or ears holding the bail, as shown in Fig. 1. If the bend is made at the proper place, the wire will rest upon it, and the handle in the center of the bail cannot touch the sides of the hot kettle. This method may make it necessary to remove the bail and slightly bend it so that it will extend over the slightly increased distance between the ears.

The second method is to drill two holes in each ear, Fig. 2, and place small pins or stove bolts in them. The bail will rest upon these pins and prevent the handle from touching the hot sides of the kettle.

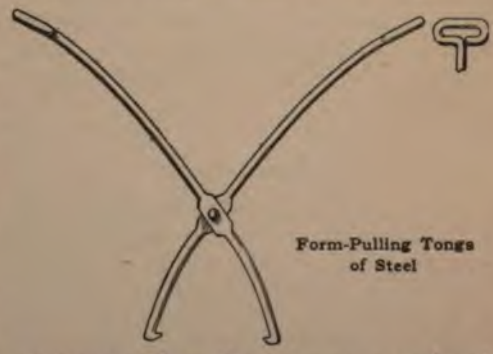
FIG. 1 FIG. 2

Projections for Holding Bail

A simple plan of warming plates and dishes and to keep the food in them hot is to place the pins in such a position that the bail, in resting upon them, will be on a level with the top of the kettle. A plate or dish set on top of the kettle is partly supported by the wood handle, and the steam from the boiling water will keep the plate hot, it being necessary, of course, to remove the kettle cover when thus used.

### Tongs for Pulling Concrete Forms

Quite often when pulling out forms used in making "goose-neck" curbs, the edges of the concrete are broken off by the crowbar in lifting them. The tongs shown in the illustration will avoid this trouble and will make the task much easier. The tongs are constructed of two pieces of ½-in. steel, each about 14 or 15 in. long. The tongs are made on the same principle as ice tongs, but of a different shape. Two pairs of these tongs are

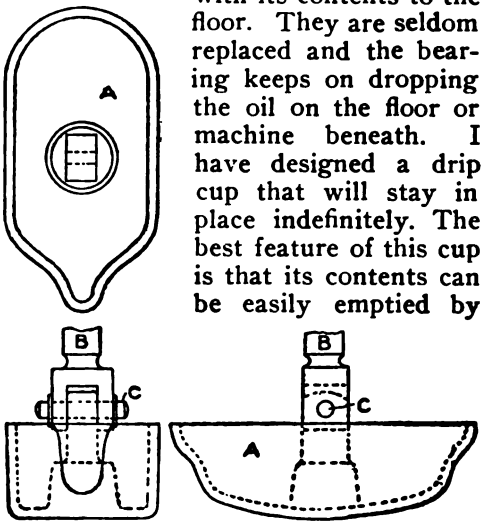


Form-Pulling Tongs of Steel

necessary when the long rear or front boards are pulled out.—Contributed by Gilbert A. Wehr, Baltimore, Md.

### A Drip Cup

Drip cups are usually fastened to the hanger with a screw, which in time loosens by the vibration and drops with its contents to the floor. They are seldom replaced and the bearing keeps on dropping the oil on the floor or machine beneath. I have designed a drip cup that will stay in place indefinitely. The best feature of this cup is that its contents can be easily emptied by simply tipping the part A. The construction of the cup is very simple and inexpensive. The cup part has a round hub in the center with a rectangular projection as shown. This projection is drilled for the pin C. The cup should swing easily on the pin so that it may be tipped.



Details of a Drip Cup

The fork-shaped part, B, can be made on the hanger casting, or, if the hanger is already in place or on hand, it can be made to screw in and pinned.

When the oiler oils the bearings, it is only necessary for him to tip the cup to take out the contents.—Contributed by Harold E. Murphy, Pawtucket, R. I.

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### Polished Floors

After much experimenting with wood fillers and finishes of various kinds and degrees of excellence, we have decided that plain boiled linseed oil, applied hot, makes the most desirable floor finish. To secure the best results, the oil should be put on the floor at the time it is nailed down. Lay a few boards, beat them together as firmly as possible, and nail them securely. Cover this strip with hot oil, then lay another strip and oil it, and continue until the space is filled.

If this procedure is not practicable protect the floor from stains by a layer of sawdust, or old newspapers weighted down, and oil it as soon as it is finished. If the floor is soiled, it will have to be scrubbed before oiling, and this is not desirable, as it tends to increase shrinking. If oiled at once, the pores of the wood are filled and the floor will never show the unsightly gaps and cracks that come so soon, even in well laid floors. In six months' time, it may be well to go over the floor again. After this application, a coat once a year will be sufficient.

Nothing but oil should be put on an oak floor. Oak is a very porous wood and needs to be well filled. With time and use and an occasional rubbing with warm oil it will take on a high polish which is more beautiful and far more durable than any varnish. We have used the oil on hard pine also with excellent results. Varnish gives a quicker finish and at first looks well, but unless the boards have been filled with oil and used for a time before varnishing, they will warp and draw apart, and in a year or two you will need a new floor. Varnish can be used after the oil is thoroughly dried in but it is best to leave the floor without varnish.

Wax is less objectionable. It may be used after the wood is well filled and the surface absolutely dry. It gives a fine polish, does not warp the boards and makes a beautiful floor, but it requires too much care for a room constantly used. The oiled floor acquires its polish more slowly, and through usage. With a little care it is durable. The floor is easily cleaned and not easily injured. Grease does not hurt it. The dust may be wiped off once a week with a soft mop and clear water. Do not use soap—scrubbing is never necessary.

Heavy brushes are best for sweeping such floors, but a piece of outing flannel tied over an ordinary broom

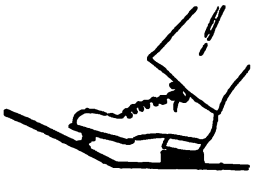
makes a very good substitute.—Contributed by Mrs. Helena Korte, Jamul, California.

### Repairing Tin Gutters

An easy way to repair a leaky bucket or a tin gutter so it will last a year or more is as follows: Paint the metal inside and out, then paint one side of a strip of cloth and apply it to the inside painted surface of the metal. Paint over the cloth and metal, and you will have a first-class repair.—Contributed by Maurice Baudier, New Orleans, La.

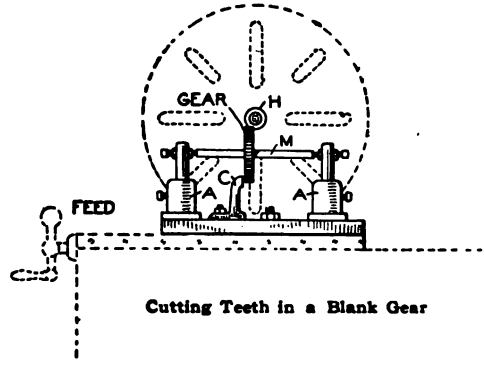
### Heel Support for Automobile Drivers

When driving my car with the accelerator pedal, I found it very hard on my ankle and leg to hold the foot in the abnormal position required, says a correspondent of Cycle and Automobile Trade Journal. I nailed a block of wood, 3 by 3½ by 3½ in., to the floor board in such a position that with my heel upon it the accelerator pedal was under my toe, with my foot in a comfortable, nearly horizontal position. I covered the top of the block with rubber matting to prevent my heel slipping off and painted the wood black. This is a great comfort and aid to me in driving. I can slide my foot forward until my toe touches the toeboard, supporting my foot, while I can push the accelerator pedal by simply bending my foot.



### Cutting Small Gears in a Lathe

The workman in a small repair shop not equipped with gear-cutting or milling machines can cut small gears on a lathe, if it is fitted with a jig as shown in the sketch. The jig consists of a flat bed, which is bolted on top of the cross feed, fitted with two posts, A A, that telescope so as to admit blanks of different diameters. A setscrew with



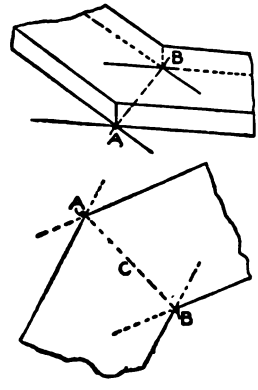

Cutting Teeth in a Blank Gear

a locknut is provided for the top of each post as centers.

The blank gear is turned up to the proper size to cut the right number of teeth and placed on a mandrel, M, and set between the setscrew centers. The posts can be adjusted to make the hob H cut the right depth. The brace C is to support the gear while it is being cut. The blank is fed on the hole by the cross feed.—Contributed by W. R. Ayers, Pittsburg, Pa.

### Cutting Miters

The diagrammatical sketch shows how I cut molding to fit any angle without a miter box. Place a piece of the molding along one surface of the object where it is to be fastened and scribe the outer surface against the ceiling or floor, as the case may be; then place the molding along the other side and scribe a line. While in that position scribe the inner surface of the molding with a sharp knife at the point marked B, also at A, the intersection of the lines scribed on the

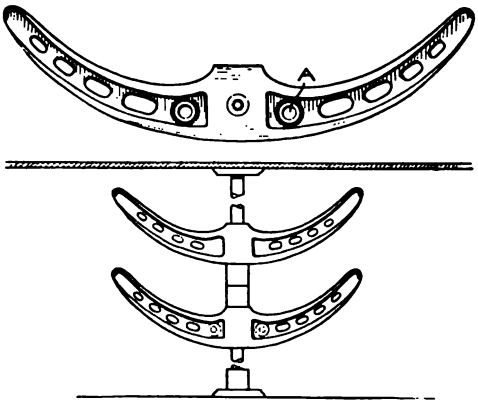


outer surface of the molding. Connect the two knife marks as shown by the dotted line C, and saw outside of the line about $\frac{1}{32}$ in. Cut all the molding before nailing.

In case of a crown molding on a wardrobe, put a temporary top on, letting it project far enough to get the necessary marks, then remove and nail the molding in place. This method will work on any angle.—Contributed by W. E. Gore, San Francisco, Cal.

### Pipe and Rod Storage Rack

The illustration shows the general arrangement of a rack for the storage of rod stock and pipe. Extra heavy




Castings for the Storage Rack

steel pipe is used for the uprights which are fastened to the floor and ceiling with 6-in. round floor flanges. Three cast-iron separating collars are placed at the base to raise the lowest rack section some distance from the floor, then alternately one of the rack sections and one of the separating collars.

The rack sections are held from turning by a $\frac{5}{8}$-in. setscrew which is screwed into the tapped hole in the hub and also by placing sections of 1-in. pipe between the racks. A piece of $\frac{5}{8}$-in. round steel is run through these sections of pipe and also through the holes A in the racks. These rods are threaded on both ends for nuts which hold them in place.—Contributed by D. A. C., Harrisburg, Pa.

### Depth Cutting in a Lathe

There are numerous ways better than using a depth gauge in cutting to a certain depth on a lathe. The gauge method of finding the proper depth requires cutting and trying several times before the result is obtained. Sometimes the compound rest is set at an angle of 30 deg. for thread cutting, and is left in that position, unless some other angle is required. Where the compound rest is graduated on the lathe, the depth can be obtained by simply multiplying the required depth by 2. The sine of 30 deg. being 0.5, the compound rest would have to move 1 in. in order to make the tool move in ½ in. Take for a more comprehensive illustration an equilateral triangle, the sides of which are 1 in. long, the angles being 60 deg. One-half of this would be 30 deg., hypothenuse 1 in. and the opposite side ½ in. The hypothenuse represents the center line of the compound rest.

Another method is to set the compound rest at zero (any angle) and run the carriage up until the tool just touches the work, lock the carriage and run the compound rest out, until you can "feel" with a piece of cold-rolled steel of the required size. Then unlock the carriage and run it up until it touches and lock again. Feed the compound rest in to the zero point and note the revolutions.

Still another method is to clamp a piece of stock with the square end on the lathe, where it will come against a clean, smooth surface of the carriage, put a piece the right size between them, lock the carriage and feed the compound rest up until it touches. Take out the piece and run the carriage to the stop.

These methods have been used with success and have been found very handy and simple.—Contributed by John Homewood, Chicago.

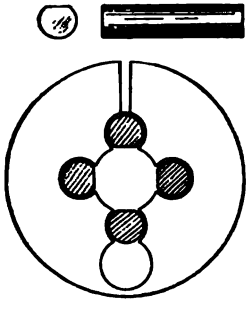
¶A sash lock can be used the same as a bolt on a door, if the casing is flush with the surface of the door.

### Waterproofing Blueprints

Blueprints to be carried into wet mines or tunnels may be made waterproof by the following process, according to the Mining and Scientific Press: Immerse a number of pieces of absorbent cloth, 1 ft. or more square, into melted paraffin until saturated. When removed and cooled they are ready for use at any time. Spread one of the saturated cloths on a smooth surface, place the dry print on it with a second waxed cloth on top, and iron with a moderately hot flatiron. The paper immediately absorbs paraffin until saturated and becomes completely waterproof.

### Retapping a Die

When a die becomes worn so as to cut a ragged thread, anneal it, close the die down and fill the open spaces with plugs as shown. Each plug should have a flat surface toward the center of the die. Tap out the threads the same as tapping a hole, remove the plugs and temper.—Contributed by J. F. Tholl, Ypsilanti, Mich.

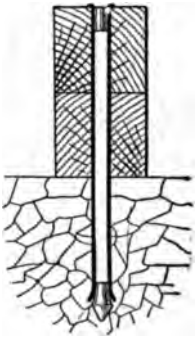


### Fireproof Paste for Furnaces

A paste or mortar that will close up cracks in furnaces to keep the gas from escaping can be made as follows: Mix together 75 parts of wet fireclay, 3 parts of black oxide manganese, 3 parts of white sand, and 1 part of powdered asbestos. Thoroughly mix by adding enough water to make a smooth paste. Apply this paste over the cracks and when dry it will be as hard as iron and stick like glue.—Contributed by H. D. Chapman, Washington, D. C.

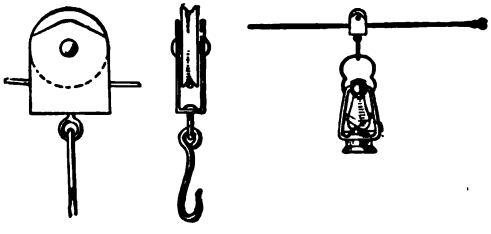
### Anchoring Beams to Rocks

Beams or timbers may be solidly fastened to a rock or concrete foundation with a piece of pipe as shown in the sketch. A hole is drilled into the foundation the same diameter as the pipe. A taper plug is cut from a piece of hard wood having its largest diameter just equal to the hole drilled in the rock. The pipe is driven through the hole in the beams and into the rock. When the end of the pipe strikes the taper plug, it is spread out against the sides of the hole. If the pipe is expanded at the top, the beams are more firmly held to the rock.



### Lantern Hanger for a Barn

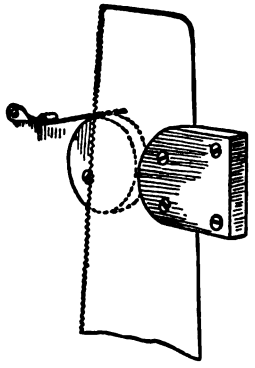
The hanger shown in the sketch makes a safe and handy way to use a lantern in a barn or stable. It is constructed of an old grooved pulley with a U-shaped hanger made of sheet iron. The hook hanger is made of a screweye cut off and riveted in place, the hook being formed of heavy wire. The pulley is run on a wire stretched overhead from one end of the barn to the other. The lantern can be easily moved from place to place, and, as it is up out of the way, it cannot be turned over.—Contributed by I. B. Spittel, Baltimore, Md.



Trolley Lantern Hanger

### Holder for a Handsaw

The workbench should be provided with a place for each tool where they will be handy for the workman. The saws are usually hung on a nail driven into the wall over the bench. When hanging a saw on a nail it must be held by the blade, which necessitates both hands in turning the saw. I use a holder such as is shown in the sketch.



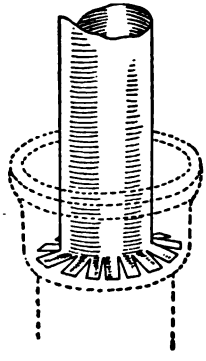
The holder consists of two blocks of wood, one 2¼ in. long and 2 in. wide, having one end cut on an arc of a circle, the other being a circular disk 2 in. in diameter. The former block is fastened with screws to the wall and the latter is attached off center so its edge will turn close on the rounded edge of the stationary block. A spring is applied to the disk to keep its edge in close contact with the edge of the other block. The downward pressure of the spring clamps the saw and holds it very firmly. A slight movement of the saw upward and outward releases it.—Contributed by Irl R. Hicks, Hallsville, Mo.

### How to Clean Brass

Keeping the hundred and one brass articles, now so popular in the home, bright is a matter of a little effort at virtually no expense, says Beautiful Homes. If the teakettle becomes stained, dissolve some whiting in lemon juice and apply with a soft piece of flannel, after which give it a bath in soapy, hot water. When a tray becomes cloudy-looking, it may be restored by using salt and vinegar. Drop the salt upon the tray, moisten it with vinegar, and scour with paste thus formed. Candlesticks discolored by gas from coal or wood may be brightened by rubbing them with a piece of soft leather. An old suede bag, a torn glove or a wornout leather pillow are just the articles to use. Soapsuds with a little ammonia is effective for embossed or pierced brass. It should be applied with a brush, and the article rinsed in warm water, then polished with a piece of leather.

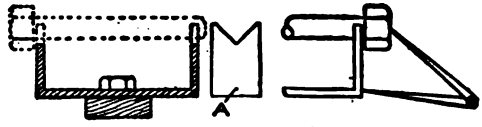
### Fastening Leader Pipes in Soil Pipes

When fastening leader pipes in soil pipes some of the cement is apt to drop into the soil pipe. As I always had trouble with making a joint of this kind, I decided to use the following method, which has given good results: The end of the leader pipe is cut and the parts turned out, as shown in the sketch, so that they will hold the cement in the joint.—Contributed by H. Van Vliet, Paterson, New Jersey.



### Centering Bolt Heads

The average bolt made from rods does not have its body central with the head. The end of the bolt never is cut off squarely and it is hard to make center holes for the lathe. When the upper end is centered from the sides of the head the body is apt to run out of true. If there is not much stock on the bolt, it will require a bit of "center throwing" to get the bolt ready for centering.



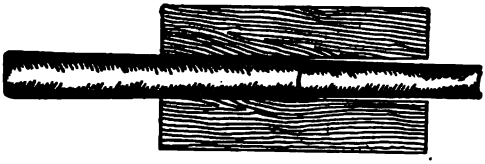
Centering the Head of a Bolt

The sketch shows a handy centering

arrangement made of sheet iron. The center-punch mark A is used for one leg of the dividers. The centers found by the dividers on this jig are the centers of the body of the bolt, and it requires but one drive of the center punch to fit it for the lathe. The tool can be attached to the wall or bench near a lathe.—Contributed by F. W. Bently, Jr., Huron, S. D.

### Repairing a Whipstock

In a block of wood bore a hole the same size as the whipstock 1½ in. below the break. If the whipstock is tapering, place the block over the break and pour melted babbitt metal into the space as shown in the sketch. If the whipstock is straight or does not taper very much, the hole must be bored ⅛ in. larger than its diameter, but not entirely through the block, the remaining distance being bored to fit tightly on the whipstock. The space is then filled with babbitt. When cool, the babbitt is finished with a sharp knife or file.—Contributed by S. V. Crane, Anderson, Cal.

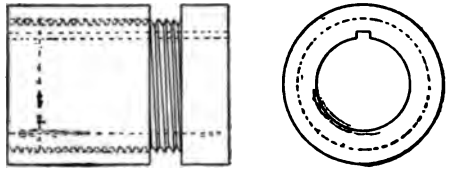


Whipstock in Mold

### An Adjustable Spacing Collar for Arbors

An old slab-milling machine used for cutting keyways in shafting had no side adjustment, and, as different-sized shafts were keyseated each day, the collars had to be changed each time. Adjustment was made easy by constructing adjustable collars as shown in the sketch.

One of the collars was placed on between the shoulder of the arbor and the first cutter, and the other between the cutters, says American Machinist. The collars were made of cold-rolled steel, having a nice snug fit so that they could be screwed together or apart as the case might be, with the fingers. The sleeve and the main body were knurled to simplify the movement. By loosening the nut on the end of the arbor it makes a very short job to arrange the cutters where they are wanted.

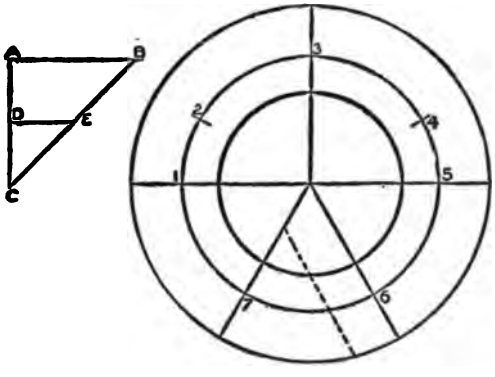


Adjustable Collar

### Rule for Smokestack Pitch Top

Draw the lines AB and AC with a square and mark the length of one-half the diameter of the top on the line AB. The height is marked on the line AC. Then one-half the diameter of the pipe is marked DE, parallel to AB. Set the compass from C to B and scribe the outside circle and set from C to E and scribe the inner circle. Set the divider points on A and B and step off six spaces on the outside circle.

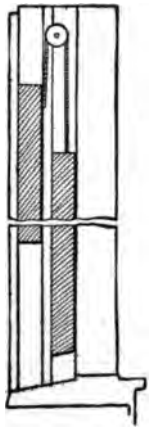
Cut the gore out on the dotted line and line 7, extending latter to the center. Draw lines 1, 3 and 5. The inner circle and lines 1, 3 and 5 show where to attach straps for holding it on the pipe.—Contributed by S. C. Shipman, Steubenville, O.




Layout for a Pitch Top

### Ventilating at the Top and Bottom of Windows

The ventilation of rooms should be accomplished through window openings both at the top and bottom. If the window sashes are fastened as shown in the sketch, the opening can be made in one operation. The top of each sash is connected with a rope which runs over a pulley at the top of the window opening. When the lower sash is raised, the top sash will descend and make the openings both top and bottom equal.—Contributed by Paul H. Burkhart, Blue Island, Ill.



### Bending Short Pieces of Pipe

It is very difficult to bend short pieces of threaded pipe without damage to the threads or kinking the pipe. The bend can be easily made in the following manner: Screw an ordinary coupling on each end of the pipe and heat it almost to a white heat. Then cool each end in water, place in a vise, and tighten the jaws just enough to hold it firmly.

Insert an iron bar into each end of the pipe and force the bars in an upward direction and the result will be a smooth bend. If the pipes are too short to be held in the vise without clamping the couplings, use two pieces of flat iron between the couplings.—Contributed by J. B. Shiver, Rock Hill, South Carolina.

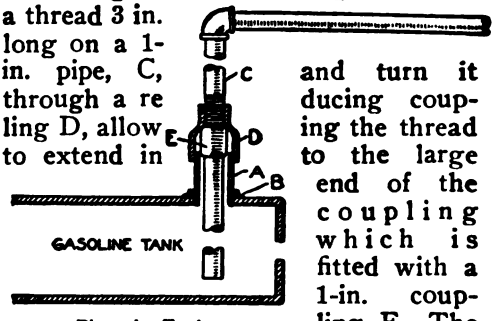
### Finding Polarity of Electric Wires

The polarity of wires can be found by placing the ends of the wires in a common white potato cut in halves. The wires should be stuck in a small space apart, the distance depending on the voltage. The positive wire of a [illegible]rent will turn the potato green and the negative side will remain uncolored. Both ends of the wire on alternating current will turn the potato green.

This method can be used in finding the polarities of current from one dry cell up to 500 volts direct current, the only difference is that with very low voltages the wires should be stuck in the potato closer together than with higher voltage. In using 110 volts, the time necessary to determine the polarity is about 10 seconds, and with a current of, say, 2 volts and upward to 10 volts, it will require about 1 minute. If electrical workers will always carry a potato in their tool bag, they will always have a reliable polarity indicator.—Contributed by Geo. H. Davie, Erie, Pa.

### Air-Tight Connection for Underground Tank

Screw a 2-in. nipple, 2 in. long, A, into the gasoline tank flange, B. Cut a thread 3 in. long on a 1-in. pipe, C, and turn it through a reducing coupling D, allowing the thread to extend in to the large end of the coupling which is fitted with a 1-in. coupling, E. The end of a 1-in. pipe is threaded and then cut long enough to allow a space of 1 in. at the bottom of the tank, when it is screwed into the coupling E. When the reducing coupling D is turned on the nipple A, all joints will be air-tight.—Contributed by Geo. M. Crawley, Jr., Newark, New Jersey.



Pipes in Tank

¶The ordinary lamp wick is too loosely woven to give best service in incubator lamps. This can be remedied by sewing back and forth across the wick, about 6 or 8 rows of stitches to the inch.

### Hose Connections

Wishing to use my garden hose which had a leak and not being able to get a regular coupling I made the repair without one. The job turned out as good as if the ordinary coupling were used.

I cut the hose as true as possible at the point of the leak and then inserted a ½-in. nipple, 3 in. long (Fig 1). I twisted one turn of bailing wire directly over the threads of the nipple

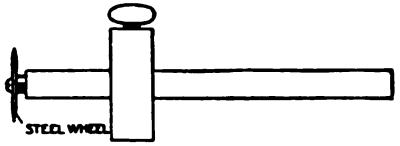
Fig. 1 Fig. 2

Pipe Nipple Used for Connection

(Fig. 2) and twisted it up tightly with pliers. The result was exceedingly satisfactory under high water pressure. —Contributed by Frank E. Drumm, Johnstown, N. Y.

### Rotary Marking Gauge

Every woodworker knows that the ordinary marking gauge with the pin arrangement has a tendency to follow the grain of the wood, causing the line to be drawn irregularly. This trouble may be overcome by placing a small steel wheel so that it will easily revolve on the end of the gauge as shown in the sketch. When marking a piece of irregular-grained wood, the steel wheel




Wheel on Gauge

will not dig into the grain, but will roll over it and make a straight mark.

### Wood Turning with a Ripsaw

In a mill where I was working we had an order to make a number of rollers and not having a lathe in the mill, I turned the pieces on a ripsaw. Figure 1 shows the work in position on the table against the gauge, and Fig. 2 the construction of the box with the stock held in place with two screws as centers. The stock was first cut to

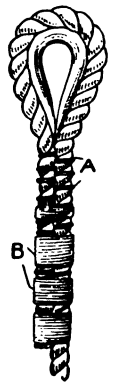
Fig. 1 Fig. 2

Material in the Box

an octagon shape, then successive slight turns were made to cut off all corners. The same method can be used on a bandsaw.—Contributed by F. O. Anderson, San Francisco.

### Putting an Eye in a Wire Rope

A simple method of splicing an ordinary wire rope for an eye so it will be as strong as the rope, is as follows: Use a strong thimble for the eye. Turn the rope around the eye and carry it back about 6 ft. along the main part. Lash the two parts together by passing a wire over and under the rope, forming a turn similar to a figure 8; then put on several short lashes, B, by wrapping the wire tightly around the two parts of the rope. This method of splicing for an eye will hold heavy work without breaking the eye or slipping.




### Laying a Plank Sidewalk

In laying boards or plank where they are exposed to the weather they will last much longer if laid with the heart side down. If the planks are placed as shown at A, they will retain the water and moisture much longer and cause


Showing Position of Grain

decay more rapidly than if placed as shown at B.—Contributed by Geo. M. Harrier, Lockport, N. Y.

### Mayonnaise Mixer

The method of preparing mayonnaise and whipped cream, which have become necessities of the modern home, has not kept pace with their increasing appreciation by the public. Their popularity would be greater if a handier method for the proper mixing were available. A good mixer can be purchased, but the price is out of reach of many. The one shown in the sketch is a homemade affair the parts of which can be purchased very cheaply.

The outfit consists of the following parts: A hardwood bracket, ¾ in. thick, 2½ in. wide and 7 in. long, with a place chiseled out to receive the handle of an egg beater. The beater is made detachable by means of a 1¼-in. cupboard button fastened to the bracket with a stove bolt. A ring such as used by harnessmakers is fastened to the opposite side of the bracket for holding the funnel.

The flow of the oil in making mayonnaise should be restricted by a cork with a small groove cut in the side. The oil should flow a drop at a time into the bowl just outside the whirl of the dashers which will quickly draw it into the vortex and thoroughly mix it. Constant beating is essential to the proper incorporation of the oil and consequent thickening of the mayonnaise, which can be easily accomplished by this method without suffering from cramped fingers and necessitating frequent stops.

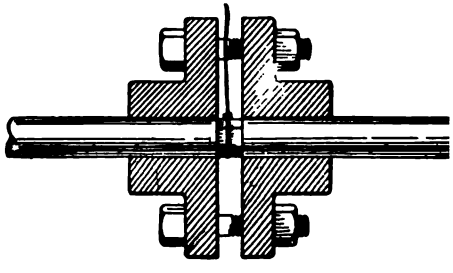
A shelf on which the bowl rests is supported by an ordinary bracket. This is placed at such a distance below the bottom edge of the bracket to correspond with the size of the egg beat used.—Contributed by Victor Labadi Dallas, Tex.

### Depositing Copper on Glass

A new method of depositing coppe on glass has recently been discovere by an English investigator. A mixtur of 1 part of freshly distilled phenyl hydrazine and 2 parts of water is heate until the solution is clear. A warm solution of cupric hydroxide in am monia is then added (made by pre cipitating sulphate of copper by potash washing and dissolving in ammonia) The cupric hydroxide is reduced t cuprous hydroxide with evolution o nitrogen gas. A hot 10-per-cent solu tion of caustic potash is then adde until a slight precipitation of cuprou hydroxide takes place. If the solutio in this condition, is brought in conta with a clean glass surface, a bright d posit of copper forms on it. This thin and perfectly reflecting.

### Removing Flanges from Shafting

Machinists often remove couplin or flanges from shafts or pump rods driving them with a sledge hamm This will batter them up or crack the if they fit the shaft tightly. After moving the keys, spread the coupli apart and place an ordinary nut block of steel between the ends of shaft. This is done by swinging nut in place with a string as shown the sketch. All that is required to



Nut between Shafts

move the coupling parts is to turn the nuts on the bolts.

If the part comes off withou. sti

ing the other, place a piece of heavy steel plate across the hole of the removed part and swing the nut in position. It is now ready to push out the shaft by turning up the nuts.—Contributed by J. Kotanchick, Ran-Shaw, Pa.

### Writing on Blueprints

To write notes or dimensions on blueprints use a pen dipped in saleratus water, or rub a cloth saturated with the solution on the print and write with a pencil on the resulting white spot.

### Placing Fibroid Filler in a Friction-Drive Automobile

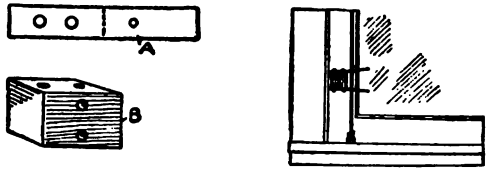
The usual way of placing fibroid fillers is to take the secondary shaft from the machine and slip the ring over the end. This requires considerable time. The following method will only require an hour's time.

Saw the filler with a very fine saw diagonally across the driving face through one of the holes. This will allow the ring to spring apart and slip over the shaft without removing it from the machine. This cutting of the ring will not damage it, as the bolt goes through both ends and holds them together.—Contributed by Earl R. Hastings, Corinth, Vt.

### Window Sash Lock and Adjuster

A device that will serve to lock a window and to keep the sash in position when raised can be easily made of two pieces of heavy spring metal, ½ by 3 in.; a piece of hardwood, 1 by 1½ by ¾ in.; two screws; some bolts, and a length of heavy wire.

Drill two $\frac{3}{16}$-in. holes for screws, one ½ in. from the end and the other ½ in. from the first hole; then drill a ⅛-in. hole 2 in. from the end A and bend 1½ in. from the end as shown by the dotted line. Drill two holes through the block on the ¾ by 1½-in. face and




Lock Attached to Window

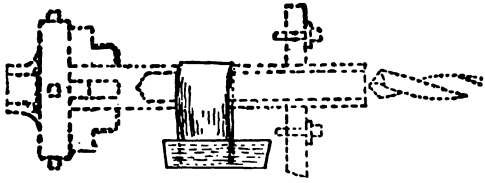
on the center line of the 1 by 1½-in. face. Drill two screw holes as shown at B.

The two pieces of metal are fastened to the block with bolts and the block is fastened to the sash with screws. The wire is fastened to the top of the window casing with a screweye and run through the two holes in the metal and fastened tightly with another screweye to the window sill.

The lock is released by pressing the two pieces of metal toward each other with the thumb and forefinger, and when the pressure is released the two springs will catch on the wire and hold the sash wherever located.—Contributed by P. H. B.

### Cooling Work in a Lathe

Having a number of shafts to make, I had considerable trouble in keeping them cool while drilling until I made the simple little device shown in the sketch. It consists of a tin pan of cold water and a piece of cloth or flannel, preferably the latter, long enough to reach over the shaft and into the pan

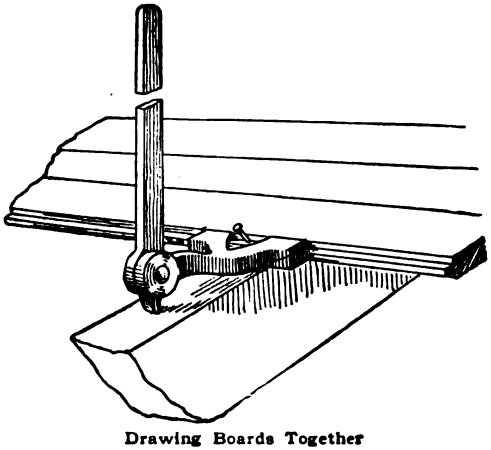


Feeding Water on Shaft

of water the same as a belt. As the water becomes warm it should be changed.—Contributed by Arthur W. Andrews, Brooklyn, N. Y.

### Lever for Laying Flooring

Recently I had several thousand feet of matched flooring to lay and it necessitated some kind of a tool to draw the joints together on winding pieces.



Drawing Boards Together

I designed a tool to meet the emergency which does the work to perfection. The sketch shows its construction and how it is applied to the boards. It consists of a lever to which a grooved and notched arm is pivoted. The groove fits the tongue on the boards and the notch provides a space for driving the nail.—Contributed by S. J. Heath, Lestershire, N. Y.

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### Making Use of a Table-Board Case

The extra case of table boards finds no place in the ordinary kitchen where they will be out of the way and kept in good condition. If a board and covering is placed on one side and a curtain fastened to the ends and front the rack can be used for a window seat, or it can be placed on brackets and used for a shelf. When a board is wanted the curtain is raised and the board pulled out.—Contributed by C. H. Floyd, Elwood, Ind.

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**¶A good bushing for sheave wheels, pulleys, etc., can be made of a piece of brass tube.**

### Green-Gold Finishes

To produce a good green-gold finish on articles at a fair cost, that neither blends to the shades of yellow or gray, but is purely green in shade and tone and cannot be termed as a yellowish or silver-green, is one of many irritating features of the electro-plating art. This is especially so when a dark or antique gold is called for.

I was called upon some time ago to produce a dark green that was green all over, both in background, as well as on the high lights, and after considerable experimenting with different chemical agents, such as lead, sodas, antimony, cadmium and nitrates, I found that the best results could be obtained from a solution containing arsenic.

I may state that it requires considerable care in the manipulatory process connected with the production of the finish obtained from the following formula:

| | |
|---|---|
| Water | 1 qt. |
| Potassium cyanide | 3 oz. |
| Potassium ferro-cyanide | 1 oz. |
| Caustic potash | 1 stick |
| Ammonium chloride | 1 oz. |
| Gold as perchloride | 2 dwt. |

Dissolve nitrate of silver in water, crystals are best, and after having the above solution in working condition suspend a platinum anode on the negative and one on the positive pole and set in action. While working, add a little of the nitrate-of-silver solution at a time until deposit shows green, then add, a drop at a time, a solution of arsenic that has been thoroughly cut and boiled with potassium cyanide until the green deposit shades over to a deep green smut. When the high lights are relieved with bicarbonate of soda on articles plated in this solution, which is used cold, they show out in a deep, rich green color.

It can be readily seen by the complication of metals and chemicals used, that this solution requires the utmost care in handling, making, keeping and working, but like everything else, it is no trouble when you get used to it and can be placed in the same class as a brass solution, so far as the plater is concerned.

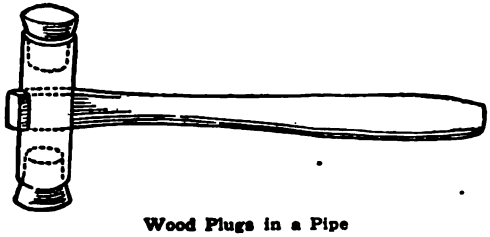
### Rejuvenating Old Awnings

A faded awning may be made as good as new, and possibly better, by painting it. Paint alternate stripes white and red or brown, allow time to dry, and the awning will look as bright as new; also, it will make the cloth waterproof.

Pin strips of paper on the cloth as wide as the stripes desired and paint between them. This will make the painting easy.—Contributed by Maurice Baudier, New Orleans, La.

### A Soft-Faced Hammer

A soft hammer, which is very handy in removing dents from copper or sheet metal of any kind, may be made in the following manner:

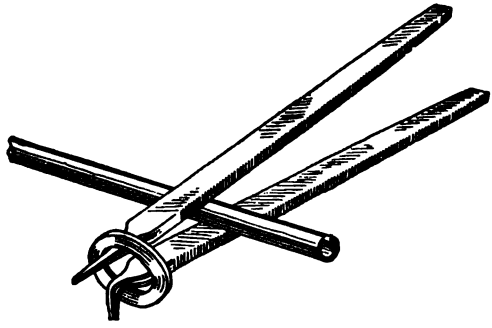


Wood Plugs in a Pipe

Procure a piece of steel or iron tube and cut it 2 in. long and drill a hole in the center for the handle. Wedge the handle in the ordinary way and cut two wood plugs, slightly tapering, to fit the ends of the tube. The plugs may be removed and new ones inserted at any time. Rawhide is excellent to use instead of the wood as it will last much longer. No dimensions are given as the hammer can be made in any size. —Contributed by John L. Waile, Cambridge, Mass.

### Turning Pipes with Files

Almost every person has in his home tool chest a wrench of some kind for doing odd jobs that do not require a mechanic, but not everyone has a pipe wrench. It often happens that a tool of this kind is required for turning pipe or holding anything round. An emergency wrench of this kind can be made of two files and an ordinary washer. The tang on one of the files is bent at



Position of Files

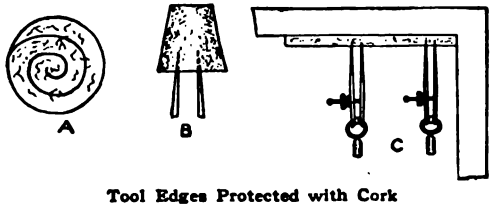
right angles and the ends of both slipped into the washer as shown. The manner of using the device is obvious. —Contributed by Joseph Olesen, Milwaukee, Wis.

### Shifting Gears on an Automobile

When shifting gears on an automobile, disengage the clutch quickly and shift the gears with a quick push or pull. At the same time close the throttle almost tight and allow the clutch to come back quickly, as soon as the gears have been shifted.

### Protecting Tool Edges in a Chest

The illustration A shows how to cut an ordinary cork to get long strips for attaching to the inside surface of a tool chest to protect the edge or points of tools. The strips are tacked or glued to the inside of the drawer or box. The points of dividers may be protected by sticking them into a cork as shown at

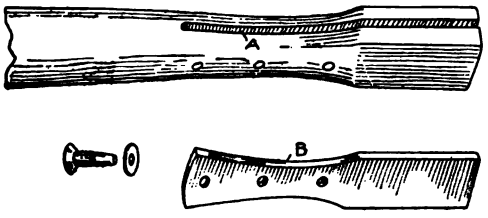



Tool Edges Protected with Cork

B. The strip protecting the tools in a chest is shown at C.—Contributed by J. F. Tholl, Ypsilanti, Mich.

### Strengthening a Hammer Handle

A nail-pulling hammer handle may be made strong enough to stand hard usage without breaking by placing a

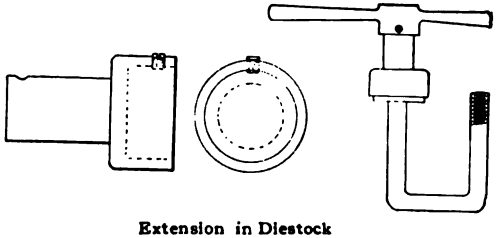



Metal Strip in Handle

piece of metal in the slot A of the handle shown in the sketch. The slot is cut in with a ripsaw past the small part of the handle. The metal B is cut to fit the slot, then drilled, and the wood countersunk for rivets. The rivets are well hammered down and smoothed off level with the surface of the handle. The hammer is fastened on in the usual manner.—Contributed by Irl R. Hicks, Hallsville, Mo.

### Diestock Extension

In the sketch is shown an extension for a diestock for threading the ends of U-bolts. It is turned from machine



Extension in Diestock

steel in the shape indicated in the diagram. This tool is especially adapted for making clips for automobile springs.—Contributed by Urban A. Towle, Portland, Me.

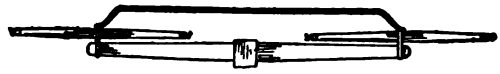
¶When fishing with a drop net place a fresh water worm in a clear medicine bottle and tie it in the net. The worm will be greatly magnified. A ground worm in salt water will go through contortions that will attract the fish.

### Turning a Typewriter Ribbon

It may interest those who use a typewriter to know that the life and usefulness of a ribbon may be almost doubled by simply turning it over after it becomes worn on one side and the impression becomes faint. I discovered this recently. Knowing that ribbons did not last long, six weeks being the limit with mine, I reversed the ribbon and was delighted to find it as good as when new. My ribbons last twice as long as when using only one side.—Contributed by A. Ashmun Kelley, Malvern, Pa.

### Keeping Lines from Under the Ends of Singletrees

A simple method of keeping a line from catching beneath the end of a singletree is to connect the clevis on



Bar of Metal on Singletrees

each singletree with a rod or strap iron. The method of applying the rod is shown in the sketch.

### Stay-Bolt Repair on a Boiler

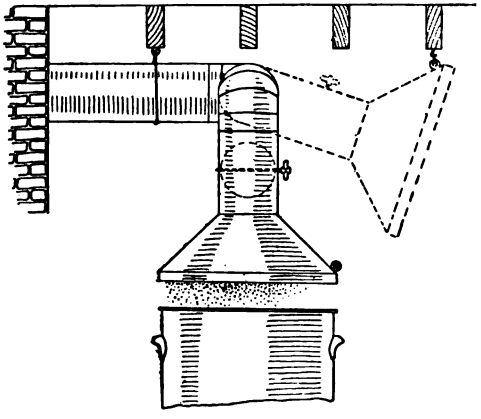
We were running an engine in the backwoods at 75 lb. pressure and had a couple of stay bolts to fix. They had been leaking so long that the iron around the stay bolts had rusted to almost a feather edge. There was not enough metal left to hold an ordinary stay bolt, although the boiler was in good shape otherwise. We used ⅝-in. bolts and put large washers and double nuts with asbestos packing instead of riveting the ends. They made a permanent and perfect repair.—Contributed by Marion P. Wheeler, Greenleaf, Oregon.

¶If cotterpins are rubbed with flake graphite, they will not rust and can be easily removed.


## Ash-Can Dust Absorber

The dust rising from cinders taken from a furnace will, in a short time, cover everything in the basement with a coat of fine ashes and many times it gets into the rooms on the first floor. A great deal of this fine dust can be disposed of, if the ashes are put into a can which is directly located beneath a large funnel covering having pipe connections to the chimney.

The pipe must have two elbow joints and a connecting short piece so that the funnel-shaped covering can be turned up and away from the can top, as shown by the dotted lines in the sketch. The pipe and funnel are turned up when the can is taken out for emptying. A damper is placed in the pipe so it can be turned to prevent a draft when not in use.—Contributed by John Blake, Franklin, Mass.



Position of Hood over Can

## Wheels on a Shop Stepladder

A ladder with wheels is very handy for the oiler, as it saves considerable time in moving it from place to place. The ordinary wheel attachments are objectionable as the ladder is liable to move on an uneven floor when the oiler is at work. In the illustration, Fig. 1, a wheel attachment is shown which has a spring strong enough to carry the weight of the ladder, but will allow the wheel to rise under the weight of a person. This causes the ladder ends to come in contact with the floor and makes it impossible to move the ladder while the oiler is at the top. The wheels on the vertical supports are attached as shown in Fig. 2.—Contributed by D. J. McKenna, New Britain, Conn.

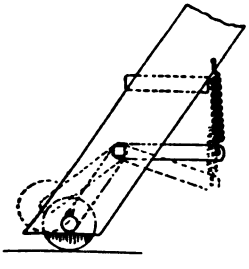


Fig. 1

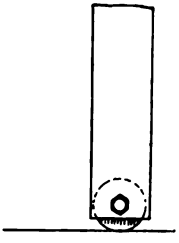


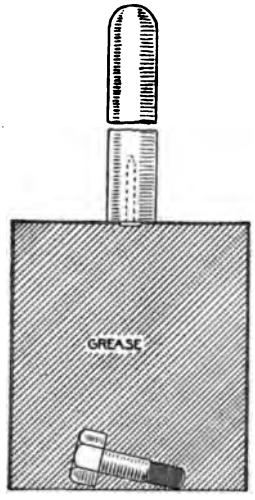
Fig. 2

Wheels on Ladder Legs

¶An adjustable water drip for a grindstone can be made by sewing the ends of several pieces of burlap together, wide enough to fit in a can, and long enough to hang below the bottom on the outside. If water drips too fast, strips of the burlap can be folded back.

### Substitute for a Small Lifting Magnet

A device that is quite useful and will take the place of a magnet for picking up small pieces, such as bolts, nuts, plugs, or anything not weighing over 1½ lb., can be made of a long stick on the end of which a can is fastened and filled full of hard oil or grease.




Some small tool or part of machinery often falls, when making repairs, into a place from which it is hard to recover, and sometimes this will cause the dismantling of the different parts to get it out. When this happens, a magnet comes in handy. If a magnet is not at hand, the device described and shown in the sketch is a very good substitute. If the parts are brass, then this substitute will lift them where a magnet would not attract them.

The device is made of an ordinary tin can with one end open and the other nailed to a slender stick, the can being filled with hard oil or grease. When the can is pushed down on the dropped part, the grease will pick it up.—Contributed by Joseph Oleson, Milwaukee, Wis.

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### Protecting Automobile Engines from Intense Cold

One difficulty in running an automobile in the winter is to keep the engine from getting too cold and the carburetor from becoming covered with frost. This trouble can be avoided by making a heavy wire frame the same shape and size as the radiator front and covering it with dark bunting which will make it look like a sieve. Fasten a strap around the wire at the top and buckle it around the water filling cap. Attach straps to each of the lower corners for buckling to the automobile frame or lamp brackets.

The bunting will stop the cold air rushing through the radiator and will shield the engine. The engine will then keep the air in the hood warm and the frost away from the carburetor. In very cold weather several layers of bunting should be used.—Contributed by Earl R. Hastings, Corinth, Vermont.

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### An Air Compressor

A simple air compressor that will produce about 50 lb. pressure in a tank can be constructed with two ordinary cast-iron open-well pump cylinders, 2½ in. inside diameter, and pipe connections. These cylinders can be purchased cheaply, complete, including guide rods and plungers. Packing boxes, A and B, Fig. 1, from old discarded valves are fastened into the tee connections on the end of the pipe C. The valve rods D and E pass through the packing boxes and are attached to a device for driving the pistons F and G. The pipe connections on the ends of the cylinders have two inlet check valves, H and I, and two outlet valves, J and K, to the pipe L attached to the tank.

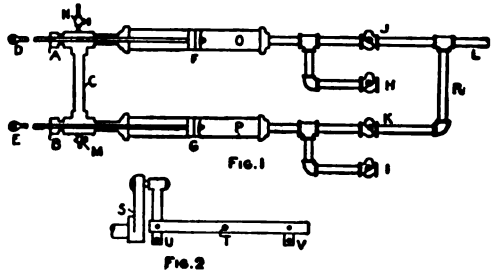



FIG. 1

FIG. 2

Pump Cylinders and Pipe Connections

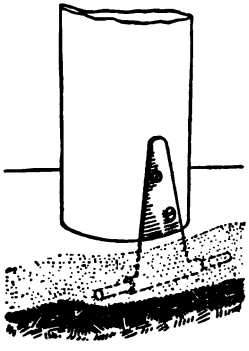
The cylinders are cooled by water in the pipe C, which is regulated by the valve M. The water outlet is through the valve N. These valves

should be regulated so that there is no pressure on the water to keep it from entering the air chambers O and P.

A crank arrangement can be fixed to operate the compressor from a shaft as shown in Fig. 2. The crank S operates an arm pivoted in the center at T. The plunger ends D and E, Fig. 1, are attached to the projections U and V, Fig. 2.—Contributed by J. S. Noble, Toronto, Ont.

### Anchoring a Post to Concrete

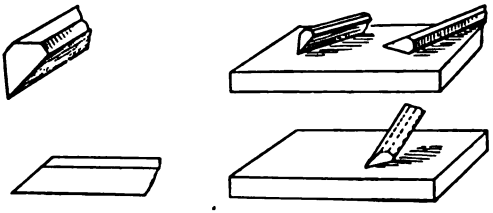
Wood posts may be attached to concrete floors by setting one-half of a heavy hinge in the wet concrete, allowing sufficient length above the surface to admit two of the screw holes. When the cement is dry the post can be fastened to its support with screws. The hinge can be reinforced by inserting a piece of rod iron into the hole before the cement is tamped in around it.—Contributed by Paul H. Burkhart, Blue Island, Ill.



### Bright Cutting on Aluminum

Grind the face of the graver in the direction of the lines, as shown in the sketch, to an angle of 45 deg. Use a fine oilstone wheel without oil. Leave the face of the graver rough and remove the bur by jabbing the end into wood. Polish the sides as shown on a hard oilstone which has had some brass rubbed into it and has been used without oil. Draw the graver from the heel toward the point to sharpen the cutting edges. Keep it moistened with pure vaseline. If the face of the graver is not polished, the metal will not adhere to it, thus allowing the chips to roll off from the point.

This method of sharpening applies to tools for cutting any kind of jewelry except turning gravers. Turning gravers for cutting bright on brass or steel may be polished as described and given a very keen edge by drawing the face the same as the sides over the stone.—Contributed by Geo. W. Coplin, Bay City, Mich.

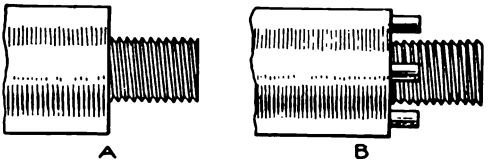


Whetting the Graver

### A Nut Arbor

Nut arbors are used to turn up pieces having threaded holes. The most common form of an arbor is shown at A in the sketch. This form has the objection of making it necessary to use a collar for the work to fit against, or the threads must be recessed in the work so as to have a close fit, or else the threads must be cut out close to the shoulder on the arbor.

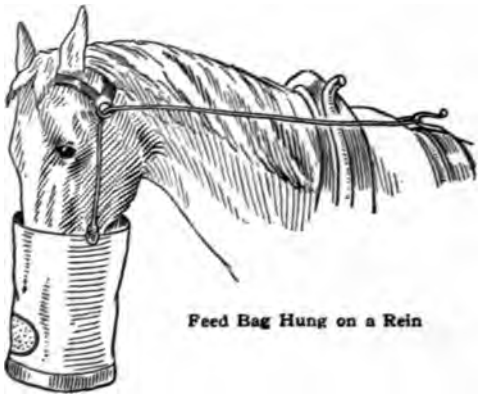
An arbor made as shown at B does not have the objections mentioned. After the threads are cut on the arbor, four holes are drilled longitudinally in the shoulder and pins driven in tightly. The arbor is then put in a lathe and the pins faced off true. This makes an arbor that is good for any kind of work without resorting to collars and recesses.—Contributed by Donald A. Hampson, Middletown, N. Y.




Pins in Arbor Shoulder

### Adjustable Feed Bags for Horses

When the feed in the ordinary feed bag gets too low for the horse to reach easily, he either throws his head up or sets the bag on the ground to get

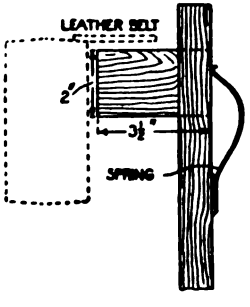


Feed Bag Hung on a Rein

the grain. In either case, much of the food is wasted. The illustration shows a feed-bag holder on the principle of a rein, which quickly adjusts the level of the grain to the mouth of the horse by a slight movement of his head downward. The sketch fully illustrates the construction of the headgear and the rein connection.—Contributed by Leonard L. Miksch, Buffalo, N. Y.

### A Belt Stick

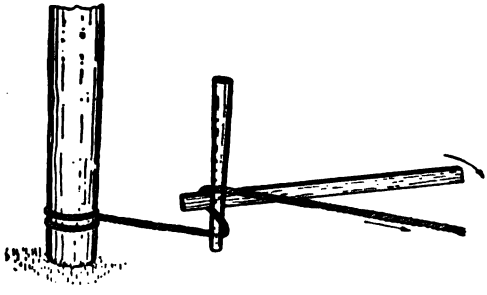
The belt stick shown in the accompanying sketch consists of a long handle made of wood with a square hole mortised in its upper end and a block, 3½ in. long, fitted to slide easily in the mortise and held in place with a spring. The block is kept from slipping through the hole by cleats or screws placed on the top and bottom sides of the block and entering a recess cut in the handle.




When a belt slips off a countershaft pulley, all that is necessary is to put the block under the belt and press the shifter stick on the side of the pulley. The block naturally slides back against the spring, leaving the belt free to slide on the pulley.—Contributed by Harry L. Berry, Philadelphia, Pennsylvania.

### Pulling an Automobile Out of a Rut

There is a handy way of getting an automobile out of a rut if you are fortunate enough to have a rope along and the rut happens to be near a telegraph pole or tree, says the Automobile. The accompanying sketch depicts a method which was much used in the old days of the horse. A turn



Position of Lever for Taking up Rope

is taken about a convenient tree or post, then a smaller pole is placed in the position shown, to act as a fulcrum for the lever pole. In this way quite a purchase can be obtained, and if the rut is not too deep and the car not too heavy, so that the rope will not break, the car often can be withdrawn.

### Quickly Made Tool for Bending Pipe

A pipe bender can be made by boring a few holes in a piece of oak plank and inserting heavy bolts or short pieces of pipe for pegs, about which the pipe may be bent as desired.

¶Rivet heads should be kept well below the surface on leather-faced clutches.

# Stencil Making

By HOMER H. KNODLE

## PART I—Designs

Painters, decorators and practically everyone have at some time or other felt the need of a good stencil to produce artistic duplication and were unable to make one because they did not know how to do it. Stencil making is quite simple and a few suggestions as to the methods of designing and the operations in cutting them will enable anyone to make them for pleasure or for profit.

The only tool necessary is a good sharp knife, preferably with a rounding point. The material used for a stencil is a heavy grade of tag or manila board which can be secured of a local printer or at a drug store. A small amount of boiled linseed oil will be required to coat the finished work, and, aside from the drawing tools, will be all that is necessary to do the best work.

A drawing board is necessary for designing, which must be as large as the largest size stencil to be made, a T-square, triangles, one 30 and the other 45 deg., and a set of drawing instruments. A fair grade of instruments amply accurate for this rough drafting should not cost over $3 for the set. A box of 2-oz. tacks will be needed for fastening the paper or tag board to the drawing board.

A very simple design consisting of a square block connected by a bar, which will serve very well for practice work, is shown in Fig. 1. This is first drawn on stencil paper by dividing the horizontal lines into equal squares, then forming the blocks and connecting them with the bars, using the 45-deg. triangle on the T-square. When drawn as shown, it is ready to be cut. This design does not require binders.

In Fig. 2 is shown another simple scroll design without any binders, intended for practice work. The design is first drawn in rectangles and then the scroll is drawn in freehand, finishing with the dots at regular intervals. The designs in Figs. 1 and 2 should not be made more than 2 in. wide.

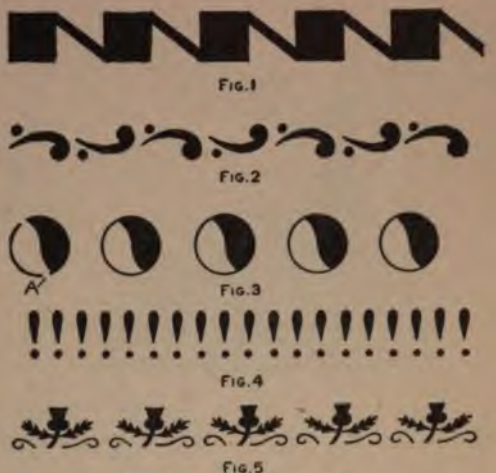



FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

**Simple Designs for Stencils**

The design shown in Fig. 3 is made up of circles which contain some black and some white. The black represents the part to be stenciled in all cases and in this particular design the white space in the circle must be held firmly in place. To do this a narrow strip, called a binder, must remain in the black surface (in this, a part of the enclosing circle, as shown at A) to hold the white crescent-shaped piece in place. When through stenciling, the uncolored part under each binder may be painted or not as conditions suggest. The binders are necessary in all intricate stencils and they must be placed as inconspicuously as possible and yet hold the part firmly.

Another practice design is shown in Fig. 4 which eliminates the binders. The method of drawing is simple spacing and duplication. This design should not be over 2 in. wide or its effect will be ordinary. It is especially adapted to be cut about 1 in. wide and used in connection with another bold

design as a border or liner to mark the line of stenciling.

Some scroll work is introduced in the design shown in Fig. 5, which will give a beginner a chance to become proficient with his knife. The light scrolls will be good practice, but the main part is a good design for anything requiring a tasteful border.

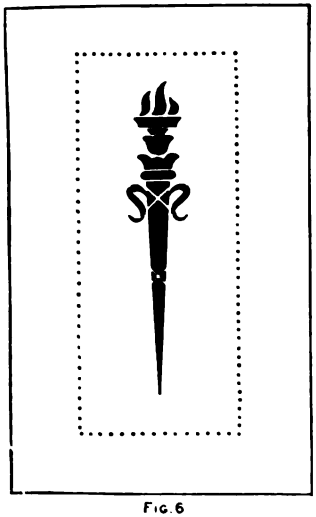


Fig. 6

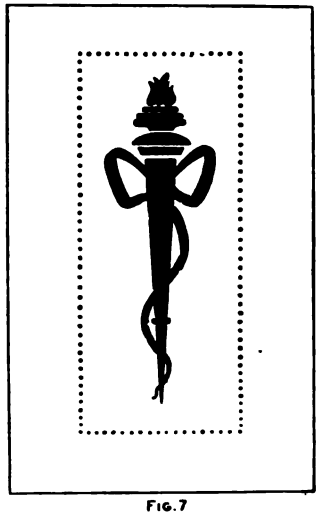


Fig. 7

Panel Designs

A panel design is shown in Fig. 6, which should be made in proportion of about four times its width in length. This is used for panel decoration and often several of the panels are combined to make a circular ceiling design. Circumstances will not permit its use in all cases, as the finishing border must fit. The best size for this design is 6 in. wide and 24 in. long. The design should occupy the position shown on the stencil and the dots should be cut out 3/8 in. in diameter. Another panel design is shown in Fig. 7, illustrating the difference between a bold and a light effect. While the design shown in Fig. 6 would serve on a small panel, it might be out of place on a large one. The design in Fig. 7 would be more appropriate for the latter. The binders shown crossing the designs are not there of necessity but for ornament.

A wreath design which can be adapted to almost any place is shown in Fig. 8. Stenciling a series of these designs about a center will make a nice circle to contain a center piece. It will serve equally well as a border. A pretty border can be made by placing a plain line on each side of the wreath or a design similar to Fig. 1 may be used. The wreath design should not be made smaller than 6 in. or larger than 20 in. The dots forming the double circle should be 3/8 in. in diameter for the larger sizes and reducing the diameter for the smaller sizes down to 1/16 in.

Another border design which should not be made over 3 in. wide is shown in Fig. 9. The scrolls are sketched in first, then the dots and then the small squares. The border design shown in Fig. 10 is for practice in cutting rather than a design for stenciling. It may be used in places requiring a very light design with little ornament.

Figure 11 shows a bold design of a center piece which will prove valuable for places requiring a heavy design of medium size. This design should not be less than 12 in. wide on the base and never over 30 in. It will give a very good effect if used with a darker tone of the body color and edged with a contrasting color. Binders will be necessary and these should be painted over after stenciling so important a piece as this one shown.

To lay out the design, mark the bounding circles first and then use the two triangles to draw the centerline of each bar as it appears in the sketch. Sketch in the outline of the bar at equal distances on either side of the centerline. Continue this over the entire design, sketching in the ornament around the border last.

When a stencil is finished remove it

from the board and place it in some convenient place and give the surfaces a coat of linseed oil. This serves to keep it and finishes the stencil. The knife should be very sharp and kept so, as a line cut over twice is always rough and cannot be trimmed without destroying the symmetry of the design. Constant practice on the simple designs will soon enable one to work on larger and more intricate work.

FIG. 8

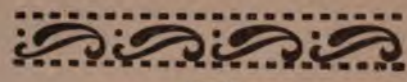


FIG. 9

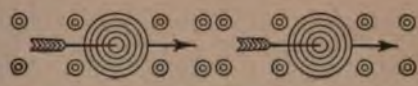


FIG. 10

FIG. 11

Designs for a Center Circle and Borders

*(To be continued.)*

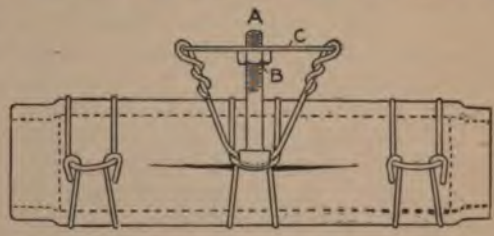
## Repairing a High-Pressure Hose

A hurry-up job had to be made on a high-pressure hose which was used in connection with a water-turbine boiler-tube cleaner with water at 150 lb. pressure per square inch. The hose had a split about 2 in. in length. The hose could not be cut off, as it would be hard to hold together under the working pressure, says a correspondent of Power.

The repair was made quickly by splitting the hose for a distance of about 5 in. on each side and inserting a nipple about 10 in. in length, first pushing it into the hose on one side of the split until the other end would enter the hose. Then the nipple was centered in the cut section. The two sides kept it from pulling apart.

The clamps used to make the connection water-tight were made of wire as shown in the illustration. When the wire was drawn tightly, the tool was pushed forward, thus hooking the two ends over the bight of the wire.

If wire of high tensile strength is used and a little care exercised in getting the wires straight, a permanent job is usually the result. A great deal depends, of course, upon the workmanship.

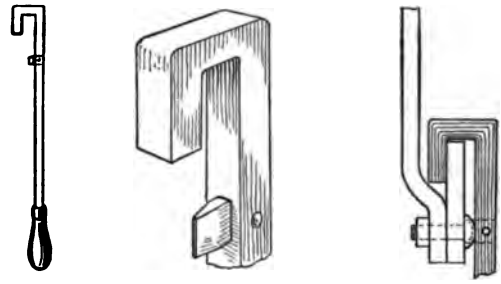



Clamping Hose with Wire

¶Spots on varnish can sometimes be removed by rubbing them well with a soft rag saturated in boiled linseed oil.

### Holding Screws When Repairing Beef Tracks

The condition of the atmosphere about beef tracks soon rusts all nuts on screws and bolts. In making re-



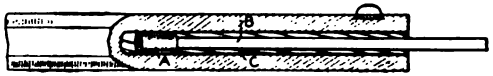
Screw-Holder Lever

pairs it is difficult to remove a nut without some means of holding the screw to prevent it turning with the nut. The leverage on an ordinary screwdriver is not sufficient to hold the screws, therefore I made a tool as shown in the sketch, the end of which is bent and fitted with a screwdriver end as shown in the enlarged view. The method of holding the screw is clearly shown.—Contributed by I. B. Spittel, Baltimore, Md.

### Removing Rust Pits in a Rifle Barrel

The rust and pits on the inside of rifle barrels can be removed without rounding the edges of the rifling, with a tool of babbitt metal made to fit the bore of the rifle.

This tool can be made by inserting a wad of paper, A, about 4 in. in the barrel from the muzzle end, and a rod, B, preferably brass, held centrally in the bore while the space C is filled with melted babbitt metal. The end of the rod should be roughened or




Molding Soft Metal End on Rod

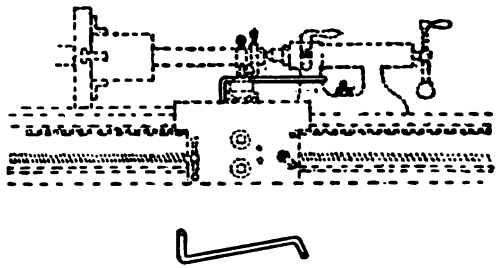
notches filed to securely hold the metal, and it should be longer than the barrel so that a loop handle can be bent in the end.

The babbitt metal will contract sufficiently in cooling to permit it to be screwed out of the barrel.

Dip the babbitt end in oil and dust emery flour over it and turn the tool through the barrel. All rust is quickly removed in this manner without damaging the rifling.—Contributed by Wilfred E. Bertrand, Philadelphia, Pennsylvania.

### Drill Feed for a Lathe

Place the drill on the center with a dog as usual, then bend a piece of iron rod as shown, one end to hook over the base of the tool-post and the other to slip into the depression in the tailstock. Put a tool in the tool-post to keep the drill from "digging in" and take up the slack by screwing drill and dog up



Automatic Screw Feed for a Tailstock

tight against the tool-post. Put a slow speed on the screw feed. This will save feeding by hand.—Contributed by J. F. Tholl, Ypsilanti, Mich.

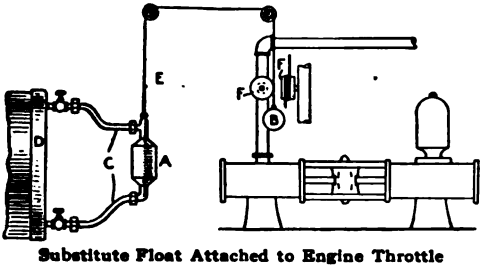
### Automatic Pump Control

The device shown in the sketch is designed to control the action of a pump drawing water from a tank or hot-water receiver. It is designed to supplant the ordinary float control. The small water receptacle A is balanced, when empty, by the counterweight B. The receptacle A is filled with water through the flexible connections C as the tank fills. As it gets heavier on account of the increased amount of water contained, it slowly falls.

The flexible cord, E, by which it is suspended, is passed two or three

times around a sheave on the valve stem of the pump throttle. This winding is done in such a way that as the weighted receptacle falls the throttle valve opens. This change continues until the pump is removing water from the tank as rapidly as it comes in. Any variation in the amount of inflow is taken care of by the same process or the reverse of it. When properly adjusted the controller will maintain a level almost constant —not more than 1 in. variation being noticeable. The same device can be connected to the ordinary automatic electric motor starter and thus control motor-driven pumps of any kind.

Experienced engineers know the trouble caused by tank floats. They frequently break, and breaks are hard to discover and difficult to repair. Usually it is necessary to shut down the whole system before attempting repairs. The apparatus described may be installed, repaired or dismantled without disturbing the action of the pump or the flow of the water. It also has the advantage over the internal float of not being influenced by the surge of the water rushing into the tank or the agitation caused by the boiling when the tank is used as a heater.




Substitute Float Attached to Engine Throttle

## Repairing a Loose-Jointed Chair or Stool

The joints of stools and the majority of chairs are sure to become loose in time as they have no diagonal bracing, and, as time goes on, the wood of the rungs dries out and becomes smaller than the holes they fill, which causes the chair or stool to drop to pieces, unless steps are taken to hold them together. Nails are useless as they soon work loose and screws are of little value. The following method is sure to make the most shaky chair or stool in the shop firm as new:

FIG. 1

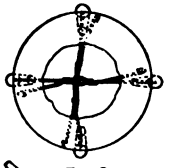


FIG. 2

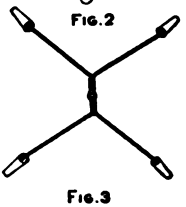


FIG. 3

Wire Braces for Stools

A section of a repaired stool taken in the plane of two opposite legs is shown in Fig. 1. To repair a stool there will be required a $\frac{1}{8}$-in. drill or bit, a brace, a pair of pliers, hammer, screwdriver and a quantity of No. 12 gauge galvanized wire. Drill four holes diagonally through the edge of the seat at one side of each leg, so that they come out on the under side; one hole through each leg obliquely toward the center, about 10 in. below the bottom of the seat, and a similar hole in each leg about the same distance above the bottom, unless it is a very low stool or chair, in which case the latter will not be required.

Insert the end of the wire through one of the upper holes in one of the legs and through the hole in the seat edge diagonally opposite. Bend a short close hook on the end of the wire with a pair of pliers, the end of the hook being parallel to the body of the wire, and hammer this into the leg like a nail, the hook lying in the plane of the grain, that is, lengthwise of the leg. Pull the wire almost taut, leaving about 2 in. slack to spare, and cut off the wire on the outside of the seat-edge hole. Turn another hook on this

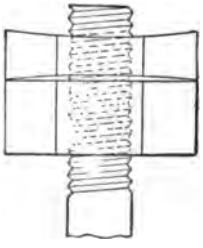
end and drive it into the seat edge, the hook in this case lying horizontal. Do the same with the diagonally opposite leg and seat-edge hole.

Take a large wire nail or screwdriver and insert it between the two lengths of wire and twist up tightly. Do the same with the other two legs and seat-edge holes, but in this case be careful to have one of the wires run over and the other under the twisted loop already formed and leaving rather more slack, because in this case two twists have to be formed in the wire on opposite sides of the first twist, as shown in Fig. 2, which is a plan view with the middle portion of the seat broken away.

The lower guying is simpler, there being only two lengths of wire, each extending between two opposite legs, and the two being twisted together as shown in Fig. 3. The whole operation takes from 20 to 30 minutes and when finished the stool is much stronger than a new one, in fact, it will hold its shape indefinitely.—Contributed by Geo. W. Colles, Milwaukee, Wis.

### A Double Nut Lock

The sketch shows the principle employed. The last or lock nut is concaved on both sides. When set up tightly the center of the nut springs down and in a way acts similar to a spring washer. At the same time its sharp corners cut into the lower nut and hold the lock nut in position. Extensive experiments on rail bolts have been entirely satisfactory.



¶Rats may be caught by putting a piece of cheese in the bottom of a wide-mouthed bottle and placing it in the hole. The rat will go in, but cannot get out.

### Thawing a Frozen Pipe

It is no easy task to thaw out a frozen pipe where the heat cannot be applied to the outside of the pipe. If hot water is poured into the pipe, it soon cools on the ice and accumulates in such a quantity that it is impossible to touch the ice with the hot water. A very efficient method is to insert a smaller pipe into the frozen one and pour the hot water into the smaller pipe. If the end of the smaller pipe touches the ice, the hot water will come directly in contact with it in a continual stream. This will force out the cold water and thaw the ice quickly.—Contributed by John Mason, Armstrong, Okla.

### Shaking Up a Telephone

Where you cannot make your party hear over a telephone, shake it up by giving the transmitter a downward strike with the open hand. Do not abuse your telephone. If a portable or desk telephone is used, turn it upside down and then right it again.

The reason for this is that talking causes waves in the air like ripples on the water when a stone is thrown into it. In a transmitter there is a small receptacle containing fine grains of carbon. The waves of sound strike upon a disk that in turn squeezes the carbon particles together. This constant compression, together with their own weight, causes the carbon grains to settle and pack into a hard lump that does not respond to the vibrations of the metal disk. When giving the transmitter a downward strike with the hand the particles are disturbed and loosened and made soft so that they easily respond to the varying pressure caused by the sound waves. When a portable telephone is turned upsidedown, all the fine grains of carbon fall to the top of their container and as the telephone is righted they settle again, but are loose and soft.

When the carbon particles are com-

pressed, the electric current flows through the transmitter easily. When they are not compressed, the current does not flow so easily, thus the sound waves produce in the transmitter a current of varying strength that passes over the line.

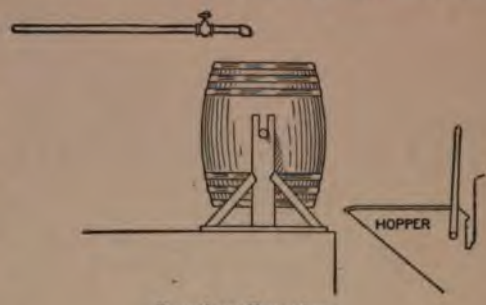
The receiver consists of a metal disk and a magnet inclosed in a hard-rubber casing with a cap. The magnet draws the metal disk. The varying current coming over the line flows through coils of wire around the magnet which weakens and strengthens the magnetism and makes the disk vibrate. The disk in turn causes sound waves the same as those given into the transmitter. If the cap of the receiver is loose, the disk often touches the magnets, which prevents it from vibrating easily. In such a condition it is hard to hear your party. If the cap is screwed up tight the disk is sprung away from the magnet about 1/100 in. and it has a hollow sound when struck with the end of the little finger. This will make the receiver produce the sound waves clearly.

The heat of the ear expands the cap and in cooling it creeps on its threads so that it will come loose in time. This will make it sound like the party on the other end of the line is very far away. Shaking up the telephone will make your party hear you well, and keeping the cap tight will enable you to hear them well.—Contributed by E. M. Morgan, San Gabriel, Cal.

### Water Barrel for a Concrete Mixer

On a concrete job, a water barrel is usually behind the mixer, and the man in charge of the mixing uses a pail to get the water from the barrel to the mixer, says a correspondent of Cement Age. The accompanying sketch shows the arrangement of a barrel mounted on a trunnion and placed to one side of the mixer. This is filled to a certain height, and when the batch is ready for the water, the barrel can be tilted and emptied easily and quickly. This allows a measured and uniform quantity of water to be added to the mixer in the shortest time possible.

The trunnions could be mounted on




Barrel on Trunnions

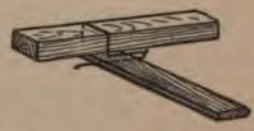
a band and the band bolted at any desired height on the barrel. This would allow the easy dumping of any required quantity of water.

### Bending Heavy Brass Braces

Heavy brass angular braces, such as are often used for automobile repair work, can be successfully formed to any desired angle without checking in the bend by using two ordinary monkey wrenches. The jaws of the wrench being smooth permit the metal to slip just enough to avoid breaking. And therefore this method is preferable to a vise.—Contributed by F. B. Mallory, Flemington, N. J.

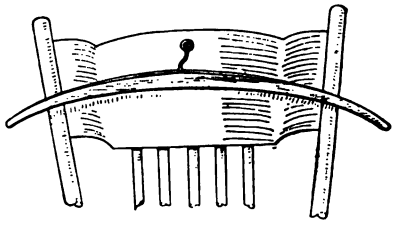
### Aid in Nailing on Long Ceiling Boards

When ceiling a porch one day I had some 16-ft. pieces to put on, and as I was alone, I could not hold them while driving the nails. I secured a piece of heavy wire and bent it around a joist, as shown in the sketch, so that it would hold one end of the board while I jointed and nailed the other end. This wire clip did the work of an extra man in holding the boards.—Contributed by Albert J. Weier, Eavons, S. Dak.



### Coat Hanger on a Chair

After leaning a few times against my newly pressed coat that had been placed over the back of a chair, I fastened a coat hanger on the chair back as shown in the sketch, and used it to

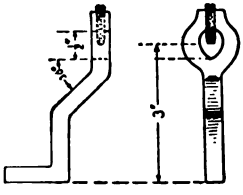


Hanger Attached to Chair Back

hang my coat on while at work. The chair can be used for the purpose it was intended.—Contributed by Victor Labadie, Dallas, Texas.

### Lathe Dog for Small Work

The ordinary lathe dog used on small and short pieces is in the way of the tool-post block. To overcome this trouble, bend the tang of the dog at an angle of 30 deg. and use a headless set-screw. The sketch shows the shape of the dog and dimensions.—Contributed by Chas. Hattenberger, Buffalo, New York.



### Clip to Keep a Pencil from Rolling

A draftsman usually has several pencils on the drawing board at a time and as these boards incline, it keeps one busy at times grabbing pencils as they roll down the board, says a correspondent of American Machinist. A piece of belt lacing placed on each pencil as shown in the sketch will provide an anti-skid device that will keep the pencil where it is placed. The sketch clearly illustrates how the piece of lacing is applied.

Clip on Pencil

### Homemade Canvas Belt

Cut a tarpaulin into strips an inch or two wider than the desired belt. Procure some old roller composition that printers use and make it into solution with water and keep it hot. If the solution is too thick, add a little syrup. Cement the cloth strips together with the composition, taking care to put the laps the same way, and make it as many ply as needed for the heft of the belt. Use enough of the cement to firmly cement the strips and when done go over it with a hot flatiron to make sure that all parts are cemented together. Lay the belt straight on the floor and line it to the desired width with a chalkline and trim the edges. If carefully made, the belt will be as good as could be bought, and less expensive.—Contributed by J. S. Van Alstin, Norfolk, Nebraska.

### To Keep a Paint Brush Soft

After finishing a job of painting and not desiring to have a can of oil standing around the house, I filled the bristles of the brush with a good supply of paint, carefully wrapped it in paper, tied it securely with a string and placed the brush on a shelf. A short time ago I wished to use the brush and upon unwrapping it I was surprised to find the bristles as soft as when put away. The oil in the paint having soaked the inner wrappings of the paper, thus preserving the brush in first-class shape for two years.—Contributed by F. D. Koon, Schoolcraft, Mich.

¶Whitewash for outside work is made of ½ bu. slaked lime, 1 lb. salt, ½ lb. sulphite of copper and 1 gal. of sweet milk.

# Underground Conduit Construction

The unsightly poles and wiring which have for years marred the appearance of city streets and country highways, as well as constituting a nuisance and source of danger, are gradually disappearing, and the innumerable wires are being laid in underground conduits. Even the smaller towns, proud of the appearance of their main streets, are replacing the poles with conduits.

The present method of construction which has been adopted by the telephone and power companies consists of placing a 4-in. concrete base on which is laid vitrified clay conduit. As the material used in this conduit usually forms a cheap glass in baking, it is absolutely the best material to construct a main conduit or subway. Creosoted-wood ducts and fiber ducts are also used, but do not give as satisfactory results as the tile on heavy runs.

After the concrete bottom is placed the multiple-duct tile is laid, Fig. 1, the joints being made by placing dowel pins in the two top holes. A piece of single-ply tar paper, about 8 in. wide, and long enough to lay on the sides of the tile, is then placed around the joint to exclude dirt, concrete, etc., from the interior of the ducts. The paper is held in place by a dab of mortar as shown in Fig. 4. The clay conduit is then capped with a layer of concrete, 3 in. thick, which projects down the sides of the tile for 3 in. This cap is to protect the conduit and the cables within from damage that may be caused by other excavations in the vicinity.

One creosoted-wood duct having an inside diameter of 3 in., or one single-duct clay tile is usually run along on top of the cap as shown in Figs. 2 and 3. These ducts are provided to allow for laterals which may be required from time to time, and which would otherwise necessitate excavating from the pole to the manhole. When the creosoted-wood duct or tile is used, the lateral is built from the pole to the single duct which is "tapped." A lateral, or subsidiary, is a term which applies to a one and two-duct run from a manhole or service box to a pole or building and, generally speaking, means a short light subway. The laterals are used to carry the underground cables to the poles or buildings above ground, so that the service from the wires can be distributed. The bends shown in the laterals in

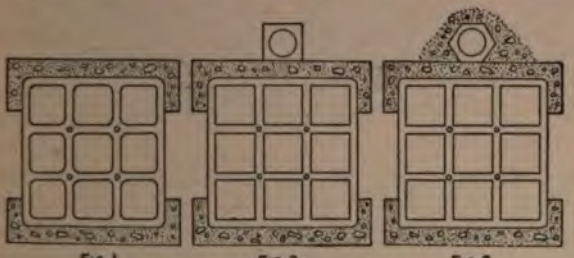


FIG. 1 FIG. 2 FIG. 3

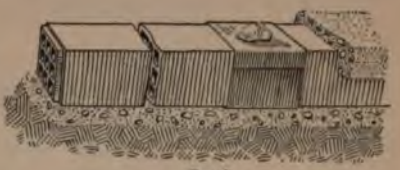


FIG. 4

Concrete Bed and Covering

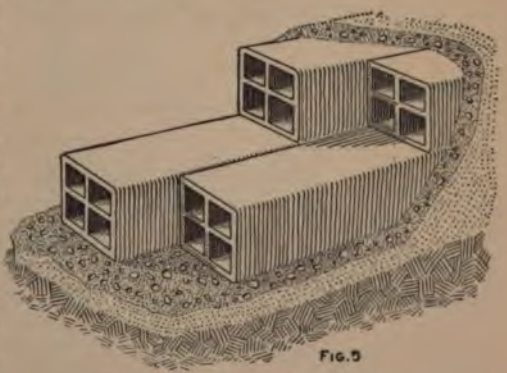


FIG. 5

Four-Tile Unit in a Concrete Casing

Fig. 7 are made of 3-in. iron pipe, which is bent to shape before delivery on the job.

When creosoted wood is used on top of the tile, the joints are simply fitted together and the earth replaced. When the single tile is used on top of the main conduit, it must be laid very carefully and covered with concrete.

As the multiple-duct tile is only made in two, three, four, six and nine-hole sizes, it often becomes necessary to build the subway using more than one unit, as shown in Fig. 5. When laid in this manner the joints must be "broken" or "staggered" and the whole run is usually, but not always, encased in a concrete jacket or envelope. When laying two-tile units, one on top of the other, it is customary in first-class work to place from ¼ to ½ in. of mortar between the units so that the upper course of tile may be laid straight and true.

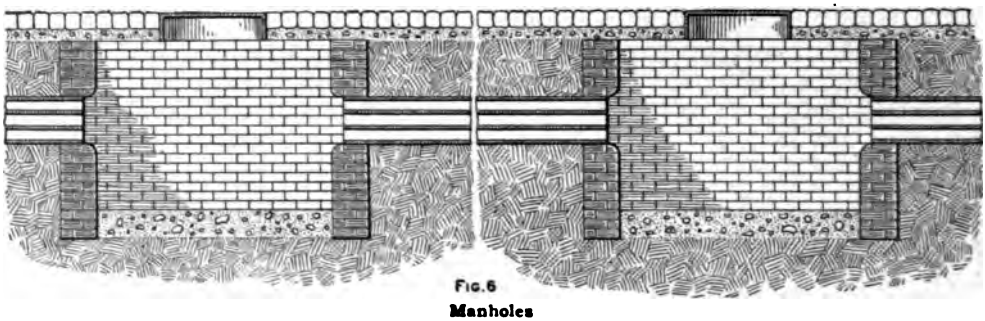


FIG. 6

**Manholes**

placed in the trench and on this the bottom ducts are laid. Concrete is then poured over these ducts and tamped into place. More ducts are laid and concrete tamped in to make it appear as in the cross section, Fig. 8. The lengths of tubes are connected by a slip joint, as shown in Fig. 10. The average length of a fiber duct is about 8 ft.

Another method of building a subway is shown in Fig. 9. When the conduit is built above ground, as is sometimes the case, it is made up of fiber ducts. This method needs no description except to state that a box is built, forms are placed to line up the ducts and the concrete placed the same as in the previous description. The disadvantage of fiber ducts lies in the fact that fiber is not an insulator, as the material of which it is composed consists partly of vegetable matter. The ducts also become soft in warm weather. Great care must be exercised while placing the concrete.

The manholes used in connection with the conduit run are usually built

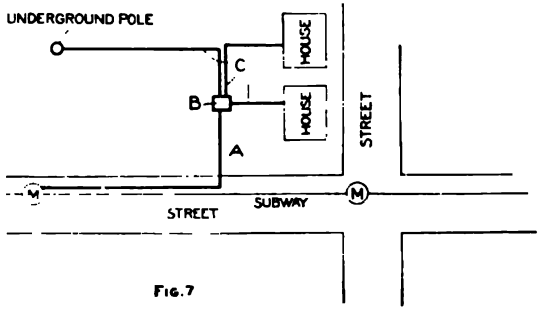



FIG. 7

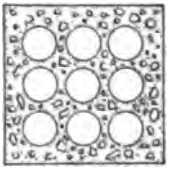


FIG. 8

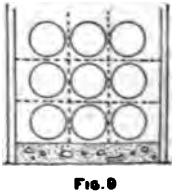


FIG. 9

FIG. 10

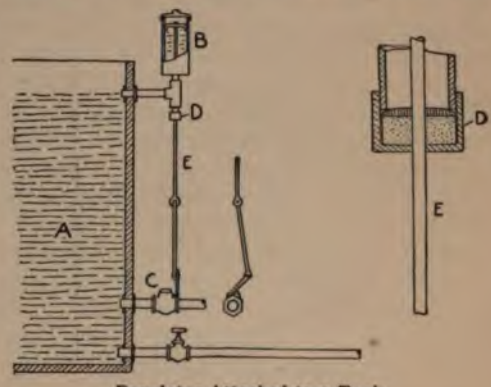
**Plan of Subway and Fiber Ducts Covered with Concrete**

of hard-burned common brick laid up in walls 8 in. thick with cement mortar. The floor is usually of concrete, 8 in. thick. The thickness of the walls depends largely on the size, location and earth pressure. A conduit construction with a manhole at each end is shown in Fig. 6. The walls are built up straight and a flat iron manhole frame set on top of them. This style of frame does away with the necessity of placing railroad iron in the walls to form a roof upon which to place the old-style round frames. The standard size for manholes as specified at present is 7 ft. long and 4 ft. wide, with 5½ ft. depth from floor to top of wall. Service boxes differ from manholes only in size, the length and width being from 3 to 4 ft. and the depth about the same. Service boxes are placed where there is an exceptionally long or crooked lateral, or in special cases, one of which is shown in Fig. 7. This allows for one 150-pair cable, A, to be drawn into the service box B from the manhole, where the three 50-pair cables, C, are spliced into it. The sketch Fig. 7 also shows a method of making up a working drawing of a job of this kind.—Contributed by Geo. M. Petersen, Buffalo, N. Y.

## Water-Depth Regulator for a Tank

A tank used for a water supply in connection with a laundry was constructed with a close-fitting cover which would stand a 4-lb. pressure when full. A regulator was attached to the side of the tank A to keep it full all the time without attention. The regulator consisted of an iron pump cylinder, B, such as is used on a hand pump, with a plunger and connecting rod to a quick-acting valve, C, on the inlet pipe. The rod E of the plunger passed through a packing box, D, made on the end of a short piece of pipe. This is shown plainly in the enlarged part of the sketch. The short pipe was fitted with an ordinary pipe cap having a hole drilled in its center a trifle larger than the rod E. A washer was placed over the end of the pipe and packing put into the cap. The check in the pump plunger was closed and blocked to make it air-tight.

The water is admitted through valve C in the inlet pipe, when the valve is in the down positon. When the tank is full of water, a portion passes into the pump cylinder and under the pump plunger forcing it up in the position shown and carrying with it the rod that connects the plunger and lever on the valve C, thus raising the lever and closing the valve. When drawing water through the outlet pipe, a vacuum is caused in the top of the tank and in the cylinder, which draws the plunger down and



Regulator Attached to a Tank

opens the valve. This admits water through the inlet again to fill the tank. The action takes place as soon as the outlet valve is opened. The inflow of water offsets the vacuum, which makes the action of the water entirely free.

If the inlet is as large as the outlet, the water cannot be lowered in the tank. If the inlet is the largest, the valve will open and close like the slow motion of a piston on an engine.—Contributed by C. S. Enright, Cle-Elum, Wash.

### Taking Care of Leaks through Hinged Windows

Most every hinged window that swings toward the inside leaks when the rain beats against it. There is no

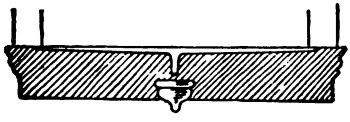


FIG. 1

FIG. 2

Cup on Window Sill

remedy for this as these windows leak even though equipped with the very best weather strips, yet architects are specifying them on new houses quite often.

While abroad I saw an attachment for these windows that interested me very much. It was nothing more than a gutter or groove cut in the window sill, being very shallow at the two extreme ends and gradually getting deeper toward the center. Right at the deepest point a hole was bored about ¼ in. in diameter, to which was attached a small pipe as shown in Fig. 1. At the end of this pipe a hook is soldered upon which a can of some ornamental design, Fig. 2, is hung. While this is not a very artistic addition to the window it looks very much better than the sill covered with towels and rags to catch the water, or having the wallpaper beneath the window stained. The device does not remedy the fault, but protects the wall and floor.—Contributed by Gilbert A. Wehr, Baltimore, Md.

### Holding a Bolt in a Turning Crank

A bolt and nut may be held in the end of a turning crank or shafting by the following method, which seldom fails, even though it is inclined to work loose. Before inserting the screw place a small block of wood in the hole. When the screw is turned up tightly against the wood, the revolving motion of the machinery will not cause it to work loose.—Contributed by Loren Ward, Stockport, Iowa.

### Detector for Polarity of Electric Wires

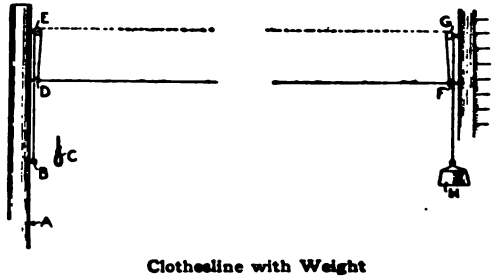
One of the simplest detectors for electrical polarity is white filter paper immersed in a solution of sodium sulphate to which has been added a small quantity of phenol phthalein. The result is a colored paper, which, if moistened, will turn violet when touched with the negative wire, but remains unchanged when in contact with the positive. The paper retains this property indefinitely, and is sensitive to a very feeble current.

Blueprint paper may be used for the same purpose, a white spot developing around the negative pole when the paper is in contact with the wire, while the positive wire has no effect on it.

### Adjustable Height Clothesline

The ordinary clothesline is a source of much trouble. To have it low enough for hanging the clothes, to keep them from dragging on the ground and then to prop it up high enough for drying the garments, is invariably a stumbling block to the housekeeper. The sketch shows an easy way to adjust a line which is never slack, never drags the clothes in the dirt, is always high when the clothes are drying and is easily lowered to hang or remove the garments.

Two spikes, A and B, are driven




Clothesline with Weight

into one of the posts and two pulleys, E and G, are fastened at the top of the posts or 7 ft. from the ground. About 5½ ft. above the ground, screw in two screwhooks, D and F. The nails A and B should have a dis-

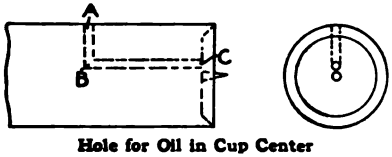
tance between them equal to the distance D and E.

Make a loop, C, in the end of the line, or tie an iron ring in the line after running it through the pulleys. Loop the end over the spike B and fasten a heavy weight, H, at the other end. Pull the line down and hook it over the hooks D and F. This will give the line the proper height for easily hanging the clothes, and the weight will keep it taut all the time.

Unhook the line at D and at the same time take the loop from the spike B and draw it to A. This action will take up that part of the line from D to E, thus making it possible to utilize all the space between the posts. Release the line from the hook F and the weight will automatically take up the line between F and G, thus keeping it taut all the time without the use of props.—Contributed by Axel C. Hanson, Lincoln, Neb.

## Oiling a Lathe Cup Center

An ordinary cup center for a wood lathe can be made with an oil hole so that oil can be applied without removing the work. The oil hole is drilled from A to B and then the hole C is drilled to intersect it at right angles. The oil being put in at A runs through the hole and strikes the end of the work at C.—Contributed by Julius Barnes, Columbus, Ga.




Hole for Oil in Cup Center

## Grip for Strap Iron

The article here shown is a little device for erecting pipes or stacks, especially where strap-iron hangers are used, but it will grip wire just as well as strap iron, says a correspondent of Sheet Metal Shop. When putting up hangers, it is difficult to pull the slack out and get them uniform. With this little device, which is composed of a wedge and link, one can, by the use of a very small set of blocks, draw the hanger to the desired tension with perfect ease and without loss of time. The wedge and link can be quickly adjusted.

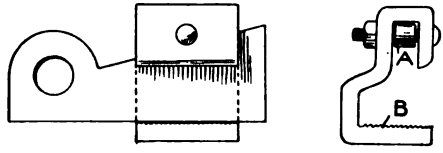



FIG. 1

FIG. 2
Grip in the Form of a Wedge

The side and end views of the wedge and link are shown in Fig. 1. It will be seen that a small roller is placed at A, which allows the wedge to roll freely to its full limit. This roller is made of ⅜-in. gas pipe with a ¼-in. bolt and nut to hold it in place. The surface of the link is made rough, as shown at B, causing it to hold while the wedge slips freely on the roller. The link may be made of ½ by 1¼-in. tool steel, but the wedge can be made of any kind of ½ by 1¾-in. iron. In Fig. 2 is a view of the grip in use.

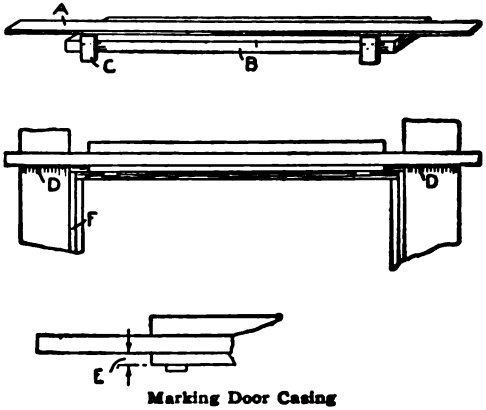
## Pointing Brick Walls

When pointing up a crack in the mortar between bricks, it is necessary to cut out the mortar a little longer than the crack and about ½ in. deep. This should be filled with a half-and-half mixture of cement and clean, sharp sand. In replacing cracked or broken bricks, great care should be taken to see that the brick is firmly bedded into the mortar on all sides, or the wall will leak and eventually settle in that particular spot.

¶Do not forget to oil a machine the first thing in the morning.

### A Marker for Door and Window Head Casing

The marker consists of four pieces put together as shown in the perspective sketch. The pieces can be of any convenient material and size, but the relative sizes shown in the sketch will be found most practical. In this case




Marking Door Casing

A is a piece of window stop, 3/8 by 3/4 in., fastened to a piece, B, 3/4 by 3 in. The pieces C are cut 1 1/4 in. long from window stop. The length of the tool will depend on the size of the doors and windows.

The pieces C are placed flush against the outside groove of the door frame. If the distance E corresponds to the thickness F, a pencil drawn along the edge D makes a mark which is true with the frame of the door. The head casing can be placed on the ends of the side casing cut to the marks and nailed without fear of a crack showing.

In the case of a window head where the frame is made of different material, the piece A is placed flush with B. This tool is particularly applicable to carpenters whose door and window frames do not always fit true in door and window openings.—Contributed by Jo Sorensen, Portland, Ore.

### Fitting Screws in Old Holes

When window or door screens are removed for the winter, and it is intended to hang them again in the spring, paint the holes where the screws were removed from the wood with a small brush or a piece of cloth. When the screens are replaced the next season the screws will not be loose but will hold as firmly as when the holes were first made.—Contributed by John T. Timmons, Cadiz, Ohio.

¶If one bolt is lost on a planetary transmission, the overweight on the others is apt to shear them off.

## Lemon Squeezer

As we were very much in need of a lemon squeezer one day and did not have one in the house, I soon made a substitute that gave better results

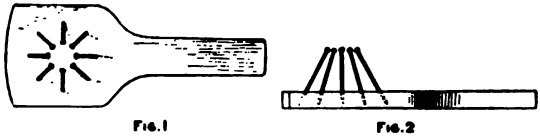




Fig. 3

Nails in a Board Take the Place of a Squeezer

than an ordinary squeezer. I made a handle of soft pine in the shape of a paddle (Fig. 1) from the wood of an old packing-box end. The handle was 3 in. wide and 7 in. long. A 2-in. circle was drawn on the paddle part and eight 6-penny nails were driven part way in on the line, in a slanting position (Fig. 2), so that the heads formed a circle about 1 in. in diameter.

The squeezer is used by holding the paddle edgewise across the top of a cup or glass with the nails in the positions shown in Fig. 3, and one-half the lemon is pushed onto the nails and turned. The squeezer can be used a great

many times as it is easily cleaned.—Contributed by W. A. Lane, El Paso, Texas.

### A Show-Window Stick

A stick, as shown in the sketch, that will prove quite useful to the window dresser, can be made in a short time and used to place small articles in a window without getting inside. The stick is made of three pieces of white pine, ½ in. thick, ¾ in. wide and in the following lengths: First, 36 in.; second, 31 in., and the third, 4¾ in. long. The longest piece, A, is first tapered from one end to the other; the next longest piece, C, is tapered to ¼ in., and the short piece, B, is tapered the same as A on the end.

The pieces are fastened together with inverted T-shaped pieces of

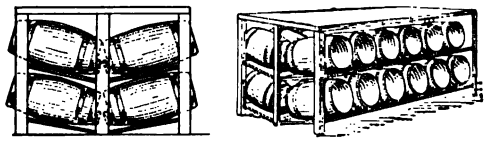

Stick Operates Like Pliers

sheet brass, D and E, placed on each side in the positions shown. The shorter one is 1⅜ in. high and the other is 1¾ in. A large rubber band, F, serves as a spring to keep the points separated. The stick is operated the same as a pair of pliers.—Contributed by W. J. Faulkner, Russellville, Ark.

### Nail Kegs Used as Bins

Large hardware stores do not require bins as receptacles for nails. The loose stock of nails should not be kept on the salesroom floor except those sold in 1-lb. boxes, says Hardware Reporter. A large stock of nails can be kept in the basement and orders filled from the original kegs, which can be arranged in rows underneath the counter or table.

The kegs can be arranged so they will incline outwardly on a plank shelf, the upper part of which is sheathed with angle iron to guard against wear. The bottoms can rest upon another plank of less width, securely fastened at right angles to the shelf and elevated from the floor sufficiently to render the contents of the



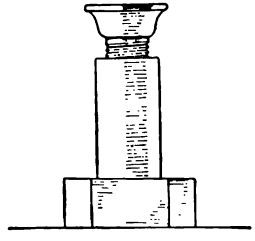
Kegs in a Table

kegs accessible without the necessity of much stooping.

The kegs should be arranged in order according to the size of the nails they contain, and as each one is emptied of its contents, it is removed and another keg full of the same size nails put in its place. The sketch shows the ingenuity of the plan, in which each keg serves as a bin for its contents, and does not permit of the accumulation of dust as does the average nail bin. It also affords more advantageous use of valuable space on the first floor of the store.

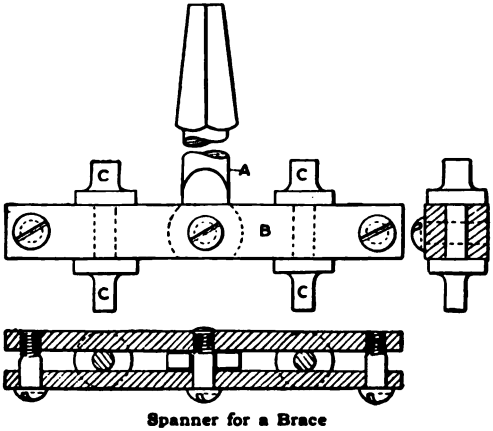
### How to Make a Small Jack

Small jacks are useful tools in any shop or garage. The shop that is not provided with these tools in sufficient numbers can have its workmen make them in spare time from scrap material. The sketch shows a jack the body part of which is made of a bolt with a hexagon head. The head is turned off to make a flat surface and a hole is drilled through its center and tapped the full length. The screw is a part of an old or broken clamp having a swivel head, which is very handy for adjusting itself to slanting surfaces. Any size or length can be made to suit the individual needs.—Contributed by Donald A. Hampson, Middletown, N. Y.



### A Spanner Wrench

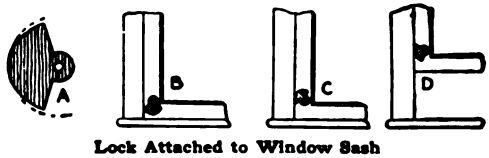
A tool for use in connection with an ordinary brace for grinding in valves of gas and gasoline engines is the invention of a correspondent of American Machinist. The shank A is of any desired length. One end of it is squared as shown, while the other end is pivoted in the swinging yoke B which carries the adjustable driving-pins C. These driving-pins enter the holes usually provided in gasoline-engine valves for the purpose of grinding them in their seats.




Spanner for a Brace

### Window Lock

A simple and effective lock which will hold the window in any position is shown in the sketch. It is attached to the window sash by means of a screw and is placed just far enough away from the window casing so that the edges of the outside circle will engage firmly against it, but will not allow the catch to pass the center. The outside edge is not an arc of a circle but is cut as shown at A. In the illustration, B represents the catch attached to the sash; C, in position to lock the closed sash, and D holds the window open at any point.—Contributed by Geo. M. Harrier, Lockport, New York.



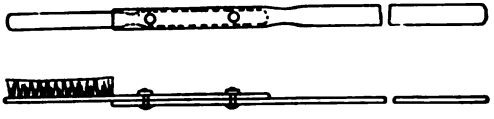

Lock Attached to Window Sash

### Attaching a Lathe Dog on Threads

In shop practice it is often necessary to apply the dog to the threaded ends of bolts and studs. Where no threaded dogs are provided, the following method can be used to advantage: Take an ordinary nut, having the correct number of threads, and saw it centrally in halves. Place one half of the nut in the bottom of the dog and the other half on top. Insert the bolt or threads of the work between the two halves and tighten with the set-screw.—Contributed by J. B. Shiver, Rock Hill, S. C.

### Brush for Cleaning Commutators

In the accompanying illustration is shown a little tool which comes in very handy for cleaning dirt, carbon and copper dust from commutators and brush holders, says Building Management. It is made by fitting a good stiff toothbrush with a long handle, as shown in the sketch. When the bristles of the brush become worn, the brush may be taken off and the handle fitted with another. This brush is also handy for cleaning the parts of circuit-breakers and other switchboard appliances.



Toothbrush Fastened on Long Handle

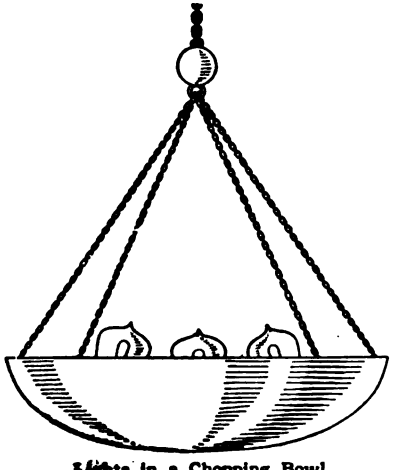
### Finishing a Hammer Handle

To put a fine working finish on a hammer handle rub in a filler consisting of a thin paste made by mixing plaster of Paris and linseed oil. This prevents the hammer from soaking up oil, and at the same time insures a good hand grip.


### Lighting Moving-Picture Theaters

To meet the requirements of the new law in a certain city, various nickelodeon managers have tried different methods of lighting their theaters while the moving pictures are being shown. The majority have installed green lights on the side walls, with which, although a dim light is furnished, it is hard to distinguish one person from another.

A unique lighting method, which makes the theater as light as day, has been employed by the manager of one theater. The ceiling of the theater was painted white and six electric lights were placed inside of wooden chopping bowls, 2 ft. in diameter and suspended from the ceiling. Although no lights are visible to the audience, the light reflected from the ceiling

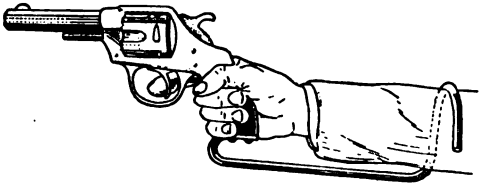


Lights in a Chopping Bowl

illuminates the entire theater, and one can even read a newspaper while the pictures are being shown.—Contributed by Geo. A. Obenauer, Buffalo, N. Y.

### Extension Stock for a Revolver

When firing a large revolver, it is hard to hold it from kicking out of range and missing the mark. With the



Stock Made of Rod Iron

use of the little device shown in the sketch, the weapon can be held steadily, and accurate shooting will be an easy matter. The device is made of an iron rod, about $\frac{3}{16}$ in. in diameter by 15½ in. long, bent as shown in the sketch and attached to the revolver with two screws. The hook end of the rod is placed over the forearm when firing the revolver.—Contributed by Gilbert H. Holter, Jasper, Minn.

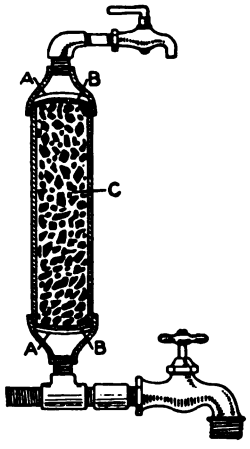
### Adjusting a Battened Door

A cottage door made of boards and battened can be adjusted in the following manner: Take the door off its hinges and stand it in a vertical position, grasp the sides and jolt it forcibly down on a heavy block or stone on the corner that is low. The weight of the door added to the force of swinging it down on the block will quickly put it in proper shape.—Contributed by John V. Loeffler, Evansville, Ind.

¶A garage should be built to exclude all dampness, as moisture will cause much labor to keep the brasswork clean, and will also corrode part of the machinery.

### A Water Filter

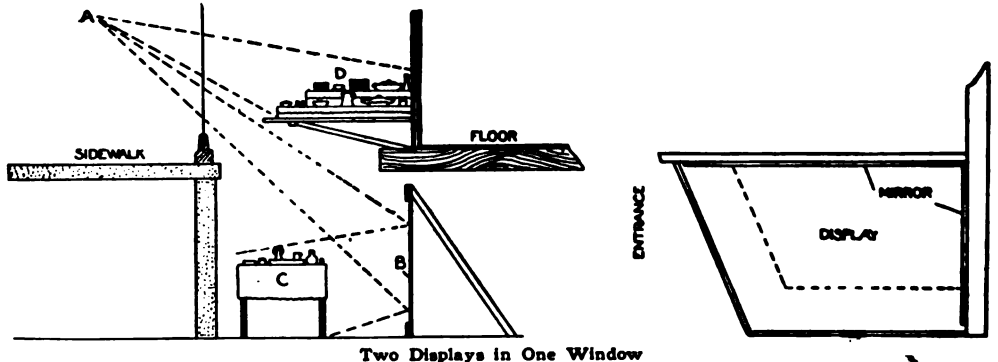
A cheap, simple and efficient water filter may be made of ordinary pipe and fittings. Owing to the bad condition of the water supply in our city, I constructed such a filter, and it gave good results. The filter is attached to the water main just back of the faucet. The large pipe or body of the filter is filled with charcoal, C, which is held in place with wool felt or filter paper, B B, and backed with wire gauze, A A. The main body of the filter is made of 1½-in. pipe with 1½ by ⅜-in. reducers on the ends.—Contributed by Whitney W. Jones, Baltimore, Md.




### Enlarging Window-Display Space

The proprietors of a store doubled their show-window space by the method shown in the sketch. The floor and joists under the window-display space were cut out and a display placed on the basement floor near the front wall, or partially under the sidewalk, and four large plate-glass mirrors were so arranged that those entering or leaving the store could view the display.

The arrangement can be better understood from the sketch. A very good effect can be obtained without the use of the mirrors by placing the basement display back far enough to be viewed direct. In the sketch, A represents the eyes of a person viewing the basement display C through the mirror B. The display D can be seen direct.—Contributed by Merle Robison, Pittsburg, Pa.




Two Displays in One Window

### Care of Oil-Soaked Waste and Rags

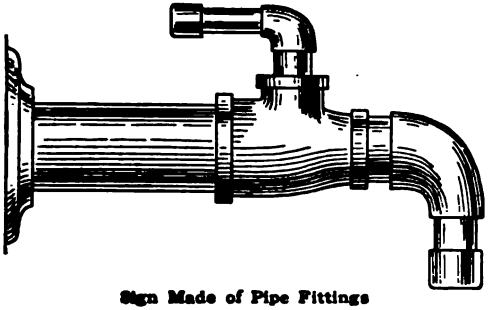
The danger of spontaneous combustion from rags or waste saturated with oil in shops, garages and residences is not sufficiently understood. This is, no doubt, because most people do not know that linseed oil will oxidize rapidly, and if cotton is soaked with oil, enough heat will be generated in a short time to char the cotton. The addition of red lead seems to make the heating more rapid, as pipe fitters have frequently observed.

It is a common thing for pipe fitters to clean the red lead and oil from a new joint by wiping it with a handful of waste. It is also common for the workman to carry the waste in his pocket. A pipe fitter once felt a hot spot against his body, which caused him to investigate his pocket with the result that he found a pocket lining burned out and a mass of charred waste. If this jacket had been hung in the clothes closet at home, a burned dwelling might have resulted, with the origin of the fire a mystery.

The safe thing to do is never to put oil-soaked rags away for safe keeping. Either burn or wash them at once. In mills, power stations, shops, garages, etc., where there is a quantity of oil-soaked waste, cans should be provided to receive the discarded waste. The cans should be made of heavy sheet metal with riveted seams, and with iron legs to hold them several inches from the floor. Use a tight-fitting metal cover.—Contributed by F. W. Brady, Scranton, Pa.

### A Plumber's Sign

An enterprising plumber constructed a very attractive sign that at once suggests the kind of business carried on within. The sign is in the shape of an ordinary faucet constructed of large

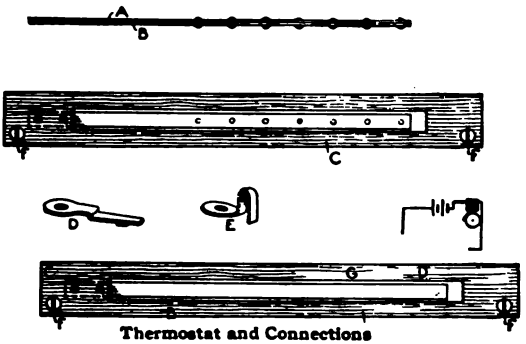


Sign Made of Pipe Fittings

pipe and fittings. It is about 2 ft. long and painted yellow to look like brass.—Contributed by John J. Keenon, Chicago.

### Alarm for a Hot Bearing

The alarm consists of a device very similar to a thermostat. A tongue is made of a strip of copper, A, and a strip of zinc, B, both the same size and gauge, riveted together with small rivets. The tongue is fastened to the base C, made of ¼-in. fiber similar to an organ reed. The slot in the fiber should be about ⅛ in. wider and ½ in. shorter than the tongue. Two screw holes, F F, are drilled in the fiber, as shown. The tongue is fastened to the base with the copper side in contact with the fiber. The electrical contacts are made as shown at D and E. These contacts are attached to the fiber




Thermostat and Connections

base with binding-posts, G G. The circuit is wired as shown.

The action is as follows: The instrument is fastened flat on the bearing cap with the metal tongue in contact with its surface. If the bearing gets warm, the zinc will expand much more than the copper strip, which causes the tongue to curl at the free end. In doing so it lifts the lever contact D into contact with E, thus closing the circuit and ringing a bell or lighting an electric light, as the case may be.—Contributed by W. W. Savage, Buffalo, N. Y.

### Bit Used as a Belt Punch

An old-style gouge-shaped bit, as shown in Fig. 1, rounded at the point, as in Fig. 2, makes a good emergency belt punch. A handle may be made of a cork. The shape of the cutting point of the gouge is shown at A. This

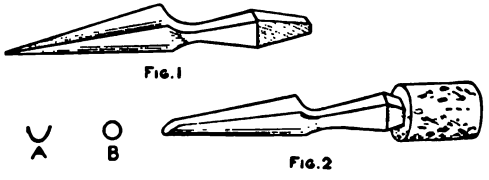



Fig. 1

Fig. 2

Bit Formed to Cut Round Holes

will make a neat round hole, B, if the tool is turned when cutting the hole. —Contributed by James M. Kane, Doylestown, Pa.

¶Sew straps to the sides of mattresses and they can be handled more easily

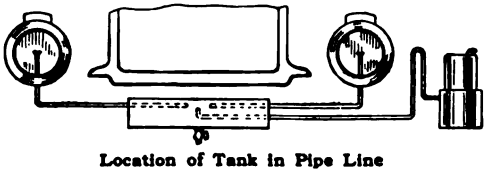
### Replacing Belts on Wheels

The contraction of a belt not used for some time will make it hard to replace it on the pulleys. The same trouble may be experienced after cutting out a little too much material when taking up a belt. In either case, the belt cannot be readily put on the pulleys by hand or with a stick. A safe way is to proceed as follows:

Procure a piece of rope, 6 or 8 ft. long and not over ½ in. in diameter,—preferably a piece of window-sash cord. Place the belt around the driven pulley after the power is stopped. Double the rope and pass the loop end through the driving pulley just ahead of one spoke. Put the belt on this pulley and around it as far as possible by hand, then pull the loop around the belt and pass the two ends of the rope through the loop and draw it up tightly, holding the ends in one hand. Start the power slowly and the belt will easily run on the pulley, and as it does so, let go of the rope ends. The belt will cause the loop to open and the rope will ride to the next pulley and fall to the floor.—Contributed by H. E. Parker, Bridgeport, Conn.

### Gas Purifier for Automobile-Lighting System

The purifier consists of a cylinder made of 1½-in. brass tubing, with ends of sheet brass soldered in. The cylinder is placed transversely under the front of the engine, as shown in the sketch. The pipes leading to the headlights enter the ends and nearly reach the center at the top of the chamber, as also does the pipe from the generator. The reason for this arrangement is to avoid filling the tubes with water when the car tips.

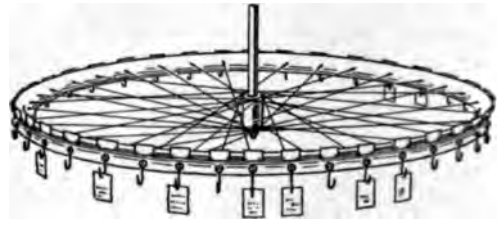


Location of Tank in Pipe Line

This device serves a twofold purpose. It keeps all water and lime dust from the lead pipes, and also serves as a storage tank for the gas, preventing flickering and other troubles and furnishing a more constant pressure. A stopcock is soldered in the bottom to drain the tank, though the purifier will operate when almost half full of water. —Contributed by Donald H. Johnston, Collins, O.

### Sales-Ticket File

A very useful and handy device for the rapid filing of sales tickets is shown in the accompanying sketch. The owners of a department store, employing 30 clerks, were obliged to use as many spindle files as there were clerks. They could not use a card-index system for the rapid filing of the sales tickets, so they suspended an ordinary bicycle wheel, with the tire removed, from the ceiling, and on its rim hung 30 hooks, one for each clerk, and each marked with a small tin plate tacked to the rim bearing the file number. The wheel being placed so that the hooks were within convenient reach of the cashier's right hand, any number could be readily located by turning the wheel.—Contributed by Axel C. Hanson, Lincoln, Neb.



Filing Sales Tickets on Bicycle Rim

¶The best sidewalk manhole guard is a barrel with both ends removed. Lighting and ventilation are perfect.

# The Art of Stencil Making

By HOMER H. KNODLE

## Part II—Cutting

After the design is originated, which may be much smaller than the stencil, the next step is to transfer it to the manila paper used to make the stencil. This is done by the use of dividers and drafting tools, and the measurements should be in such proportion that the design will be enlarged to the necessary size. Two boards are needed, one, built as described, to do the cutting on, and a regular drafting board. The reason for having two boards is that if the cutting is done on a drafting board, it will soon be useless for drafting. For drawing out the full-size design, a 31 by 42-in. board will be large enough. The cutting board should be larger, not less than 36 by 55 in. in size, and constructed as follows:

Using good white-pine boards dressed on four sides, not less than 1½ in. thick and 6 in. wide, build a board as shown in Fig. 12. The cross-pieces should be of the same material as the board and fastened to the board with screws, using at least two to each piece making up the board. The support is made from heavier lumber, substantially as shown in the illustration. The board may or may not be inclined, as desired.

The usual size of stencils ranges from 2 by 6 in. to 30 by 50 in. The paper used should be 3-ply manila,

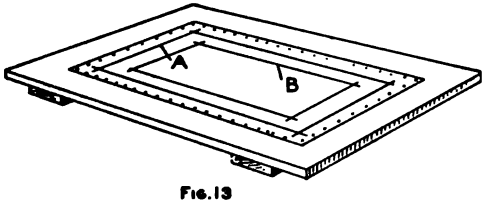
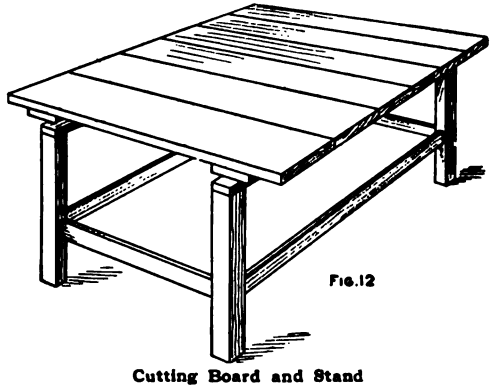



Fig. 13
Drawing Board

which can be obtained cheaply from a printers' supply house. The paper should be cut about 4 in. larger each way than the extreme size of the stencil to be made, to allow an edge for tacking to the board, as shown in Fig. 13. The tacks are placed around the entire edge of the paper, so as to hold it firmly. One-ounce tacks will be found amply large.




Cutting Board and Stand

In drawing the large full-size designs, the triangles should be from 12 to 16 in. long. (Triangles made of wood are not expensive.) After the paper is fastened to the board, lay out the extreme border line A and the design border line B, as shown in Fig. 13. Starting at the left-hand part of the border, draw in the design just as it would appear on the wall, as shown in Fig. 14, paying no attention to the binders. The best effects are usually obtained when the design is finished as a whole and not each particular part separately.

The number of binders to hold each part of the design should be considered. An especially large surface should have more than three binders, while for ordinary-size pieces, three binders, if properly placed, will hold the piece in position very well. In handling very small units, two binders will be found sufficient, but never less than two. The location of the binders are marked with a red crayon, as shown by the dotted lines in Fig. 15. Beginning at one corner of the design go over it to see if any have been omitted, as a binder cut out will spoil a stencil. Mark each part to be cut out with blue crayon.

It will be found best to follow, to some extent, the outline of the piece, so that when a binder is reached, the colored crayon will be a signal to look out for the red line. A finished design as it will appear when stenciled on a wall is shown in Fig. 16.

The knives which will be found useful in cutting out stencils are shown in Fig. 17. These can be obtained at any hardware store. One is a common steel eraser and the other is a Swedish carpenters' knife. No other tools are necessary. The operation of cutting out the stencil is purely mechanical and consists of simply following the lines drawn, being careful to hold the knife so that a perpendicular cut will be made, and also being sure to cut entirely through the paper, as a recut will make a ragged edge. When the lines are completely cut out, the stencil is finished with the exception of oiling, and that should be done with a camel's-hair brush and boiled linseed oil. Both sides should be coated and the piece hung up to dry. The oiling should be done before the outside border of the stencil is cut away so as to have all the surface well oiled. A name and address, or some other mark, should be stamped in one corner before oiling, so as to designate which side to place against the surface to be stenciled. This will preserve a clean surface on the stencil.

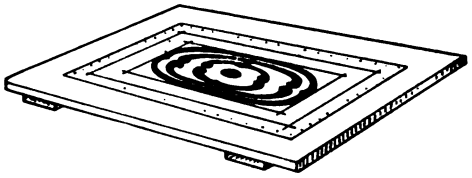


FIG. 14

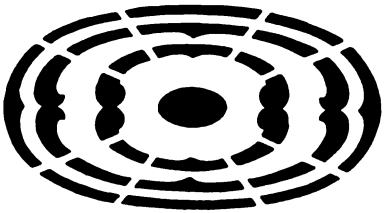


FIG. 16
The Full Size Design

FIG. 15

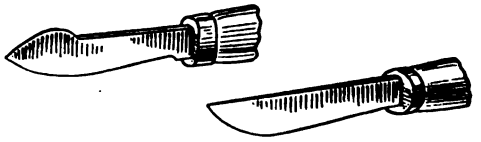


FIG. 17
Marking the Binders
Cutting Knives

*(To be continued.)*

## Repair on an Automobile-Horn Bulb

The ordinary rubber horn bulb used on an automobile can be repaired with the use of a vulcanizer in the following manner, as described by the Automobile Dealer. A very common form of damage, a split on the top of the bulb, is shown in Fig. 1.

FIG. 1 FIG. 2 FIG. 3
The Split and Its Repair

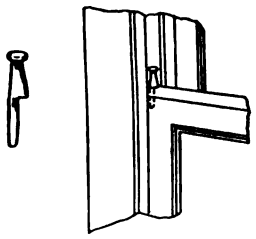
The first process of repair is to thoroughly clean the rubber where it is split, with benzine, outside and, if possible, inside. The inside of the rubber should be roughened with a rasp or wire scratch brush, and the outside edges of the split beveled off with a pair of scissors and roughened with a rasp. The split after this treatment is shown

in section in Fig. 2. If the size of the split is sufficiently large to make this possible, a piece of old inner tube should be inserted to cover the split, the rubber having previously been roughened and covered with vulcanizing solution. The inside of the bulb is also treated with the vulcanizing solution. It will be easier to insert and place the patch before the solution dries.

The split and beveled portion should be coated with the solution and allowed to dry, if possible, for several hours. Some lengths of vulcanizing compound, about ¼ in. wide, should be cut and softened by heating on the vulcanizer and then pressed into the V-section split until the whole is level with the outer surface of the bulb. The lower part of the bulb can then be pressed up as shown in Fig. 3. The doubled-in portion, back of the split, should be filled with waste or rags as tightly as possible and the whole covered with a piece of thin linen, sprinkled with soapstone where it comes in contact with the vulcanizing rubber. Care must be taken that no creases in the bulb are allowed to remain in contact with the vulcanizer, as this will make them permanent.

### Anti-Rattler for a Window Sash

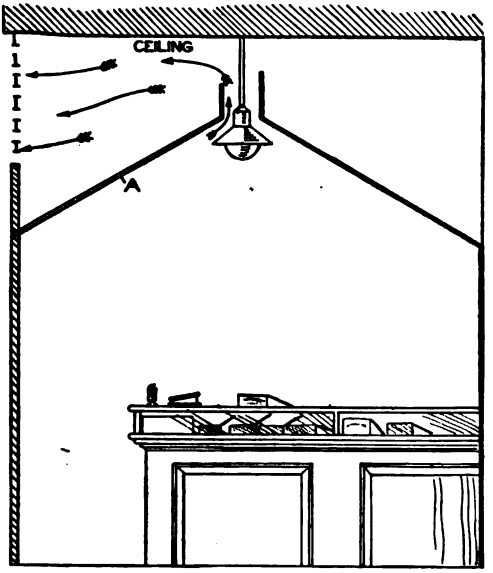
An ordinary wood clothespin, having one leg broken off as shown in the sketch, makes a good anti-rattling device for a window sash. The remaining leg of the pin is pushed between the sash and window casing. —Contributed by Paul H. Burkhart, Blue Island, Ill.



¶The tires of an automobile placed in storage should be cleaned with castile soap and tepid water and then stored in a dark place, well ventilated.

### Ventilating with a Gas Lamp

A small cigar store located in a large office building had no outside opening and the air was bad and made more so




Lamp Ventilator

by the smoke from the patrons' cigars. To obtain good ventilation for this room, it was fitted with a sub-ceiling, A, tapering up to a peak in the center. A large gas lamp was placed in an opening in this peak, so that the heat from the lamp and its consumption of air created a strong upward draft which causes the smoke and air to flow out of the room and exhausts it into the main corridor through a perforated plate. The lamp must be used continuously regardless of the brightness of the day. — Contributed by Albert Scheible, Chicago.

### Wallpaper Protection

The condition of the paper on a wall behind pictures may be kept similar to that on the uncovered surfaces by placing a glass push pin in the wall where each lower corner of the frame rests. This keeps the picture away from the wall and allows the air to circulate freely.

### Pole for Hanging Pictures

The accompanying sketch shows a holder for picture-frame hooks for use in hanging pictures. The holder can

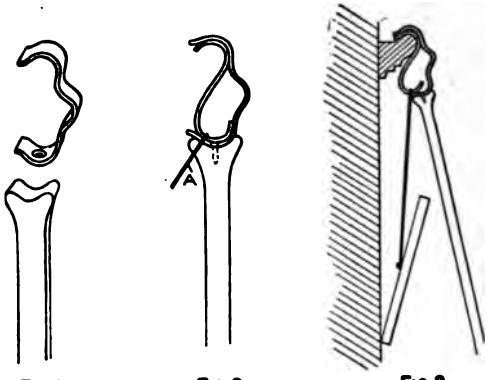



FIG. 1 FIG. 2 FIG. 3

Clip on the End of Pole

be made of brass or steel, ½ in. wide, or slightly under the width of the picture hook. When forming the holder, as shown in Fig. 1, use a hook as a pattern or form. Make half of the lower bend first, then drill a hole for fastening it to the rod or pole, as shown. Cut out the end of the pole to fit the holder and attach it as shown in Fig. 2. The hook is placed in the holder and the picture-frame wire A in the hook. The manner of hanging the picture is shown in Fig. 3.—Contributed by C. G. Carlstrum, Rochester, New York.

### Lathe Work in a Milling Machine

From the history of machine tools we learn that the early milling machine was a modified form of lathe without

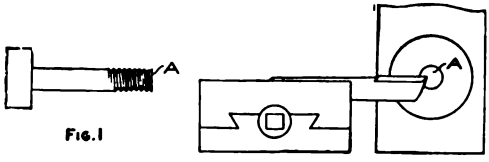



FIG. 1 FIG. 2

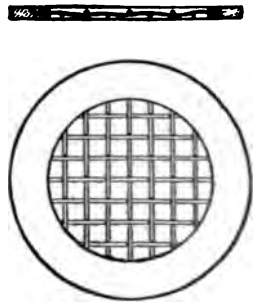
Cutter in the Vise

the long bed and the tailstock. In shop practice today it is of common occurrence to see the lathe doing the work of the miller, and vice versa. An instance of lathe work done in a milling machine is as follows:

We had several thousand screws of the shape shown in Fig. 1. These had been made on an automatic screw machine. They had to be within less than .001 in. of the specified length, which, as they were all over size, meant facing off one end. Ordinarily this would have been a lathe job, but no lathe was available at the time. An unused milling machine was made to take the place of the lathe. The screws were held in the chuck on the nose of the milling-machine spindle, each one being set against a positive back stop. They were then faced off on the small end by a regular side tool. The arrangement is shown in Fig. 2. The job was finished as quickly as if done on a lathe.—Contributed by Donald A. Hampson, Middletown, N. Y.

### An Open Stove Plate

The stove plate shown in the sketch is used for setting small utensils on to keep them from falling into the fire. To make this plate, cut a ring pattern to fit the stove cover and procure a piece of ½-in. mesh screen made of about No. 10 gauge wire. Cut the screen to almost the outside diameter of the plate. Take the pattern and screen to a local foundry and have the molder lay the screen between the mold parts. When the metal is poured and the casting finished, the screen will be solidly fastened in the iron ring, making a plate that one would hardly part from after once using it.—Contributed by Henry C. Ronfeldt, Toledo, Ohio.



¶ Pianos should never be set against an outside wall as dampness is apt to rust the strings.

## The Repair and Care of Lubricators

Loose lubricator brackets not only cause serious leaks of oil and water where they screw into the lubricator body, but are also the cause of the aggravating and dangerous breakage of sight-feed and register glasses.

The brackets can be securely and permanently tightened by inserting a thin copper gasket (Fig. 1) between the bracket joint and its seat in the body. The bracket is turned into line with the one above or below against the jacket, which, as it is squeezed against the body, makes the joint tight and holds the bracket rigidly in place.

Worn choke or reducing plugs are not only a source of trouble in the operation of the lubricator, but cause the excessive use of valuable oil. A number of lubricators, each of a different type, may be used on the engines about the plant, each lubricator possessing differently constructed choke or reducing plugs. When no extra ones are kept on hand, new ones are often made on a common lathe, necessitating a bit of expensive labor.

The usefulness of a reducing plug can be prolonged considerably by closing the small oil passage, using a hollow punch as shown in Fig. 2. A number of lubricators in a plant having excessively worn reducing plugs can waste a great amount of oil, and the use of a punch for this purpose on

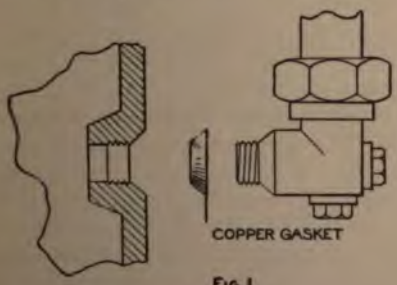



Fig. 1
Gasket in Joint

the reducers will result in the saving of money expended for lubricant.

A bracket that is not in line with the one securing the other end of the glass is very liable to break the glass when it is forced to withstand its pressure of water and oil. The two can be lined up very quickly and accurately by the

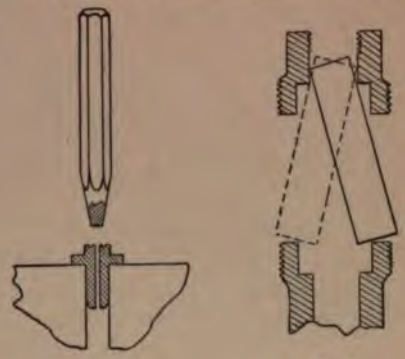


Fig. 2 Fig. 3
Closing Passage and Lining Parts

use of the glass itself as a tool. The opening in the upper bracket through which the glass is inserted is large enough to allow the glass to be swung some distance each side of the bracket below (Fig. 3). By forcibly turning the bracket, through which the glass is inserted, the glass will clear each side of the other bracket an equal distance, at which position the two brackets are correctly in line, permitting the glass to hold its pressure without danger of breaking.—Contributed by F. W. Bentley, Huron, S. D.

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### Coloring Brass Black

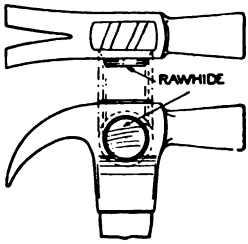
The solution made up as follows is given by Camera Craft for coloring brass articles black: Dissolve blue vitriol in water and add washing soda. Allow precipitate to form and then pour off the clear liquid. The precipitate is carbonate of copper, which, mixed with strong ammonia and heated to 150 deg. F., will stain brass black if dipped in it. Be sure and clean the article well with potash before staining.

---

¶Always caliper work when at rest and not in motion.

### Combination Hammer and Mallet

A carpenters' hammer with a rawhide insert in the side is a very handy substitute for a mallet. The hammer is removed from the handle and a hole drilled in the side and tapered. A piece of rawhide is shaped to fit the hole and put into place. The hammer is then put on and fastened to the handle. The temptation to drive a chisel with the ordinary hammer is removed, as a mallet and hammer are combined.

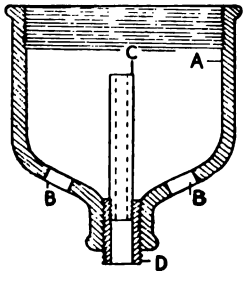



### Drilling Dies

Die makers should space off a die with a double-center punch having a space between points equal to any desired number of drill. Alternate holes should be drilled first, after which the intervening holes should be made with a drill having a point to fit into an angle of 45 degrees or less. Such a drill will cut into the holes on both sides without running off, as long as the taper guides the drill. The core will drop out of the die after the last hole is drilled.

### Sanitary Drinking Fountain

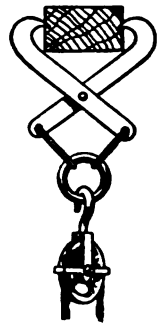
Ordinary pipe fittings can be arranged to make a sanitary drinking fountain. A reducer, 2 by ½ in., forms the main body of the fountain. It is screwed on a water main, D, which has a short extension of ⅜-in. pipe, C. The holes B B may be of any size to drain the water out slowly. A valve is placed in the pipe below the fountain.




### Homemade Hoist for Garages

In all automobile-repair shops there must be some arrangement for hoisting work that is too heavy to be lifted by hand. This is true particularly during the overhauling season, when motors, transmissions, etc., are removed from the frames, and other heavy operations must be performed, says the Motor Magazine of Canada. A device is shown in the sketch to take the place of the more expensive and cumbersome hoisting outfits, and one that can be made easily by the repair man. It will be found equally handy in a private garage, the expense of making being small.

The essential members are two hooked pieces and three rings, two of which are oval in shape. The size recommended for a hook for use on a 6-in. joist is 1½ in. wide by ⅜ in. thick. The metal is forged and holes ½ in. in diameter drilled ¾ in. and 3 in. from the end to receive the links and hinge pin. The hooked pieces are then fastened by a ½-in. rivet or cap screw, leaving them free to turn. The oval links go in the end holes and are connected by the other ring, into which is hooked the tackle. The stock for the links is ⅜ in. in diameter, welded into shape, as shown.



In using the device, the hooks are clamped on the timber, the points being driven in with a hammer. The chain hoist is then hung into the lower ring. The greater the strain the deeper the hooks will sink into the beam, thus giving more and more holding power. For use on larger joists, or for holding more weight, this appliance can be larger and heavier to suit the requirements.

¶Plaster of paris mixed with paperhangers' paste is the proper material for stopping holes in a plastered wall.

### Rust-Proofing Iron and Steel

The metal to be treated is first briefly immersed in a boiling solution of sodium or potassium hydrate to remove oil and grease. If rusty or badly tarnished, it is given the ordinary sulphuric-acid pickle. It is then well washed in clean water, preparatory to the final treatment.

The rust-proofing solution consists of a 4-per-cent solution of phosphoric acid mixed with clean iron filings. It is kept at boiling temperature. The article to be treated is prepared as described and then immersed in the boiling solution for 2½ to 3 hours. The metal will then have a greenish-black appearance. Dry the article and oil it with linseed or paraffin oil. The final color will be gray-black.

### Tire-Pulling Tool for Blacksmiths

The tool shown in the illustration is specially designed to remove a steel tire from a felloe without splitting the latter or marring the paint. The sketch clearly illustrates its construction. The size of the material will depend on the work it is intended to do. The several holes in the tire hook make it adjustable for various widths of rims.—Contributed by J. W. Plemons, Circleville, Ohio.

Puller on Tire and Felloe

### Fruit Cans as Oil Retainers

Empty fruit cans are very handy to have in a small workshop. They can be used for holding oils, paints or small parts. Cut the cover off one of these cans as near the rim as possible, turn over the jagged edges to make them safe for the fingers, and it will make a fine oil container. Hammer out a place, as shown at A, Fig. 1, and a good spout is formed. These cans are good

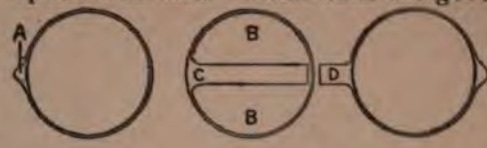



FIG. 1

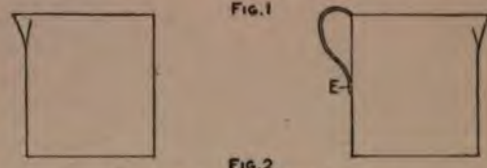



FIG. 2

Cans with Spouts and Handles

for holding drill compounds on the drill press, or kerosene oil or any liquid that does not require the oil can.

Small-size cans used for condensed milk can have a handle formed of the part C by cutting out the spaces B B. The strip C is turned over to form the handle D. The end E of the handle may or may not be soldered, as desired. —Contributed by Hy. W. Hankin, Troy, N. Y.

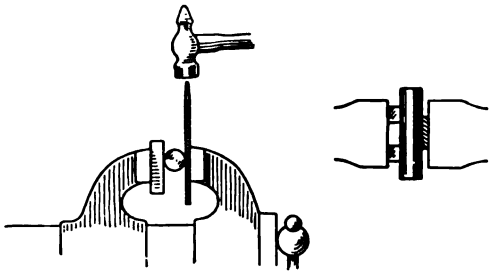
### Reversing Bristles in a Brush

Having occasion to use a small varnish brush, I found that it had been put away without cleaning and that the bristles were stuck together in a solid mass. After removing the small nails holding the bristles in the tin binding, I pulled out the bristles and reversed them, forcing the end that was stuck together into the binding, and after replacing the nails I had a brush that was as good as ever and one with which I did a big job of varnishing without a bristle coming out. The ends of the bristles that had been protected from the varnish by the binding were as soft as those in a new brush.—Contributed by W. M. Hope, La Crosse, Wash.

¶An old rat-tail file, ground smooth and rounded to a point on the end and magnetized, makes a useful tool for removing steel particles from the eyes.

### Knurling with a File

Take a sharp file and two pieces of square stock; place the file on one side of the piece to be knurled and the

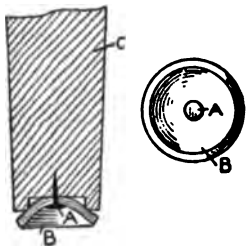


Driving the File through the Jaws

square stock on the opposite side as shown in the sketch. The surface of the file placed against the face of the jaw is ground off and made smooth. Continuous striking on the end of the file causes it to slide down thus rolling and knurling the piece. The square stock gives clearance to the knurl. Sheet-brass jaws will give good results on very small rods, if used in the place of the square stock.—Contributed by J. F. Tholl, Ypsilanti, Mich.

### Cushions for Chair Legs

The ordinary felt tips for chair legs can be supplanted by homemade rubber tips as shown in the illustration at less expense of time and money. An old discarded tire casing will furnish the material from which to cut the rubber disks. The disks B are cut ¾ in. in diameter and are attached to the legs of the chair C by boring a hole, ½ in. in diameter and ⅛ in. deep, in each one and driving a tack, A, in the center. The disks form a cup that makes them stick to the floor without scratching the varnish.—Contributed by John V. Loeffler, Evansville, Ind.

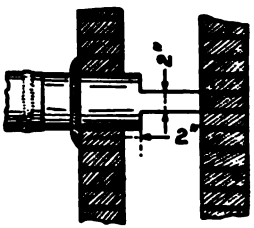



### Securing a Fork in a Stag Handle

I had a stag-handle carving fork which came apart and, as it was too good to throw away, I mended it as follows: I warmed the handle by standing it in boiling water, open end up, being careful to keep the water out of the hole. When it was thoroughly hot I poured melted sealing wax into the hole until it was nearly full and then forced the tang of the fork, which I had previously notched with a file, into the wax until the shoulder came against the end of the stag handle. This made a good repair which was not affected by hot dishwater.—Contributed by W. E. Morey, Chicago.

### To Keep Pipe from Entering a Flue Too Deeply

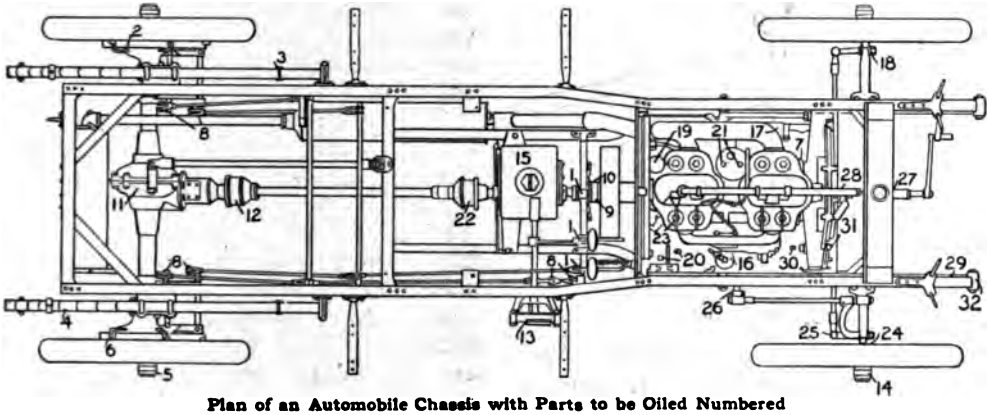
When setting up a stove, the pipe always has a tendency to slip into the chimney too far, thus closing off the draft and making the stove smoke. This can be remedied by cutting the pipe to form a projection on each side, as shown in the sketch. The projections should be just long enough to rest against the opposite side of the chimney when the pipe is in its proper place.—Contributed by P. J. Theisen, Denver, Colorado.




### Lubricating an Automobile

In lubricating an automobile, it must be borne in mind that no two automobiles of the same make and model will consume the same amount of oil with the same mileage. This is because the frictional resistance of the bearings will be in proportion to the actual work done, with the load and the condition of roads. While the accompanying

chart and following table of reference will be found simple and convenient, the question of mileage must also be taken into consideration. The oiling time, as shown in the table, is based upon the maximum work an automobile should do. The table is made up on a monthly basis.



Plan of an Automobile Chassis with Parts to be Oiled Numbered

| | |
|---|---|
| 1—Brake-lever shaft bearings | Twice |
| 2—Internal-brake cam oilers | Once |
| 3—Rear-spring bolt greasers (non-fluid oil) | Twice |
| 4—Rear-spring leaves " " " | Once |
| 5—Rear-wheel hub caps | " |
| 6—Rear-axle outside bearing greasers (non-fluid oil) | Weekly |
| 7—Magneto-shaft coupling | Twice |
| 8—Brake fittings and connections | Weekly |
| 9—Clutch-pedal bearings | Twice |
| 10—Clutch-housing | " |
| 11—Differential housing (non-fluid oil) | Once |
| 12—Rear universal joint " " | Twice |
| 13—Gear-shifter shaft | Once |
| 14—Front wheel hub caps (non-fluid oil) | Once |
| 15—Transmission case (special non-fluid oil) | Once |
| 16—Air-valve stem | Once |
| 17—Magneto oil cups and wells | Twice |
| 18—Steering-knuckle bolts | " |
| 19—Commutator oiler and greaser | " |
| 20—Steering-case greasers (non-fluid oil) | Once |
| 21—Crank-case filler and oil tank | Daily |
| 22—Front universal joint (non-fluid oil) | Twice |
| 23—Valve-rod guides | Weekly |
| 24—Front-wheel bearings (non-fluid oil) | Once |
| 25—Steering cross-tube greasers (non-fluid oil) | Weekly |
| 26—Steering connecting-rod greasers (non-fluid oil) | Once |
| 27—Starting-crank bearing | Twice |
| 28—Fan-bearing oiler | Weekly |
| 29—Front-spring leaves (non-fluid oil) | Once |
| 30—Water-pump shaft coupling | Twice |
| If shaft has greaser (pump lubricant) | Twice |
| 31—Timing gear compartment (non-fluid oil) | Once |
| 32—Spring-bolt greasers (non-fluid oil) | Twice |

One filling of the differential housing and transmission case will run 1,500 miles. A little oil should be added each month to keep up the proper amount and insure the best lubrication. The crank-case filler and oil tank should be always examined before starting out, to insure a plentiful supply of oil for the trip.

### Repairing a Flexible Shaft

Clean both ends of the shaft which are to be joined together with gasoline, to remove all grease, oil and dirt. Secure a piece of brass tubing about 4 in. long, no less than $\frac{1}{32}$ in. thick, and a trifle smaller in diameter than the shaft. Split the tubing with a hacksaw all the way down one side so that, when the ends of the shaft are inserted in the tubing, it will expand and make a tight fit around the shaft. Place one end of the shaft in a vise and fasten the other end on a block of wood, making the part to be joined level and rigid. Heat the joint with a blowtorch, being careful not to draw the temper in the brass tubing or shaft. When the joint is hot, pour melted babbitt metal in through the split in the brass tube until the babbitt sweats itself thoroughly into the ends of the shaft and fills up the seam in the tube. The babbitt must be heated until it chars a piece of wood when dipped into it. Dress the joint with a file, and it will be found to work perfectly. As many as four joints of this kind have been made in one shaft, 7 ft. long, with satisfactory results.—Contributed by J. O. E. Dieterich, New York.

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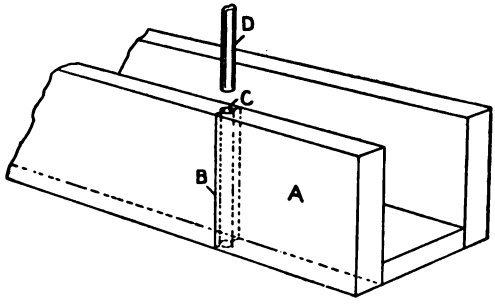
¶The atmosphere of a cellar where vegetables are kept is not fit for an incubator. The air is charged with carbonic-acid gas, which is fatal to young chicks.

### Water-Tight Joint in Sluices

Laundry tubs, sluices and troughs that are longer than the material used in making them should have the joints




Pin in the Joint

matched as shown in the sketch. The joint is made by squaring the ends of the boards, butting them together and putting a pin between the ends. If the ends are not a good fit, take a saw and cut through the joint, then nail a piece on one side to keep them in line temporarily.

The sketch shows a sluice of which A is the side and B the joint to be made water-tight. If the sides are of 2-in. material, take a ⅝-in. bit, long enough to extend through the width of the board, and bore a hole, C, through the joint. Bore a hole in a piece of scrap with the same bit. Cut a pin, D, from soft wood, a trifle longer than the width of the board A, dress it round and just a little larger than the hole bored with the bit, point the end, and then carefully drive the pin through the hole in the scrap. This will make it to size. Drive the pin in the hole C, after the boards are nailed in place, and a perfect water-tight joint is secured.—Contributed by W. A. Lane, El Paso, Tex.

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### Waterproof Cups for Painters and Decorators

The painter, and especially the sign painter, often has occasion to use a small quantity of one color or another and the color mixed would be of no further use if any were left over. Furthermore, it would possibly consume valuable time to clean a cup, and different cups for the various tints would take up too much space in a kit. I use a waterproof cup that can be made in any size, and carried conveniently in the paint kit, and is so cheap that it may be thrown away after using.

The cups are made up of oiled stencil board that is not too heavy. The board is cut into pieces 5½ in. long by 2¾ in. wide, as shown in Fig. 1. The dotted lines are run over with a blunt knife so that the board may be folded easily without breaking at the folds. After following the measurements in Fig. 1, proceed to shape the cup by folding both ends and sides until the corners meet, as shown in Fig. 2, leaving a triangular flap at each corner. Bend the flaps back on the ends, as shown in Fig. 3. Take the long end and bend down over the flaps, after which push the remaining ends between the triangular flaps; and a neat waterproof cup will be formed. Several dozen cups can be made from the aver-

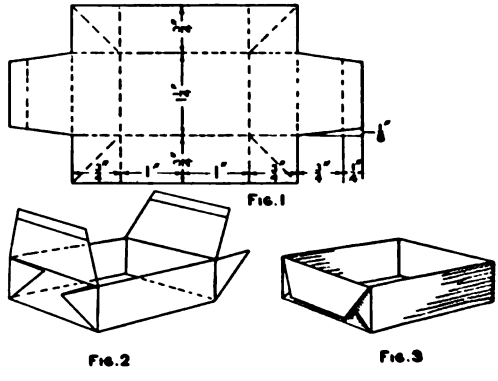

Fig. 1

Fig. 2

Fig. 3

Pattern and the Finished Cup

age-size oiled board. A great many pieces can be cut out and scored ready to be formed into cups and carried flat in the kit, ready for use on any job.—Contributed by Harry Marcelle, San Diego, Cal.

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¶Brass work requires a higher lathe speed than for cast iron or steel.

### Using Old Inner Tubes

Do not throw away or sell for scrap old inner tubes, which have sound sections of unperished rubber. By saving the old tubes, and cutting out and sending the sound sections to a tire company, they may be joined into a new tube, says Cycle and Automobile Trade Journal. While this joined tube does not have a good appearance, it will be found capable of giving good service, and when the shoe is put on, only the owner will know how the tube looks.

### A Draftsman's Ink-Bottle Holder

A handy ink-bottle holder for a draftsman's slanting board can be made as shown in the sketch. A block of wood is turned up, having the dimen-

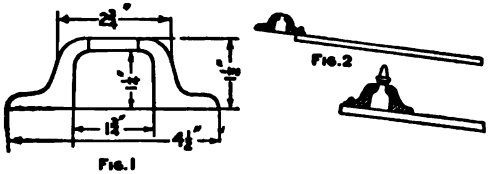



FIG. 1
Holder Attached to Board

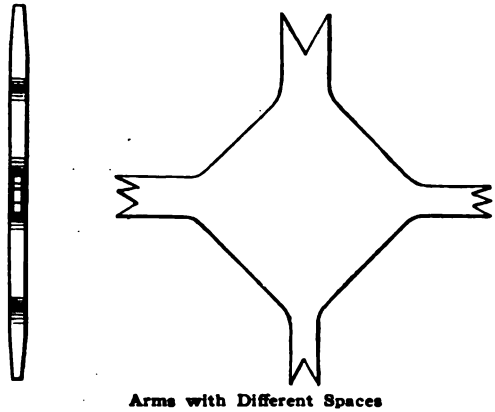
sions shown in Fig. 1. The block is then attached to the upper edge of the board with one screw through the rim so that the holder may swing down over the board as shown in Fig. 2. The ink bottle is slipped into place before turning the block.—Contributed by A. V. Borklund, Cleveland, O.

### Removing Small Steel Particles from Brass, Copper or Nickel

Place the piece of brass, copper or nickel in a porcelain dish and add a generous amount of powdered alum. Cover well with water and boil over a fire. It is only a matter of a few hours' time until a small tap, as large as No. 10 size, will be entirely dissolved in this solution. The method is especially adapted for removing broken screws from watch plates.—Contributed by Geo. W. Coplin, Bay City, Michigan.

### Lettering Guide

A very handy device for the spacing of title letters on drawings is shown in the sketch herewith. The device is



Arms with Different Spaces

the invention of a correspondent of American Machinist. It is made of sheet brass about 3/64 in. thick. The points are filed to a blunt edge, and the spacing of the points may be made to suit the size of the letters used on the drawing.

### Removing Lead from Wood

A contractor securing a job of refinishing some church benches damaged in a fire found that the melted lead from the skylight had spattered over a number of the benches, burning part way into the wood wherever any of it struck.

The problem was how to remove this lead. A scraper made no impression upon it and sandpapering only rubbed the particles of lead further into the grain of the wood. After much experimenting, the finisher discovered that when the wood was thoroughly cleaned of the old varnish, the lead could be easily rolled out of the wood with sandpaper while the surface was wet with gasoline.

¶Aluminum steels containing less than 3 per cent of aluminum have the same properties as ordinary steels. Above this percentage they become quite brittle.

## Setting Lathe Tailstock for Turning Tapers

It is sometimes necessary to figure the amount to set over the tailstock in turning a taper where there is no taper-turning attachment. The amount can be determined only approximately by calculations, as it is not known how far the lathe centers enter the piece, and the final adjustment must be made by trial.

When the piece is to be tapered the entire length, the tailstock should be set over the amount obtained by the following rule: Suppose the piece is 8 in. long and the taper per foot is to be ¼ in. Divide the taper per foot by 12 which will reduce it to the taper per inch. The problem can be easier worked in decimals. The decimal for ¼ in. is .25. Then .25 ÷ 12 = .0208+ in., which is the taper per inch. If the piece, is 8 in. long, then .0208+ in. × 8 = .1664+ in. As the tailstock must be set over one-half the amount of the taper, the result is divided by 2. Then .1664+ in. ÷ 2 = .0832+ in., or almost 5/64 in., a fraction, the amount to set over the tailstock to turn a piece tapering that is 8 in. long with a taper of ¼ in. per foot.

It is sometimes necessary to find the amount to set over the tailstock for work tapering its full length when only the two diameters are given, the diameter of the large and small ends of the work. In this case subtract the small diameter from the large and divide by 2. For example: Suppose a piece of work is to be turned tapering its full length, the large end to be 2 in. and the small end 1½ in. in diameter. When subtracted the remainder is ½ in. The ½ in. divided by 2 gives ¼ in., or the amount to set over the tailstock.

A tailstock must be set over sometimes for a piece of work, on which only a part is to be tapered. If the diameters of the large and small ends of the tapered portion, the length of the taper and the length of the work is given, then proceed as follows: Subtract the small diameter from the large diameter of the tapered portion, divide the result by the length of the taper and multiply the quotient by the length of the work, and finally divide by 2. Suppose a piece of work is 12 in. long and only 6 in. of its length is to be turned tapering, the diameter of the large end being 2 in. and the small 1½ in. Using the preceding rule, subtract 1½ in. from 2 in. and the remainder will be ½ in. Dividing the ½ in. by 6 in., the length of the taper, the decimal problem will be .5 in. ÷ 6 in. = .0833+ in. Multiply the result by the full length of the piece, .0833+ in. × 12 in. = .9996+ in., and this divided by 2 gives .4998+ in., or about ½ in., the amount to set over the tailstock.

Then again, on such a piece of work where only the taper per foot and the length is given, the amount to set over the tailstock must be determined as follows: Divide the taper per foot by 12 which reduces the taper to the inch. Multiply this result by the length of the work and divide by 2. Suppose a piece of work 12 in. long is to be turned to a taper of ⅛ in. to the foot. As the rule states divide the taper per foot by 12. The problem in decimals is, .125 in. ÷ 12 = .0104+ in., the taper per inch. Multiply this amount by 12 in., the length of the work, and the result will be .1248+ in. Divide this amount by 2 and the result will be .0624 in., or about 1/16 in., the amount to set over the tailstock. —Contributed by Harold E. Murphy, Westerly, R. I.

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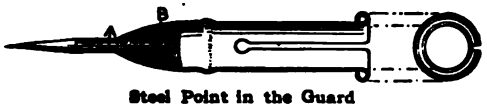
## Holding Water in a Tank while Replacing Valve

A large tank placed in the back yard and supplying the house with water had a 1½-in. gate valve in the main line that developed a leak. It was found that a new valve must be put in place of the old one. The

problem was to remove the old valve and put in the new without emptying the tank. The job was accomplished by stopping up the end of the pipe in the tank with a brick covered with clean rags. The rags were tied around the brick which was lowered with a cord into the tank near the pipe opening. When the pipe was disconnected at the union above the valve, the first rush of water drew the rag-covered brick over the end of the pipe and stopped the flow of water. When the new valve was replaced, the brick was removed.—Contributed by L. W. Javete, Honolulu, T. H.

### Weighted End on a Pencil

A very useful draftsman's device, to keep a sharpened pencil from breaking when it drops to the floor, may be made in the following simple manner: Take a pencil-point guard and a com-



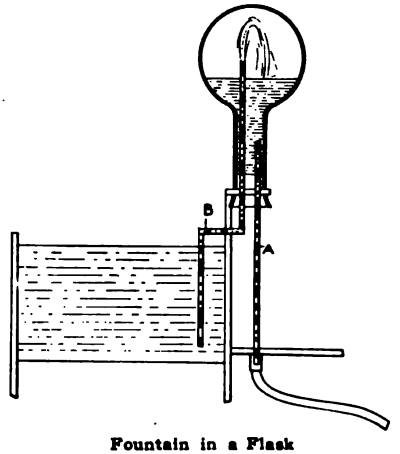

Steel Point in the Guard

pass point or a point made by filing and hardening a piece of steel wire; notch the large end of this point A to lock it into the solder B, which may be poured into the open end of the thimble, the point being previously forced through the guard from the inside.

When the pencil rolls from the board with the weight on the eraser end, this end will strike the floor first, and the sharp point will stick therein, thus saving the pencil point from breaking.—Contributed by L. L. Williams, Cleveland, O.

### A Fountain Window Display

An attractive window display for a drug store or soda fountain can be made of an inverted flask which is supplied with water through tubes in the manner of a siphon, causing a miniature fountain within the flask. The two tubes, A and B, entering the flask must be of the same size. They are fitted tightly in holes in the cork of the flask. The flask is partly filled with

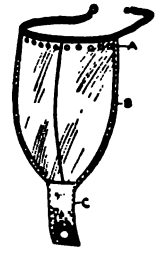



Fountain in a Flask

water. The relative positions of the tubes must be as shown in the sketch. The flow of water is started the same as a siphon. The waste water, flowing from the tube A, may be caught in a vessel and returned to the tank. —Contributed by W. J. Archibald, New Westminister, B. C.

### Face Protector for a Motorcyclist

A good face protector for motorcyclists' use in the winter can be made of a piece of celluloid. The celluloid is cut in the shape shown in the illustration, and a wire, B, is stitched in the edges to keep it from cracking and to hold it in shape, says Motorcycling. Holes for ventilation are cut as shown at A. Elastic bands are attached at the top to go around the head. The lower end C is shaped to be fastened under the coat. Such a protector will not steam or crack in the winter wind.




¶The insulation on fine enameled wire can be easily removed by drawing the wire between a fold in fine emery paper.

## Color Harmony in Painting

Color harmony is, or ought to be, a very important subject to the painter, says a correspondent of the Painters' Magazine. A working knowledge of color harmony can be acquired only by long experience.

The primary colors, which cannot be made by mixing two or more colors together are red, blue and yellow. The colors obtained from mixing any two of the primary colors together are called secondary colors. There are three secondary colors, namely, purple, green and orange. Red and blue give purple, blue and yellow make green and red and yellow produce orange.

By mixing any two of the secondary colors together we get what is called the tertiary colors, citrine, olive and russet. Thus, orange and green produce citrine, green and purple make olive and orange and purple give russet. Black and white are not regarded as colors.

A good black can be produced by mixing the three primary colors together in proper proportions. By adding white to any color you produce a tint of that color. By adding black to any color you get a shade of that color. This is the difference between "tint" and "shade." Black subdues or lowers the tone of any color to which it is added.

To preserve the richness of colors when you wish to darken them, use the primary colors instead of the black; for instance, to make a yellow darker, use red and blue; to blue add red and yellow, and so on. Every shade or tint of color required by the painter can be made from red, blue and yellow with black and white.

To make any of the umbers or siennas lighter in color and to preserve the clear richness of tone, always use lemon chrome instead of white. If you want a subdued or muddy umber or sienna color, then use white.

The most useful primary colors are: Yellows—lemon chrome, deep ocher; reds—vermilion, Venetian red and crimson lake; blues—Prussian blue and ultramarine.

Gold and silver leaf harmonize with all colors, and with black and white in small quantities, and can be used to bring into harmony the most glaring colors.

Some colors never look well on large wall spaces. Blue is not a good color to use in large quantities unless there is a transparent effect obtained by glazing over with a light ground, and even then the effect is depressing. Red on walls makes a room look smaller and absorbs light. Yellows give light and airiness to any room and will reflect light.

The best colors to use in large quantities for churches and public halls are, primrose yellow, terra cotta (white, burnt sienna and lemon chrome), all tints of ocher, flesh color (white and burnt sienna), pea green, apple green, gray-green (white, paris green and a touch of black), ivory shades (white, lemon chrome or ocher), old rose (white, ocher, Venetian red or pure Indian red and black), nile blue or nile green (white, Prussian blue, lemon chrome), light citrine, light olive or light russet.

For ceilings, the best tints are the creams, or ivory tints and grays. Creams and ivory tints are made from white tinted with one or more of these colors: lemon chrome, orange chrome, ocher, raw sienna. To produce a warmer tone add a small quantity of burnt sienna, vermilion or Venetian red. To produce a colder tone use a little green, black, raw umber or blue.

Grays are made from white, tinted with either black, black and green, blue and umber, black and red, red and blue or burnt sienna and blue. Light colors are always to be used for ceilings in preference to darker colors.

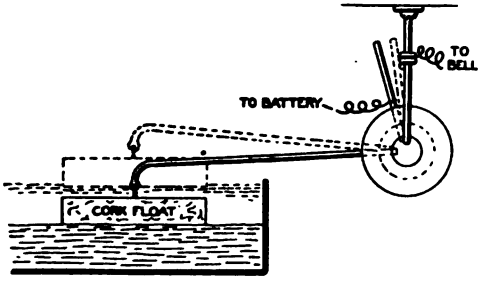
A knowledge of color harmony is

even useful in outside painting. For instance, if you want to find a good color for a trim in contrast to any primary color, use the other two primaries together, thus—principal color used, red; trim, green (blue and yellow). Principal color, yellow; trim, purple (red and blue), and so on, remembering that black and white and shades of gold color can be used for trim to any color.

There is no use trying to mix good clear tints with cheap materials. Only the best goods should be used. It is a good plan to procure a few tubes of artists' colors, imported if possible, as a standard to compare with the colors purchased.

### Alarm for a Drip Pan

Being annoyed by the overflowing of the refrigerator drip pan, I attached the small device shown in the illustration to the refrigerator to remind me to empty the pan before it would overflow. A cork float and a common spool with wires set into it at right angles comprise the outfit. The whole device was fastened with screws to the under side of the refrigerator. When the float has risen to the top, an electric circuit is formed, which rings a




Battery Connections to the Float

bell. The wires can be lengthened and bent to suit the size and depth of the pan used.—Contributed by Frank W. Preston, Paterson, N. J.

¶Test the heat of an oven with a piece of bond paper. If the heat turns the paper light brown, the oven is moderately hot.

### Type Made of Leather

A printer in a small town, not having large type of the desired size for a job, made up sufficient letters for his

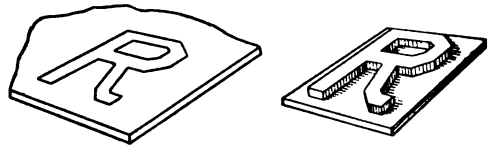


Fig. 1 Fig. 2

Leather Face on a Wood Block

needs from leather glued to blocks of wood. The leather used was the best quality patent leather not less than $\frac{1}{32}$ in. thick. The letter was laid out on the polished side of the leather, as shown in Fig. 1, and then cut out with a sharp knife. Each letter was glued to a block of wood, Fig. 2, making both together type-high, and weighted.

The type so made seemed to spread the ink better, making no air bubbles, and thus eliminating the small white spots usually seen on large ink surfaces.—Contributed by Homer H. Knodle, Decatur, Ind.

### Drilling a Hole in the Joint of Two Pieces

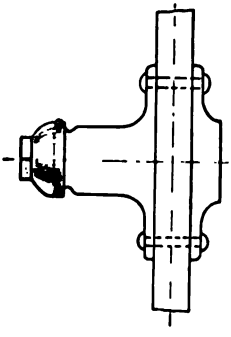
Put the pieces to be drilled, one at a time, into the shaper and with a V-shaped tool just mark the work along the centerline the drill is to follow. When the work is put together, there is a very small hole for the center of the drill to follow, says American Machinist. By using a small drill first, to widen out the hole, other drills can be easily held in their course.

¶A good paint for ironwork is composed of best French yellow ocher, 39 lb.; lampblack, 1 lb.; raw linseed oil, 54 lb., and Japan drier, 6 lb.

¶The ways of a lathe should never be used to knock the file on for removing filings.

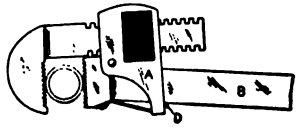
### Fastening Automobile Hub Caps

Place the cap on the hub and drill three holes through the cap and into the hub. Tap these holes for suitable machine screws. The screws will hold the cap securely, and the whole presents a neat appearance. —Contributed by O. L. Bontz, Greenville, Pennsylvania.



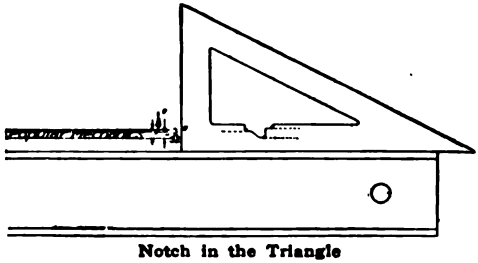
### How to Use a Pipe Wrench

Pipe can be very easily crushed with a heavy pipe wrench, if the workman does not understand its use. A correspondent of Power suggests placing the wrench on the pipe and pulling lightly to get the jaw to take hold, then slacking off on the nut until the frame A comes in contact with the handle B at D, as shown in the sketch, thus preventing the jaws from closing. The wrench then has power to turn, but not to jam, the pipe.




### Letter-Ruling Triangle

A simple device for ruling a drawing for letters can be made of an ordinary triangle, as shown in the sketch. The notches are cut to the desired depth for each line. By placing the point of a pencil in the notches and sliding the triangle along the T-square, light and uniform guide lines may be quickly drawn.—Contributed by C. S. Orcutt, Buffalo, N. Y.



Notch in the Triangle

### A Hardening Mixture

The following mixture produces a temper in tools that will not "bend or break":

| | |
|---|---|
| Whale oil | 1 gal. |
| Tallow | 4 lb. |
| Beeswax | 1 lb. |
| Rosin | ¼ lb. |

Make a brine that will bear up a fresh egg, adding to it 2 oz. of saltpeter and 1 pt. of vinegar for every 12 qt. of brine. Put this into a tank or other suitable receptacle and cover with the above mixture.

For lathe and planer tools, and also for milling cutters, dip into this bath, letting the tools cool in the brine, but do not draw the temper. For tempering springs, the first solution is most excellent. In this case it is used alone without the brine. In the usual manner of tempering springs, dip the work into the solution when it is at the proper temperature. When it has ceased to "sing," hold over the fire and blaze off the oil, then allow to cool in the air.—Contributed by Donald A. Hampson, Middletown, N. Y.

### Easy Way of Removing Corks

Corks that have been replaced in bottles are often hard to pull out again. Especially is this true when one is in a hurry and has neither the time nor patience to hunt for a corkscrew or a knife. To remedy this, take, before replacing the cork, a piece of thin white cloth about 3 in. square, and wrap the cork in it, tying it at the top with a piece of twine and allowing the cloth to extend far enough to take hold of with the fingers. The cork may be then easily removed.—Contributed by Louis Fisher, Kansas City, Mo.

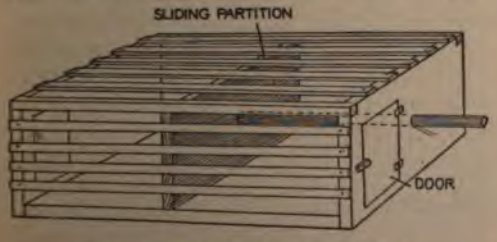

### Keeping Dampness from Tools

In most climates where excessive dampness prevails, the manner in which rust attacks edged tools is very aggravating. It will be found that a small open box of unslaked lime, kept in a corner of the tool box or cabinet and replenished from time to time, will absorb the excessive moisture and keep the tools in good condition.—Contributed by Bert L. Forse, Poughkeepsie, N. Y.

### Sliding Partition in a Chicken Coop

A good retaining pen from which to sell poultry may be had by building a coop of the desired size and placing in it a sliding partition for use in forcing the fowls toward the door at either end, enabling a person to take out one at a time.

The sliding partition may be used for dividing the pen into two compartments by placing the partition in the center of the coop. The pole which runs from the center of the sliding partition through a hole at one end of the cage for pulling the partition back and forth may be used also as a roost

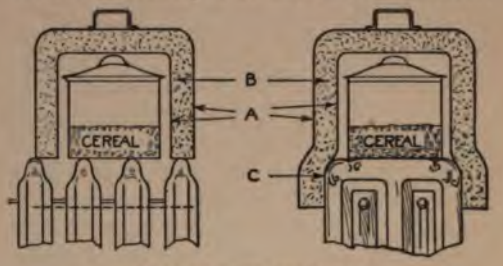



Partition Forces Chickens to the Door

when it is desired to leave the fowls in the pen for several days for fattening purposes. — Contributed by Monroe Woolley, Ft. Casey, Wash.

### A Radiator Cereal Cooker

The accompanying sketch shows a cereal cooker designed to use the heat of an ordinary radiator in conjunction with the principle of the fireless cooker.




Used as a Fireless Cooker

The device consists of a pail or other suitable receptacle in which the cereal may be brought to a boil, and a cover consisting of two tin shells, A, with about 1½ in. of insulating material, B, between. The cover extends downward below the top of the radiator C, on two sides, to retain the heat better, and it is readily set over the pail after it is placed on the radiator.—Contributed by W. E. Morey, Chicago.

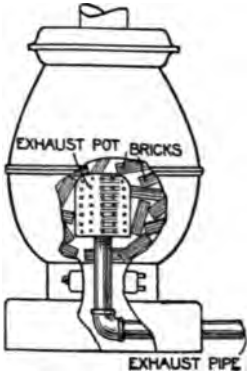
### Draining Water from an Automobile Gas Generator

Drill or punch a ¼-in. hole in the bottom of the water tank over the carbide basket. Cut threads in a nut with a ¼-in. pipe tap and solder the nut over the hole. Procure a ¼-in. faucet or pet cock and turn it into the threads of the nut. Use white lead on the threads.

In cold weather the water may be easily removed by turning the faucet after removing the bottom carbide can. —Contributed by Earl R. Hastings, Corinth, Vt.

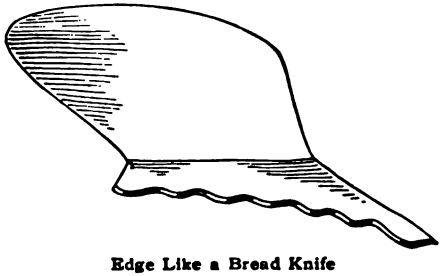
### Heating Stove with Gasoline-Engine Exhaust

An inventive miller utilized the exhaust from his gasoline engine to heat his office stove in cold weather. The stove was an ordinary coal stove and the exhaust pipe was run from the engine to its base. The pipe was wrapped with asbestos to prevent loss of heat. The muffler, or exhaust pot, was screwed on the pipe in the lower half of the stove and a number of bricks placed over and around it. The smoke and fumes from the exhaust pass out through the chimney. The stove keeps the office well warmed, and, as the bricks hold heat for some time, the room is kept warm long after the engine is stopped.—Contributed by Irl R. Hicks, Hallsville, Mo.




### Plowshare for Alfalfa

Anyone that has ever plowed alfalfa sod knows how hard the roots are to cut. In plowing many of the roots are not cut off. I had a field of alfalfa at one time that I was unable to plow, as my team was too light to draw the plow through the roots. After thinking it over for a time, I decided to make the edge of my plowshare like the cutting edge of a bread knife. The edge was ground on an emery wheel as shown in the sketch. I had no trouble in plowing the field. The roots slip over the scallops and are cut off easily and clean.—Contributed by A. S. Thomas, Amherstburg, Ont.

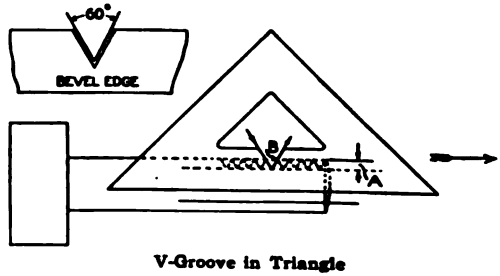


Edge Like a Bread Knife

### Drawing the Pitch of Threads

Sometimes it is desirable to show threads in full on a drawing instead of using the conventional methods. The best way to draw these threads is to add a V-notch of 60 deg. in the triangle, as shown in the sketch, and bevel its edges. The part to be removed must be carefully marked and cut out, and the edges dressed straight with a common file. The beveled part makes a thin edge to keep the ink from running under the triangle.

For all ordinary threads the triangle will be self-spacing, and all that is necessary to draw them are the construction lines for the top and bottom of the thread A. The triangle is set against the T-square so that the point of the pencil or pen will just touch the bottom construction line, then, when the pencil point is at B, the triangle is moved along until the opposite side of the notch touches the pencil point, when the operation is repeated. With a little practice the threads can be drawn very rapidly.—Contributed by H. G. Clay, Washington, D. C.

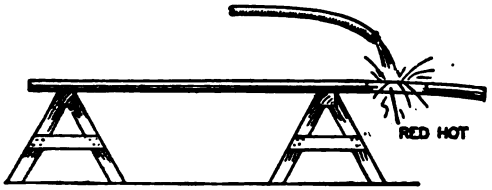



V-Groove in Triangle

¶Coffee can be made without a fire by setting the coffeepot on a piece of limestone and banking sand around the lime and pot so it cannot turn over, and then pouring water on the lime. In a few minutes the coffee will be boiling.

### Straightening a Small Bend in a Large Shaft

Place the shaft upon the horses and set a forge under the bend and heat it to a bright red, then remove the forge or roll the shaft along the horses until it clears the forge and turn the shaft so that the bow will be up. Apply a small stream of water on the center of the bow. This will cause the top to cool and contract while the lower side remains hot, thus stretching the lower side and straightening the shaft. I have tried this on a large screw, 5 in.




Straightening by Contraction

in diameter, and the results were satisfactory. If a lathe is not available to make a test for straightness, use a straightedge.—Contributed by F. J. Schenck, Hugo, Okla.

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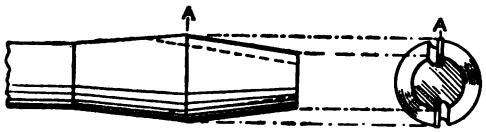
### How to Make a Taper Reamer

Turn a piece of brass or cold-rolled steel to the same size and taper as the hole to be reamed, leaving it long enough to be held in the chuck. Saw a slot lengthwise of the tool on each side of the tapered part and remove the metal on the cutting side to make a flute for clearance.

Procure two pieces of a broken hacksaw blade—power saws are the best—and solder each securely in the slots cut in the tapered part. Grind the outer edge of the saw blades to form a cut-

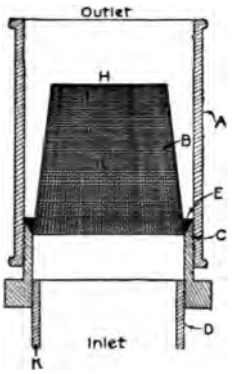



Cutter Made of Hacksaw Blade

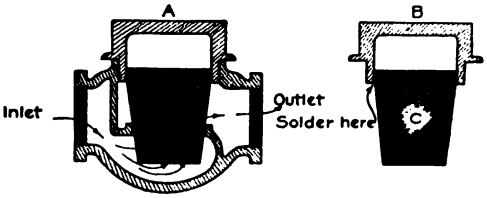
ting edge and to make the same taper as the tapered part. This will make a very good and cheap reamer.—Contributed by M. Hohn, Chicago.

### Sediment Kept from House Water Pipes

The same principle of placing a strainer on the gasoline pipe near a carburetor can be used on a larger scale for a simple, efficient and inexpensive strainer for eliminating foreign matter, such as vegetable matter, sand, etc., in the water in many localities, and thus preventing it getting into the house pipes, water meters, steam boilers, etc. It is especially valuable on pipes from 1 to 2 in. in diameter. About the only cost is the bare fittings, and it requires no mechanical skill to put it together.




An extra-long pipe coupling, A, is fitted with a fine, strong brass screen, B, formed into a frustrum, and a flat top, H, is soldered to it. This is soldered to a bushing, C, at E. A union can be used on the nipple end




Screen in a Check Valve

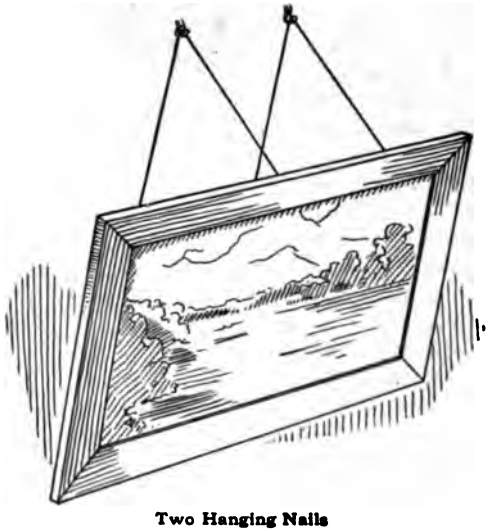
K, so that the screen may be removed with little trouble when it requires cleaning. A tee with a blow-off valve can be attached, instead of the union, and the filter cleaned in a few seconds by opening the valve and allowing some of the water in the outlet side of the pipe to flow back.

Another simple way is to secure an old check valve that has been discarded as worn out, and fit the screen in it. Unscrew the top and remove the disk and stem. Shape a piece of screen, C, the same as described, and solder it to the top as shown at B. Screw on

the top, as at A, and you have as fine a screen as can be bought for delivery pipes. To clean this type of strainer, unscrew the top A, and wash out the screen.—Contributed by Jas. E. Noble, Toronto, Canada.

### Hanging Pictures

A large picture hung by one wire is hard to keep in place so that it will always appear straight, as a slight jar



Two Hanging Nails

or a gust of air may shift it. An improvement in the hanging can be made by attaching two wires as shown in the sketch. The hanging can be better accomplished and the picture held more firmly in place in this manner.—Contributed by Frank Rosenberg, Worcester, Mass.

### Removing Carbon Deposits in Gasoline Engines

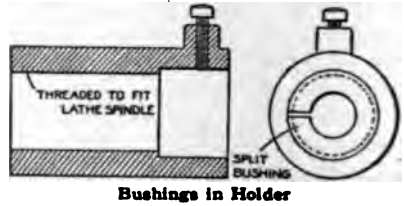
Carbon deposits in a gasoline engine cause considerable trouble, and while scrapers can be used in some engines, others must be taken apart to remove the carbon.

A very simple way is to use two metal pot washers in the following manner: If you have a 4-cylinder motor, remove the valve caps from cylinders one and four, then put one of the washers and about 1 pt. of kerosene in each cylinder. Replace the valve caps and remove one and four spark-plug wires. Start the motor on cylinders two and three and allow it to run about 10 minutes, then remove the washers with a wire hook. Do the same with cylinders two and three. On a 6-cylinder motor three cylinders can be cleaned at a time.—Contributed by Fred Grinham, St. Louis, Mo.

### Chuck for Cold-Rolled Steel

Few lathe chucks can stand the hard and varied service they receive and have their jaws remain straight and true after a couple of years of steady work. For holding work of standard size, such as pins, bushings, etc., but more particularly for holding the commercial sizes of cold-rolled steel, the device shown in the sketch is of great value.

It consists of a body of cast iron which is threaded to fit closely on the lathe spindle when in position. The front end is bored out as shown. This gives a recess concentric with the motion of the lathe. A boss provided for a setscrew is drilled and tapped. Bushings are made with the holes to receive the standard sizes of steel and their exteriors turned to fit closely in the recess of the improvised chuck. Make as many of these bushings as there are sizes of stock, split them and one has attachments that will prove invaluable.




Bushings in Holder

If the fitting has been well made, the "squeeze" of the setscrew will not throw the work out of true over 0.001 in.—Contributed by Donald A. Hampson, Middletown, N. Y.

¶A lathe center should be in first-class shape to do first-class work.

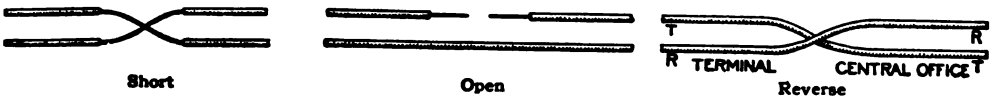
# Tracing Down Telephone Troubles

By GEORCE M. PETERSON

## PART I

### Terms

An explanation of the principal terms used on "trouble" is the first thing which must be understood in order to arrive at the fundamental principles of the art of galvanometer work, or, as the common expression goes, "shooting trouble." The terms in use on telephone troubles are, "short" or "short circuit," "open," "reverse," "split pair," "ground," "cross" and "transposed pairs," and are defined as follows:



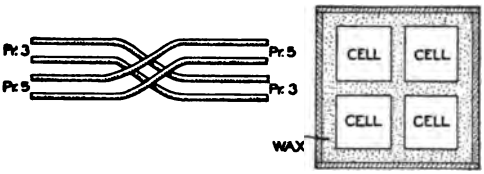

Short Open Reverse

A "short" is the term applied to a pair of wires from which the insulation has become removed in some manner, so that the two wires touch each other. An "open" indicates that one or both wires of a pair are broken, thereby causing an open circuit. A "reverse" signifies that the two sides of a pair of wires are either reversed in the sheath or quite often in a splice. A "split pair" shows that in some manner, usually due to clearing trouble, one wire of a pair has become separated from its mate and is working with an odd wire—possibly the mate to a wire which is in trouble.

A "ground" is the most common of all cable troubles and is used to indicate that in some manner the electric current has broken through the insulation and is leaking to ground. This is sometimes caused by the insulation being torn off or broken, although grounds are usually the result of moisture entering the cable. The two causes can be readily separated, on account of the fact that a moisture ground will nearly always affect more than one wire, while a ground due to mechanical troubles usually takes but one or two wires at a time. A "cross" indicates that the insulation of one wire of two or more pairs has broken down or leaked so that they are touching each other. A "transposed pair" means that the wires are improperly fanned out in the central office or cable terminal box.

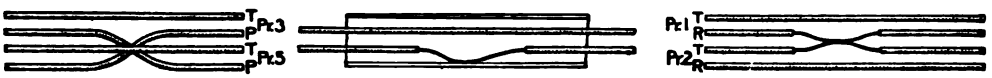
### Instruments

A voltmeter having a range of from 0 to 150 volts, a portable battery having an electromotive force (E. M. F.) of from 100 to 130 volts, a Wheatstone bridge, a fault finder, a buzzer test set, a galvanometer and an induction test set usually make up a trouble man's outfit. These instruments must be purchased from some maker of standard goods, but the battery and buzzer test set can be made in a short time and will give better satisfaction than any which can be purchased complete.



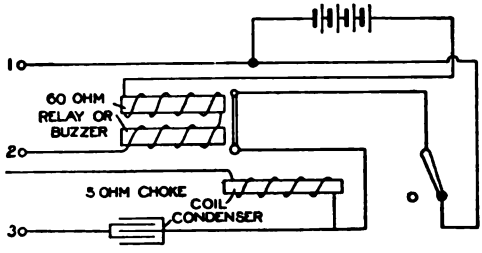

Transposed Pair Battery in Box

The battery consists of 40 pocket flashlight batteries, each one of which has an E. M. F. of 2½ volts. A box is made in which to place the battery for carrying purposes. As the batteries each measure about 3 by 3½ by ¾ in., and are usually placed two wide and two high, the carrying case should be about 7 by 8 by 10 in. inside dimensions, to allow space for the paraffin around each cell. The bottom of the box is lined with heavy paraffined pa-




Split Pair Ground Cross

per. The batteries are connected in series and placed in the box, the connections are carefully soldered to avoid loose joints, and the positive and negative wires, which should be of No. 14 gauge lamp cord, are led up to the binding-posts on the cover. Several layers of heavy paraffin paper are placed between the rows of batteries and then the outfit is tested. If the test shows the battery to be perfect, the box is then filled with hot paraffin, care being taken to insure the wax getting into all the corners and inclosing the batteries in a solid cake. This will prolong the life of the battery 100 per cent, as it is protected from the deterioration due to dampness. The sketch shows a cross section of a complete battery.



Buzzer Test Set

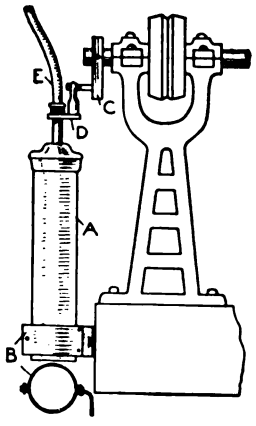
The buzzer test set shown in the sketch should be made up and placed in a small box having a shoulder strap for carrying it easily. This set has the advantage over the old style in that it does not always require a head receiver. The relay, or buzzer, can be used, and the earphone usually can be omitted.

*(To be continued)*

## Air-Pump Attachment for a Speed Lathe

The accompanying sketch shows how I constructed a blower-pump attachment for use with a gas blowpipe, which I mounted on my grinding and polishing table.

The pump A, which is a cast-off hand bicycle pump, is fastened to the table with a clip, B, such as is used to fasten such a pump to a bicycle frame. The clip was originally a double loop, but was cut down as shown, then drilled at the bent portion and fastened to the table with a wood screw, a washer being placed underneath to serve as a bearing.




A simple crank, C, having a stroke of 1½ in., was fastened to the polishing-head spindle with a setscrew. A small, flat, oval-shaped brass piece, D, was bored to fit over the stem of the pump plunger and an upright pin was inserted therein, which was bored to receive the crankpin. The air passes from the pump to the tank through a rubber tube, E. The pump oscillates with the motion of the crank, but on account of the flexibility of the rubber tubing, this is no drawback.—Contributed by Harry F. Lowe, Washington, District of Columbia.

## How to Make a Set of Steel Figures

Any machinist in a shop desiring to have a set of figure punches of his own can readily make them in the following manner: Usually enough discarded center punches or other punches can be found about a shop that will serve the purpose, but if these are not to be had, a length of tool steel, of the right size, can be purchased to make 10 pieces the length of the punches. Procure a flat piece of tool steel, about ½ in. thick, having sufficient surface to receive the 9 digits and the cipher to be placed on the punch ends.

One end of each punch must be forged out and squared, so that it will

receive the figure without much extending edge. They are then annealed, as well as the flat piece of steel.

Secure the loan of a set of steel figures from the tool room and sink each figure in the surface of the steel plate, while it is soft. Be sure to drive in a perfect impression of each figure. The indentation is shown by the figure 6 in Fig. 1. After all the figures are indented into the steel plate, dress up the surface with a very fine file to remove any bur that may have been raised by the punches, so that the indentation will be as shown, in section, in Fig. 3. After a perfect indentation of each figure is secured in the surface of the steel plate, temper it, and this die will always be ready to make any subsequent punches desired.

Take the prepared punches and remove by drilling any unnecessary metal for each figure the punch is intended to make. For the figure 6 the metal is removed by drilling two holes as

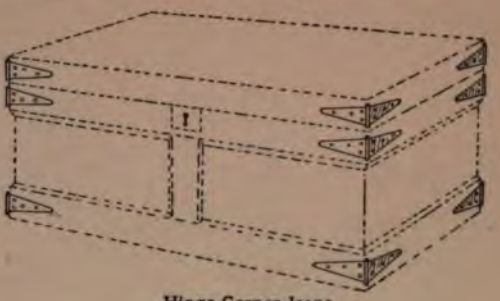

Fig. 1 Fig. 2 Fig. 3

Die and Punch Faces

shown in Fig. 3. Drill these small holes wherever possible and it will help the piercing die. Make sure the ends of the steel to be stamped are square. Stamp them all, cut and dress away the outside metal and any unnecessary metal remaining inside, until only the outline of the figure remains. Temper the ends and you will have as good a set of figures as can be purchased.—Contributed by Clement Howe, Plainfield, N. J.

## Corner Irons for Chests

A strong and inexpensive corner iron for boxes and chests that are heavy and much handled can be made by using light wrought-steel strap hinges. They also relieve the strain on the lock if two of them are fastened over the joint of the cover near the ends. The lower ends of these hinges can be fastened with screws while shipping, or they can be made



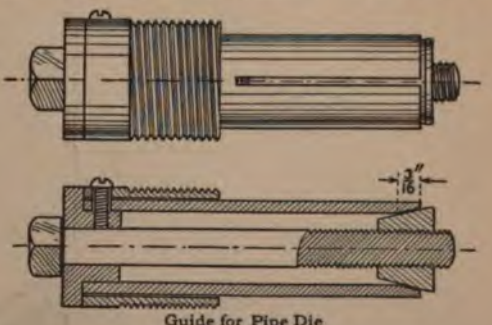
Hinge Corner Irons

to slip into staples made for the purpose.—Contributed by W. A. Lane, El Paso, Texas.

## Die Starter for Cutting Threads on Pipe

Many times the plumber or steamfitter must cut threads on broken pipes in places where it is impossible to work a regular stock and die. Without the stock it is hard to start the die, but a starter, as shown in the sketch, makes it possible to start a die on the square end of a pipe.

The way to use the starter is to screw the die on the threads backward and insert the small end in the pipe. The bolt is then tightened to hold it firmly in place. The die is next turned off the threaded portion of the starter and onto the pipe to be threaded. The screw



Guide for Pipe Die

feed will force it to go straight and cut the threads as it turns. The sketch plainly shows its construction.—Contributed by Sandford A. Larson, Denver, Colo.

### Weatherboard Spacing Gauge

Where one man is working alone, nailing on weatherboards, the device shown in the sketch not only gauges the part to the weather, but also holds the opposite end of the board. The gauge is made as shown in Fig. 1, with the length A equal to the amount of board allowed to the weather. After two or three boards are put on, shove the spring up under the last piece of siding and then place the next piece on top in the notch. —Contributed by D. L. Kellogg, Stillwater, Minn.

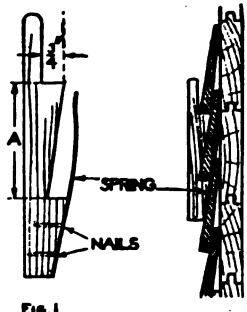


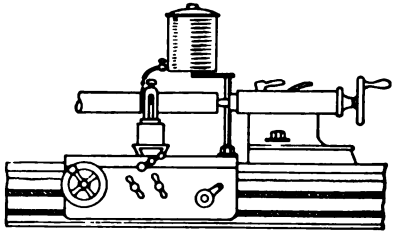
Fig. 1

Fig. 2

### Oiler on a Lathe

Most lathes in ordinary machine shops are not equipped with a can for dropping lard oil on cutting tools. Having a large number of pieces to cut off recently, I rigged up a can in a few minutes, as shown in the sketch. A milling machine close by being idle at the time, I used its oil can.

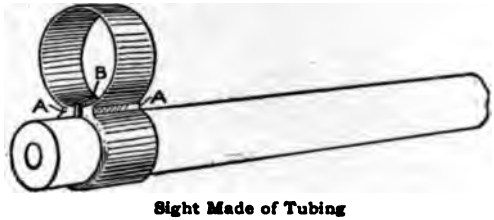
The can has an arm about 7 in. long and swings on a short tapered post driven into the housing of the milling machine. All I needed was a 5/8-in. bolt, about 10 in. long, with a 2-in. length of thread on the end. I sawed the head of the bolt off, so that it would allow the can to swing over the tailstock of the lathe and tapered the end to fit the arm of the can. A nut and washer was run well up on the thread and another nut run on just far enough to have a full thread. I inserted the bolt in the slot at the rear end of the carriage and turned the top nut down on the washer. This made a rigid post for my can. The oil can may be swung in any position to follow the movement of the tool. When not in use, it can be swung out of the way or detached entirely in a moment.—Contributed by H. L. Raabe, Akron, O.


Oil Can on Arm

### How to Make a Globe Sight

A handy globe sight for a single-barrel shotgun or rifle may be made of two 1-in. pieces of thin brass or steel tubing. The pieces may be of the same diameter, or one may be larger than the other.

Connect the two pieces with two ribs of solder as shown at A A, then file a slot through the pieces to separate them. This permits the sight to be slipped over the muzzle without removing the bead sight B at the point. The section to be slipped on the barrel should be of the same diameter as the barrel so that when the slot is cut, it will expand enough to slip on and fit tightly.—Contributed by Jas. M. Kane, Doylestown, Pa.



Sight Made of Tubing

### Use for Old Blueprints

In many establishments blueprints accumulate until the quantity reaches amazing proportions. Some concerns keep a record and file of all prints made and at fixed times destroy the old ones. It makes no difference what method is used in handling them, at some time great quantities of these prints are destroyed in some way and the paper is a total loss. In addition to this,

at the time of printing, there is sure to be a certain waste due to poor exposures, blotchy paper, etc. A method for turning this waste into a useful article is presented by a correspondent of the American Machinist.

These old or useless prints may be bleached by immersing them in a soda bath, containing 4 oz. of soda to 1 gal. of water. If it is desired to bleach only a portion of the print, this may be done by painting that part with this solution. By washing the prints in fresh water, after bleaching, any discoloration is prevented. The blank paper thus obtained furnishes a fair grade of sketch paper, and there are numerous other ways in which it may be used.

### A Lineman's Screwdriver

Every lineman has use for a screwdriver, but this tool is not always a handy thing to carry. A screwdriver point to be used in connection with the pliers is made as follows: Cut a piece of ⅛-in. steel 3 in. long, and shape it as shown in Fig. 1. Then shape a piece of steel to just fill the opening A, Fig. 2, in the pliers. This latter piece is grooved to receive the end of the screwdriver point, then they are riveted together. In use, the large end

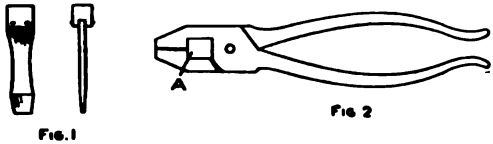



Fig. 1 Fig. 2

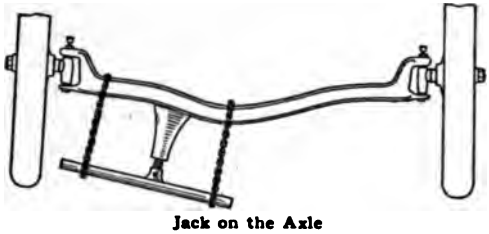
Screwdriver Blades for the Pliers

is placed in the opening A, and the jaws of the pliers closed tightly.—Contributed by John H. Selden, Lynn, Mass.

### Straightening an Automobile Front Axle

Quite often, through accident, the front axle of an automobile is bent out of line. To straighten the axle it is either necessary to remove it and place it in the fire or to straighten it cold. Heating an axle destroys a certain part of its strength, therefore it is best to straighten it cold. This can be done quite well in the following manner without removing the axle from the car:

In the first place it is necessary to have a steel shaft stronger than the



Jack on the Axle

axle to be straightened, a couple of chains and a screw jack, all of which may be procured with very little trouble. By placing the chains around the axle and shaft as shown, with the jack between them, the axle may be straightened by turning the screw. I have straightened axles on heavy cars in this way, without removing them from the car.—Contributed by J. N. Bagley, Superior, Neb.

### Making Blueprints from Blueprints

The making of a blueprint from a blueprint is described by a correspondent of Machinery, as follows: To obtain good results, a clear, sharp and rather dark print is essential, for if it is blurred or light, it will not reproduce satisfactorily.

The method consists of coating the print with a little kerosene and then printing immediately. The oil used will not affect the reproduction of the new print, unless it is applied very thickly, nor will it spoil the original, as the oil soon dries, leaving the print in as good condition as before. This process will also work perfectly when it is desired to make prints from heavy drawings. It has been used with success to make blueprints from printed matter. To make the original perfectly transparent, apply a coat of boiling hot paraffin.

¶Anti-fatigue metal is vanadium steel which has very great resistance to repeated shocks.

# The Art of Stencil Making

By HOMER H. KNODLE

## PART III—DESIGNS

Originality is the key to success in stencil making, and although the designs and descriptions given in this article present some of the principles of the art, the resourceful worker can secure hundreds of others by additions to and variations of them.

FIG. 18

FIG. 19

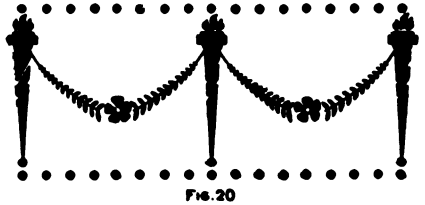


FIG. 20
Border Designs

Each design given is original and anyone may use them, keeping in mind that slight changes may add individuality and insure a design different from that used by any other decorator.

A very light border, formed entirely of even lines, is shown in Fig. 18. This is drawn by laying out the square and then drawing in the diamond shape by means of the 45-deg. triangle. This design also can be made to represent a rope border by leaving narrow binders across the face at regular intervals. The stencil should not be made wider than 4 in. and the width of the line in proportion.

A straight, geometrical border, formed of parts of a circle, is shown in Fig. 19. First lay out the inclosing square and therein draw the four circles; then divide the center so that the parts that are to show will be of even length, and the design is finished. This border can be made as large as 6 in. with the lines in proportion. It may also be varied without destroying the effect. For instance, the small circle in the center may be made larger.

A wide border, demanding light treatment, is shown in Fig. 20. This design should be from 6 to 18 in. wide, and the dots of such a size that all will be in proportion.

A combination of very light and heavy treatments is shown in Fig. 21. This is appropriate only in very dark corners and out-of-the-way places. The scroll can be ornamented as desired, but should not bear too much detail.

A design which can be adapted to almost any space is shown in Fig. 22. It may be made about 6 in. high and repeated for a border design, or, if made larger, may be used for a panel. In case it is made over 1 ft. high, it should be narrower than the sketch shows.

A centerpiece can be made by stenciling several times around a center. This will produce a heavy effect. In planning a centerpiece it should be remembered that it may be used only with a tint of the body color. Almost any style of leaf design can be adapted to this outline, and with a little ingenuity a large number of designs can be worked out from this motif.

A design for heavy treatment intended for a centerpiece is shown in Fig. 23. This design can be made from 8 to 40 in. in size. All sizes over 20 in. are made in half and the stencil repeated to complete the design. For a room longer than it is wide and having enough ceiling space, this design will prove valuable as a centerpiece with other designs placed around it.

A very appropriate design, either for a panel repetition or as a border, is shown in Fig. 24. When used as a panel, it should be surrounded by a square or rectangular light border of

some plain design to mark the real outline of the panel. If repeated as a border, it should have a light border on either side to offset the commonplace effect of repetition. This design is made by first drawing a circle and sketching in the point and the bottom outline. Inside of the circle, draw a line to denote the bottom of the leaves and sketch in the vertical leaf, and, with the use of the two triangles, separate and combined, draw at the proper angle the centerline of each succeeding leaf, which, in this case, is easily done. This design should not be made smaller than 10 in. Many different designs can be devised from the general outline of this figure.

A light design to fill the requirement of an artistic combination of lines in a panel or wide border is shown in Fig. 25. The layout is the same as shown in the complete design. The lines should be of proper width to balance well, but aside from that no special effort need be given to it.

The design shown in Fig. 26 is another that can be used in the same positions and under the same conditions as the one shown in Fig. 24. It is merely a different treatment of the same idea.

An oval design is shown in Fig. 27.

Fig. 21

Fig. 22

Fig. 23

Border and Centerpiece Designs

Fig. 24

Fig. 26

Fig. 25

Fig. 27

Fig. 28

Fig. 29

Panel Designs

This will appear well in a border, if not made more than 3 in. wide. Use care in forming the leaves to have them the proper shape and size, as the design is entirely in the form of leaves.

A heavy design for a centerpiece is shown in Fig. 28. This is excellent when used with a darker tint of the body color. The effect can be heightened by outlining the work with a color or shade of contrasting tint. In making the stencil, only half of the design shown need be made; but if the design is drawn small enough, it is well to make it all in one piece. The circles of the design, where the leaves appear, are drawn first and then the design drawn in the finished form. Draw in the denture ovals and finish the design with the parts as shown.

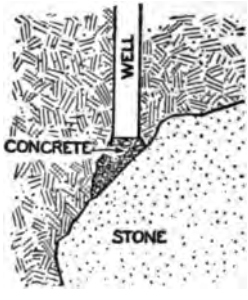
Another design for a centerpiece is shown in Fig. 29. This piece is laid out by means of the compass and triangles. After the circle is divided the work of sketching in the detail is easy, if care is taken to follow the original closely. This design is applicable to almost any size, and the figures can be enlarged or made smaller to suit the size of the stencil. Take care to keep every part in proportion.

In making stencils of any kind, always be careful to place the binders correctly and have them in sufficient numbers to hold the inside parts. As the placing of the binders in a stencil is the last thing in drawing a design, and as they could not be clearly marked in designs so small as the ones illustrated, it was thought better to leave them out.

*(To be continued)*

### Drilling Well on a Slanting Stone

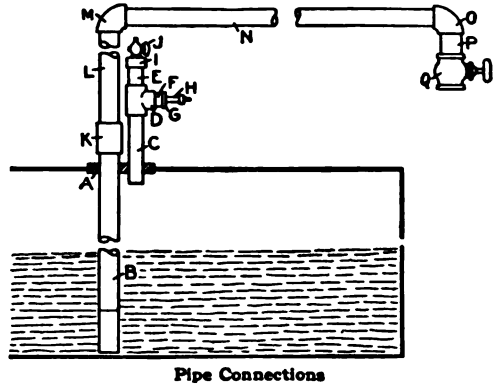
When a slanting rock is struck in boring a well, the drill will push to one side and not enter the rock on a straight line. This trouble can be overcome by mixing some cement and fine stone and pouring it into the hole. Allow the cement to set 24 hours, and the drill will cut through the concrete and stone in a straight line.—Contributed by J. S. Grant, Winchester, Va.




### Removing Gasoline from a Barrel

If gasoline or oil is kept in a barrel, it is slow work to draw the liquid out through a faucet or bibcock. Also there is apt to be considerable waste.

The illustration shows a compressed-air apparatus which will remove the oil from the top or bung of the barrel. The apparatus can be made by anyone who has a few tools as the pipe can be purchased cut in the right lengths, or they can be cut by anyone having a diestock. A plug, A, having holes to receive a ⅜-in. pipe, B, and a ¼-in. pipe, C, is fitted in the bung of the barrel. The connections on the pipe C, are a ¼-in. tee, D, and two nipples, E and F, each 2 in. long, on which two ¼-in. caps, G and I, are fitted. The caps are drilled, tapped and fitted with a tire valve, H, and an air cock, J. The ⅜-in. pipe B has connections as follows: Coupling K, with pipe L, has an el, M, to which the long pipe N is fitted, with end connections of an el, O; nipple, P, and a globe v

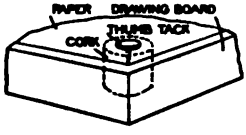



Pipe Connections

All joints should be lubricated with rosin soap before screwing the parts together. The pipes L, N and P may be of such lengths as to carry the oil to a handy place. Pressure is applied to the oil through the valve H. An automobile tire pump can be used for applying the pressure. When the desired quantity of oil is secured through the valve Q, open the air cock J, and allow the air pressure to escape.—Contributed by Earl R. Hastings, Corinth, Vermont.

### Cork Corners in a Drawing Board

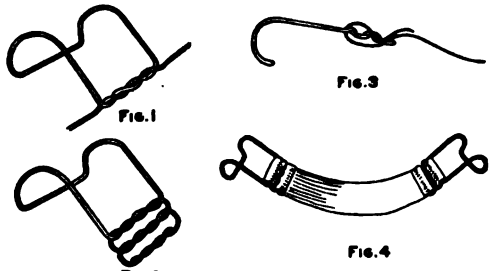
While fastening a piece of drawing paper on my drawing board I noticed at each corner there were many small holes, made by the thumb tacks which were used to hold the paper. I decided to remedy this and at the same time make an improved drawing board.




I bored ¾-in. holes at each corner of the drawing board, procured four large solid corks, and pressed them firmly into the holes. The tops were trimmed off flush with the surface of the drawing board. The thumb tacks can be easily pushed into and removed from the corks. The tack will hold the paper as firmly as if it entered the wood of the drawing board. The corks can be taken out and replaced when they become full of tack holes.—Contributed by Chas. Homewood, Waterloo, Iowa.

### Bathtub Seat

The holders for the seat are each made of one piece of heavy wire, the ends of which are bent at right angles, leaving 4 in. of wire straight in the middle. Both ends of the wire are bent in hook shape, so as to form a grip or roll over the edge of the tub. At a convenient distance from the hook part, the wire is again bent at right angles, so that the ends will lie parallel to the part of the wire forming the hook. The ends of the wire are twisted together as shown in Fig. 1, and are turned again and another twist made,

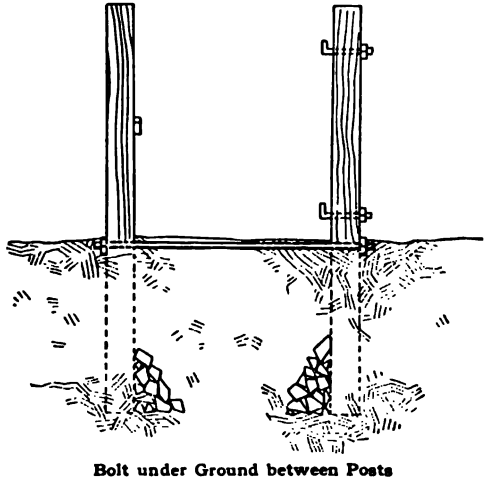



Wire and Web Connections

and then still another, as shown in Fig. 2. The ends of the web are woven into the twisted ends of the wire as shown in Fig. 3. The completed seat is shown in Fig. 4.—Contributed by John Dunlop, Craghead, Eng.

### Preventing Gate Posts from Spreading

Gate posts may be kept parallel vertically, without cumbersome braces, by connecting them beneath the surface of the earth with a long rod. When setting the posts, small rocks or bricks should be packed tightly on the inside of the lower ends. This construction will make a substantial brace, which

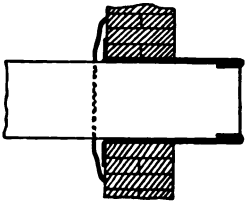


Bolt under Ground between Posts

will be out of sight and will effectively prevent the posts from spreading.—Contributed by Gilbert H. Holter, Jasper, Minn.

### To Hold Stovepipes in Place

A very practical way to hold a stovepipe in place is to bend two pieces of wire in the shape of hooks as shown by the heavy lines in the sketch, and put one on each side of the pipe in the chimney hole. The ends of the wire, turned at right angles, are covered over with the collar. The hooks will prevent the pipe from slipping into the chimney.—Contributed by C. H. Mount, Galesburg, Illinois.

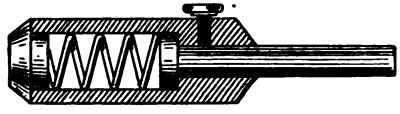


### A Roller Chair

Any straight-back chair can be easily converted into a roller chair for an invalid by the use of roller skates. Procure a pair of roller skates and cut each skate in two, crosswise, giving a complete roller for each chair post. The parts may be strapped to the posts, or a metal clip riveted to the skate top with an upright end for screwing to the leg can be used. This makes a very satisfactory invalid's chair, as the occupant can easily turn it in any desired angle.—Contributed by Mrs. Della Schempp, Broadhead, Wis.

### Caliper-Setting Tool

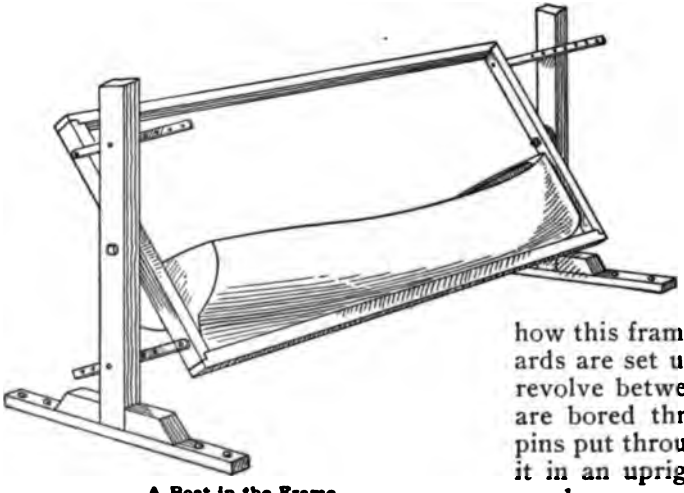
The device shown in the sketch has been designed and used by a correspondent of American Machinist for setting calipers accurately. It is placed between the micrometer anvil and head, the micrometer then being adjusted to the size required, and a small thumbscrew tightened. The spring inside is just strong enough to bring the plunger back in place.



Tool to Set Calipers

## Frame for Holding Boats while Building

Boat builders will readily recognize the value of the boat-building frame illustrated herewith. This device saves great deal of the labor in moving the boat about and allows the builder to readily place it in a position to work on any part.



A Boat in the Frame

Several frames can be made for the different-sized boats. The standards are 4 by 6-in. material, and the bottom piece of the swinging frame is 4 by 4-in., with the other parts of lighter material.

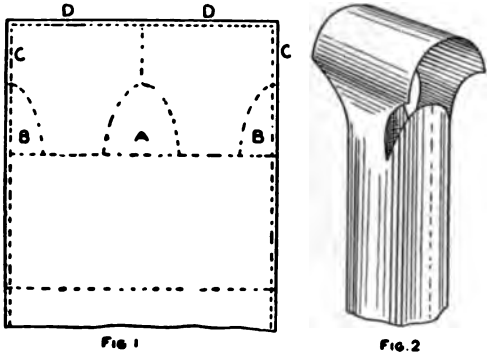
The illustration gives a good idea of how this frame works. The two standards are set up and the frame made to revolve between them on pins. Holes are bored through the standards and pins put through into the frame to hold it in an upright position. These pins can be removed and the boat swung so as to permit the builder to get at it easily from all sides, and without hav-

ing to lift it. Pieces are arranged at each end and connected to the standards. These are provided with holes and pins so as to hold the frame in any desired position while working. The boat can be turned completely over and the shavings easily removed. Care should be taken to make the frame perfectly square and solid, as the keel is laid on the bottom piece and the stem and transom squared up by the ends of the frame.—Contributed by James Bashford, Tacoma, Wash.

### Pipe and Hood Made of One Piece

A hood is necessary on a stovepipe used as a chimney, to keep out the rain and prevent the wind from checking the draft. Such a top piece with a hood can be made from one piece of metal. For a 5-in. pipe, mark a square, 16 by 16 in., on a piece of metal as shown in Fig. 1, allowing a ¼-in. margin at the top and sides for overlapping at the seams.

Draw a line across the center and draw a half ellipse, A, 4 in. at the base, then one-quarter ellipses, BB, 2 in. at the base. Also draw a line from the top of the ellipse A to the edge of the metal. Cut out the metal on the dotted lines, then bend the lower part into the form of a pipe and join the edges.

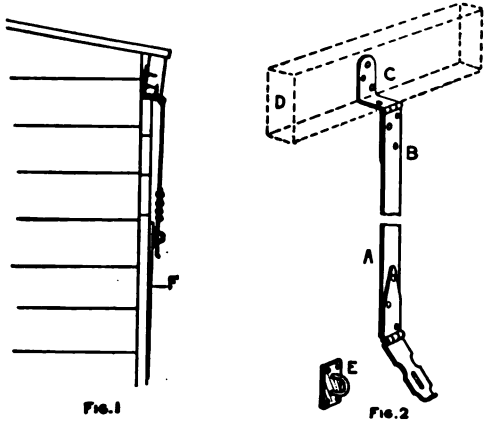


Pattern and Complete Hood

Shape the upper ends to form a half circle and join the edges DD. This will make the pipe and hood as shown in Fig. 2.—Contributed by H. Horace Romig, Allentown, Pa.

### One Lock for a Double-Door Coal Bin

The sketch shows a way of using one padlock to serve two purposes on a coal bin with a hinged cover. Both



One Long Hasp on Two Doors

the cover, which can be elevated while loading, and a small hinged door on the front may be locked with one padlock, as shown in Fig. 1. The device consists of one whole hinge hasp and a part of another.

One side of the hinge hasp, B, Fig. 2, is riveted to a strip of metal, A; the other side, C, is fastened to the cover brace D. The hasp is bent to conform to the shape of the cover brace and fastened with screws. The other hinge hasp is riveted to the lower end of the metal A. The hinge hasp E is fastened to the door F with screws.—Contributed by Victor Labadie, Dallas, Tex.

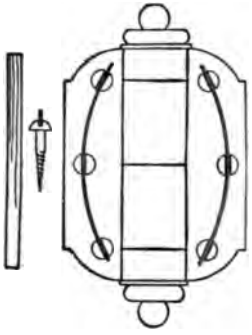
### Preventing Drill from Catching as It Passes through Hole

If a drill squeaks or catches on a burr as it breaks through the work, peen the corner at the heel of the cutting edge, slightly increasing the length of the edge. This will also cause a drill to make a slightly larger hole.

¶A radiator may be made to appear oxidized by painting it a dull yellow and, when dry, lightly smoothing it with sandpaper, then applying a thin coat of the desired color, a mere glaze, and rubbing out to imitate oxidizing.

### Screw Lock for Screen and Storm-Door Hinges

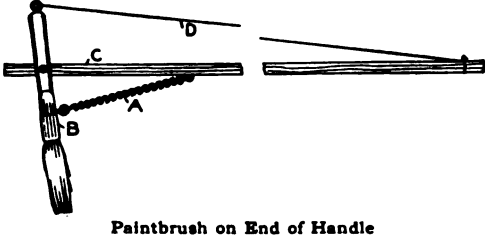
Screws in screen and storm-door hinges are very difficult to prevent from working loose, as these doors are usually supplied with springs which will close the door with such force that in time it will jar the screws loose. Wood screws, once loosened, will never hold firmly. The sketch shows a very successful way to lock the screws after they are in place.



A stiff flat spring, ⅛ in. wide, is attached so as to engage the slots in the screw heads and then soldered in place. For best results the spring should be attached before the screws have had time to work loose.—Contributed by Irl R. Hicks, Hallsville, Missouri.

### Extension Handle for a Paintbrush

Some time ago I had a few gutters to paint which were very difficult to reach. It was necessary to take a ladder up on the roof in order to get at them. Being alone I was unable to place the ladder on the roof. The drawing shows a device by which the painting was done without a ladder, and with much less exertion.

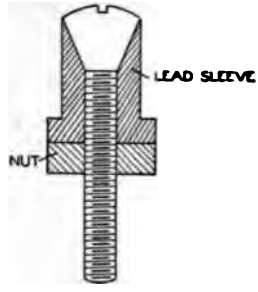



Paintbrush on End of Handle

An ordinary paintbrush, B, was pivoted on the extension handle C and operated with the cord D, the spring A drawing the brush back after each stroke. The brush may be mounted either flat or edgewise, according to the shape of the object to be painted. —Contributed by Mark A. Franklin, Schenectady, N. Y.

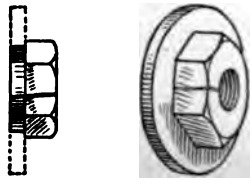
### Repairing a Leak in a Stove Reservoir

A leak developed in the hot-water tank attached to my kitchen range, and after several unsuccessful efforts to repair it, the following plan was adopted: The hole was reamed out and a small bolt with a tapering head which would just pass through the hole selected. This was inserted head downward in a hole bored in a block of wood, and a lead sleeve cast around it, with a shoulder on one end. The sleeve was removed and reamed out to remove the threads in it and to allow it to slip on the bolt. Then the sleeve was replaced, the nut screwed up against it, and the device inserted in the hole as far as the shoulder. The bolt was held from turning by gripping the projecting end, and the nut turned up tightly. This expanded the inner end of the sleeve and made a perfectly water-tight repair. The end of the bolt was then cut off and smoothed with a file.—Contributed by J. A. Bannister, Cobourg, Ont.




### Repairing a Cracked Nut

Sometimes a new nut cannot be easily had to replace a cracked one, because of its odd size or thread, and the repairing of the damaged nut becomes necessary. In one instance where a nut on the rear axle of a motorcycle was cracked from being drawn up too tightly, it

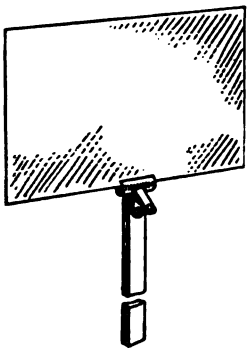


was repaired in the following manner, and used permanently in preference to a new one afterward purchased.

The illustration shows clearly how the nut was repaired. It was clamped in a vise and a recess was filed on the inner surface, just deep enough to form a shoulder to keep the washer in place. The washer was of a size to fit snugly over the round part when the crack was forced shut. No welding or heating was necessary, the washer was merely forced on and the nut was ready for use.—Contributed by L. M. Eifel, Chicago.

### Bill-Card Poster

Having occasion to put up a number of bills for a coming fair, I used the following plan to put them high up in inaccessible places, far from the reach of the small boy.

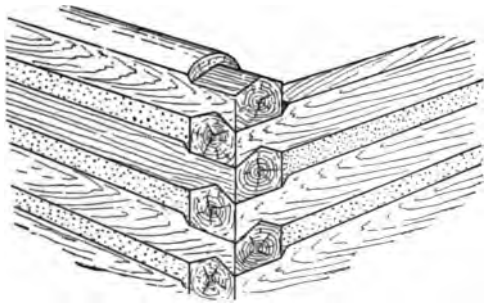


An ordinary clip, such as is found in most offices, is fastened to a strip of solid wood of the desired length. This, in connection with a long-handled magnetic hammer, makes a complete outfit for putting up cardboard bills.—Contributed by Chas. W. Meyer, Brooklyn, N. Y.

### Log-Cabin Construction

The essential part in making a log cabin is locking or building the corners, says the American Carpenter and Builder. The first thing to do is to square off the sills on four sides, frame them for joists, and lay them on the wall; then square off two pieces on three sides and cut the saddles as shown. One man should be at each corner to cut the saddles so that they will be plumb, and other men should be stationed at the middle of the sides to hold the logs in place, while the corner men cut the saddles. Enough help should be on hand to make the work easy.

After the walls are built, cut openings for the windows and doors, allowing room to admit a 2-in. plank on each side, spiked or pinned to the ends of the logs. Then slip in the frames. The plates should be squared and the end ties and rafters should be framed into the plates. At each corner, bore a 2-in. hole, about 18 in. deep, into which drive a good hardwood pin.



Saddles on the Ends of Logs

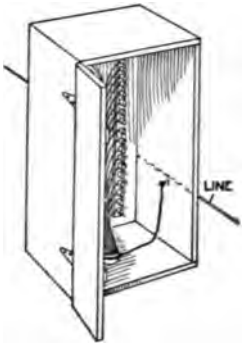
In selecting timbers to be flattened, get as near one size as possible and remove all of the bark. Care should be taken to keep the walls level by selecting logs for the purpose. Reversing the ends on each layer will keep the wall true and level. After the building is up, chink in between the logs with wood and fill in with mortar. About all the tools required are a good chopping ax, a broadax, a square and a crosscut saw.

In hewing timbers, care should be taken not to score so deeply that it will show after the surfacing is done. The hewer should trace his line 3 or 4 ft. and cut down plumb; then score back and hew; then the second line should be hewed. Care should be taken to have the top and bottom of the same width.

¶In cold weather when one is in haste to remove thick liquids, such as syrups, molasses, etc., from jugs, the flow can be increased by inserting a bent metal, rubber or glass tube into the mouth of the receptacle.

### Nail in a Cable Box Causes a Ground

A certain line of a telephone system caused trouble by flashing in during storms accompanied by winds, says a correspondent of Telephony. A quiet rainstorm would not cause the trouble. When the storm was over the trouble would disappear. On testing, the trouble showed as a swinging ground.




The trouble men failed to locate the fault for some time, but one finally noticed that the line was swinging against a wood cable box. He climbed the cable pole and observed the mark the line made striking the box. Then, opening the door, he saw a wire running up the side and fastened to a nail, where the line struck the box.

Looking outside he saw that the line was striking the nail head. Then tracing back the wire inside the box he found that the other end was fastened to the grounded lead sheath of the cable. This explained why the trouble occurred only during a storm accompanied by wind.

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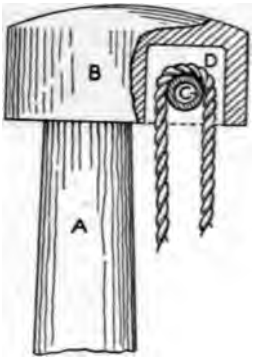
### Rigging for the End of a Flagpole

A simple and sure way to rig the top of a flagpole for carrying the flag rope is shown in the sketch. The flagpole A has a cap, B, with a ½-in. hole, C, in which a ½-in. glass tube or bar is inserted. A recess, D, is cut part way through, large enough to allow plenty of room for the rope. Close the ends of the glass tube with putty and paint the cap, but not the glass, where the rope passes over the center. This makes a rigging that will not stick in wet weather.

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¶Copper in small quantities will increase the strength and toughness of steel.

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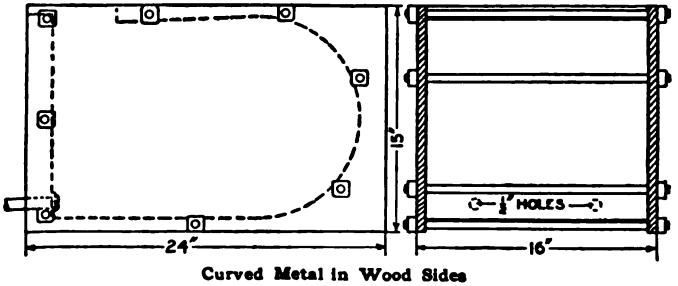
## A Shop Steam Washer

The washer is made of two 1-in. boards, 24 in. long and 15 in. wide, between which a curved piece of metal is




Curved Metal in Wood Sides

ld with ½-in. bolts, 17 in. long. A ve is cut in each board the shape efore it is put in place. Two ½-in. pipes are connected to the lower edge of the vertical part of the metal for steam connection.

This washer is made for shops and factories to wash grease-covered outer garments. The clothes are thrown into the washer with a little piece of soap and a little washing soda, and the steam is turned on the inlet pipes. The flow of steam along the bottom drives the clothes up the curved end and they will drop back into the steam, causing a continuous rotation of the garments.

A little water should be added to the washer after the steam is applied.—Contributed by John Kotanchick, Ran Shaw, Pa.

### Opening Evaporated-Milk Cans

Those using various brands of evaporated milk find it necessary to procure a hammer and nail to puncture the can. This is considerable trouble and at the same time unsanitary, as both dust and flies get into the openings.

The simple device shown in Fig. 1 punches the holes with a slight pressure of the hand, and when not in use it serves as a suitable cover. The perforator consists of a strip of metal, A, having a hole in each end, with part of the metal turned over after the tacks B B are inserted. The cover is

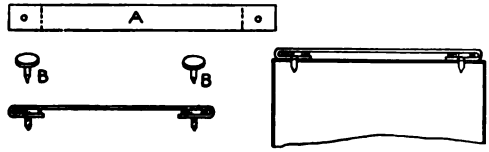


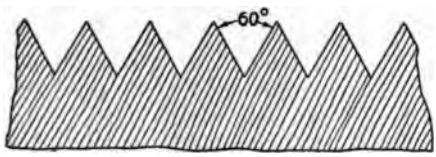

FIG. 1 FIG. 2

Tacks in the Metal Strip

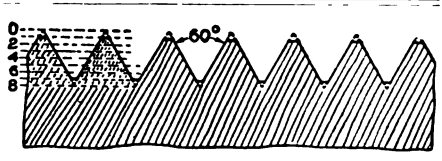
had by leaving the tacks in the holes as shown in Fig. 2.—Contributed by W. A. Jaquythe, Richmond, Cal.

¶Although cobalt and nickel have very similar properties, cobalt steels do not resemble nickel steels in the least.

TAP-DRILL SIZES




Standard "V" Form of Threads




United States Standard Form of Thread

| Size of Tap | Threads per Inch | Tap-Drill Size | Threads per Inch | Tap-Drill Size |
|---|---|---|---|---|
| 1-16 | 60, 64, 72 | 58, 57, 56 | 60, 64, 72 | 57, 56, 56 |
| 5-64 | 56, 60, 64, 72 | 54, 53, 53, 52 | 56, 60, 64, 72 | 53, 53, 53, 52 |
| 3-32 | 48, 50, 54, 56, 60 | 51, 50, 50, 49, 48 | 48, 50, 54, 56, 60 | 50, 50, 49, 49, 48 |
| 7-64 | 48, 56 | 44, 43 | 48, 56 | 44, 43 |
| 1-8 | 32, 36, 40, 48, 50 | 44, 43, 42, 40, 39 | 32, 36, 40, 48, 50 | 43, 42, 41, 38, 37 |
| 9-64 | 32, 36, 40 | 39, 37, 35 | 32, 36, 40 | 37, 35, 34 |
| 5-32 | 30, 32, 36, 40 | 33, 32, 31, 30 | 30, 32, 36, 40 | 31, 31, 1-8, 30 |
| 11-64 | 32, 36 | 29, 29 | 32, 36 | 29, 28 |
| 3-16 | 24, 27, 30, 32, 36 | 29, 28, 27, 26, 24 | 24, 27, 30, 32, 36 | 28, 27, 25, 24, 5 32 |
| 13-64 | 24, 32 | 26, 19 | 24, 32 | 23, 19 |
| 7-32 | 24, 28, 32 | 18, 17, 15 | 24, 28, 32 | 18, 16, 14 |
| 15-64 | 24, 32 | 15, 10 | 24, 32 | 13, 8 |
| 1-4 | 20, 24, 27, 32 | 12, 9, 7, 4 | 20, 24, 27, 28 | 11, 7, 5, 4 |
| 9-32 | 20 | 2 | | |
| 5-16 | 18, 20, 24, 27, 32 | D, 1-4, F, 17-64, I | 18, 20, 24, 27 | D, F, 17-64, I |
| 11-32 | 18 | J | | |
| 3-8 | 14, 16, 18, 20, 24, 27 | 9-32, N, N, 5-16, P, 21-64 | 16, 20, 24, 27 | N, O, 21-64, Q |
| 13 32 | 16 | Q | | |
| 7-16 | 12, 14, 16, 20, 24, 27 | P, T, T, U, W, 25-64 | 14, 20, 27 | 23-64, V, 25-64 |
| 15-32 | 14 | W | | |
| 1 2 | 12, 13, 14, 16, 20, 24, 27 | Y, Y, 13-32, Z, 7-16, 7-16 29-64 | 12, 13, 20, 27 | 13-32, 13-32, 7-16, 29 64 |
| 17-32 | 12, 13 | 27-64, 27 64 | | |
| 9-16 | 12, 14, 27 | 15-32, 15-32, 33-64 | 12, 18, 27 | 13-32, 1-2, 33-64 |
| 19-32 | 12 | 31 64 | | |
| 5-8 | 10, 11, 12, 20, 24, 27 | 31-64, 33 64, 33-64, 9-16 9-16, 37-64 | 11, 12, 18, 27 | 33-64, 17-32, 9-16, 37 64 |
| 21-32 | 11 | 35-64 | | |
| 11-16 | 10, 11, 12 | 9-16, 37-64, 37-64 | 11, 12, 16 | 37-64, 19-32, 39-64 |
| 23-32 | 11 | 39-64 | | |
| 3-4 | 10, 12, 20, 27 | 5 8, 41-64, 11-16, 45-64 | 10, 12, 16, 27 | 41 64, 21-32, 43-64, 45 64 |
| 25-32 | 10 | 21-32 | | |
| 13-16 | 10, 12 | 11-16, 45-64 | 10, 12 | 45 64, 23 32 |
| 27-32 | 10 | 23-32 | | |
| 7-8 | 9, 10, 12, 27 | 47-64, 47-64, 3-4, 53 64 | 9, 12, 14, 27 | 3-4, 25-32, 51 64, 53-64 |
| 29-32 | 9 | 49-64 | | |
| 15-16 | 9, 12 | 51-64, 53-64 | 9, 12 | 13-16, 27-32 |
| 31-32 | 9 | 53-64 | | |
| 1 | 8, 12, 27 | 27-32, 57-64, 61-64 | 8, 12, 14, 27 | 55-64, 29-32, 59 64, 61-64 |

### Metal Jaws for a Wood Vise

An old 12-in. file makes fine jaws for a wood vise. The file is heated and then allowed to cool in the air or in

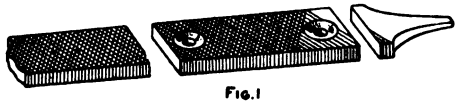


FIG. 1

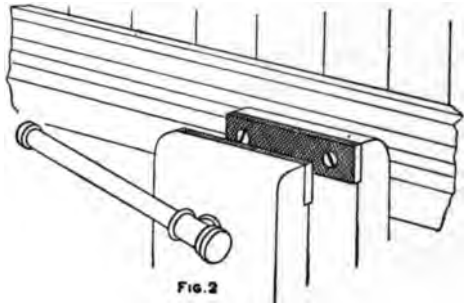


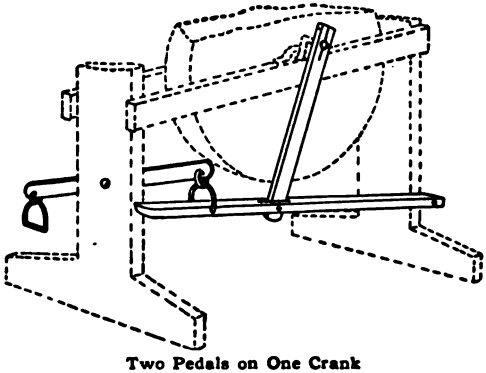
FIG. 2

Old File Used for Vise Jaws

lime. It is then cut and two holes drilled as shown in Fig. 1. Two pieces can be cut from one file. These are fastened to the jaws as shown in Fig 2.—Contributed by Clarence L. Orcutt, Buffalo, N. Y.

### Attaching Pedals to a Grindstone

The grindstone I had was one of the old-fashioned kind having only one short crank. I wanted to use a double treadle, so I made the attachment as shown in the sketch. A seat was attached to the top of the front support.



Two Pedals on One Crank

This is the way I saved changing the fittings, and it works to perfection.—Contributed by A. S. Thomas, Gordon, Ontario.

### Motorcycle Anti-Skid Chains

For wet, slippery or snowy weather there is no better way to prevent skidding than to fit a chain to the rear wheel of a motorcycle, says Motorcycling. This almost eliminates the side slip, and the fitting of such a chain is easier than most riders imagine. A number of different chains which will serve the purpose may be purchased at any hardware store, and the cost is quite low, being about 4 cents a foot.

The accompanying sketch shows the method of fixing the chains on the wheel. Short lengths of chain are cut to go around the rim and tire and the ends fastened together. The number of these chains should be about 16 — twice the number of belt-rim lugs on the rim—and a chain should be firmly fastened to each lug. To prevent the chains from creeping, they are all fastened to another long chain extending around the inside of the rim. It is not a good method to fasten the chains to the spokes, for the wear soon loosens them. When putting on the chains which go around the tire it is best to let a little air out of the tire so when it is pumped up the chains will be held very tightly, in which condition they are less liable to cause trouble.

¶In overhauling an automobile, cover the fenders with newspapers or old rags to prevent scratching them. They make a handy place to lay tools and parts.

¶Brass should be annealed at a temperature between 600 deg. and 700 deg., in order to obtain the best combination of strength and ductility.

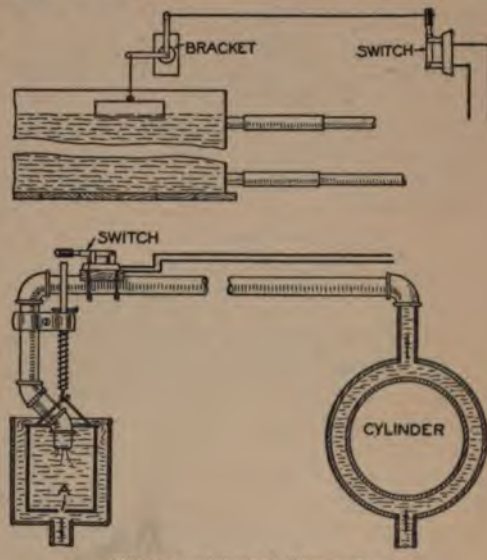

## Safety Stop to Prevent Gasoline-Engine Cylinders Overheating

In the accompanying illustration are shown two ways of inserting a safety switch in the circuit of electric wires on the ignition system of a gasoline engine to prevent overheating, should the water for any reason fail to reach the cylinder.

On the thermo-siphon system of cooling, it is easily made, as it requires only an extra switch, a block of wood for a float, some wire and an L-shaped piece of metal. The first sketch shows how it makes a break in the circuit when the water falls below the required amount.

For engines using forced-feed circulation from a low water supply the safety switch can be installed as shown in the second sketch. This requires an extra switch, an old curtain-pole spring with the wooden rod in it, a sheet-metal clamp to hold the spring, and a small pail. A larger pail to receive the overflow from the small pail is connected to the return water pipe as shown. In the bottom of the small pail there is a hole, A, one-quarter the diameter of the outlet on the pipe. As long as there is plenty of water the small pail will overflow and hold the pail down, but when the water fails to run, the small hole will drain the pail, the spring will draw it up, and the small rod inside of the spring will make the break at the switch. A small nail driven in over the clamp will keep the pail from stopping the flow of water through the pipe below.

When adjusting the small pail upon installation, it should be filled with water and the hole in the bottom plugged until the right adjustment is reached. When starting the engine, pull the plunger rod in the spring to one side of the switch. The flexibility of the clamp will allow this to be done. —Contributed by J. P. Simons, Herrick, So. Dak.




Wiring and Switch Connections

### Homemade Chair Bottoms

Chair bottoms can be made at home by anyone who can drive a nail straight. The following method was used by a suburbanite who could not take advantage of city conveniences or afford the prices. This chair bottom can be easily duplicated by persons similarly situated. The cost is small and the labor so slight that 15 min-

utes will be sufficient to complete the job.

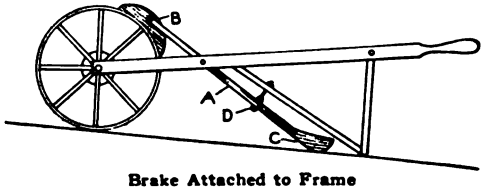
Scraps of the paper that was left from the roofing of his bungalow were utilized. These pieces were a very good grade of paper, which can be procured from a first-class dealer in lumber. The paper has the appearance of leather, is about the same thickness, and wears well. The paper can be bought by the roll or square foot, and a single square yard should be sufficient to make bottoms for several small chairs.

The paper is fastened with carpet tacks or brass-head upholstering tacks, the latter making a better appearance. Place the material under the bottom of the chair and mark with a pencil the size of the opening. Cut out the bottom with scissors or a sharp knife, 1 in. outside of the pencil line and tack it on the top of the chair frame. —Contributed by Della Yoe, Knoxville, Tenn.

### A Wheelbarrow Brake

Pushing or rather holding a loaded wheelbarrow in going down an incline is very tiresome, and I made a brake as shown in the sketch that works exceedingly well. The brake consists of two pieces of channel iron, A, run between the handles of the wheelbarrow frame down to a trifle below the level of the supports on the handles. On the top of these channel irons I fastened a block of wood, B, by means of a single bolt. Another block, C, is placed at the bottom.

To prevent the brake from sliding on the ground when the handles were

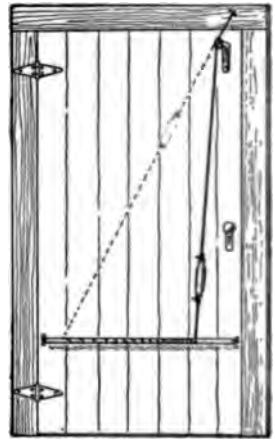



Brake Attached to Frame

lifted, an eyebolt, D, was placed in the brace to hold the channel-iron arm. When going down an incline with a load, it was only necessary to slightly lower the handles and the pressure on the block C would cause the brake block B to be held tightly against the wheel.—Contributed by J. N. Bagley, Superior, Neb.

### Use for an Old Shade Roller

Many shed and storm doors are hung where it is almost impossible to attach a weight in the ordinary way without interfering with other doors or with people passing in or out. By using an old shade roller, as shown in the drawing, the weight can be put on the door itself, taking up no room, the roller keeping the weight in place.



Take an old shade roller and break off the stops or checks, leaving the roller, when the spring is wound up, to run its limit without stopping. Take the holders of the same roller and place them on the door about 1 ft. 6 in. from the bottom in a similar manner as when they were on the window. Then place the roller in the holders and drive a nail over the side with a slot in, to keep the roller from slipping out. Then take the end of the line (heavy twine will do) and tack it in the roller on the side nearest the hinges, and wind the line around the roller. In that way, when you pull the string, you wind up the spring, just as a curtain is wound around a roller, and when you release the string it winds up. After this is successfully tried, turn the spring around about ten times so that it is always strong, and tie the other end of the line to the weight.

The rest is simple. Put a small hook in the frame over the door; fasten the end of the string to this, pass the line

through the pulley, which is on the upper corner, down, and attach it to the other end of the weight.—Contributed by J. L. Brown, Jersey City, New Jersey.

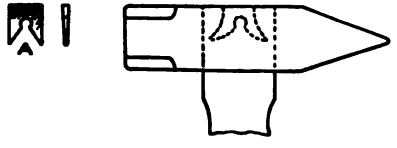
### Care of Blowtorches

When extinguishing the flame of a gasoline blowtorch or fire pot, the valve should never be allowed to remain tightly closed. If it is closed tightly and left so, the hot valve body will contract as it cools on the needle, and this will cause the needle to slightly enlarge the hole through which the vapor issues, and the torch will fail to work so well.

To shut off the flame, the valve should either be nearly closed and the flame blown out, or else entirely closed and then slightly opened.—Contributed by Van Allen Lyman, Paynes Creek, Cal.

### Wedge for a Hammer Handle

A common wedge in a hammer handle usually comes loose in time and causes considerable trouble to keep the hammer tightly on the handle. If the wedge can be kept in place, the hammer will not loosen on its handle. A simple wedge that will not come out is shown at A in the sketch. It is made




Shape of the Wedge

of soft steel. When driven into the hammer handle, the wood spreads the two prongs so that it is impossible to pull the wedge out.—Contributed by F. G. Marbach, Cleveland, O.

### How to Stiffen the Backs of Saws

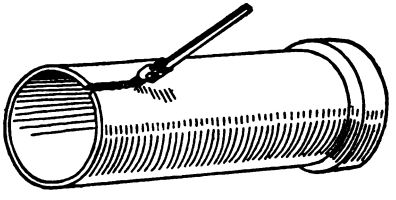
When cutting hard wood with a carpenter's saw I have had much trouble with the sudden bending of the saw, which would cause it to break or get out of line. Where there is no heavy work to be cut requiring the saw to pass entirely through it, the device described as follows will be found helpful.

Metal on Saw Back

Secure a piece of stiff sheet metal. about 18 in. long and 1½ in. wide. Bend it to a narrow U-shape so it will fit over the back of the saw, as shown in the sketch. This will prevent the saw from bending, and the metal may be easily removed when desired.—Contributed by Wm. Grotzinger, Baltimore, Md.

### Cutting Terra-Cotta Tile with a Pipe Wrench

An ordinary large pipe wrench makes a much better tool for cutting terra-cotta sewer tile than a chisel and



Wrench in a Cut

hammer. The wrench is less apt to break the tile where it is not wanted.

The manner of using the wrench is very similar to that of breaking glass away from a cut with a pair of pliers. The jaws are set to the thickness of the tile wall and short bits are broken away by leverage as the course of the cut is followed.—Contributed by L. H. Atwell, Atlanta, Ga.

¶Two mill files placed crosswise in a vise so as to form a V, make a good knife sharpener. The knife edge is drawn through the V-notch.

¶Cement work, consisting of 1 part cement and 3 parts sand, can be made waterproof after the work has set by applying as much kerosene oil to the surfaces as they will absorb.

### Homemade Drill Press

The elevation of the drill is shown in Fig. 1. The two uprights, A, are of 1½ by ⅜-in. iron, as are also the horizontals B and C, and the intermediate upright D. The main shaft, F, is of ⅝-in. round steel, as also handwheel shaft E. Cut a $\frac{3}{16}$-in. keyway in the shaft F. Obtain a pair of bevel gear wheels. Fix the small wheel on the shaft tightly with a pin, but allow wheel on the vertical shaft to slide with a flat key. The feed is controlled by the wing nut L. Two coil springs, K K, keep the pressure plate against the thumbnut.

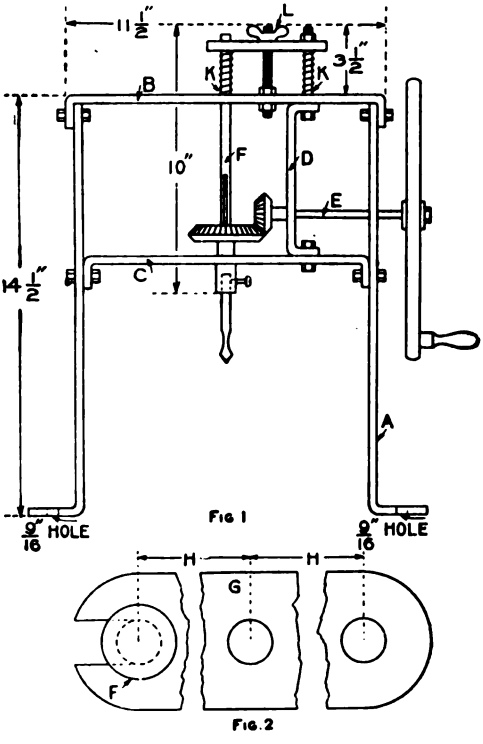


Fig 1

Fig.2

Details of the Drill Press

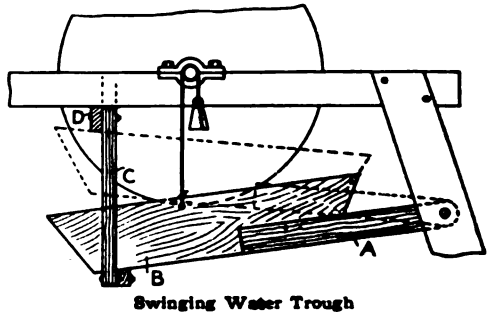
The dimensions H H, Fig. 2, must be determined by the size of the wheels procured. The top of the shaft F must be turned to form a notch to slip into a slot cut in the plate G, which is 1¼ by ⅜ in. All bolts and studs are ⅜ in.—Contributed by J. W. Verner, Roxbury, Mass.

### Removing Fence Posts

A laborer was sent to remove a number of fence posts from an old fence. The job would have taken a half day of ordinary work, but two hours later we found him asleep in the shade, and the posts all removed. We let him sleep till noon as we thought he had earned his rest. His method of removing the posts was very simple, as he used an ordinary gravel pick, drove the sharp point into the post close to the ground, put a hardwood block under the pick and pulled on the handle. This operation was repeated as the post was drawn out of the ground.—Contributed by J. C. Auman, Saskatoon, Can.

### Wetting Attachment for a Grindstone

A grindstone will quickly absorb any water in which it rests, thereby causing it to become worn unevenly and run out of true. The sketch shows how to attach a trough which is raised when the crank is turned, thus bringing the water in contact with the face of the stone as long as the grinding goes on. Two braces, A, are bolted loosely to the legs of the stand and fastened on the sides of the trough B, which normally rests on the support C. A small rope is fastened to the trough and wound around the shaft to give it the necessary friction. A small weight is added to raise the trough to the stop D. When through grinding, raise the weight, and the trough will lower itself.—Contributed b Loeffler, Evansville, Ind.



Swinging Water Trough

# The Art of Stencil Making

By HOMER H. KNODLE

## PART IV — Centerpiece and Panel Designs

A design that will fill the need of a dark effect where it is necessary to balance the scheme of treatment is shown in Fig. 30. It may be used for a panel by surrounding it with a border, either fancy or straight-line. If a line is used, it should be heavy enough to harmonize with the main part of the design. The torch should have the binders across to relieve the monotony of the heavy outline. It should not be made much larger than 2 ft., nor smaller than 1 ft., as the massiveness of the design necessitates large treatment. This design is susceptible of a variety of changes without altering the general outline. A slight change may be made by leaving narrow binders throughout the length of each bar crossing the darts.

A heavy effect, for a centerpiece, is shown in Fig. 31. The central oval may be attached to the balance of the design, if so desired, or it can be kept separate. In the former case, the oval should have a lighter treatment. The scrolls can be ornamented in any manner in harmony with the general style of the design, and the outer border may be varied in several ways. A large portion of the design should be left white so as to relieve the heavy outlines and give the desired contrast. This design can be made in almost any size, and only one-half need be cut out as the stencil can be reversed to finish the other half. It should not be made smaller than 30 in.

Another panel design that can be treated in various ways is shown in Fig. 32. It may be used as shown, or inclosed in a border of proper proportions, or it may serve for a combination border and panel by using the top portion as a border, inclosing it in a neat border, and the bottom part as a panel design, inclosing it also, but stenciling the bottom design only under every other motif of the top. This will give about the proper proportion and will be found to look very well. It will prove doubly effective if it is stenciled in a lighter tint of the body color, and trimmed with a contrasting color. This design also may be variously altered to produce original patterns.

A heavy centerpiece design that will be found especially adapted to use in conjunction with other designs in the decoration of Gothic buildings, is shown in Fig. 33. The leaves of the design are laid out on radial lines drawn with the aid of the 30 and 60-deg. triangles, used separately and together. The outside border may be given a variety of treatments and permits some delicate work.

The various panel designs can be changed by using different borders,

Fig. 30

Fig. 31

Fig. 32

Fig. 33

Centerpiece and Panel Designs

which, however, must harmonize with the design to produce the proper effect. Four such designs are shown in Figs. 34, 35, 36 and 37. That shown in Fig. 34 should be made from 1 to 2 in. high, or may be made as high as 4 in. and be used alone as a border. The one shown in Fig. 35 is very similar, but is not adapted to be used alone. It must not be cut larger than 2 in. Figure 36 shows a purely geometrical design which will stencil in conjunction with other designs along the same line. It should not be made much larger than 3 in. It is designed by crossing a perfect square with another perfect square at an angle of 45 deg. and using the perimeter thus formed for the outline. The design in Fig. 37 is useful only for its contrast. The diamonds are shaped with the 30 by 60-deg. triangle, and the squares drawn in to suit the designer. Diamond shapes may be substituted for the squares.

Fig. 38

Fig. 39

Panel and Centerpiece

Another torch design adapted to a panel is shown in Fig. 38. A smaller design of a torch can be used with equally good results, and the design will look well also without the outside border.

A centerpiece, intended for light treatment or in small sizes in medium-heavy treatment, is shown in Fig. 39. This design can be made in any size needed, and is one of the most flexible motifs known. The center can be completely changed and the symmetry of the design still be maintained. The design is laid out mechanically and necessitates no free-hand work.

Throughout the work great care should be taken to preserve sufficient binders. The design should first be drawn full size, completely ignoring the binders, and first when this work is completed, the binders should be laid in and colored as previously described, starting at the center of the design and working outward. If a design contains 12 repetitions and one or more binders each, one of the binders in each design connecting like pieces are cut one after the other. This will prevent the maker cutting or forgetting a binder. The binders need not be any wider than ¼ in. Only one principle need be observed: to place the binders where they will be as short as possible.

Fig. 34

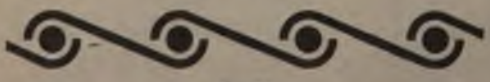


Fig. 35

Fig. 36

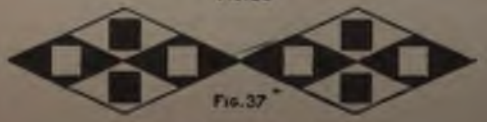


Fig. 37

Borders for Panels

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¶Oiling nails with common machine oil makes it easy to drive them into hard wood.

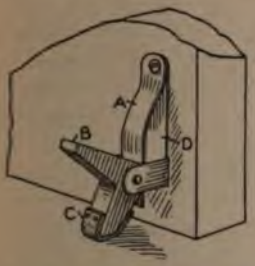
### Ash for Cleaning Cooking Utensils

A good ash for this purpose can be made by burning rags coated with the following solution: Dissolve 2 lb. of coarse salt in 1 gal. of water and soak the rags in this solution. After drying the rags they are burned in the open air and the ash saved. To use, moisten a rag in water and sprinkle a little ash over it and scrub the utensil.

This ash with a little vinegar added also removes flyspecks from gas-lamp globes and all glass articles. It does not injure either the hands or the articles to be cleaned—Contributed by Loren Ward, Des Moines, Iowa.

### A Door Holder

A door that is closed with a spring can be held open at any point with a stop as shown in the illustration. The stop can be thrown in or out of action with the foot.



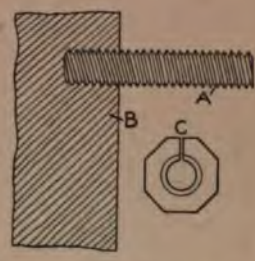

The base D is a piece of sheet metal cut and bent to form a bearing for the L-shaped block of wood B. The spring A holds the block either up or down as it is set. A piece of rubber, C, is put on the wood for contact with the floor.—Contributed by C. R. Poole, Los Angeles, Cal.

### A Draftsman's Substitute Horn Center

Take an ordinary solid-head thumb tack and make a small depression exactly in the center of the head with a center punch. File the tack part until it is about 1-32 in. in diameter. This will prove valuable to the draftsman where a lot of circles are to be drawn from one center. It will not dull the compass points.—Contributed by Theo A. Oberhellman, St. Louis, Mo.

### Removing a Threaded Stud

A threaded stud screwed solidly into metal is hard to remove without injuring the threads. Such a stud was in a flywheel of an automobile engine and I wanted to remove it without twisting the metal off or mashing the threads. The threaded stud A was very solid in the metal B. I used a split nut, C, clamped like the jaws of a vise over the threads, in turning the pin. The stud was thus easily removed and without injury to the threads.—Herbert A. Bartlett, Brockton, Mass.




### A Belt Stick

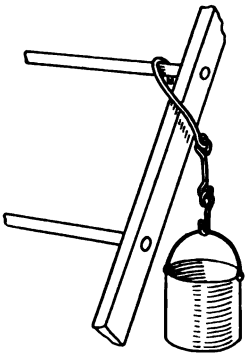
The illustration shows a very handy device for placing belts on pulleys. The device is made of ½-in. iron in any suitable length. If it is to be used for very heavy belts, make it of ¾-in. iron, and the length will depend on the height of the pulley from the floor. Belts can be easily put on pulleys from 16 to 18 ft. from the floor.—Contributed by Lewis F. Enyeart, Marion, Ind.

### Coloring Iron or Steel Silver-White

Dissolve about 1 qt. of white-ash bark ashes in the cooling water, which must be soft. Heat the iron or steel to a good red and then plunge it into the solution to cool. The metal will be silver-white when removed.—Contributed by Irl R. Hicks, Hallsville, Mo.

### Paint-Pot Hanger

The ordinary method of hanging a paint pot on the rung of a ladder makes it necessary to pass the brush between the rungs to reach the paint. A very handy way to hang a pot is to use a hook made up in sections, as shown in the sketch, and hang the pot over the side of the ladder. This will prevent dropping of paint on the rungs of the ladder, and also makes it accessible for the painter.—Contributed by Fred L. King, Islip, N. Y.



### Emergency Belt for a Motorcycle

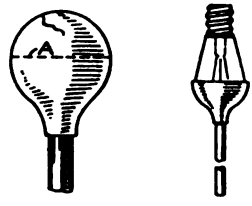
A little distance from home I broke the V-belt which drives my motorcycle. A new belt could not be secured and the old one was beyond repair. I tried a number of ideas, but to no avail. Finally I decided to take the clinch from an old automobile tire and use it as a belt. This belt carried me about 500 miles, and when I removed it to put on a new belt, it was in fine condition.—Contributed by J. N. Bagley, Superior, Neb.

### Increasing the Killing Power of a Small Rifle

A 22-caliber cartridge may be made to equal that of a larger-bore rifle in killing power by the following method. A long cartridge should be used. Split the lead from the point of the bullet almost to the edge of the shell. Flare the split slightly and place a small shot in the split as shown in the sketch. Use a shot about B-size. Close the lead over the shot with a pair of pliers so that it is held [illegible] The shot should project a little beyond the point of the bullet. In striking an object the shot is driven into the bullet by the impact, thus spreading the lead still more and increasing the killing power. Trim off the bullet after cutting it open and fastening the shot, so that it will fit the bore of the gun.—Contributed by John L. Waite, Cambridge, Mass.

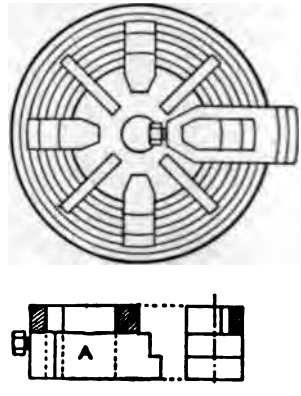
### Long-Handle Electric-Globe Remover

A discarded automobile-horn bulb makes an efficient receptacle for replacing or removing electric-light globes in places too high to reach. The bulb is cut off on the line marked A in the sketch and the lower end is fastened to a long pole. The rubber will have sufficient hold to the glass bulb to allow it to be unscrewed from the socket. The use of the device is obvious.—Contributed by Morgan Hand, Jr., Ocean City, N. J.




### Increasing the Size of a Lathe Chuck

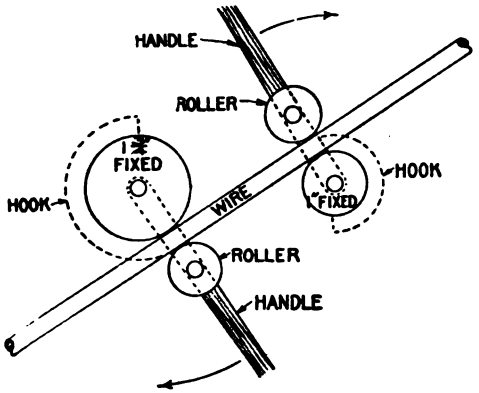
The attachment shown in the sketch is in use in a shop for the purpose of increasing the radius of an ordinary lathe chuck of small dimensions. The auxiliary jaws A slip over the regular jaws and are held in place by set-screws. The one shown is intended for holding piston rings or other hollow work that may be held from the inside. It is evident, however, that a modification of the same arrangement, having an over-



hang, may be applied, by which larger diameters may be chucked than would be possible with the regular chuck.

### Making Hooks for Trolley Ropes

In making hooks for use in holding trolley ropes, instead of heating the wire and bending it over the horn of an anvil, a handy device used by a correspondent of Electric Traction Weekly makes the work easy and saves much time. This is shown in the sketch. It consists of two slightly grooved disks, respectively 1¾ in. and 1 in. in diameter, fixed to the base. Around the pins by which the disks are

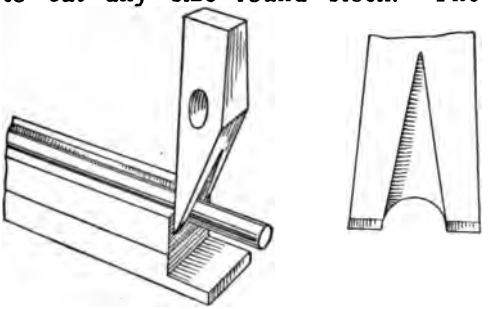



Levers to Bend the Wire

fastened to the base rotate two handles, to each of which, in the same plane as the disks, is attached a roller. The wire used, which is $\frac{5}{16}$-in. mild steel, cut to the proper length, is run between the fixed disks and the rollers, and by working the handles in the directions indicated in the illustration, the wire is bent into the desired shape.

### Cutting the Ends of Round Stock

The base of the cutting tool is forged the same as a swage and capped with steel. An offset is formed to provide a cutting edge and a soft base for the chisel edge to strike when it cuts through the metal. The semicircle in the chisel edge should have a long slope filed so that it will extend upward on the sloping side of the chisel. The steel cap is rounded out to fit the round stock. A tool of this kind can be made to cut any size round stock. The



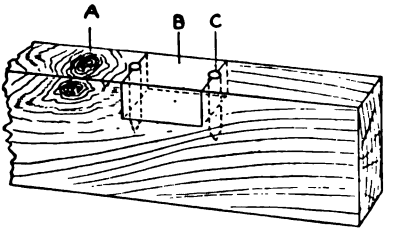
Cutter and Die

larger sizes should be cut hot. Both tools should be tempered, in the same manner as chisels.—Contributed by D. O. Wilkins, Hempstead, Tex.

### Filling in the Place of a Knot

Sometimes, in using second-grade lumber for sluices, troughs and laundry tubs, a board will be sound except for a large loose knot that may happen to be on the edge. To cut the board at that point would be a waste of lumber, and to leave the knot in would present a bad appearance. The knot may be successfully removed as shown in the sketch. At A is shown a knot, and at B how the board will appear after the knot is cut out and a block put in its place.

The first thing to do is to mark around the knot, squaring a portion a little larger than the knot, then sawing on both end lines and carefully cutting the bottom out with a chisel. The chiseling can be better accom-




Removing a Knot

plished if several saw cuts are made through the knot. Fit a straight-grained block of the same material

tightly in the opening so that it will need driving in place. Bore a hole, deeper than the notch cut, at each end of the block and drive a pin, C, into each hole. Dress the surfaces with a plane. A knot in the center of a board can be fixed in the same manner with the exception that no pins are used.—Contributed by W. A. Lane, El Paso, Texas.

### Method of Laying Out Angles in Degrees and Minutes

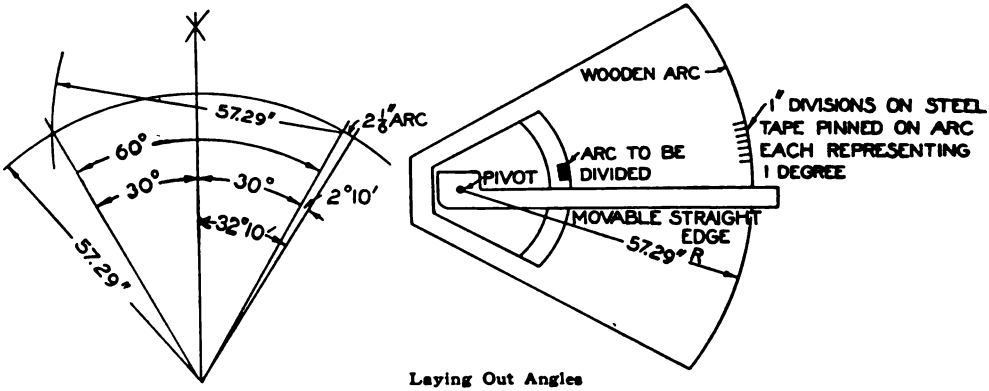
The following method for obtaining odd angles will be found very useful by patternmakers, machinists and those engaged in laying out bends for pipe lines, which are usually given in degrees and minutes.

Any angle can be obtained by the use of a trammel and pair of dividers, without any calculation, as follows: If an arc be drawn having a radius of 57.29 in., then 1 in. of the arc will subtend an angle of 1 deg., or in other words, if two points 1 in. apart be located on the circumference and a line be drawn from each point to the center, the angle between these lines will be 1 deg. It should be noted here that while this distance, to be absolutely correct, should be measured on the arc, for practical purposes the chord and arc for a distance of 1 in. may be considered equal. From the above it will be seen that an angle of 30 min. would have an arc ½ in. long; 15 min., ¼ in. long; 7½ min., ⅛ in. long, and 5 min., 1/12 in. long. It will be seen also that 1/60 in. on the circumference represents 1 min., and where a scale is not available having divisions in multiples of 60, a scale with 64ths can be used, if the number of minutes is small. When taking 1/64 in. to represent 1 min., it will be seen that the error is 1 min. in 15. If, however, the arc be drawn with a radius of 53.71 in., 1 min. on the circumference will be subtended by 1/64 in., or in other words, every 1/64 in. of the circumference will represent an angle of exactly 1 min., and 1 in. will represent 1 deg. 4 min.

It may be of interest to know how the radius 57.29 in. is obtained, which is as follows: If we assume that 1 in. on the circumference is to represent 1 deg., then the whole circumference which contains 360 deg. will be 360 in. long. If we divide this by 3.1416, we obtain 114.58 in., which is the diameter of the circle, and one-half of this is 57.29 in., or the radius.

It is evident that the method outlined is not intended for laying out directly a very wide angle, but rather for finding the odd degrees and minutes after the approximate number of degrees has been found in some other way.

For example, suppose it is desired to lay out an angle of 32 deg. 10 min. First scribe the arc with a radius of 57.29 in., then with the same radius lay off a chord on the arc which will give 60 deg. Bisect this arc and each half will be 30 deg. From one end of the 30-deg. arc lay off a




Laying Out Angles

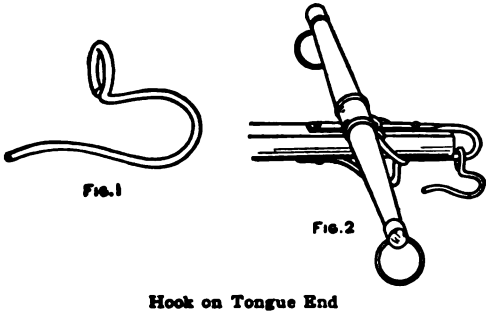
2 1/6 in., which added to 30 deg. will make the desired angle. This operation is shown in the first sketch.

If the angle is not required to be laid out very accurately, a radius of 28.64 in. can be used for the arc, then ½ in. of the circumference will represent 1 deg.; or with a radius of 14.32 in., 1 deg. will be subtended by ¼ in. on the circumference.

This method may be used for graduating arcs in degrees and fractions by sawing out an arc of the desired radius and pinning a steel tape on it as a scale. The arc to be graduated is fastened so that its center coincides with the center of the large arc. By means of a straightedge, pivoted at the center of the arcs, a very accurate division can be made. If a radius of 57.29 in. be used for the large arc, then with an ordinary steel tape the 1-in. divisions will represent degrees; the ½-in., 30 min., and the ¼-in. divisions, 15 min. The method of doing this is shown in the second sketch.—Contributed by C. A. Jackson, New York.

## A Neckyoke Safety Hook

The purpose of the hook is to prevent the neckyoke from accidentally slipping off the tongue. It is made of a piece of round iron bar, about 12 in. long and bent into the shape shown in Fig. 1. The hook is fastened into the end of the iron on the tongue, as shown in Fig. 2. If, from any cause, the neckyoke should slip toward the

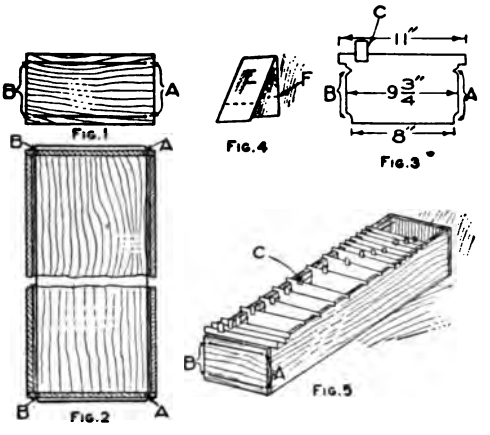



Hook on Tongue End

end of the tongue, the ring will catch in the hook and prevent the tongue from dropping down.

## To Make a Check and Bill File

Take two cypress boards, 4 ft. long and 6 in. wide, one board, 4 ft. long and 10 in. wide, and two pieces, 11 by




Check and Bill File

6 in., all ½ in. thick. Out of these make an oblong box, and at each end bore four holes, about ¾ in. from the bottom and sides, as indicated at A and B in Fig. 1. Run picture wire through from one end to the other, A A, Fig. 2, then across the end and back from one end to the other, B B, and fasten the ends at the starting point. Cut 26 pieces of pasteboard, as in Fig. 3, with notches as shown at A and B. Cut some heavy paper into 3-in strips about ½ in. wide and fold as in Fig. 4. Paste at dotted line F to board, and letter cards. Then insert cards in box in alphabetical order. The notches and wire will keep the boards upright and thus prevent loss and mixing of checks and papers. —Contributed by Maurice Baudier, New Orleans, La.

## Removing Old Paint or Varnish

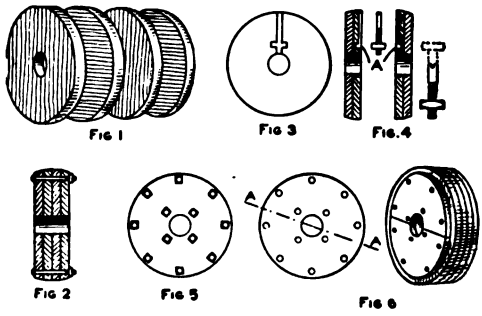
The average person, when wanting to revarnish or paint some article, removes the old coating with sandpaper. This is a waste of time and labor, as old paint or varnish can be washed off much easier in the following manner:

Dissolve one-half cupful of washing

soda in a pint of warm water. Wet the article with this solution, then scrub it with a stiff brush. Rinse with clear water and let it dry thoroughly before recoating. This method will easily remove varnish or paint from crevices.—Contributed by Katharine D. Morse, Syracuse, N. Y.

### Wood Pulley with Internal Setscrew

The drawings show how I built a wood pulley which gave good satisfaction and cost but a trifle for materials.




Parts of the Wood Pulley

Cottonwood was selected because with it there is less danger of cracking. Four circular pieces were cut and placed together, with the grain of each piece at right angles to its neighbor so as to prevent warping. See Fig. 1.

Placing these in a vise I fastened them with two carriage bolts, and then bored the hole for the shaft (Fig. 2). The shaft hole was bored so as to secure a snug fit. A ⅜-in. hole for the setscrew was then bored between the two central sections until it met the shaft hole (Fig. 3). Withdrawing the bolts, I cut a square pocket, A, Fig. 4, across the setscrew channel in each of the central sections. The pockets were cut a short distance from the edge of the shaft opening. Cutting the head off a ⅜-in. bolt I filed a screwdriver slot in it. This bolt when finished should be a trifle shorter than the channel so that it will not project beyond the face of the pulley.

The square pockets mentioned above should be cut just large enough to allow the square nut to fit in them without any play.

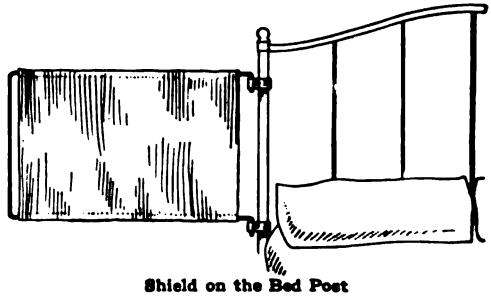
After placing the nut and bolt in the channel and pockets, I smeared the sections with white lead, inserted the two carriage bolts and added the remaining bolts as shown in Fig. 5.

As it was not advisable to screw the nuts and washers so tightly as to force them into the wood, I cut another piece of wood a trifle less in diameter than the other sections, Fig. 6, and bored holes in it to correspond with the bolts in the pulley. This piece was screwed to the pulley face to conceal the nuts and prevent them from tearing the belt, should it slip off on that side. This shield could be cut in half on the line AA, so that it could be removed without disturbing the pulley.

After filing a seat in the shaft for the setscrew, I placed the pulley in position and tightened the setscrew. I found that it held quite as well, if not better than a wedged pulley. If one setscrew is not deemed sufficient, more can be added in the same way.—Contributed by James M. Kane, Doylestown, Pa.

### Draft Shield for a Bed

A screen for preventing drafts blowing across a sleeper's head, when a window is left open for fresh air, is shown in the sketch. The screen is attached to the bed post on hinges, so that it may swing in any position. This permits it to swing out of the way either when getting into bed or in case the sleeper gets up suddenly in the dark, in which case he might break



Shield on the Bed Post

an ordinary stationary screen or injure himself, if it were permanently attached.—Contributed by W. E. Morey, Chicago.

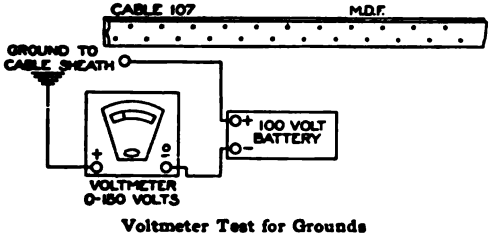
# Tracing Down Telephone Troubles

By GEORGE M. PETERSON

## PART II — TESTING

When a case of cable failure is reported, the galvanometer man is immediately called and he at once connects his voltmeter and battery on the cable and pairs which are in trouble, the connection being made as shown in the sketch, and care being taken to connect like poles together.

The first operation consists of connecting the voltmeter lead to a good ground, usually the cable armor, and touching each wire in the cable with the battery lead. This is the test for "grounds" and will show up grounded wires having anywhere from 2 volts to a "solid," or full voltage of the battery ground. A grounded wire with less than a 6-volt ground is fit to use, but is apt to be a bit noisy. If the voltmeter shows up several

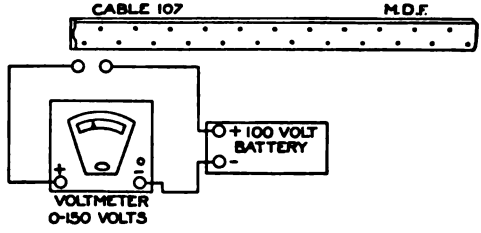



Voltmeter Test for Grounds

heavily grounded pairs, the trouble may be taken for a "ground" and a Wheatstone bridge or any of the various faultfinders is brought into action to obtain the exact location.

If the trouble happens to be "shorts" instead of grounds, the voltmeter is connected as shown and the leads touched to each side of a pair, taking the pairs straight through the cable and recording the voltage of each pair. If the full voltage of the battery is recorded, it shows a "dead" or "solid" short, and again the bridge is used to determine the actual location.

Crosses are also located with the voltmeter and battery by attaching one lead to the crossed wire until the wire with which it is crossed is picked up by the other voltmeter lead. If the battery has an E. M. F. of 100 volts and the crossed pair should register up to 140 volts, it shows that

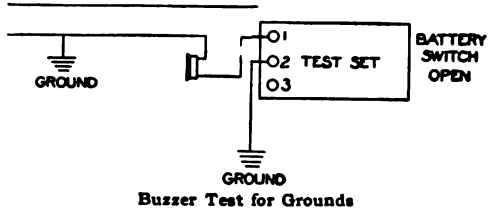



Voltmeter Test for Shorts

it is crossed with "battery," as the "common battery" system carries a voltage of 40. Often the voltage of a cross will be so high that the voltmeter needle leaves the dial completely. Then look out, as the cross may be with a high-potential circuit and great care must be exercised, not only to protect the instrument, but life as well.

The buzzer test set can also be used for testing out open crosses, shorts, etc. When testing for "grounds" with the outfit described in Part I, the circuit is arranged as shown for grounds. A heavy ground closes the relay through the receiver, but a light ground causes a faint click in the receiver alone.

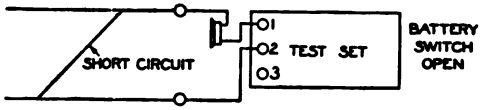
By putting a "ground" on certain wires at the farthest terminal box, one after another, and connecting test set as shown, the wires may be tested




Buzzer Test for Grounds

for continuity or "opens." A sharp click of the relay shows the wire to be continuous or closed, but the lack of any click in the receiver shows the wire to be open.

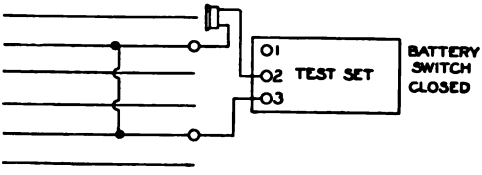
A "short-circuited" pair can be tested by arranging the set as shown for "shorts." The short circuit will cause the relay to close through the




Buzzer Test for Shorts

receiver. If the relay remains open, the pair is all right unless it is open.

In testing for crossed pairs in a working cable, the set must be con-




Buzzer Test for Crosses

nected as shown for "crosses," and test must be made from terminal. The cross will also make itself known by closing the relay through the receiver.

In an underground case, where tests show several heavy shorts and grounds, together with numerous crosses and opens, an experienced man would know that most likely the cause of the trouble was the cutting, or the breaking in two, of the cable. A solid ground on several pairs usually indicates that water has entered the cable through some poorly wiped sleeve, that electrolysis has eaten away the armor allowing the water to enter, or that some similar accident has happened.

In aerial cables the troubles are many and varied, the main trouble being from "burn outs" caused either from high-potential crosses with the cable itself, or from lightning. Then there are the mechanical damages caused by bullets, knife cuts, spur holes, etc.

*(To be continued)*

## Heating a Shop with Engine-Jacket Water

In a small shop operated by a gas or gasoline engine considerable expense can be saved in winter by utilizing the cooling water from the engine for heating purposes, says a correspondent of Power. The method employed is shown in Fig. 1, where A is the jacket-water outlet pipe, and D the cooling-water return pipe. The pipes E and F are the circulating pipes connecting the engine with the regular cooling tank, and B and C, Fig. 2, are the heating coils. Valves are provided to control the flow in all of the pipes.

To secure the most efficient operation of the system, the coils and piping should be arranged as shown in Fig. 2, as this arrangement gives better circulation than when the coils are placed on the same level.

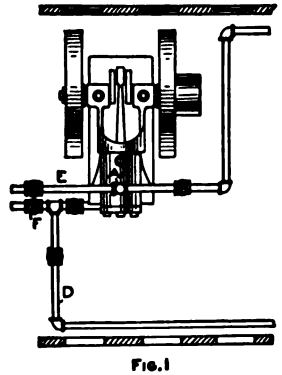



Fig. 1

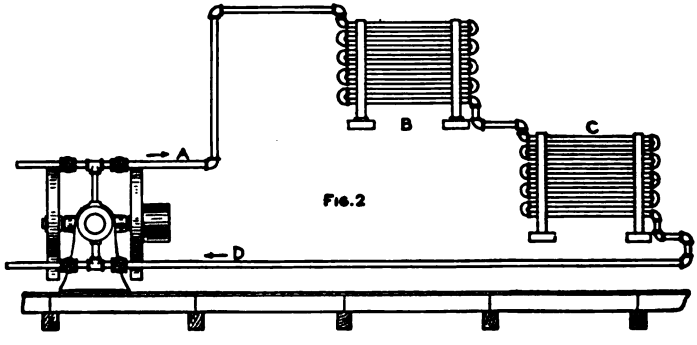



Fig. 2

Plan and Elevation of Piping System

If the volume of water passing through the heating coils be regulated by the valves in the supply and return pipes, the temperature of the room being heated may be varied to suit the weather conditions. It must be remembered, however, that when these valves are partially closed, the valves in the pipes E and F must be opened an equal amount to allow the engine to receive the required volume of cooling water.

The amount of space that the system will heat depends, of course, upon the amount of cooling water passed through the engine jacket, and the power and efficiency of the engine. Under ordinary conditions, the quantity of heat carried away per hour by the cooling water is from 2,000 to 4,000 B. T. U. per brake horsepower. A fair average is 3,000 B. T. U. per brake horsepower and about one-half of this is available for heating. Multiplying this quantity (1,500) by the brake horsepower and dividing by the number of B. T. U. required per hour to heat 1 cu. ft. of free air from 20 to 75 deg. F. for ordinary climates (or from —25 to 75 deg. for cold climates) gives the number of cubic feet which the system will heat.

The number of B. T. U. required to heat 1 cu. ft. of air through the required number of degrees of temperature can be obtained from any standard book on heating and ventilation, and will vary somewhat with the construction and exposure of the building.

The heating coils should not be built haphazardly, but should be figured out beforehand by the use of some of the simple formulas found in books and catalogs on heating and plumbing.

### Grooving Short Pieces on the Saw

The sketch shows how short blocks of wood may be grooved on the saw without danger of kicking back, thereby preventing accidents. The drawing will be understood at a glance by any woodworking mechanic, and the rigging can be made in 15 minutes. This method not only eliminates the possibility of injury to the operator's hands, but also makes it possible to do more work in the same time than by


How to Groove Short Blocks

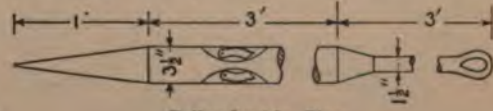
the old way of dropping the pieces on the saw.—Contributed by Henry Zahn, Chicago.

### A String Cutter

The accompanying sketch shows a handy little string cutter for fastening to the edge of the counter. It is made of a thin piece of steel and the cutting edge A tempered and sharpened. The shape of the cutter forms a guard over the cutting edge and prevents anyone from being cut. It also allows the string to reach the cutting edge easily.—Contributed by Abner B. Shaw, N. Dartmouth, Mass.


### Pipe Puller

A puller the right size to pull a 4-in. pipe must have the dimensions shown in the sketch. The main body is made of soft steel and the catches of tool steel tempered. The two catches are pivoted in notches milled in opposite sides of the main body in such a way that when the puller is lowered in the pipe, they will slip through, but, upon drawing the puller, the catches will




Puller for 4-In. Pipe

take hold on the pipe and pull it out. As many catches as are desired can be fastened to the puller.—Contributed by J. C. Talley, Rock Hill, S. C.

### Mending Moving-Picture Films

A little device which gives the best results in repairing films, says a correspondent of the Moving Picture World, is made of steel, ¼ in. thick by ⅝ in.

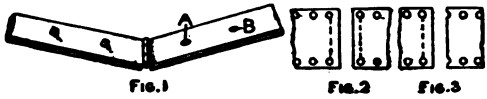



Fig. 1 Fig. 2 Fig. 3

Hinge Clamp

wide. Two pieces are hinged together as shown in Fig. 1. Small pins, the same shape as those on the sprocket of a moving-picture machine, are set in one half of the hinge, spaced the same distance apart as the two rows of perforations in the edges of the film. Two holes, A and B, are drilled in the other half hinge to receive the pins. This makes an effective press for the patch.

The ends of the film are prepared in the usual manner. The mend is made as shown in Fig. 2. This will not split the sprocket holes. If it is desired to split the holes, as in Fig. 3, then use more than one set of pins in the mending hinge.

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¶A tool for cutting brass should have no top rake, but for cast iron it should have at least 5 deg. and for steel at least 15 deg. rake.

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¶Small jugs, 1-qt. size, covered with crocheted wool make excellent hot-water bottles.

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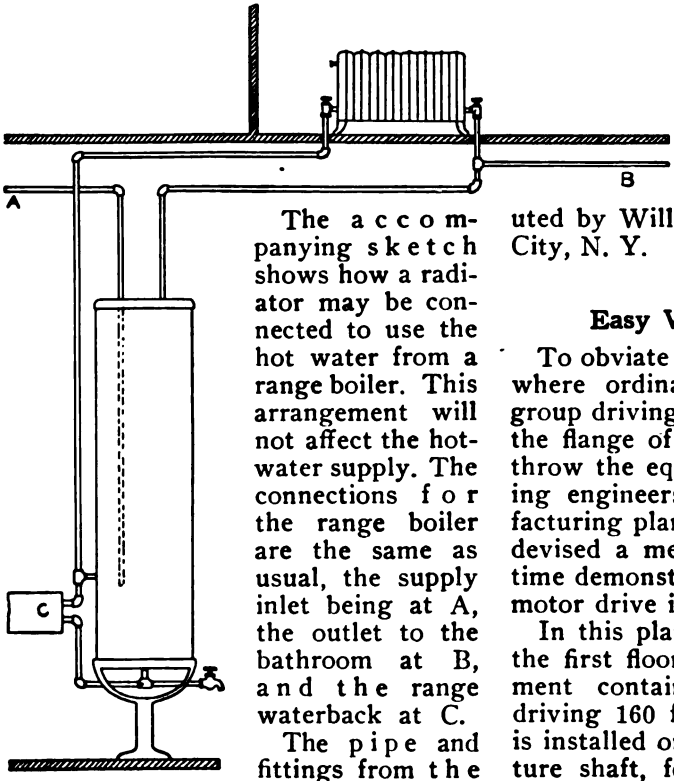
## Connecting a Radiator to a Range Boiler




Connections from Waterback to Boiler and Radiator

The accompanying sketch shows how a radiator may be connected to use the hot water from a range boiler. This arrangement will not affect the hot-water supply. The connections for the range boiler are the same as usual, the supply inlet being at A, the outlet to the bathroom at B, and the range waterback at C.

The pipe and fittings from the boiler to the radiator and the waterback and return should be 1 or 1¼ in. The inlet pipe and the pipe supplying the bathroom can be the regular size for the boiler. The radiator will heat a good-sized room nicely.—Contributed by William Carroll, Long Island City, N. Y.

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### Easy Way to Shift Belts

To obviate the tendency of the belts, where ordinary pulleys are used in group driving of machines, to slip over the flange of double pulleys and thus throw the equipment idle, the designing engineers of a big cotton-manufacturing plant at East Boston, Mass., devised a method which at the same time demonstrates the flexibility of the motor drive in special cases.

In this plant, according to Factory, the first floor of the spinning department contains forty 20-hp. motors driving 160 frames. A double pulley is installed on each end of each armature shaft, four frames being driven per motor, but instead of the usual flange on the double pulleys to separate the belts, the crowning on each

section is made ¼ in. off center, away from the middle of the pulley. By this means the belts are kept apart without any danger of their climbing the flange and being thrown off, and in addition, by centering these tight and loose pulleys on the frames with the highest point of the crown on the driving pulley, the belt can be shifted without throwing it off the motor pulley.

### Broom Holder Made of Rubber Hose

A piece of rubber hose, 6 or 8 in. long, cut as shown in the sketch, and nailed or screwed to a wall, makes a handy broom holder. The hose should be tacked to the wall about 2 or 3 ft. from the floor, so that the broom handle can be pushed through from the top and rest on the floor. This holder is easily made and will give satisfaction.—Contributed by Irl R. Hicks, Hallsville, Mo.

### Tamper Made of Pipe and Fittings

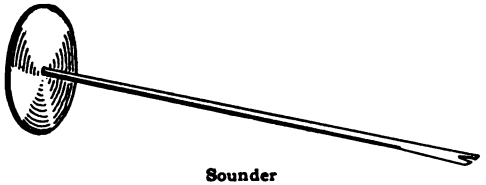
A very satisfactory tamper for earth can be made of a 1-in. pipe, fitted with a bushing and caps, as shown. The pipe should be about 5 ft. long. The bushing is used to secure a large tamping head.—Contributed by Earnest Boyce, Winterset, Iowa.

Tamper of Pipe and Fittings

### Boring-Tool Sounder

When boring on a lathe it is quite hard to determine whether or not the tool is cutting properly. The instrument shown in the sketch will tell with a remarkable degree of accuracy. The instrument is made of a piece of ⅛-in. drill rod, about 13 in. long, set in an elliptical piece of wood, 1⅛ in. long and ⅜ in. in diameter in the largest part. A small fork is formed on the end, as shown in the sketch.

In using the fork, place it on the boring tool and place the wood knob close against the ear. If the tool is cutting a trifle out of the way, the vibrations will show it instantly.—Contributed by F. W. Shrier, New Haven, Conn.



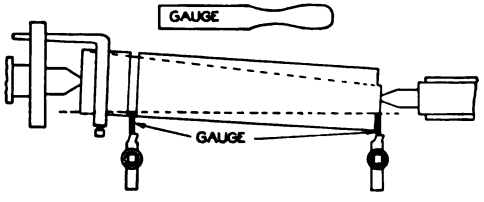
Sounder

### A Safety Lathe Dog

The construction of this lathe dog is apparent from the illustration, from which it will be seen that the setscrew is so protected as to avoid the familiar accident due to the lack of such protection. The setscrew can be adjusted by the ordinary type of wrench, and should it become burred or damaged, can be readily renewed by the use of a socket wrench inserted through the hole in the protection frame.

### A Gauge for Setting Centers in Taper Turning

It is not always necessary to know the amount to set over a tailstock on a lathe in turning tapers. A very easy way to set the work in the centers to turn a taper is to use a gauge as shown in the sketch. The first requirements




Gauge Used in Setting Taper Stock

are to turn a place to the right diameter at each end of the part to be tapered, then loosen the tailstock so that it can be easily moved. Set the gauge between the surface of the turned part and the cutting edge of the tool first at one end and then the other, without changing the crossfeed, but moving the carriage back and forth until the tailstock is set right to make it gauge the same in the cut at both ends. Set the clamp bolt on the tailstock and cut the taper.—Contributed by C. Gatter, Bridesburg, Pa.

### Cutting Off Hollow Bored Cores

Cylindrical hollow steel bodies with bottoms can be made from the solid bar by boring out a core down to the inside of the bottom and using an undercutting tool to cut down to where the core may be broken off, as shown in Fig. 1. This method is applicable to all kinds of steel, says the American Machinist. It is especially advantageous, where valuable material is used, in saving the stock in the core, and, where the interior pressure is to be high, in simplifying the construction and reducing the cost.

The cutting-off tool for hollow core borings is shown in Fig. 2. Its construction is special. The body of the tool, A, is made of steel. A steel bolt is screwed into a milled eye and on this bolt a tool-holder, B, is pivoted, curved in conformity with the bore. The cutter C, of high-speed steel, is dovetailed into the holder. In the end of the holder there is a hole in which there are fastened two cords of very high-grade steel wire, with loose ends. The cords are led out through opposite eyelets in the tool body, parallel to its axis. The cord that is entirely visible in Fig. 2 serves to feed the cutter under. The smaller cord may be used to pull the cutter out of the undercut. The body of the tool is centered in the bore that has been made by four hardwood blocks, D, dovetailed into the periphery of the body.

The cutting off of the core is performed on the same machine that is used for the boring, Fig. 3. The cutting-off tool is attached in the same manner as the hollow boring tool, by means of threads on the hollow boring bar. The cord F, Fig. 3, used to feed in the cutting-off tool, is led over the pulley G, and wound on the drum I, which is driven by the feed rod H. For undercutting the core, the feed

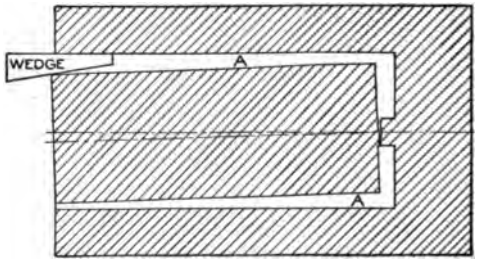



Fig. 1

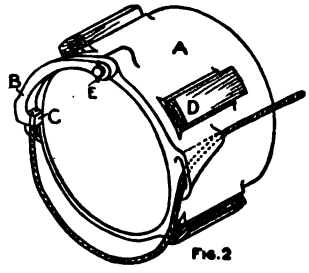



Fig. 2

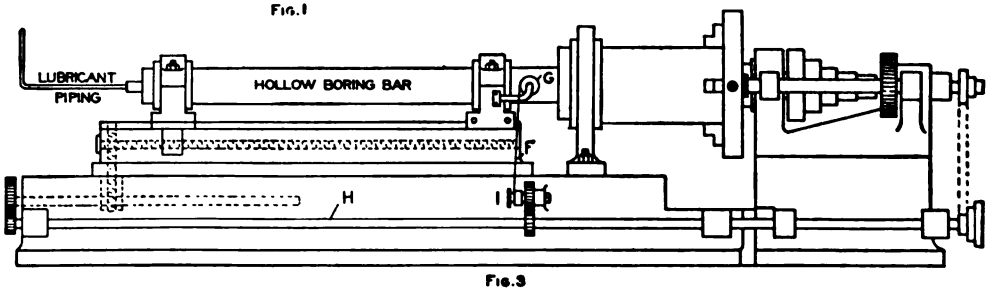



Fig. 3

Cutting-Off Tool and Its Position on a Lathe

of the hollow boring bar must, of course, be disconnected.

The cutting lubricant, composed of a mixture of water with a cutting oil soluble in water, is forced, under high pressure, through the boring bar, to wash away chips. It is of great importance to grind the cutter so that the chips do not roll off as long shavings, but break into small pieces.

### Chip Magnet for Drill Holes

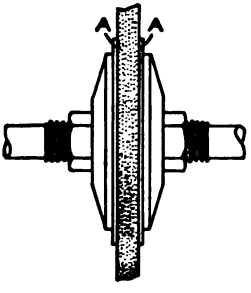
When drilling holes in parts that cannot be turned over, the little tool shown in the sketch cannot be excelled for removing the metal chips from the

Small Rod Magnet

bottom of the holes. It is made of a piece of ⅛-in., or larger, drill rod. The rod has a slot cut in it, as shown; then the steel is magnetized by placing on an electric generator, or, by wrapping a coil of insulated wire around the head end and passing an electric current from a battery through the wire. —Contributed by J. F. Tholl, Ypsilanti, Mich.

### Mounting Emery Wheels

A way to lessen the chances of an emery wheel breaking is to use two rubber washers, AA, between the sides of the wheel and the nuts. In case the wheel should break, the greater part of the fragments are prevented from flying. I have tried this only on wheels up to 6 in. in diameter. —Contributed by Chas. Hattenberger, Buffalo, N. Y.




¶Window sash can be made to run smooth in the grooves by applying a solution of paraffin in turpentine.

### An Emergency Tire-Lacing Needle

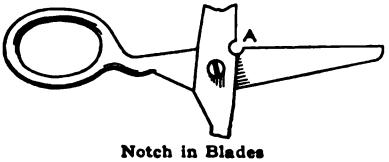
A needle for lacing the casing of a double-tube tire can be easily made of a piece of medium-weight wire

Needle of Twisted Wire

twisted as shown in the illustration. Such a needle is better than the ordinary steel needle as it can be bent to pass through the holes, and not being sharp, it is not so liable to puncture the inner tube.—Contributed by Paul H. Burkhart, Blue Island, Ill.

### Wire-Cutting Notch in Shears

A small pair of pocket shears can be fixed to cut small wires by forming a notch in each blade, as shown at A in




Notch in Blades

the sketch. The notch does not interfere with the ordinary use of the shears.—Contributed by C. Irving Fisher, New York City.

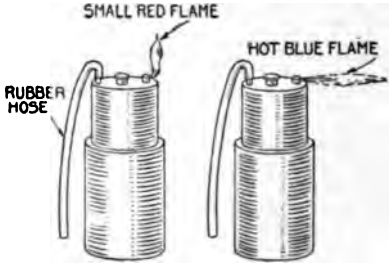
### A Whitewash Mixture

Walls may be given a bright, clear, white coating with a whitewash made up as follows: 1 teacupful of salt, 1 teacupful of brown sugar and 2 oz. of powdered blue vitriol are separately dissolved in hot water and then added to 1 pailful of water-slaked lime. Stir the parts together thoroughly. This will make a whitewash that will not rub or peel off.

The vitriol gives a bright, clear color. If a yellow tint is desired, use green vitriol instead of blue. The mixture will have a green tint, but when it dries on the wall it will be a nice yellow.—Contributed by Frank J. Lilja, Indian Orchard, Mass.

### A Gasoline Torch

An old discarded gas generator used on a motorcycle served the purpose well in making a gasoline torch, says a




Connections to Tank

correspondent of Motor Cycling. I put a hose, 6 or 7 in. long, over the water pipe on top of the generator, and then lit the gas that escaped from the opening in the top. It burned with a small red flame. When blowing through the tube, it was changed into an intensely hot blue flame. This is a handy torch for a multitude of things where the ordinary gasoline blowtorch is generally used.

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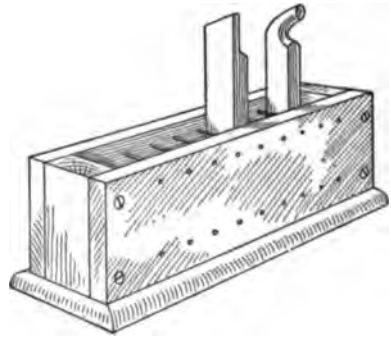
### Stand for Lathe Tools

Lathe tools often become scattered, and even when they are laid in order, it is sometimes difficult to pick out the right one. To overcome this difficulty, the stand shown in the sketch was



Tools in Stand

made, in which the tools are kept upright and the points in plain sight. In addition to this, all the tools may be moved easily. No dimensions are given, as each stand will have to be made for each particular set and size of lathe tools. The stand will be of more use for small lathe tools.

The stand is made by clamping two sides together and laying out the holes, which are spaced so that the distance between them will be about $\frac{1}{16}$ in. larger than the thickness of the lathe tools. The lines of the holes are about as far from the edge of the side pieces as the pieces are thick. Each hole in the bottom line is directly under the corresponding hole on the top line, so that when the tool is placed in the stand it will be held upright. The holes for the crosspieces, which are wire finishing nails, are drilled through one side but not quite through the other, and must be a shade smaller than the nails, or else the nails will work loose and fall out. If the nails fit too tightly, the wood will split when they are driven in.

The end pieces are cut $\frac{1}{8}$ in. wider than the largest tool and as long as the sides are wide. Small round-head screws are used to hold the sides to the ends. The base is $\frac{1}{4}$ or $\frac{3}{8}$ in. larger all around than the main body and is rounded or chamfered on the four top edges. It is fastened to the body by countersinking a screw through it into each end piece.—Contributed by Donald A. Price, Wilmington, Del.

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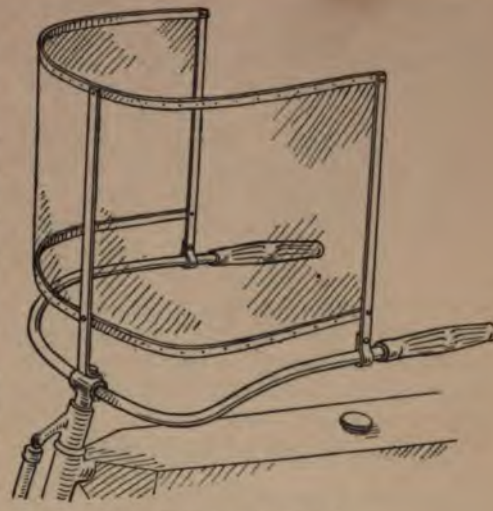
### Drilling Holes in Metal

Starting a hole with a center-punch mark and drilling until the depression is gone, then using the punch again, is slow work on large holes and, besides, is not very accurate. I tried using a small drill and following with a larger one. Holes $\frac{1}{2}$ in. in diameter can be drilled through very heavy plate in this manner without any particular effort. Start the hole with a $\frac{1}{8}$-in. drill and follow with a $\frac{1}{4}$-in. drill. Holes can thus be drilled both quickly and accurately either by hand or on a makeshift drill press.—Contributed by C. W. Goddard, Bellaire, Mich.


### Windshield on a Motorcycle

A good motorcycle windshield can be made by constructing a frame of copper strips, ⅛ in. thick and ½ in. wide, as shown in the sketch. The frame is fastened to the handlebars and covered with celluloid, the edges of which are attached with small bolts. In this operation care should be taken to keep the celluloid taut, and washers should be used on the bolt ends. The shield is easily adapted to the shape of any handlebar.

The shield may be made long and high enough to protect the greater part of the rider's body, but should not be so long as to interfere with the cooling of the engine.—Contributed by Harry C. Kelley, Pittsfield, Mass.



Shield on Handlebar

## Humidifier for a Hot-Air Furnace

The chief difficulty in heating a house to summer temperature is to supply the proper amount of moisture. A room with humid air, at 65 deg., seems warmer than with dry air at 70 deg. In addition, the humid air is more healthful because more like the air of outdoors. Hot-air furnaces seem to dry all the moisture out of the heated air. To supply humidity the furnace is usually provided with a small pan, which, however, is not very effective, as it does not present sufficient evaporation surface to the air current within the furnace.

A practical scheme for moistening the air is to connect a water pipe as shown in Fig. 1. The vertical ¾-in. pipe is placed directly above the pan. The water flows out from the upper end A of the pipe, and runs down along the outside of the pipe, which presents a large surface to the current of hot air. The unevaporated water drips into the pan B, from which it is drained by the pipe D, leading to the cellar drain. By properly regulating the valve C, there will be very little overflow into the drain.

To find whether the air is being prop-

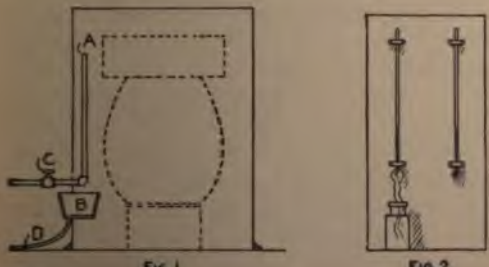


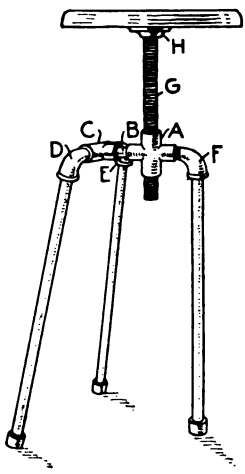

Fig. 1 Fig. 2

Humidifier in the Furnace

erly humidified or not, a hygrometer must be used. A sufficiently accurate hygrometer can be made at home as shown in Fig. 2. Take two thermometers which register alike or nearly so, and mount them side by side on a board. Under one of them place a small bottle filled with water. Wrap a wick of cotton batting around the bulb of this thermometer and immerse the other end of the wick in the water. The two thermometers will register different temperatures if the air is dry. If it is moist, they will read alike. The greater the amount of moisture in the air, the less the difference in the readings. The reason is that the drier the air, the greater the amount of moisture that will be evaporated from the wick, and since the water must absorb heat to evaporate, the thermometer bulb is cooled, causing the wet thermometer to register a lower temperature than the dry.—Contributed by J. J. O'Brien, Buffalo, N. Y.

### How to Make a Shop Stool

The central piece consists of a ⅜ by ½-in. reducing cross fitted on one end with a close nipple, B, which in turn is screwed into the side outlet of a ⅜-in. tee, C. Two ⅜-in. street els, D and E, are screwed into the end openings of the tee, and one into the cross. Three pieces of ⅜-in. pipe are cut about 2 ft. long, and a thread cut on both ends of each piece. One end is fitted with a cap, and the other end turned into the street els D, E and F. This completes the three-legged base of the stool.




The standard G of the seat is made of a piece of ½-in pipe about 1 ft. long. A long thread is cut on this pipe so that it can be secured into the ½-in. threads of the cross A. The upper end of the standard is fitted with a floor flange, H. The seat is a wooden disk turned to about 8 in. in diameter. The floor flange H is fastened with screws to the under side of the disk. All joints should be turned up tightly; and to make a more rigid stool, drill holes and place rivets through the parts.—Contributed by F. S. Moore, Los Angeles, Cal.

### Coating Cistern Walls

A way to prepare a sanitary cistern is by painting it with two coats of "water glass" or glass paint. The painting insures the softness of the water, since no chemical action can take place between the walls and the water. It also keeps the cistern from leaking and prevents pollution of the main part of the cistern by surface or sub-surface water.

A good and cheap cistern may be made by simply plastering the dirt wall and floor of an excavation with a 1-in. coat of cement and painting it with the water glass. The water will then be soft from the start, as it is not necessary to allow the water to saturate the chemicals of the cement, before it will be kept soft in the cistern.

The water glass is absolutely harmless and can be purchased at any drug store and is a very cheap material to use for sanitary measures.—Contributed by Loren Ward, Des Moines, Iowa.

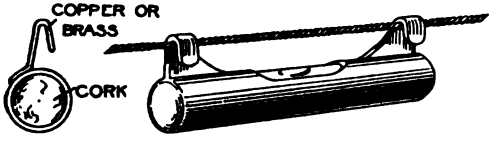
### A Homemade Line Level

A very handy and convenient tool, known as a line level, is shown in the sketch. It can be made quickly and easily and only the spirit bubble glass need be bought. This level not only takes the place of an ordinary 12 or 16-ft. straightedge, but can also be used for rough-grading of sections up to 100 ft. in length.

Bubble glasses can be purchased in several sizes, the smallest

by ¼ in., and the next larger, 2 by ⅜ in. The latter size is the best to use for this purpose. A piece of copper or brass tubing, ⅜ in. inside diameter and 2½ in. long, is used for the barrel. An opening, 1 in. long, is filed in the center of the tube for observing the bubble in the glass. Two copper or brass hooks are soldered on the ends of the barrel as shown, great care being taken to have the hooks exactly the same height. A piece of white paper is then fastened on the under side of the glass firmly secured to it with narrow strips of gummed paper at each end. After inserting the glass in the tube a little wad of cotton or tissue paper is put into each end, and corks, previously dipped in shellac, are pushed in as far as possible. The corks are then cut off flush with the ends of the tube and covered with shellac.

To test the line level a line is put




Level on a Line

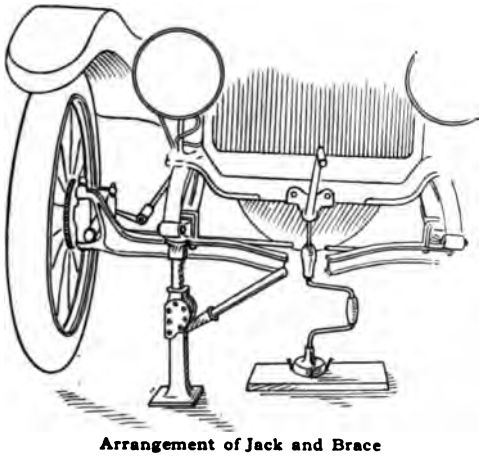
up and leveled. The level is then reversed, end for end, and when the bubble rests in exactly the same position either way, the instrument is ready for use.

## Drilling an Automobile Crankshaft by Hand

The crankshaft pin, engaging with the dog of the starting crank of a four-cylinder automobile, sheared off and had to be drilled out in order to put in a new pin. The position of the front axle prevented the use of a breast drill, and the radiator hindered working from above.

The car was jacked up and a carpenter's brace, with the proper drill, was set below with the handle fastened by driving nails into a board under it. The car was gradually lowered, its own weight being the "feed," and in a short time the hole was drilled.

Thus all the trouble of removing the radiator, etc., was avoided, and what at first seemed a hard proposi-



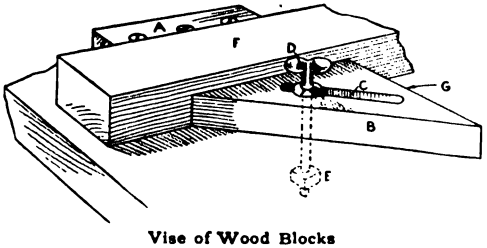
Arrangement of Jack and Brace

tion, was easily accomplished. A ratchet brace was used, as the axle and tierod were in the way. This method could be easily used instead of a chain drill for many jobs around the shop. —Contributed by Odin Dorr, Bala, Pa.

## Bench Vise for Light Work

A bench vise for light work can be made of two blocks of wood and a bolt. The block A is fastened to the bench with screws. The block B being triangular has a slot, C, cut parallel to the long side. The bolt head is forged into a thumbnut, D, and the bolt inserted through the slot and bench top, and screwed into a nut beneath.

The work F is placed between the blocks, and the triangular piece B is tightened like a wedge by driving with

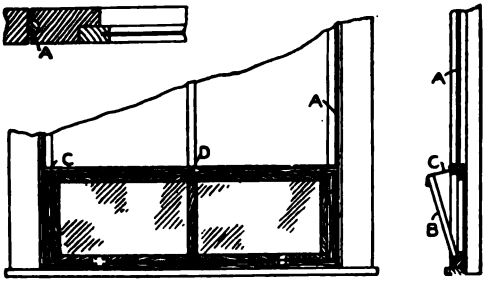



Vise of Wood Blocks

light blows of a hammer, on the edge G.—Contributed by James E. Noble, Toronto, Ont.

### A Window Ventilator

The perplexing problem of ventilating a room on a windy night without causing a violent draft and yet have




Ventilator in Window

fresh air, caused me to construct the ventilator shown in the sketch. A frame, about 1 ft. high, was made to receive a lighter frame, B, containing two panes of ordinary window glass, and fitting in the same slides A on the window frame as were used for the screens in the summer. The light frame is fastened with two hinges at the bottom to allow it to open inwardly, so that, when the lower window is raised, fresh air can be admitted without a draft.

Pieces of leather, C, are fastened at either end of the frame A, and on the window B, to allow this to open about 3 or 4 in. A small wooden button, D, is used to hold the window closed. The whole frame can be removed to another window of the same width when desired.—Contributed by C. D. Maxson, Westerly, R. I.

### Turning Dowels

As I had occasion to use a large number of small dowels and had nothing but a small lathe to turn them on, it was quite a problem how to do the job easily and quickly, until I worked out the little device shown in the sketch. I drilled a hole of the right size for the dowel in a piece of steel and then, with a cold chisel, cut some teeth in the edge of the hole on one side. After the teeth

were cut, a drill was run through again to remove the burrs. This, used in connection with the lathe, made an excellent cutter for dowels.

Pieces of wood were planed out and held in the chuck of the lathe and the tool run on the wood while it was turning.—Contributed by J. H. Beebe, Rochester, N. Y.

### Soldering Metal Fixtures to Lead Pipe

A cone-shaped piece of strong asbestos sheathing fastened on a piece of copper, iron or brass tubing, as shown in Fig. 1, allows enough solder to be built up around the point where the two pieces of tubing are to be joined, to assume the shape shown in Fig. 2. This mass of solder can be filed or rasped into the form shown in Fig. 3.

Besides being a reinforcement, this joint is more uniform in shape and thickness than the joint ordinarily made with the soldering iron. Instead

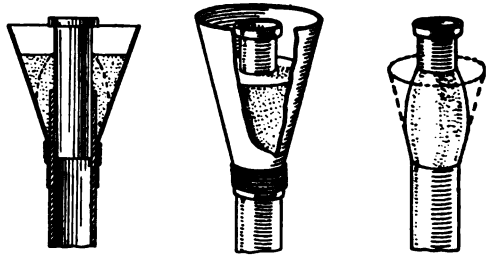


Fig. 1 Fig. 2 Fig. 3

Cone on the Pipe

of the soldering iron, a blowtorch can be used, the joint first being tinned and then pieces of melted solder dropped into the asbestos cone and heated to the requisite degree for forming a joint.

### Preserving an Oilstone

Some time ago I wrapped my oilstone in a piece of cotton cloth after having used it and upon unwrapping it the next time discovered that the stone was perfectly clean. Since then I have always kept it rolled up when not in use. The cloth seems to ab-

sorb the oil and remove the particles of steel. The stone is always keen and never gums up, notwithstanding it is used by everyone in the shop, and with all kinds of oil.—Contributed by Fred N. Parks, Norwich, N. Y.

### Repairing a Broken Spring

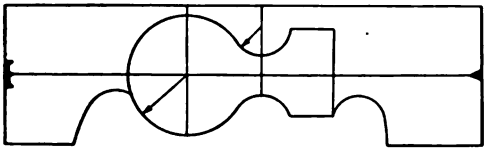
Springs broken as shown in the sketch can be very easily repaired by bending a piece of round iron of the same size as the spring wire into a U-shaped eye and applying it as shown.

Clip on Spring End

A spring repaired in this manner will be found as good as new.—Contributed by G. H. Holter, Jasper, Minn.

### Wood Turning without a Template

When turning work for which a template is necessary, the following method will prove quite accurate, and the work is quickly accomplished. Turn the work cylindrical to the largest diameter of the pattern. While the piece is turning, use the dividers to lay off the centerlines. Take the piece out of the lathe and lay out the outline on the parting of the lower half,



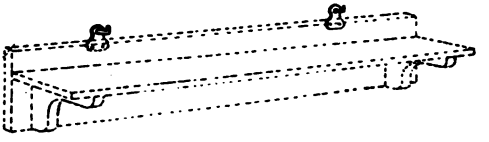
Form of Wood

as shown in the sketch, with the crowfoot center at the left. Cut the wood on the jig or band saw accurately on the line drawn. Fasten the halves together and place them in the lathe. If the job is one that is not parted, the pieces may be glued. In finishing the piece, turn the wood down on the line sawn.—Contributed by W. C. Conway, Eddystone, Pa.

¶Never work over open running gears without buttoning the blouse.

### Hanging a Shelf

The lugs taken from a discarded tin pail are worth keeping. They can be

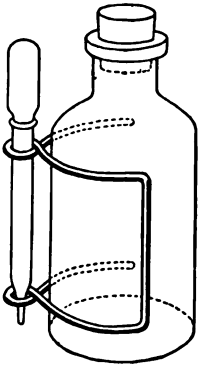


Pail Ears on the Shelf

used to hang shelves, small medicine closets, etc. The lugs are easily fastened to the wood with screws.

### Bottle Clip for a Medicine Dropper

The accompanying illustration shows a medicine-bottle clip for holding the dropper or pipette. Anyone can make the clip of a piece of wire by bending it to fit the size and shape of the bottle as shown. Two loops are formed in the wire, the one at the top being large enough to receive any pipette loosely, while the lower loop holds and supports the tip. The pipette can thus be easily removed and replaced.



### Extension Shank of a Twist Drill

Procure a piece of round stock, a little larger than the drill shank, and drill a hole in one end, about ½ in. deep. File a ½-in. slot, A, to the center, with its edge even with the bottom of the hole. File the shank of the drill B flat for about ½ in. When


Fig. 1 Fig. 2

Drill Shank Extension

the drill is inserted, the two flat surfaces will prevent it from turning.—Contributed by I. W. Verner, Roxbury, Massachusetts.

### Portable Automobile Crane

A crane for use in a garage can be easily constructed of scrap material picked up about the shop. It is made principally of gas pipe and angle iron.

Crane of Scrap Material

The base is 5 ft. long, 3 ft. wide at one end and 18 in. at the other. It is built of 4 pieces of ½ by 3-in. iron bars. The upright post is a 3-in. gas pipe, 6½ ft. long, set in a collar fastened to a cross plate of ½ by 6-in. metal.

The narrow end of the bed has a V-shaped brace made of 1½-in. angle iron. The 3-in. tee on the top of the upright is bored out to fit the arm of the crane, which is also a 3-in. gas pipe. A 1¼-in. shaft constitutes the drum, which is passed through bearings in the V-shaped angle-iron brace and on the upright. A crank and ratchet is attached to the outer end to facilitate the hoisting.

Two straps of metal, each ¼ by 4 in., are shaped similar to a horseshoe and placed over the top of the crane arm, one at the end, and the other central between the upright post and the end brace. A pulley is placed between the ends of these straps, and a hole cut on the under side of the pipe to allow the chain to enter the pipe.

Such a crane will easily lift one end of an automobile and is very handy for removing the power plant or transmission to make necessary repairs.—Contributed by J. C. Turner, Franklin, Kentucky.

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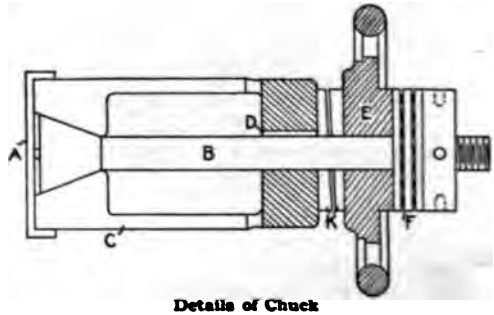
### Expansion Chuck for Automatic Buffing Machines

The chuck shown in the accompanying sketch was devised by a correspondent of American Machinist to hold work securely in an automatic buffing machine to increase its output.

The central expander post, B, has no end motion, the angle on the expander end being made fairly steep, so that the expanding sleeve C, which is a sliding fit on B, will release itself as soon as unlocked. The lever D turns the ring C with the post B, which is an extension of the machine spindle proper.

The locking ring E is the principal feature of the chuck. This ring, with a handwheel attached, or made integral, as preferred, is made with two cam pieces, K, directly opposite each other. The locking ring is a running fit on the expander B. The ball thrust bearing F takes the thrust.

The operation of the chuck is simplicity itself. As the buffing spindle revolves, the operator grasps the handwheel on the locking ring E for an instant; this either releases or engages the cam K with the expanding sleeve C, causing it either to contract or expand, as required. In making different chucks for various sizes of




Details of Chuck

work, it is necessary to make only one new piece, namely, the expanding sleeve C. After its first in[illegible] the cost of maintenance is [illegible].

# The Use of Stencils for Interior Decoration

By HOMER H. KNODLE

## Part I — Preparing the Room

The first problem that confronts the decorator or maker of stencils when he comes to use them, is the preparation of the walls of the room.

The coating of color is applied in the usual manner and lines along which the different shades of the wainscoting, wall and ceiling meet are rough and ragged. The dividing line between the ceiling and the wall is usually covered with a picture molding, and that between the wainscoting and the wall, by an ornamental border or chair rail. Sometimes only a plain band, about ½ or 1 in. in width, is used with good effect.

The stencils must be in good order and, if used before, should be thoroughly cleaned so that none of the color used on a previous job remains on them to mix with the new color to be used.

In the preparation of colors, the usual practice is to make a darker tint of the wall color for the border, where a dark shade is used on the ceiling. If the ceiling is light, a lighter tint of the wall color is used. In mixing stencil color, add enough lampblack to the wall color to obtain the desired tint. Above all, mix the colors thoroughly, and be sure to prepare a sufficient quantity for the whole job in one mixing, as a second mixing will never prove the same tint as the first. Only one color at a time can be used in stenciling. If two colors seem desirable, shade the stencil design with the selected second color. Two-color work requires two sets of stencils cut so accurately that the design will register, and even then, if they are not placed correctly, the finished design will be rather unsatisfactory.

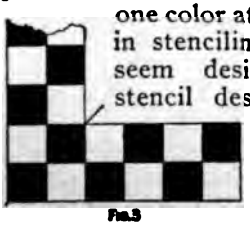


Fig. 3

Before beginning to stencil, it is necessary to lay out the guide lines accurately in order to obtain the best result. Measure the vertical dimensions accurately with a yard stick from the floor upward, and make distinct marks that can be readily found. When this is done, take a chalkline, chalk it thoroughly, and draw it taut against the wall, then let someone "snap" it by pulling it from the wall at the middle and then suddenly releasing it. This will produce a perfectly straight line. Make these lines on all vertical measurements. In laying out the ceiling, measure from the edge, again using the chalkline.

After the lines are all laid out, measure them and see if the stencil will match properly. If this cannot be accomplished, make the junction of the design in the corner, where it will not be readily seen. This is shown in the illustration. A matched stencil in a corner is shown in Fig. 1, and one that is not matched, in Fig. 2. No

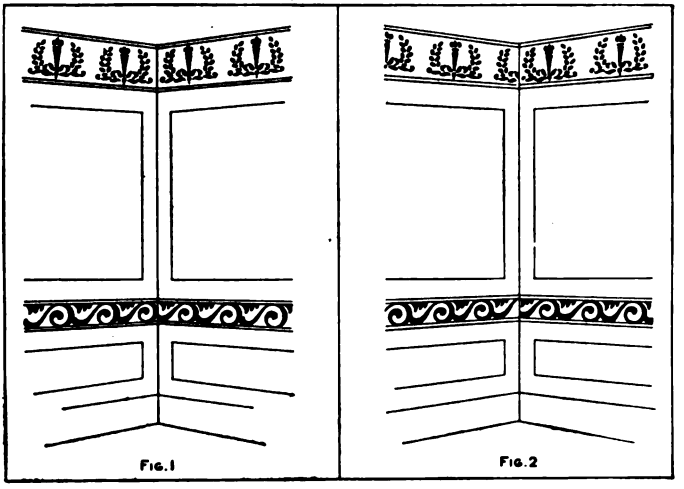


Fig. 1 Fig. 2

Matched and Unmatched Corners

effort should be made to patch up the work, as this would only make the junction more noticeable.

If no cornerpieces are used on a ceiling panel, the corners must be matched

Fig. 4
Holding the Stencil

as shown in Fig. 3. A line is drawn at the corner of the ceiling at an angle of 45 deg., to show where to stop the color. If this is followed closely, it will give a neat joint.

Still greater care must be exercised when oil colors are used, as they are of a permanent character, and it is difficult to change the colors if a mistake is made. Only the best quality of oil colors should be used. They are always mixed with boiled linseed oil, to which sufficient turpentine has been added to produce a flat color. A good mixture is made of half oil and half turpentine.

Very little color should be used on the brush. The color is stuck on the wall through the perforations with short strokes of the brush. The method of holding the stencil to the wall while painting the design is shown in Fig. 4.

Water colors are used in the same manner, the only difference being in the mixing. The color should be mixed very thick. Some decorators use them mixed to the consistency of a thin wax, and stipple the design on the wall. If a standard color is used in water-color work, it is not so important that a large amount be mixed, as the shade can be duplicated by buying it from the same manufacturer. Homemade water colors are not so reliable and it will pay to purchase colors that are guaranteed.

When stenciling with calcimine, it will be necessary to coat the stencil in order to protect it from the chemical action of the liquid. Coat the stencil sheet on both sides with orange shellac, taking care to cover the edges. If a used stencil of the right pattern is at hand, another can be made by stenciling the pattern on another piece of stencil board and cutting it out.

(*To be continued*)

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### Strike-Off Tool for Cement Workers

A tool for striking off the surface of cement in sidewalk construction is very important. Such a tool can be made by any blacksmith. The illustration


Angle-Iron Strike-Off Tool

shows a tool which was designed by a correspondent of the Cement World. It is simply a piece of 1½-in. angle iron, 6 in. or more longer than the width of the sidewalk on which it is to be used, with a large handle on each end. The handles are of ¾-in. round iron, with ends flattened and riveted to the inside of the angle.

To use the strike-off tool, a workman at each end grasps it by the handle, each handle being convenient for holding with two hands, and the surface of the top coat is cut off neat and clean with a sort of sawing motion. Each man in turn pushes his end slightly forward so as to keep the surplus material on the walk ahead of them. When this accumulates, it may be removed with a shovel. If a little care and judgment are used in the striking-off process, it saves a large part of the work of finishing and greatly improves the quality of the work.

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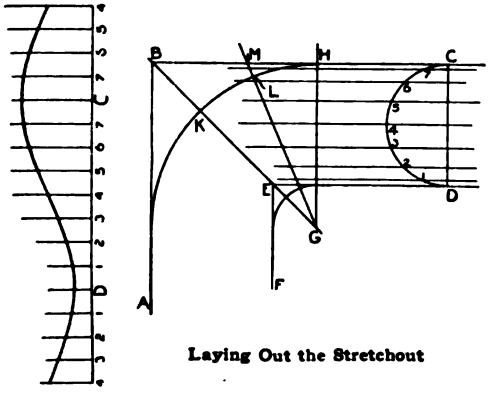
¶A large tool should never be hardened in a small bath, as this will result in uneven hardness.

### Pattern for a Three-Piece Elbow

Draw lines ABC and DEF, the distance between these lines being equal to the diameter of the elbow, and find a point G on the line BE extended, so that EG equals one-half the diameter of the elbow. With G as center, scribe two arcs of a circle each one being tangent to the lines AB and BC; DE and EF, respectively. Space off one-half the distance from H to K at L, and draw the line MG. Draw a semicircle, CD, and divide it into as many equal parts as suitable for the size of pipe. Then draw the horizontal lines on the divisions, and lay out the stretchout as shown.

As the seam is to be on the side of this elbow, begin to determine the points of the curved line by setting off at the end (4) of the stretchout a distance equal to that part of the middle horizontal, or line marked 4, which lies between the lines HG and MG. Proceeding downward on the stretchout, next set off the corresponding part of horizontal line 5 on the line marked 5 in the stretchout, and so on, until the line BC is reached. Now return and set off the proper distances of the horizontal lines on the lines in the stretchout marked with the corresponding numbers, until line DE is



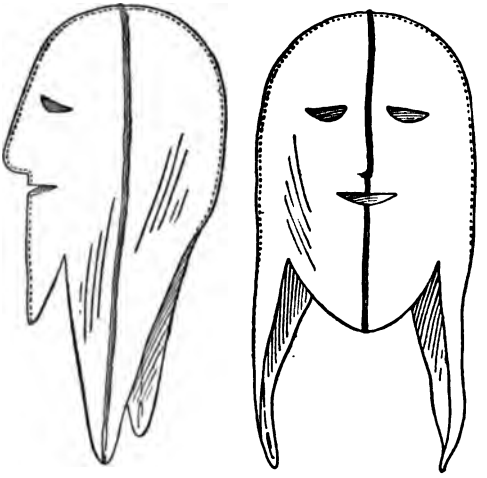

Laying Out the Stretchout

reached, thence back to the starting point or central line 4. By joining all the points thus determined on the stretchout, the line to which the flat sheet iron should be cut is found.

It is scarcely necessary to state that the lines on the stretchout should be stepped off the same distance apart as the divisions between C and D on the semicircle.—Contributed by S. C. Shipman, St. Petersburg, Fla.

### Motorcyclist's Headgear for Cold Weather

Several kinds of caps and face protectors were tried out by a correspondent of Motorcycling and none found



Face Protector of Chamois

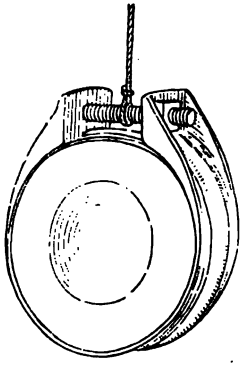
as good as that shown in the sketch. It is made of four pieces of chamois skin, which were stitched together as shown, to make one of the seams come in the center of the face and another back of the head. Two holes were cut for the eyes and one for the mouth. The hood should be long enough to come down over the neck and inside the coat or sweater. The headgear is worn under a riding cap or knitted toboggan cap.

### Tapping Composition-Rubber Bushings

At one time I had a large quantity of composition-rubber bushings to tap, such as used for insulating purposes on electrical connecting cords. After breaking a good many, I tried soaking them in hot water until they were soft, and then tapped them without any loss.

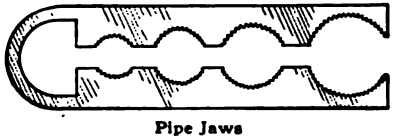
### Billiard Chalk Holder

A very serviceable billiard chalk holder can be made of hose clamps, as shown in the sketch, by using a piece of wire as a connection between the holder and the cord. The cord may be tied directly to the bolt. If small clamps cannot be obtained, a little friction tape can be wrapped around the chalk before it is inserted in the holder.



### Pipe Jaws for an Ordinary Vise

The average mechanic cannot resist the temptation to hold a pipe in an ordinary vise when no pipe vise is at hand. The pipe will be dented or crushed, if the jaws are closed too tightly. This may be prevented by using a pipe jaw especially made for the ordinary vise. The jaw is made by drilling a number of holes to fit the different sizes of pipe in a piece of flat steel, and notching their edges. A slot is cut lengthwise of the piece through the holes and one end cut out to form a spring. When this pipe jaw is slipped over the pipe and clamped in



Pipe Jaws

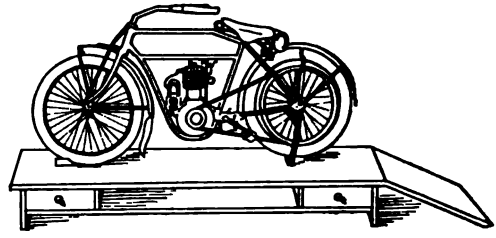
a vise, an equal pressure is distributed around the pipe. The teeth will prevent the pipe from turning.

### Plumbing Tall Work

Sometimes it is necessary to plumb high and heavy work and have it quite accurate. The usual way is to attach the plumb-bob line to the object as it is raised. This means that somebody has to climb up and release the line. A much easier way is to place the plumb-bob line on some object about on a level with a person's head at a distance, and sight along the line and the object to be plumbed. It can thus be readily determined which way to move the object in order that it may be in line.

### Motorcycle Repair Bench

The object of the bench shown in the sketch is to get the motorcycle well off the floor, so that the repairman can work without too much stooping. The bench is about 15 in. high. A drawer is provided at each end for special motorcycle tools, parts, etc. These drawers slide both ways, giving access from either side of the stand. The central space is spanned



Motorcycle on Bench

by an open shelf which is very convenient. Such benches are usually nailed to the floor, and the inclined board is permanently fastened in its position.—Contributed by Donald H. Johnston, Collins, O.

### Covering Ignition Wires

High-tension cables and other insulated wiring of automobiles become short-circuited with oil after they have been in use for some time, causing the current to jump through the insulation instead of jumping across the gaps in the spark plugs. This is very annoying as spark plugs will work very well when they are out of the cylinders, but will not spark under compression. This trouble can be remedied by covering the cables with old or new rubber hose, either of which is much cheaper than new cables.

# A Homemade Brass Furnace

Brass casting has been accomplished for more than 25 centuries, yet in all that time the crucible brass furnace has changed but little. The simplicity of the method seems to have made it difficult to improve upon, although of course there have been many changes in the details of construction and in the fuel used.

There is hardly an iron foundry today that does not devote some of its floor space to making brass castings, and there are numbers of foundries casting brass only, or perhaps brass and aluminum. A correspondent of Southern Machinery had occasion to install a double furnace, as shown in Fig. 1. For various reasons—chiefly, however, to test some theories of his own—he decided to build the furnace himself. He secured a furnace giving excellent satisfaction.

The furnace was made as follows:

A single furnace, Fig. 2, can be taken as the example, the only difference being in the size of the main chimney. All that is necessary in the way of patterns is the bottom plate and the grate, which most foundries will have in stock. It should be mentioned that these are natural-draft furnaces. The inside dimensions are 16 in. in diameter by 20 in. deep. The flue opening is in the side, about 2 in. below the top of the furnace wall. In this instance the flue was made rectangular, 6 in. deep and 8 in. wide. This gave a depth for the fire and crucible of 22 in. below the flue. The top and bottom plates were made from the same pattern, the only difference being the lugs on the bottom plates for hinging the grate. The plates and grate being made, a sheet-iron drum large enough to admit a brick lining, leaving a diameter of 16 in., or the same size as the opening in the top and bottom plate, was obtained.

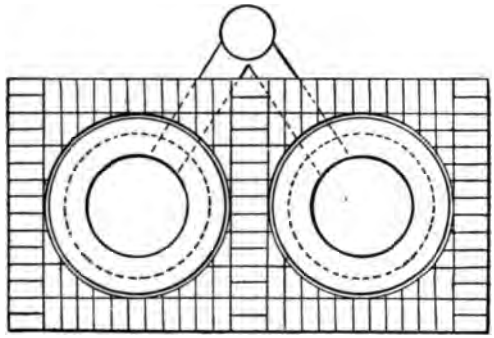


Fig. 1—Homemade Double-Crucible Furnace

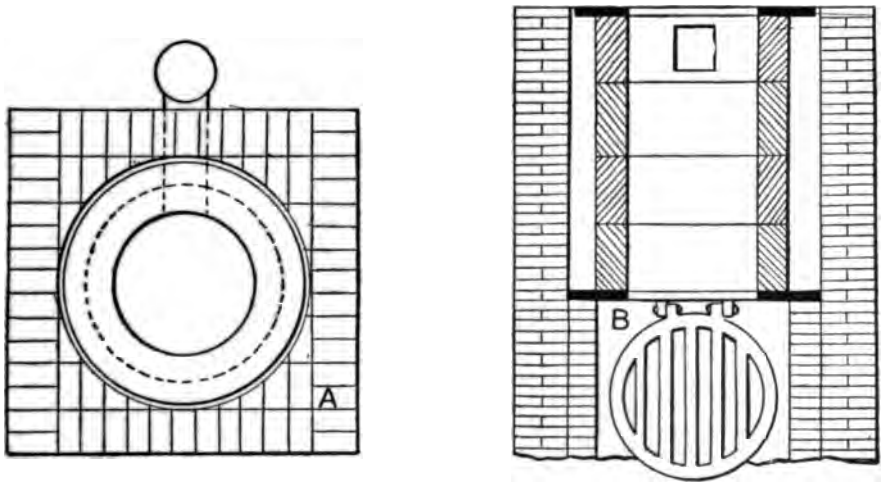



Fig. 2—Homemade Brass Furnace for a Single Crucible

This furnace was set in a pit so that the top would come even with the floor. The pit was dug and walled up with brick, and a concrete floor laid on the

bottom. The pit was large enough to allow of its being easily cleaned out and deep enough to allow the grate to swing free from the floor when it was dropped—that is to say, the depth equaled the height of the furnace plus the diameter of the grate plus about 2 in. After flooring and walling up the pit, a brick foundation wall, 18 in. high, was laid up next to the outside wall on two sides of the pit. This wall supports the bottom plate. This allowed plenty of room for a free draft and for the grate to swing clear.

Sufficient space must be allowed for the crucible, and the space between it and the furnace wall must, to secure the best results, be three times the area of the grate surface, and in no case less than twice this area. Under these circumstances, a free circulation of air is obtained from the grate to the flue. In building the stack, or chimney, its area must be at least equal to that of the flue, but the best results will be obtained when it is 1⅓ times this area. The height of the chimney will influence the draft, but usually 25 or 30 ft. will be sufficient. If two or more furnaces, Fig. 1, are connected to the same chimney, the area of the chimney should be 1⅓ times the combined areas of the flues.

The illustrations show the construction so clearly that little description is required. A start in the calculations is made by taking the largest crucible to be used and from this determining the size grate, depth of furnace, diameter of furnace, size of flue, size of chimney, and, finally, the pit. By following out these steps little trouble should be experienced.

### Color Holders for Decorators

When doing stenciling and line work on walls and ceilings it is necessary to have several colors at hand. To have these handy it is best to arrange a sufficient number of tin cans on a stout cord or small rope, tying it as a belt around the waist. Holes are made in the tops of the cans to admit the cord or rope. This will save a great deal of stooping to secure the colors desired.—Contributed by C. O. Soots, N. Salem, Ind.

### Harness Hanger

On my little farm are a number of labor-saving devices, the best of which, I think, is my method of hitching and unhitching, which is similar to that used in fire-engine houses. In the barn, directly over the point where the horse stops, two pulleys are fixed to the ceiling and one double pulley is placed in the ceiling near the side wall. A sack filled with enough sand to make it a little heavier than the harness and shafts, is tied with two sash cords which run up to the double pulley and branch out to the two angle pulleys then drop to the level of the horse's back where they are fitted with large hooks, one to catch in the saddle on the back band, and the other just in front of the crupper.

The buckles on the harness are replaced with snaps. Patent fasteners are placed on the hames and collar. These can be procured from any harness shop.

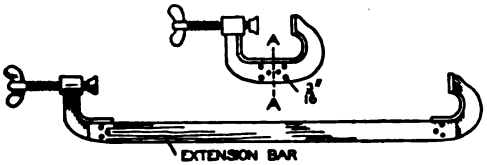
The horse is driven under the device and stopped at a point where the front hook is directly over the saddle. The two hooks are attached to the harness. The belly bands, hames and lines are unsnapped, and the harness and shafts are lifted from the horse by the weight. The whole operation requires less than two minutes.

This method of hitching and unhitching has other advantages. As stated, there are no buckles to unfasten, which is a great convenience, especially on a cold or wet night. The traces, hold and back straps, and lines, all remain fastened to the wagon. The harness is never in the mud or dirt, nor does it become misplaced. To hitch up takes no more time than the unhitching.

The cost is practically nothing, as the whole outfit of pulleys, sash cord, snaps, etc., will be less than one dollar.—Contributed by H. P. Ijams, Knoxville, Tenn.

### Extension Clamp

Anyone having some small screw clamps can easily make them into extension clamps, as shown in the sketch. Drill six $\frac{3}{16}$-in. holes in the clamp and saw it in two, as shown by the dotted line A A. Make the extension bar of an old wagon-tire iron and drill holes in the ends to match the holes in the ends of the clamp. Fasten the parts with small bolts. Make some small strips of metal for each side of the

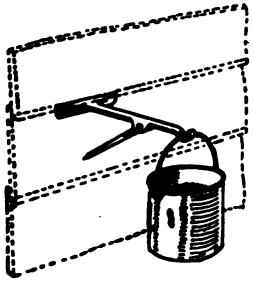


Bar on Clamp

clamp, so that it can be used as it was originally. Several different lengths can be made by having several extension bars.—Contributed by W. A. Lane, El Paso, Tex.

### Paint-Pot Bracket Hanger

The hanger shown in the sketch is intended for use on the side of frame houses, and is very handy for hanging paint pails, as it can be fastened anywhere on the siding of a frame house, and is very easily moved from one place to another. It is made of steel and consists of two parts. The top part is simply an arm with a hook in one end and a row of fine teeth on the other end, as shown in the sketch. The teeth slip up under the lower edge of the siding and prevent the hanger from pulling away. The bottom arm is hinged to the top arm near the center and the tapering end has a sharp point which prevents it from slipping.—Contributed by Chas. Homewood, Waterloo, Iowa.



### Garden-Hose Nozzle

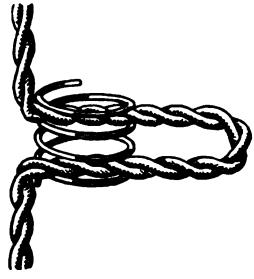
A nozzle on a garden hose that throws only a straight stream can be made to spray by means of a triangular


Netting on Hose Nozzle

piece of galvanized wire netting bent as shown in the sketch. The wire netting is fastened with wire and can be taken off when a spray is not desired. —Contributed by Paul H. Burkhart, Blue Island, Ill.

### Adjuster for Flexible Lamp Cords

Among the many adjusters for the flexible electric cord the open-spiral spring is one of the best. The globe can be readily adjusted to any height. The spiral spring is simple to make, if one cannot be found, and when fastened to the flexible cord it serves both as adjuster, and to take up any jar on the electric globe. The spiral should be of spring wire and about ½ in. in diameter by 1½ in. long. The coils should be close enough together to hold the cord firmly.—Contributed by Abner B. Shaw, W. Lynn, Mass.

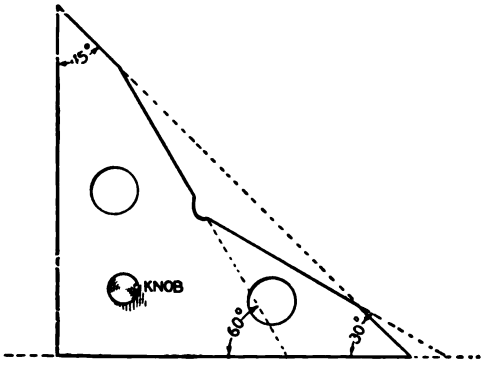


### How to Clean a Cistern

An easy and effective way to clean a cistern is as follows: Procure a hose long enough to reach from the top to the bottom of the cistern and use it as a siphon, the top end being placed in a tub or large vessel of water. The lower end of the hose is used as an ordinary hose nozzle under pressure for washing the dirt and sediment from the walls.—Contributed by J. F. Garlick, Addinville, Ill.

### Combination Triangle

A triangle having short edges of 30, 60 and 45 deg. can be made from an old discarded 45-deg. triangle. The knob




Combination of Angles

is quite handy in holding the triangle. The combination of angles makes the instrument quite useful.—Contributed by G. T. Kutz, Stamford, Conn.

### Oversize Printer's Rollers

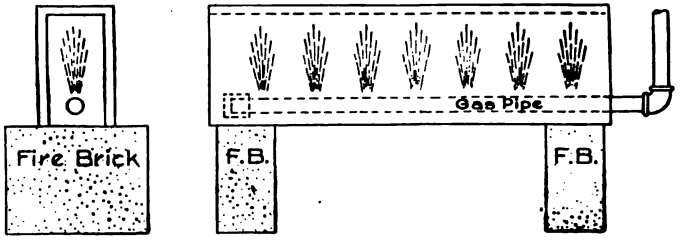
Rollers for presses are cast larger than the bearing rollers at the ends, and as a result the rollers jump when passing onto the type forms. This is especially troublesome with small forms as it not only fills the type with ink but is very wearing on the rollers. The usual method, where anything at all is done by job printers, is to lock up type-high roller bearers in each end of the chase. The bearers will take the ink and smear it on each end of the drawsheet where one is liable to get his fingers into it—and besides it wastes ink. A better way is to get one or more strips of felt and fasten them with glue on the roller guides at each end of the press. This raises the rollers so that they pass over even single-line card-job forms smoothly. The felt will wear for months in the ordinary small-town job shop before they need be replaced.—Contributed by C. W. Goddard, Bellaire, Mich.

### Bronzing Cast Iron

A German paper gives the following process of bronzing cast iron without covering it with a metal. Thoroughly cleanse the metal and rub it smooth. Apply evenly a coat of sweet or olive oil and heat the iron, being careful that the temperature does not rise high enough to burn the oil. Just as the oil is about to decompose, the cast iron will absorb oxygen, and this forms upon the surface a brown oxide skin, which holds securely, and is so hard that it will admit of a hard polish, thus giving it the appearance of bronze.

## Temper-Drawing Outfit

Having a large number of small tools to make, which demanded, for certain reasons, that the temper color should be left on them, it was necessary to get out more than one at a time. The arrangement for doing this is shown in the sketch. A connection with the gas line was made and ended by putting a cap on the end of a ⅜-in. pipe that had been perforated in several places on top. Over this was placed a U-shaped hood of $\frac{1}{16}$-in. sheet steel and this set on two firebricks high enough for the top of the flame to about strike the

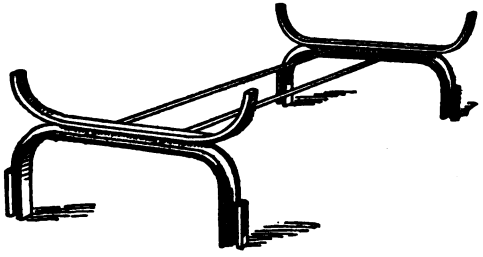



Outfit for Temper Drawing

steel. Air could then enter from the bottom and pass out at both ends. This outfit was placed where the light was good but not too brilliant and glaring, for that would have made a false color appear on the work. The tools, after hardening and polishing, were laid on the flat top, 20 or 25 at a time, and were quickly and uniformly drawn to a brown color. They were then taken off and allowed to cool.—Contributed by D. A. H.

### Pipe Stand

Procure two lengths of 35 or 40-lb.-per-yard railroad rail, cut through the head about 12 in. from each end, and cut it from the rail for another 12 in. Turn this part up and bend the bottom as shown in the sketch. An 8-ft. length of rail makes a well-proportioned stand. Two rails fastened together with distance pieces make a very handy stand. Old discarded rails may be utilized.



Stand of Railroad Rails

### Improved Caliper Gauge

Every machinist and toolmaker has undoubtedly experienced some trouble in gauging parallel surfaces with a caliper gauge, especially at the moment when the work is about to enter the jaws of the gauge, says Machinery. If the gauge is held so that the jaws are slightly inclined to the surfaces to be gauged, the piece will not enter the gauge, even if it should be several thousandths of an inch under size. This condition is indicated in Fig. 1.

In Fig. 2 is shown a caliper gauge which eliminates this difficulty, and allows the gauging to be done quickly and accurately. When this gauge is used, the long jaw A is held against one of the sides of the piece to be gauged and moved along it until the piece enters completely between the jaws, provided it is of the correct size or under size. If the piece is above the correct size, it will be brought to a stop against the gauge as soon as the short jaw B is reached.

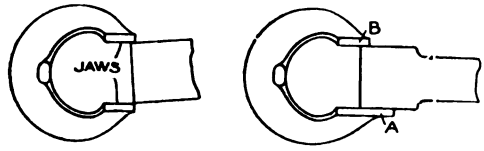



Fig 1 Fig 2

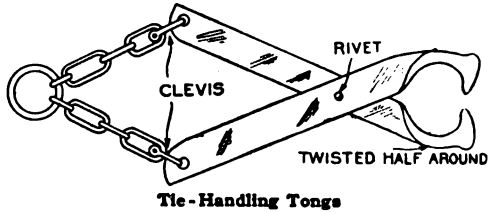
Gauge for Calipers

### A Lath Holder

Most workmen find it quite difficult to place the lath in a place conveniently at hand while putting them on a ceiling. This trouble may be overcome by using an ordinary nail keg with a wide bottom attached to it, and standing a bundle of lath inside. A brick placed in the bottom of the keg increases the stability.

### Tongs for Handling Ties

The tongs illustrated are used for handling ties. Such tongs have taken the place of the more complicated types formerly used, says the Railroad Age Gazette. A pair of tongs may be made of two old switch bars riveted together, the ends being twisted to form points. Similar tongs are also used for handling rails.

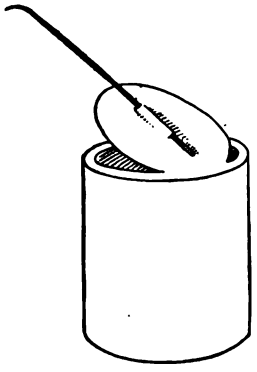



Tie-Handling Tongs

¶In drawing the temper, do not hurry the work. The slower, the better.

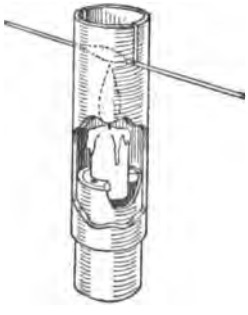
### Homemade Surface Gauge

A very handy surface gauge for planer work can be made from an ordinary tin can and a piece of heavy wire. The cover or part cut to remove the contents of the can is bent up at an angle, and the wire inserted through two holes cut in the cover as shown. The outer end of the wire is sharpened. The cover may be raised or lowered as desired.—Contributed by N. L. Danielson, Oshkosh, Wis.



### Soldering Line Joints with a Candle

The accompanying sketch shows how a candle may be used for soldering a line splice even in a strong wind, says a correspondent of Telephony.



The device consists of two brass tubes, one of which slides tightly in the other. A candle stub is fastened to the inside tube and two holes are punched to allow the air to make a draft. The top of the outer tube is slotted, and after the splice is made, the candle lighted and the tube slipped up to the proper point so that the hottest part of the flame will envelop the splice, a very good job results. This works almost as well as a Bunsen burner.

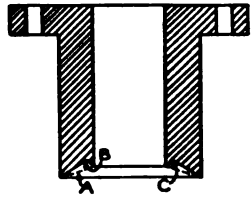
¶A tap will never run straight in a jig unless the pilot at the end fits the hole closely.

### Leather Piston Packing

A service pump in a street-railroad power plant gave considerable trouble by water slipping past the plunger, says Power. The engineer could find nothing that would remedy this trouble until he tried ordinary leather packing rings, six in number, which easily fitted in the water cylinder when dry. These were placed on the piston just as ordinary packing, and the follower plate and nut put in position. Since using this method of packing the water plunger, the pump will often run 18 months without attention.

### Shaping a Stuffing-Box Gland

The straight taper on a stuffing-box gland should be turned to a double taper as shown in the sketch to hold the packing on a worn piston rod. The straight taper A squeezes the packing against the rod, and if the rod or hole is worn, the packing will blow out. But if the taper is cut as shown at B, the packing will be squeezed also against the small taper C, which keeps it from blowing out through the worn hole.—Contributed by Joe V. Romig, Allentown, Pa.




### Testing the Indelibility of a Typewriter Ribbon

All aniline colors fade and finally disappear from the effect of light, and only ribbons impregnated with a color containing a carbon base are permanent, says a French magazine.

To find if the ribbon will give indelible writing or not, scrape off some of the substance on the ribbon, stir it up in hot alcohol and put a drop of the mixture on a blotting paper. If the spot made is uniformly colored, the ribbon contains aniline, but if there forms around the central colored spot an outer uncolored ring of moisture, the ribbon will make indelible writing.

# Tracing Down Telephone Troubles

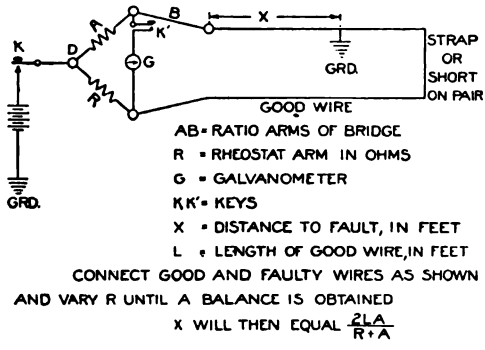
By GEO. M. PETERSON

## Part III — Locating

Knowing the nature of the trouble and having obtained some idea of the extent of the damage done, the Wheatstone bridge is brought into action. In locating faults with the Wheatstone bridge, there are two methods in universal use: the Murray loop and the Varley loop. The Murray loop is generally preferred, and the Varley is used to check. The two methods are shown in the sketches.

As the Murray loop locates the fault, while the Varley loop locates from the "short" back, it can be readily understood why the Murray is taken as standard. In making an open test with a Murray loop, alternating current is supplied at E from a secondary circuit formed by bridging a condenser across a buzzer of 60 ohms' resistance, which is in series with a battery of four dry cells. A shall be made 1000 and B zero.

All "bridge" readings are taken in ohms and then multiplied by the number of feet per ohm. The accompanying table will be found useful in this connection. Having obtained the number of feet to the seat of the trouble, a print of the plant is obtained, and the distance scaled. This will show the exact location of the trouble, and




**Murray Loop Test for Grounds**

locates it in a splice or a section of cable.

A great deal could be written on this subject by going into details as to the methods of using the bridge, and the various kinds of faultfinders; by explaining the methods used in "clearing" the trouble after it has been tested out and located, and by detail-

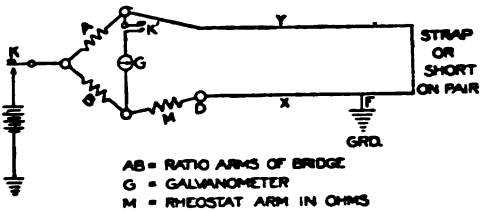
COPPER WIRE ONLY

| Gauge No. | Diameter in Mils or 1/1000 inch | | | B. and S. | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Weight in Pounds | | Length in Feet | | Resistance in Ohms at 68° F. | |
| | Brown & Sharpe B. & S. | Birmingham or Stubs B. W. G. | New Brit. Standard N. B. S. | Lb. per 1000 Ft. | Lb. per Mile | Ft. per Lb. | Ft. per Ohm | Ohms per 1000 Ft. | Ohms per Lb. |
| 11 | 90.74 | 120 | 116 | 24.93 | 131.63 | 40.120 | 795.3 | 1.257 | .05045 |
| 12 | 80.81 | 109 | 104 | 19.77 | 104.39 | 50.590 | 630.7 | 1.586 | .08022 |
| 13 | 71.96 | 95 | 92 | 15.68 | 80.791 | 63.790 | 500.1 | 1.999 | .1270 |
| *14 | 64.08 | 83 | 80 | 12.43 | 76.191 | 80.440 | 396.6 | 2 521 | .2028 |
| 15 | 57.07 | 72 | 72 | 9.858 | 52.050 | 101.400 | 314.5 | 3.179 | .3225 |
| 16 | 50.82 | 65 | 64 | 7.818 | 41.277 | 127.900 | 249.4 | 4.009 | .5128 |
| 17 | 45.26 | 58 | 56 | 6.200 | 32.736 | 161.300 | 197.8 | 5.055 | .8153 |
| 18 | 40.30 | 49 | 48 | 4.917 | 25.96 | 203.400 | 156.9 | 6.374 | 1.296 |
| *19 | 35.89 | 42 | 40 | 3.899 | 20.595 | 256.500 | 124.4 | 8.038 | 2.061 |
| 20 | 31.96 | 35 | 36 | 3.092 | 16.324 | 323.400 | 98.66 | 10.14 | 3.278 |
| 21 | 28.46 | 32 | 32 | 2.452 | 12.946 | 407.800 | 78.24 | 12.78 | 5.212 |
| *22 | 25.35 | 28 | 28 | 1.945 | 10.268 | 514.200 | 62.05 | 16.12 | 8.287 |
| 23 | 22.57 | 25 | 24 | 1.542 | 8.142 | 648.400 | 49.21 | 20.32 | 13.18 |
| 24 | 20.10 | 22 | 22 | 1.223 | 6.457 | 817.600 | 39.02 | 25.63 | 20 95 |
| 25 | 17.90 | 20 | 20 | .9699 | 5.121 | 1031.000 | 30.95 | 32.31 | 33.32 |

* Indicates gauges generally used on telephone work.
Add 1% to resistance for every 4° the wire is above standard temperature (68° F.).
Subtract 1% from resistance for every 4° the wire is below standard temperature (68° F.).

**Table of Gauges, Weights, Lengths and Resistance of Copper Wire in Ohms**

ing the numerous cases of seemingly freakish trouble which one encounters. It has been the purpose of this article,

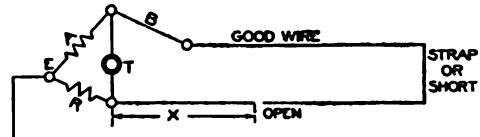



AB = RATIO ARMS OF BRIDGE
G = GALVANOMETER
M = RHEOSTAT ARM IN OHMS
KK = KEYS
D = FAULTY WIRE
Y = RESISTANCE OF GOOD WIRE LOOP TO F
X = RESISTANCE FROM D TO F
R = TOTAL RESISTANCE OF LOOP X+Y, IN OHMS.
CONNECT GOOD AND FAULTY WIRES AS SHOWN AND VARY M UNTIL A BALANCE IS OBTAINED.
X WILL THEN EQUAL $\frac{BR-AM}{A+B}$

**Varley Loop Test for Grounds**

however, to explain the methods used, and to have the reader understand the great part "trouble" plays in the maintenance of a telephone system.

While there is plenty of light, easy work to be done by the galvanometer man, such as testing out bad pairs or clearing up a single pair of wires for immediate use in a congested cable, etc., there is also plenty of hard work and long hours at a stretch. It must also be understood that in this work, as in all others, no hard and fast rules can be laid down, and that only years of experience and training can produce the quick-acting and accurate galvanometer man who can take in the situation at a glance and apply the




AB = RATIO ARMS OF BRIDGE
R = RHEOSTAT ARM IN OHMS
T = HEAD RECEIVER
X = DISTANCE TO FAULT, IN FEET
L = LENGTH OF GOOD WIRE, IN FEET

CONNECT GOOD AND FAULTY WIRES AS SHOWN AND VARY R UNTIL NO TONE IS OBTAINED IN RECEIVER. X WILL THEN EQUAL $\frac{LR}{R+A}$ IN WHICH R EQUALS RHEOSTAT READING WHEN NO TONE IS OBTAINED.

**Murray Loop Test for Opens**

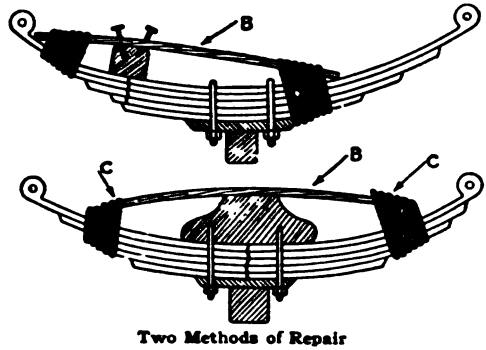
shortest possible test in order to locate and clear the trouble with the least loss of time.

*(The end)*

## Temporary Repairs on Elliptic Springs

When breaks occur on elliptic springs, and especially those on automobiles, it is well to know how to make repairs without unnecessary delay, says the Motor Magazine of Canada. Springs break in various places, but most commonly in the center between the spring clips or in proximity to these fastening devices, as shown in the sketch. While these clips will hold a spring together, the ends are liable to sag and put a dangerous strain on the fasteners. An emergency repair of a broken spring can be made as indicated in the sketch.

If the break is near the end, a block of wood should be nailed to the board




**Two Methods of Repair**

over the break. The operation of fastening is practically the same as for the center break, which is as follows: A hardwood board, B, from 1 to 2 in., is trimmed on its sides so that it will be about 5 in. in the center and 2 or 3 in. at the ends. Drive nails in the ends of the board to hold the binding, lift the frame of the car with a jack to take the weight off the spring and put the center of the board on the rubber bumper, or, if there is no bumper, on a block of wood. Bind the ends of the board tightly to the springs with straps, wire or rope.

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¶Tin can be removed from tin-plate scrap by boiling in caustic soda. The tin in the solution can then be deposited on a sheet-iron plate by electrodeposition.

### Holding Eyeglass Case in the Pocket

Many an eyeglass lens is unnecessarily broken when the eyeglass case chances to slip from the vest pocket and drop on a hard floor or pavement. This happened to the writer once and wishing to avoid a repetition of such an accident, I tried to devise some means of preventing it. A pencil pocket clip was purchased, and the circular portion was straightened out and shaped to fit the lid of the eyeglass case. Two holes were drilled in this part of the clip, about $\frac{1}{16}$ in. in diameter and $\frac{3}{8}$ in. apart, and then transferred to the lid of the case, which was afterward drilled with the same drill. Two round-head brass nails were cut to length, the clip was fastened to the lid with the nails, which were riveted on the inside. The round heads on the outside gave a more finished appearance to the job.—Contributed by E. N. Davey, Lachine Locks, Can.

### Tongs to Hold Plowshares

A method of making tongs to hold plowshares is described by a correspondent of the Blacksmith and Wheelwright as follows: First make one side of the tong to fit on the share, Fig. 1, same as the land bar, with a hole that corresponds with the hole in the share on the land side, and make the other jaw of the tong as an ordinary

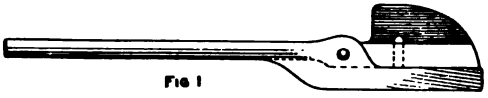


Fig. 1

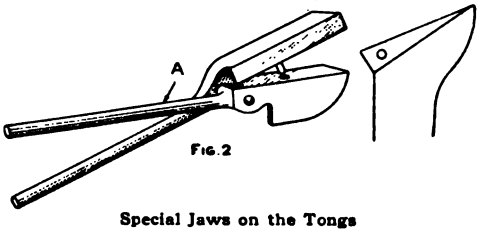



Fig. 2

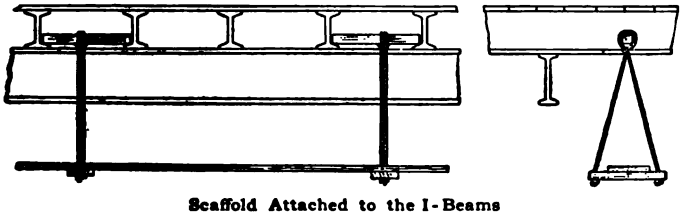
Special Jaws on the Tongs

flat tong with a pin so that, when the handles are pressed together, the pin will go through the hole in the land side of the share and the other jaw of the tong. The jaw on handle A, Fig. 2, must fit the same as the land bar. With this tong I hold my shares just as if a land bar were bolted on.

¶A casting should be well pickled and free from sand before it is placed on a milling machine.

## Swing Scaffold for Painting Bridges

While painting several county bridges, I was unable to find a way of hanging a scaffold under one of them.



Scaffold Attached to the I-Beams

The bridge was 30 ft. wide and had a sidewalk on one side. Having nothing convenient, long enough to reach across the full width of the bridge, a scaffold was made as shown in the sketch.

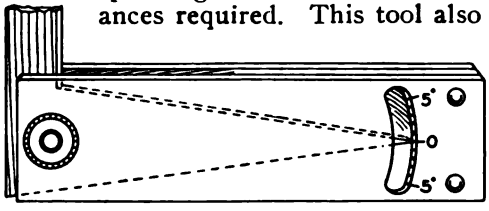
Two pieces of wood, 2 by 3 in., cut with little clearance so that they could slide easily between the floor beams and turn flat when in place, were the principal parts. Two hangers were made as shown, with a 1-in. rope and a board, 1½ by 6 in., having holes for the rope to pass through 3 in. from each end at the center. The knots on the ends of the rope were made large enough so that they would not pull through.

In moving this scaffold, the third and fourth planks of the bridge from where the blocks rested were raised each

time, and the blocks were drawn and moved ahead under the next third or fourth plank. In this way, a space of 15 ft., which was the distance between the crossbeams, was painted by moving the scaffold only twice. One-half of the bridge was painted going in one direction, and the other half on the return.—Contributed by Mathew H. Jones, Cresco, Pa.

### Angle Square for Die Filing

The angle square shown in the sketch will give the degree of clearance of the dies when machined or filed, eliminating the need of having solid-degree squares corresponding to the different clearances required. This tool also

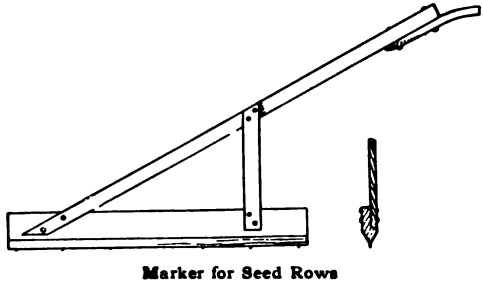



Blade can be Set at Any Angle

does away with the necessity of setting a small level to a graduated protractor. A screw and knurled nut bind the scale between the stock of the square.—Contributed by Henry C. Ronfeldt, Toledo, O.

### Garden Seed Row Marker

The hoe is generally used for marking seed rows in a small garden. A line is stretched taut and the hoe is drawn along it to make the rows straight. I constructed the tool shown in the sketch to mark the seed rows

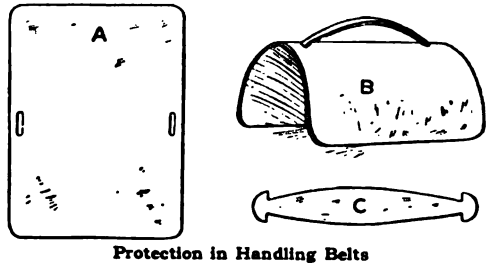


Marker for Seed Rows

and to make them straight without a line. The marker will make a row straight for 100 ft. and make it narrow and of even depth. The sketch clearly shows its construction. The length of the marker will cause it to make a straight row.—Contributed by A. S. Thomas, Gordon, Ont.

### Mitten for Handling Belts

A handy device for protecting the hands of those working around belts can be made of a piece of flexible, single-leather belt. This is used in the palm of the hand by bending it in a U-shape, says the American Miller. The corners of the belt are trimmed as shown at A, and two slots cut as indicated. Another piece of leather is formed as shown at C, for the strap over the back of the hand. Insert the




Protection in Handling Belts

two ends of this piece in the slots and the protector will be complete, as shown at B. Put a protector of this kind on when attempting to throw on a running belt.

### How to Straighten an Automobile Frame

Some time ago I had to straighten an automobile frame which had been in a wreck. I straightened it in the following manner: A chain having a turnbuckle in the center was run diagonally across the frame between the corners that were out. The turnbuckle screw made it easy to draw the frame perfectly square at the corners.—Contributed by J. N. Bagley, Superior, Nebraska.


### Covering a Stovepipe Hole in a Chimney

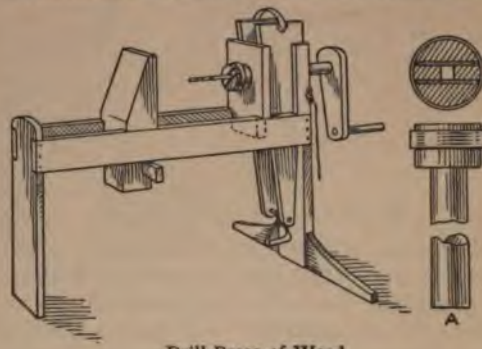
The stovepipe hole in a chimney can be easily covered when the stove is removed for the summer by using an asbestos stove mat in the following manner: The metal ring on the mat is removed and the asbestos cut to fit the hole. Paste the asbestos on a square of muslin and allow both to dry under a weight. Place the asbestos in the chimney hole and paste the muslin to the wall. Paste wallpaper over this. When it is necessary to open the hole, cut around the circle and remove the asbestos.—Contributed by L. G. Roberts, Mt. Carmel, Illinois.

### A Homemade Drill

The farm workshop seldom has many tools, and especially the more expensive ones are naturally missing, for the cost of a drill press or lathe is entirely out of proportion to the amount of work for which they would be needed on a farm. One farmer solved the problem of drilling holes by making a device, almost entirely of wood, which would serve to drill any hole that may be required on farm machinery.

The illustration clearly shows its construction. The pressure of the foot on the stirrup will make the drill take hold sufficiently, but, if not, the wedges may be struck with a hammer. A small rope is provided to hold up the wedges when they are not in use.

The spindle and chuck is made of a piece of tough wood, the smaller diameter being 1¾ in. and the larger, or chuck end, 2¾ in. This allows ½ in. flange, which must be well lubricated when using the drill. A ¼-in. hole is bored for the shank of the bit, then a slot about ¾ in. in depth is cut on either side of the hole. Pieces of a broken file are inserted in the slots and

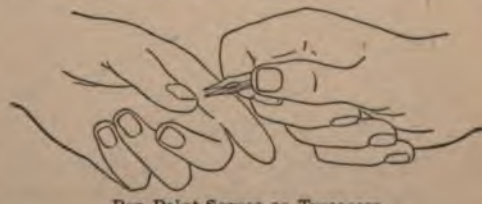



Drill Press of Wood

a metal ferrule shrunk on the outside of the wood, as shown in A. The hole in the chuck is either squared or left round, to fit the drills that may be on hand.—Contributed by A. S. Thomas, Gordon, Ont.

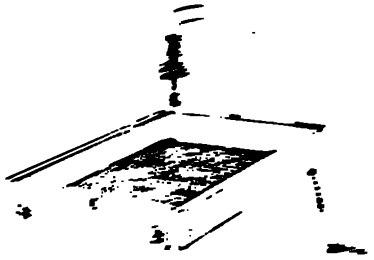
### Removing Splinters from the Flesh

An ordinary steel writing pen is handy to have in the workshop for use in extracting splinters from the flesh.

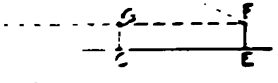


Pen Point Serves as Tweezers

Press the pen down on the flesh, as shown in the sketch, so as to slightly open the points and then push toward the splinter. Allow the points to close



## Easy Method of Determining the Height of an Object




Angle in Obtain Height

the following method, which does not necessitate climbing to the top of the object in order to make the measurement.

Let AB in the figure represent the height of the object to be measured. First measure off a known distance, AC, from the base of the object, and at the point C erect a pole of known height DC. Cut a straight piece, having a length approximately equal to the height of the observer's eye above the ground, and then find the point where this piece must be placed in order that its top, the top of the piece DC, and the top of the object being measured, will all be in line when sighting over their up-

per ends. The short piece should always be held in a vertical position when sighting over it, and the lower ends of all the pieces should be in the same horizontal line. After locating the position of the short piece, measure the distance of its base from the object. When the above dimensions have been determined, the following relation is obtained: The height BH is to the height DG, as the distance HF is to the distance GF, or the height BH is equal to

$$\frac{HF \times DG}{GF}$$

After determining BH, as indicated above, the height of the short piece, which is equal to HA, must be added in order to get the height of the object.

## A Buzzer Test Set

The set shown in the sketch is what might be called an "old-timer," but the results which are obtained with it are far ahead of those obtained with the more elaborate apparatus of the present day. The set is composed of the following parts: One No. 13 induction coil; two 2-M.F. condensers; two standard dry batteries; three binding posts; one one-point switch, and one carrying case.

This set can be used in testing for "opens," "grounds," and "crosses," as well as for buzzing out a working cable. In use, the ground wire is securely fastened to the sheath of the cable to be tested, while the "live wire" is attached to one side of the talking pair. The "talking set" or head phone is bridged directly across the pair of wires to be tested. The buzzer must always be used from the C. O. end when testing a working cable, or the line lamps on the switchboard will be continually flickering as the search needle is run over the cable wires.

The splices at the outer end of the test tell the man in the office which pair of wires to place the search on, one side at a time. If no tone is heard, the wire is "open." If a tone is heard on more than one wire in the cable, but rather faintly, a "ground" is indicated. A full, strong tone on more than one wire indicates a "cross," but

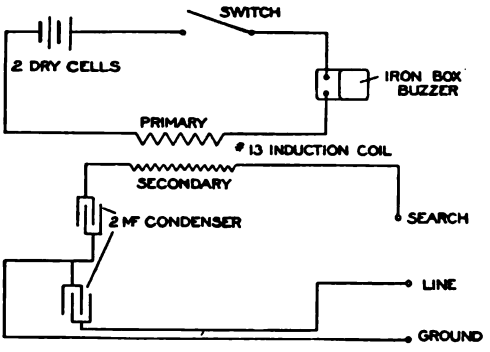


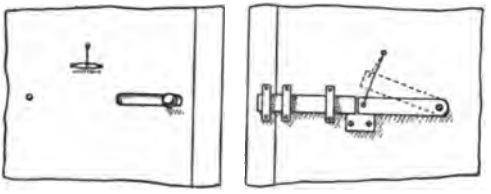

Diagram of Set

if the tone is heard clearly on both wires of a pair, it shows that the pair is crossed with itself, or, properly speaking, is "short."

Such trouble should be tested out with a voltmeter and battery, or more exact apparatus, but the buzzer gives the workman a good idea of the condition of the cable in which the lines are being tested, and if it is in very bad condition, it may be reported to the galvanometer department for a test.—Contributed by Geo. M. Petersen, Buffalo, N. Y.

## A Barn-Door Latch

Every farmer or horseman knows how provoking it is to own a horse that will unlatch a stable door by sliding or lifting the latch with his teeth



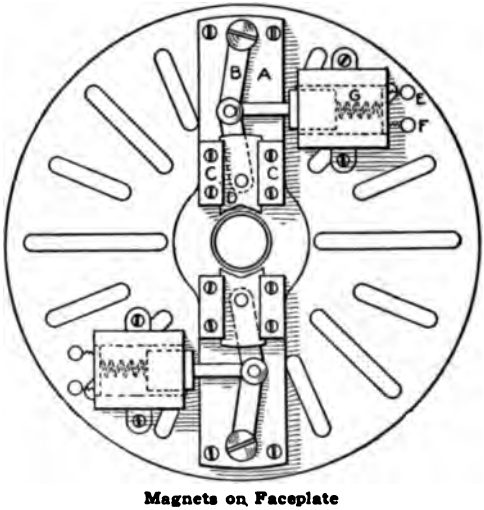
Out and Inside Parts

or nose. The accompanying sketch shows a latch fastener that will baffle the efforts of any horse to open the door. The latch cannot be pushed back until the bar is raised, thus requiring two movements at the same time to open the door. The latch can

be drawn from the outside by using the old-style latch string to lift the bar, and a knob in a slot to move the latch. —Contributed by J. L. Wright, Granville, O.

### Automatic Magnetic Lathe Dog

The magnetically operated jaws shown in the sketch were designed to facilitate the handling of lathe work,




Magnets on Faceplate

and to do away with the ordinary lathe dog, where hundreds of pieces of the same kind are to be turned between centers.

The toggle joint B and the guide pieces CC are attached to the piece A, which is fastened to the faceplate of the lathe. The driving dog D is attached to the toggle joint and slides between the guides CC. The soft-iron movable cores of the magnets are connected to the toggle joint as shown.

Two brushes, communicating with a switch connected to the belt-shifter rod, are attached to the lathe bed back of the faceplate, one bearing against the latter and the other on an insulated ring. The terminal E of the magnet is connected to the faceplate, and F, to the insulated ring.

After the proper adjustments are made, a piece of work is inserted between the centers of the lathe. When the lathe is started, the switch connected with the belt shifter closes and sends a current through the magnets. The operation is obvious. Stopping the lathe opens the switch, the current is broken and the movable cores of the magnets are released. A spring, G, is used to make the release prompt and to remove any pressure on the dogs.

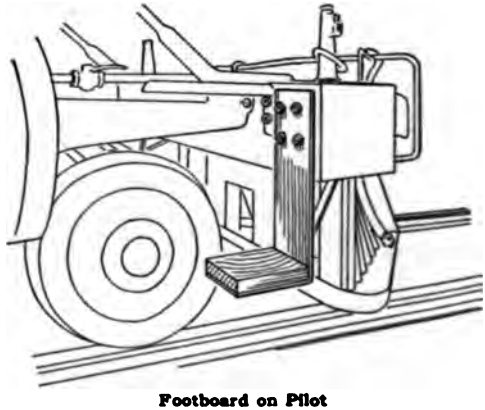
The piece A is fitted loosely on the faceplate, so that the pressure of the dogs upon the work will be equalized. The dogs are not powerful enough for roughing cuts, but are very useful for light work. The current may be taken from an ordinary lighting fixture.—Contributed by Chas. Schaffner, Chicago.

### Pilot Footboards on a Locomotive

Any measure adopted by the railroad companies that tends to lessen the danger under which its employes perform their duty, is of interest to everyone, whether connected with railroad activities or not.

Perhaps the latest action taken for the safety of trainmen, is the installation of an ample footboard on the rear side of the pilot beam, and consequently in such a positon that the trainman is at all times plainly visible to the engineer taking signals.

For a long time previous, the trainmen while switching rode standing on the thin lower board of the pilot. This



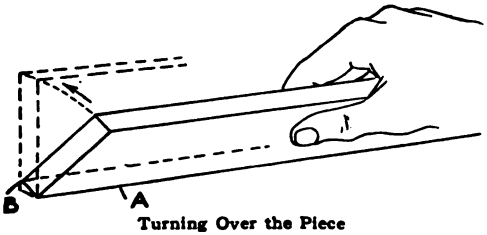
Footboard on Pilot

affords but very little footing and many a trainman has accidentally fallen off, suffering in ma[illegible] the

loss of limb and even life. The footboard illustrated in the cut insures the safety of a trainman riding on the pilot of any locomotive, no matter how badly it may pitch and rock while in motion.

## Making a Margin Line in Job Presswork

Mark the margin line on the tympan sheet, for the purpose of setting the gauge pins, with the edge of a piece of wood furniture. If a letterhead with a corner card, a 24-point top margin is about right. Take a two-em piece of wood furniture and touch one edge, B, lightly on the ink roller, then lay the adjoining edge A along the top of the letters of the impression on the



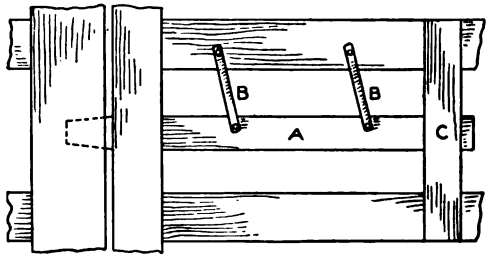
Turning Over the Piece

draw sheet. Tip the piece of furniture firmly outward onto the inked edge B. This is done by rolling the wood and keeping it in contact with the tympan sheet. A neat line will be made by which to set the gauge pins. If the job is a handbill, with, say, 1-in. margin, take a six-em piece of furniture, and so on, as the size of the work increases.—Contributed by C. W. Goddard, Bellaire, Mich.

## A Gate Latch

A good latch for farm gates may be made as shown in the accompanying sketch. The slide A is suspended by the hangers BB, which are placed on each side of the gate. The back end of the latch works between the guides C, and the front end between the end pieces of the gate. The slide engages with a slot in the gate post when the gate is shut.

The hangers BB are made in any convenient length. The holes are ¼ in. in diameter and tire bolts are used as fasteners. The holes for the hang-

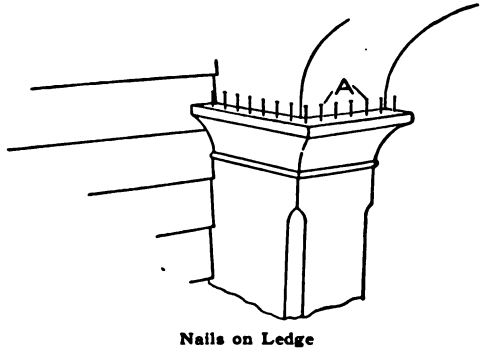


Swinging Gate Latch

ers should be drilled one-third of the width of the latch from its top to make the largest part of the weight fall below the fastenings of the supports. The slide being in a horizontal position, it works better between the guides. When the slide is in the gatepost slot, the hangers should be at the angle shown, so that the weight of the slide helps to hold it in place.—Contributed by Willard H. Elder, Berkeley, Cal.

## To Keep Sparrows Away from Ledges on Buildings

If a row of finishing nails, A, are driven part way into the ledge or projection of a building, as shown on the projecting part of a column capital in the sketch, they will prove an effective means of keeping sparrows or other

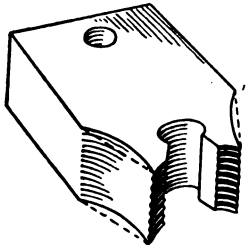


Nails on Ledge

birds from nesting thereon. The sketch clearly shows the way to place the nails.—Burton F. Harrington, Providence, R. I.

### Grinding Dies

A set of dies that had been ground as shown by the dotted lines in the sketch were thrown away as worn out. I picked them up and ground them concave, and they seemed to cut better than when they were new.—Contributed by L. H. Atwell, Atlanta, Ga.

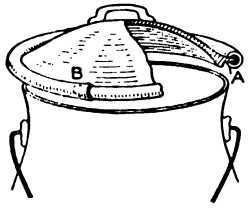


### Cushion Made of Steam Hose

Some repair work had to be done on a locomotive standing on a siding. As the boiler had been washed out, I found the ground very wet. I did not have a cushion, nor could I secure one. In looking about for something to sit on while working, I found a length of hose which I made into a coil that served the purpose much better than a cushion.—Contributed by Frank O. Kunkel, Cochrane, Ont.

### Noiseless Slop-Jar Cover

The noise made in replacing the cover on the ordinary slop jar used in a sick chamber is often very annoying to the patient. To remedy this, and to render the slop jar more sanitary by preventing the escape of foul gases, I used the device shown in the sketch with success.

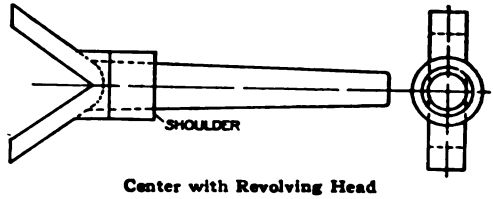



Take a piece of rubber tubing of, say, ¾ in. outside diameter—red rubber preferred—and slit it open on one side the full length, being careful to cut straight with the tubing, then slip it over the edge of the cover as shown at A, and stretch it taut all around, allowing the ends to overlap about 1¼ in., as shown at B, and after removing the tube from the cover cement the ends together using ordinary rubber cement. After the cement has dried enough, slip the ring over the cover.—Contributed by A. P. Weitz, Toledo, Ohio.

### A Revolving V-Center for a Lathe

A handy revolving V-center for a speed lathe can be made as shown in the sketch. The main feature of this center is that it can be turned to any position to correspond with the work being drilled. In using the ordinary kind, as shown by the dotted lines in the sketch, the center must be removed from the socket to locate its correct position.

The shoulder is squared off until the taper shank becomes a snug running fit, and at the same time the shoulder fits up against the socket so as to prevent the taper shank from binding.—Contributed by David Major, Providence, R. I.




Center with Revolving Head

### An Emergency Router

Sometimes a carpenter on a repair job runs into work where he could use a router to advantage. Should he have none in his tool box, a router is easily devised by taking the plane bit out of a small wood plane and using a narrow chisel instead. Set the chisel edge to the right depth and tighten the wedge just as when adjusting a bit, and the router is ready for the work. It takes only a few minutes to make the change, and this emergency tool will do better work than could be accomplished by cutting the wood out with a chisel and mallet.—Contributed by W. A. Lane, El Paso, Tex.

# How to Make a Permanent Magnet

By A. E. MARLIN

A permanent magnet is a piece of iron that possesses magnetic properties, it having acquired these properties by being placed under the influence of another permanent magnet, an electromagnet, or a solenoid, and retaining a certain amount of the magnetism set up in it after it has been removed from the influence of the magnetizing force. All grades of iron are not equally suitable for making permanent magnets, as some grades retain the magnetism to a greater extent than others, even though they be subjected to the same treatment mechanically and the same method is used to magnetize them.

The best grade of steel to use in the manufacture of permanent magnets is known as tungsten steel. It has the property of retaining a large part of its magnetism, when subjected to a magnetizing influence and that influence then removed. This property is called the retentiveness of the iron. It also requires a comparatively large magnetizing influence to demagnetize tungsten steel after it is magnetized. This property is called its coercive force, or ability to resist being demagnetized. Soft iron will retain quite a bit of its magnetism after being subjected to the influence of a magnetizing force; but its coercive force is so small that it easily loses this magnetism, and for this reason such iron is not suitable to use in permanent magnets.

The piece of iron, after it has been formed into the desired shape, should be well hardened, as that increases its coercive force and retentiveness. In tempering the iron be careful not to make it too hard, as it will not stand any mechanical abuse then without being easily broken. The best results are obtained in tempering by immersing the iron in the water when it is a pale straw color, it having been heated uniformly to a bright red. There are three methods that may be employed in magnetizing: first, by means of a very strong permanent magnet, sometimes called a "king magnet;" second, by means of an electromagnet; third, by means of a coil of wire, called a solenoid, through which a current is flowing.

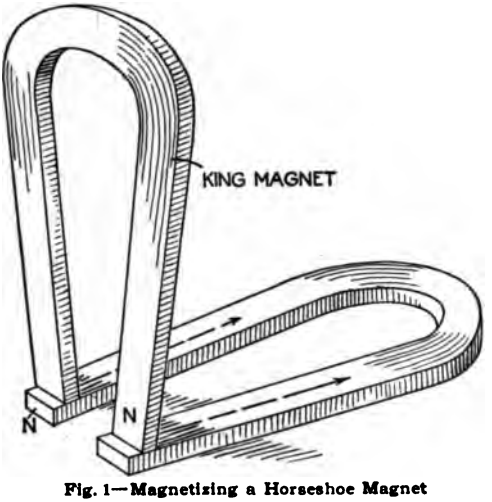



Fig. 1—Magnetizing a Horseshoe Magnet

It is best to have the "king magnet" of what is called the horseshoe form, and if it is to be used in magnetizing a large number of other magnets, it should be very large, and the distance between its two ends, or poles, should correspond to the distance between the poles of the magnets being magnetized. The polarity of the "king magnet" should be determined by means of a compass needle, and its north pole marked with the letter N. Each of the pieces to be magnetized should have one end marked with the letter N also.

To magnetize the magnet proceed as follows: Place the unmagnetized horseshoe, assuming it is of the horseshoe type, in a horizontal position. Then place the poles of the "king magnet" in contact with its ends, making sure that the south pole, or unmarked end is in contact with the marked end of the horseshoe being magnetized, and that the other two ends are also in contact as shown in Fig. 1. Move

the "king magnet" along toward the bend, as indicated in the figure, until its poles reach the bend, and then return it to its original position, when

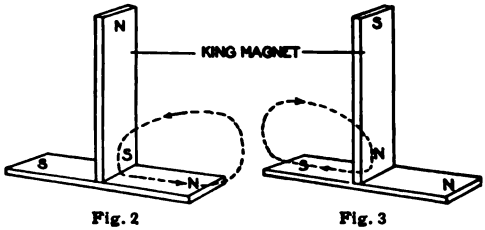



Fig. 2 Fig. 3

**Magnetizing a Bar Magnet**

it should be lifted up and away from the new magnet. The "king magnet" should then be carried back through the air, and placed on the new magnet at the bend, the poles being in the same relation to each other as in the previous case, then drawn towards the end of the new magnet and again removed. This operation should be repeated a great many times, and the new magnet then turned over, and the same procedure repeated, on the opposite side. Make sure you have the poles of the two magnets in their proper relation to each other, north to south and south to north, when the new magnet is turned over.

A bar magnet can be magnetized by means of a permanent magnet as

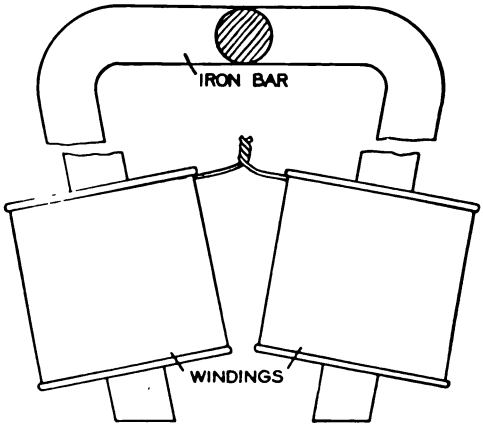



Fig. 4—An Electromagnet

shown in Figs. 2 and 3. The poles are alternately presented to the center of the new magnet, and they are moved in opposite directions. If properly carried out, this method will give a fairly strong permanent magnet, provided the "king magnet" is itself of sufficient strength; but the magnets will not be nearly as strong as if magnetized by the second or third method.

An electromagnet consists of a bar of iron about which there is wound one or more coils of wire, and arranged so that a current of electricity may be sent through these windings. The various coils should all be connected in such a way that the current in each of them passes around the iron core in the same direction, or, in other words, so that the polarity becomes the same in all of them. A simple horseshoe electromagnet can be made, as shown in Fig. 4, from a bar of iron about 1 in. in diameter and 10 in. long, with two coils of wire about its ends. These coils should consist of such a number of turns, and be capable of carrying such a current, that the product of the total number of turns and the current in them is approximately 1,000. For instance, 100 turns on 10 volts. This electromagnet can be used in magnetizing a magnet just as the "king magnet," but it will produce a much stronger magnet.

If the piece of iron to be magnetized has a temporary winding placed about it and a current sent through this winding, it will become magnetized and will retain a certain part of its magnetism after the circuit is broken. The winding may be removed after the piece of iron is magnetized, or it may be wound upon a form of such shape that it can be slipped on and off the piece of iron, which permits its being used an indefinite number of times. The construction of a coil, or coils, suitable for this purpose will depend upon the dimensions and form of the magnet being magnetized.

An electromagnet that will operate satisfactorily on a 110-volt direct-current circuit, and one that can be used in magnetizing different forms of magnets, may be constructed as follows: Procure two pieces of brass tubing, each 6⅛ in. long, with an inside diameter of 1¼ in. and a wall $\frac{1}{16}$ in. thick.

Square off one end of each of these pieces of tubing and then cut the other end off until they are 6 in. in length. Now obtain four pieces of ⅛-in. brass, two, 3¼ by 3¼ in., and two, 3¼ by 4 in. Cut two circular washers, 3¼ in. in diameter, from the two square pieces, and then cut a circular opening in the center of these pieces so that they will slip on the brass tubing. Cut openings in the remaining two pieces as shown in Fig. 5 so that they will slip on the brass tube. Solder, or preferably braze, these pieces to the brass tubing, placing one round and one square piece on each tube as shown. Make sure to get the pieces squarely on the tubes. Take a hacksaw and saw a slot in each of the completed spools from end to end. The slot should be sawed in the position shown in Fig. 6. Four $\frac{3}{16}$-in. holes are drilled in the corners of the square pieces, as shown, before they are soldered to the tube; if this was not done, it should be done before proceeding with the winding of the coils. Two ⅛-in. holes are also drilled in these pieces, to be used in mounting a terminal strip for the binding posts. Cut, from some mica, about .02 of an inch in thickness, eight circular washers, with an outside diameter of 3¼ in. and the diameter of the opening about $\frac{1}{16}$ in. greater than the outside diameter of the brass tube. Slit each of these washers along a radius so that they can be put on the brass tube. Then wind on the brass tube at least six layers of paper .004 in. in thickness. The width of this paper should be at least ¼ in.

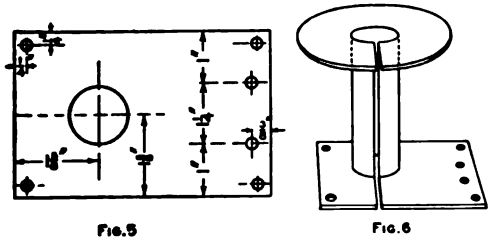


FIG. 5 FIG. 6

Headpiece and Complete Spool

greater than the inside distance between the heads of the spool. Slits should be clipped along the edges of the paper before winding, which will allow it to extend along the heads about ⅛ in. on each. The various layers may be shellacked in place. Place four of the mica washers loosely

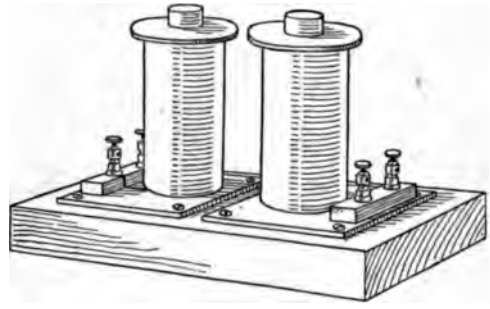


FIG. 7
Complete Electromagnet

on each of the spools, two at each end. Cut, from some cardboard about $\frac{1}{16}$ in. thick, two more washers, and in each of these washers cut a slot about ⅛ in. in width. The spools are now ready to be wound, which is done as follows: Obtain approximately 12,000 ft. of No. 28 gauge double-silk-covered copper wire. Solder a piece of insulated No. 16 gauge copper wire about 12 in. long to the end of the No. 28 gauge wire, and insulate the joint with a piece of tape. Place one of the pasteboard washers between the mica washers against the rectangular head of the spool. The No. 16 gauge wire should be placed in the slot cut in the pasteboard washer and the inner end firmly bound to the brass tube with several turns of good linen thread. The groove in the pasteboard washer should be so placed that the No. 16 wire will come out directly opposite one of the ⅛-in. holes. After this has been done, push the second mica washer down against the pasteboard washer and proceed with the winding. In putting the various washers in place make sure that the slits in those that are at the same end of a spool do not come opposite each other. Place a layer of onion-skin writing paper between each two layers of the winding. Wind 38 layers on each spool. The winding will then terminate at the same end at which it was started.

A piece of heavy wire should be

soldered to the outside end of the winding, and the heavy wire wrapped around the spool several times and firmly bound in place. The outer end should terminate opposite the second ⅛-in. hole.

When the two windings are completed, they can be covered with several layers of heavy paper or cloth, which will serve as a mechanical protection. Two small binding posts may be mounted on a small piece of hard rubber which in turn may be mounted on the inside surface of the rectangular head by means of two screws that pass through the ⅛-in. holes, Fig. 5. The ⅛-in. holes should be countersunk on the outside and flathead screws used. The terminals of the windings should now be fastened to the binding posts and the coils are complete.

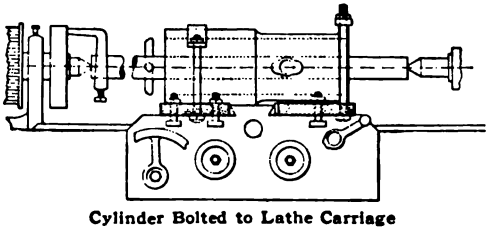
The base of the electromagnet may be made from a piece of cast iron, approximately 8 by 10 in. and at least 1 in. thick. The cores of the coils should be made from a good grade of wrought iron, and should be at least 6½ in. in length. The ends that are to rest upon the base plate should be perfectly square, so that there will be a minimum of air space between them and the plate. The upper ends may be made in several different forms, depending upon the shape of the magnet to be magnetized. Holes may be drilled in the base plate and screws used in mounting the coils, the four holes in the corners of the rectangular heads being used for this purpose. The upper ends of the cores should be fastened together by means of strips of brass, which will relieve the coils of some mechanical strain. If all the magnets that are to be magnetized are of the same dimensions, it is best to fasten the cores to the base plate permanently by passing a machine bolt up through the base plate into the lower end of each of the cores. The two coils should be connected in series and they should act in conjunction in magnetizing the cores. Figure 7 shows the completed electromagnet.

The magnetization can be accelerated by tapping the magnet when it is under the influence of the magnetizing force. The tapping is supposed to aid the molecules in readjusting themselves.

All magnets lose some of their magnetism with age. This loss can be reduced by placing across the poles, when the magnet is not in use, what is called a "keeper," it being nothing more than a piece of soft iron. Better results will be obtained if this keeper is placed across the object being magnetized, before the magnetizing force is removed.

## Boring a Cylinder

In boring or machining a gas-engine cylinder, in a shop where there is no special boring machine, and facilities



Cylinder Bolted to Lathe Carriage

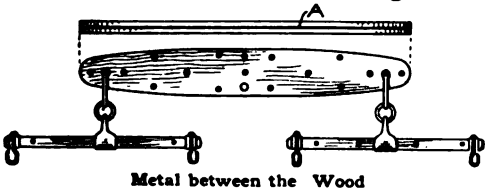
are somewhat limited, I found the following method gave good results:

I first removed the saddle of the lathe, and bolted two pieces of hardwood plank, about 2½ in. thick by 8 in. wide, crosswise of the lathe bed, as shown in the sketch. These planks formed a base upon which the cylinder was to rest, and were of a sufficient thickness to raise the cylinder ½ in. above the center, so that it was necessary to cut a recess in the wood, which both lowered the cylinder to center and at the same time formed a close-fitting support for its lower side. A strap of iron, 1½ by ⅜ in., was bent to fit the upper side of the cylinder and bolted down with ½-in. bolts through the plank on each side, a straight piece of iron of the same dimensions being used for the base end of the cylinder, which was square, and similarly bolted

to the plank below. A 2-in. boring bar was used, and the cutter, which was made from ½-in. stock and ground to a length corresponding to the bore, with a cutting edge at each end, was adjusted so as to cut at both ends at the same time, and wedged into the bar and further secured by two set-screws. The centering of the cylinder was then perfected by running up to the cutter on the head end, then reversing boring bar and using the same method at the base end, moving the cylinder slightly as required to aline it properly for boring. After boring, the ends of the cylinder were faced by putting a longer cutter in the bar (reversing, of course, for the two ends) and completing the operation without disturbing the alinement of the cylinder. The grinding in of the piston was accomplished while the cylinder was still in position, the bar being removed and a chuck substituted for the faceplate. Into the chuck was secured a steel bar which was fitted between the wrist-pin lugs on the piston. The lathe was then started, with the feed on, plenty of oil and a fine grade of emery being used, and the result was a finely finished cylinder and piston.—Contributed by H. L. Elfes, Minneapolis, Minn.

### Reinforced Doubletree

A reinforced doubletree can be made of two 1-in. oak boards with a piece of metal, A, between them. The metal should be about $\frac{3}{16}$ in. thick. All three pieces should be cut and shaped alike and riveted together. The singletrees



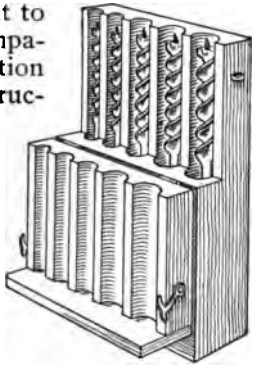
Metal between the Wood

are made in the same manner. They are not difficult to make and will hold the strongest team, besides outlasting a dozen ordinary doubletrees.

¶Uneven heat in tempering causes irregular strain and cracks in tools.

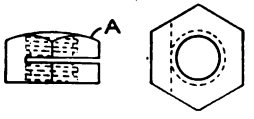
### Homemade Bit Case for Carpenters

A carpenter should be ready to make use of any suggestion that will help keep his tools in order and convenient to carry. The accompanying illustration shows the construction of a wood case for the bits of various sizes which make up part of the carpenter's kit. It is made of a block of wood into the end of which are bored several holes of the proper size to receive the bits. A part of the block is cut out and hinged to form a cover.—Contributed by B. E. Blanchard, Chicago, Ill.



### A Remedy for a Loose-Fitting Nut

A loose nut may be made to fit the threads of the bolt tightly by cutting a slot in the side, a trifle over half way through the nut, and striking it at A with a hammer to close the opening and shorten the pitch of the threads. The nut will turn on tightly, and where the threads fit very closely it takes the place of a locknut.—Contributed by Chas. Williams, Indianapolis, Ind.




### Pumping Clean Water from a Cistern

Clean water may be drawn from a cistern in the following manner: Use a rubber hose instead of the lead pipe and attach a block of wood a little above the lower end so as to keep the end of the hose under water. The wood will float and keep the hose end just under the surface at any level of the water.—Contributed by G. R. Lloyd, Jackson, Mich.

### Folding Tomato-Vine Arbor

The arbor is made of 1 by 2-in. strips of wood, 3 ft. long, fastened together with three hoops about 18 in. in diameter. The hoops can be constructed of No. 9 gauge galvanized wire. The lower end of each strip or stake is pointed, and three ½-in. holes are bored in the upper part, about 9 in. apart. Before the ends of the wire hoops are twisted together they are run through the holes in the sticks, as shown in Fig. 1. The arbor is placed over the tomato vine and the stakes are spaced evenly and driven into the ground. The vine is trained inside the hoops and the stakes make an ideal support.

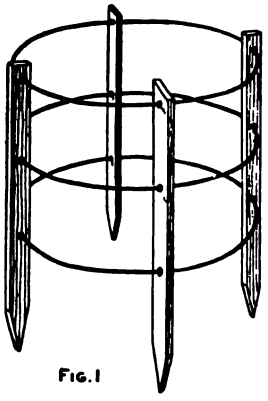


FIG. 1

FIG. 2

Arrangement of the Stakes and Hoops

This rack takes up little space and leaves room to work all around the vine. When not in use, it can be folded as shown in Fig. 2 and stored. —Contributed by H. H. Renges, Shippersburg, Pa.

### Finishing Wood Patterns

The finish on a pattern has a distinct effect on the finish of the casting produced. A rough pattern cannot leave a smooth mold in the sand. The dampness of the molding sand and the cleaning of a pattern by washing with water from a hose bring out all the "hair" from the surface of the wood, leaving it covered with small raised particles. Cleaning patterns by the use of water is, therefore, extremely poor practice, as is also drying them near steam pipes. Places where the end wood appears on the surface of the patterns are most difficult to get smooth and keep smooth. After once smoothing the pattern, the least dampness brings out the roughness again to a greater degree than on portions with the grain.

To prevent this, prepare some glue water—a small quantity of glue in hot water—and with a brush apply two coats to the end grain of the wood. This fills up the pores with a retaining substance, which effectively prevents "pulling out." Over this apply finishing paint as usual. This kink is also often applied to hardwood furniture.

### To Prevent Copper Gaskets from Leaking around Port Openings

It is sometimes almost impossible to get a copper gasket to form a perfectly tight joint around port holes, no matter how tightly the head bolts may be drawn. The outer portion of the gasket can be calked if it leaks, but the inner leakages around a port are not so easy of access, and may seriously interfere with the action of an engine or other power machine.

If the metal can be nicked completely around the port, as shown by the dotted lines in the sketch, with the point of a small cold chisel, the metal is raised at the edges and a groove is formed. The raised portion of the metal cuts into the gasket, while the gasket is also squeezed into the groove caused by the point of the chisel.


Grooves to Hold Gasket

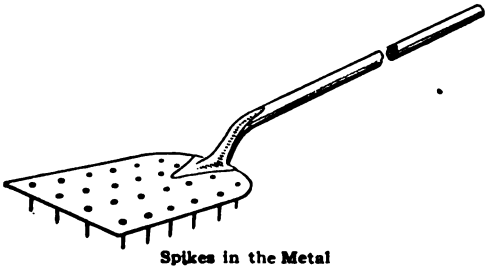
This bit of work will make almost any copper gasket form a tight joint around a port hole, and keep the pressure of an engine, or other device, from being lost.

### Protection for Paint on an Automobile

Dissolve a piece of paraffin, the size of an English walnut, in a pint of gasoline and apply the solution to the surface of the paint with a soft piece of waste or rag after a good cleaning. This will leave a thin coat of paraffin on the painted surface, which will prevent dust or dried mud from scratching the varnish, and at the same time give it a good luster. Apply the preparation after every three or four washings.—Contributed by Emil M. Buerger, Cincinnati, O.

### Earth Pulverizer for Gardeners

A handy garden tool for pulverizing the soil can be made of an old long-handled shovel, as shown. Heat the shovel and flatten it out, drill holes



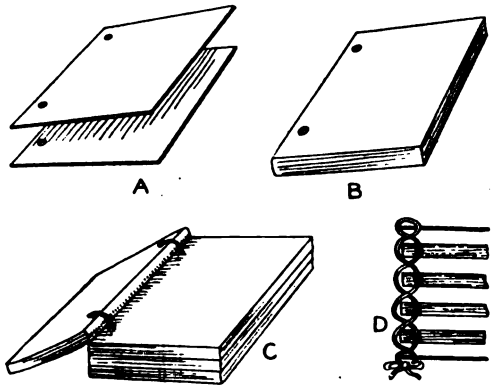
Spikes in the Metal

about 2½ in. apart and rivet spikes in them. A board with large nails, having a long handle attached will also answer the purpose, but not so well as the shovel.

### Preserving Trade Papers

Many trade publications are worth saving for future reference, but unless fastened together, they become scattered and perhaps destroyed. The accompanying sketch shows a very simple and easy way of tying them together, which has the further advantage that the books will open out flat and any of the issues can be easily read.

If a cover is desired, procure two pieces of cardboard the size of the magazine and punch holes as shown in A. Punch corresponding holes in each magazine as shown in B. These holes can be made with a belt punch. The magazines are tied together as shown in C and D, using a shoelace or fancy cord if desired.



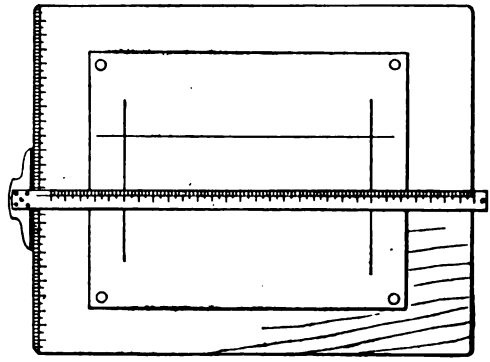

Back and Method of Tying

Magazines can be added one at a time by simply untying and adding the copy to the others and tying the binding cord again.

### Scaling with a T-Square

A very handy way to scale drawings on a large board is to use a scale on the edge of the T-square, also one on the edge of the drawing board. The divisions may be marked the same as on a rule, without any figures, says a correspondent of American Machinist.

In making centerlines, start the horizontal opposite an inch mark on the side of the board, and the vertical cen-

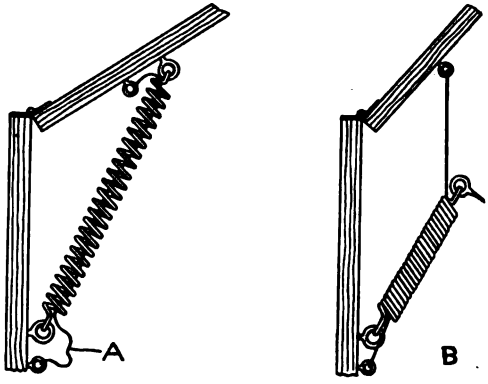


Scale on the Board and T-Square

terline opposite an inch mark on the T-square. The distances on each side of the centerlines can be marked without taking up the rule.

### Safety Cable for Door Springs

Where springs are set up on doors as shown in the illustration, there is danger that they injure someone

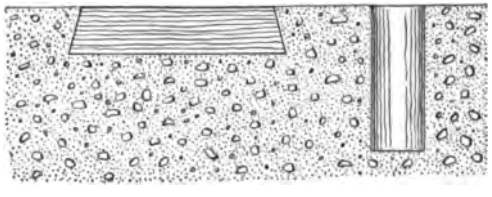



Cable through Spring Fastened at Both Ends

should they break, and especially, if they should fly out when the door is opened too wide. To prevent this, a small piece of cable should be passed through the spring and fastened to the door and jamb with screweyes. If the spring should break, it cannot hurt anyone, as it will be kept back by the cable. The cable need not be very strong—fishing cord will do—as it is not subject to much strain when the spring breaks, and none at all otherwise. For large springs use a piece of chain such as a key-ring chain.—Contributed by P. Mertz, Jamaica, Long Island.

### Fastening Machinery to Concrete Floors

The sketch represents a small section of concrete floor and shows two ways of placing fastenings. The first



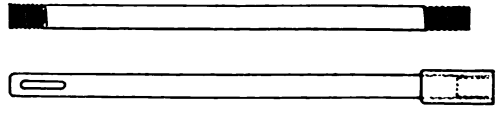
Wood Blocks in the Concrete

is a plank imbedded in the concrete. The plank may be of any size to suit the work in hand, and of suitable length to accommodate the feet of the machine, or its base. Sometimes the plank is made narrower at the top than at the bottom, to increase the holding power of the concrete. The planks must be set when the floor is laid.

A method of placing a fastening when the floor is already laid, is shown by the plug, which is of hard wood and driven into a hole drilled in the concrete. Lag screws are turned into the plug.

### A Way to Run Wires between Walls

Electricians often have trouble getting wires down or up inside of a wall, especially when the upper and lower holes through the plates are not on the same vertical line, or when there are cross braces inside the walls, says a correspondent of Electrical Review. On such jobs I use a steel rod, threading the wire through a hole at one end



Rod Sections

of the rod. The rod I make is built up to any desired length in sections of 12-in. bars of cold-rolled steel, the diameter of which is $\frac{3}{16}$ in. Each section of the rod—except that having the hole for the wire—is threaded on both ends, and adjacent sections are held together by means of a short coupling having the same thread on the inside at either end.

If preferred, the couplings may be knurled, and a coupling pinned permanently on one end of each section of rod. I carry sections enough in my tool kit to make up a rod 14 ft. long. I find that with this device I can fish wires in walls much more readily than is possible with a chair and fish wire. The sketch shows two sections of rod.

¶A metal chip from a cutting tool should never be pulled off with the bare hand.

# The Use of Stencils for Interior Decoration

By HOMER H. KNODLE

## PART II—Laying Out the Work

The problems arising in the layout of continuous designs, while extremely simple, nevertheless require close attention and accuracy in order that the results of the stenciling may harmonize with the scheme of decoration. The layout is made by the use of the chalkline as described in Part I.

In making the initial layout of a job that includes panels, the first thing to do is to lay out accurately the continuous designs. In other words, the most simple part of the work should always be laid out first. This will furnish a basis to work from, and will allow such proportioning of the more difficult layout that the whole may be in harmony. In laying out a panel, first find the exact center of the area that is to contain it. The method of doing this is clearly shown in Fig. 5. The lines need not be prominent, merely heavy enough to be seen, and will then not show in the finished work. In case the area is to contain more than one panel, make the layout as in Fig. 6, which shows an area intended to be decorated with three panels. Make all measurements from this center, and the boundary of the panel design may be determined as shown in Fig. 7.

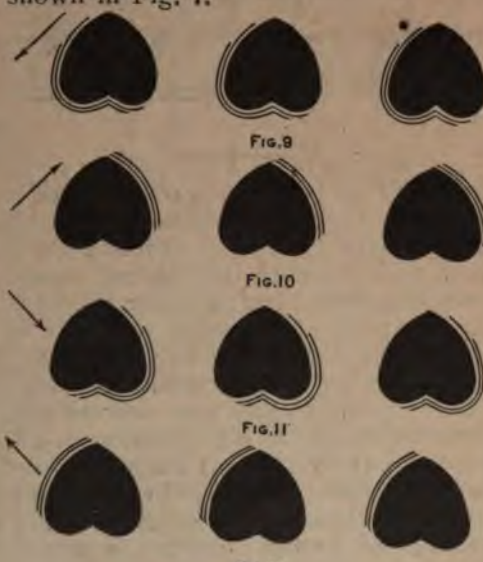


Fig. 9

Fig. 10

Fig. 11

Fig. 12

Shading

When laying out centerpieces, the center of the ceiling must be found, and the extreme boundaries of the design drawn from that center. The principle is exactly the same as in the layout of a panel and should not be difficult of execution. If a center design must be circular to form the centerpiece, lay out the necessary guide lines to properly space it around the 360 deg. of the circle. If it is to be stenciled at some distance from the center of the ceiling, as shown in Fig. 7, draw a circular guide line around the center as shown. The point of intersection of the circle and any guide line gives the starting point for the inside of the design. By laying the stencil design with its cen-

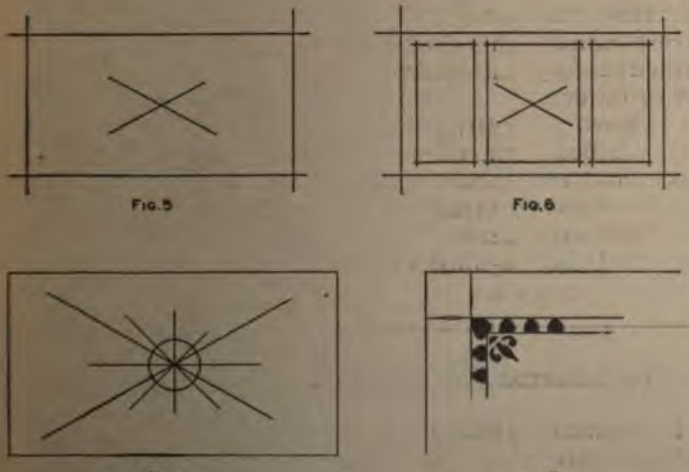


Fig. 5

Fig. 6

Fig. 7

Fig. 8

Layout for Panels

terline perpendicular to the guide line, the design will come into its correct position.

Corner pieces are easier to place than centerpieces, but they, too, re-

FIG 13

A Retouched Stencil

quire to be correctly set in their proper positions. From two points at equal distance from the corner on the two walls forming the corner, draw two intersecting lines as shown in Fig. 8. Continue these guide lines for a sufficient distance to cover the length of the design. With the intersection of the two lines as a base, stencil the corner piece in its right position. In all cases the distance of the point of departure from the wall is determined by the consideration of giving the ceiling panel proper display. In stenciling the corner pieces be sure they are at the correct angle with the layout, as a mistake here will result in either a crooked line or a badly joined border.

Sometimes it is best to shade the stencil designs with a corresponding color. This adds to the attractiveness of the work and also serves to relieve the monotony. In Fig. 9 is shown a simple design and how it is shaded, the design being solid black, and the shading denoted by lines. It is necessary to shade all the parts from the same direction, as in Figs. 9, 10, 11 and 12, which show the effects of shading, the four drawings being identical, while the shading is applied from different points as designated by the arrows. The importance of proper shading may be easily seen from the contrasting drawings, the difference in the direction of the shade causing quite a difference in appearance.

As to the color of the shading, never use a contrasting color. The best color that can be selected is a lighter shade of the wall color. If the stencil is placed in a lighter shade of the wall color, the shading color must be still lighter. The wall, stencil design and shading should be of different tints of the same basic color.

Occasionally there is demand for a decoration in retouched stencil work. This is the nearest approach to freehand decoration that can be accomplished with mechanical means. Instead of the design showing the binders, these are carefully painted out and the shading done as described. A retouched stencil is shown in Fig. 13. The design is complete without a break in the motif. The retouching will require a good set of brushes, the smallest practical outfit being a set of "riggers" from 1 to 6, and a set of flat artist's brushes, sizes 1 to 12. With this combination the work can be done satisfactorily.

A torn stencil can be repaired by cutting out a pattern that will match the torn places, and, after cleaning the stencil thoroughly, gluing it on the outside. Thus a smooth surface is preserved on the inside, or the one laid against the wall.

*(The End)*

## How to Measure the Internal Resistance of a Battery

The current that can be obtained from a battery is dependent not only upon the electromotive force and the resistance of the circuit to which the battery is connected, but, in addition, upon the internal resistance of the battery. The principal factors upon which the internal resistance of a battery depends are: the area of the plates forming the electrodes; the distance between these plates; the kind of electrolyte used; the age of the battery, and the current the battery is supplying. As the internal resistance of a battery increases, due to any cause, such as continued use; drying out of the paste

used in dry cells; decrease in area of plates, etc., the current it is capable of supplying to a given circuit decreases and, as a result, the battery in time will fail to operate any devices that may be connected in circuit.

The internal resistance of any cell can be determined as follows: The voltage of the battery is first measured by means of a voltmeter, having a comparatively high resistance, when the battery is connected to the voltmeter alone. This reading is called the open-circuit voltage, and we will represent it by the symbol $E_o$. Now connect a variable resistance (rheostat) and an ammeter in series to the battery terminals, allowing the voltmeter to remain connected, and place a switch in both circuits, as shown in the figure. (If the voltmeter be constructed with a key for opening and closing its circuit, no switch need be connected in series with it.) The circuits may now be closed and readings taken on the ammeter and voltmeter as promptly as possible after the current has been adjusted to the desired value. This second reading of the voltmeter is called the closed-circuit reading, and we will represent it by the symbol $E_c$. The difference between the closed and open-circuit readings of the voltmeter represents the pressure required to cause the current to pass through the internal resistance of the battery. The current, I, was read on the ammeter and the internal resistance can now be calculated by dividing $(E_o - E_c)$ by I, or

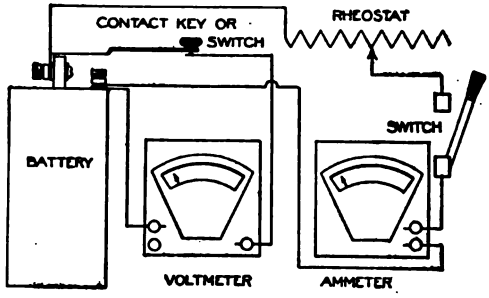
$$\text{Internal resistance } (R_{int}) = \frac{E_o - E_c}{I} = \text{ohms}$$

The internal resistance can be determined for different currents and after the cell has been operating or connected in circuit for different intervals of time. The battery should be given ample time to recuperate after each set of readings before the following set is taken.

The ammeter can be dispensed with by using a piece of wire or a coil, whose resistance, $R_c$, is known, instead of the rheostat. The current can be determined by dividing the closed-circuit voltage by the resistance, $R_c$, connected to the battery.

$$\text{Current } (I) = \frac{\text{Closed-circuit voltage } (E_C)}{\text{Resistance of coil } (R_C)}$$

If the voltmeter has a rather low resistance, considerable current will be

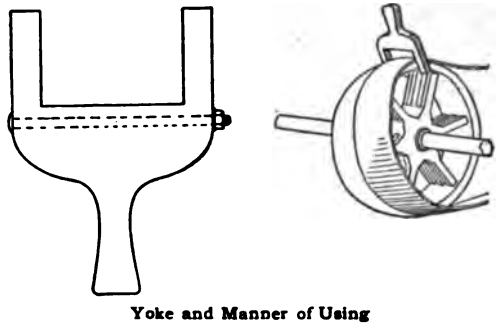


Voltmeter and Ammeter Connections

taken from the battery to operate it, and its indication, when there is no resistance across the battery, will not be the total voltage of the battery, as there is a small part of the total battery pressure required to cause the voltmeter current to pass through the internal resistance. Hence it is desirable to have a high-resistance voltmeter.

## Belt-Throwing Yoke

To make the job of putting a belt on a pulley by hand simple and safe, cut a fork or yoke from a wood block 1¼ in. thick, with a handle of sufficient length, as shown, and use it in place of the bare hand. The fork should be


Yoke and Manner of Using

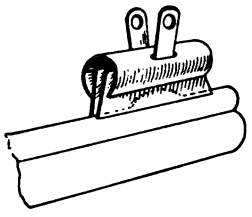
reinforced with a bolt to prevent its splitting.

The belt is thrown on the revolving pulley by pulling the fork over the wheel and belt at the same time.

Where there are several sizes of belts and pulleys, a belt yoke can be made for each width.—Contributed by John V. Loeffler, Evansville, Ind.

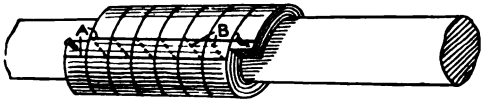
### Temporary Globe Sight for a Gun

An ordinary bill clip of the type shown in the sketch makes a good globe sight when fitted to a rifle having a large front sight. The clip is simply set over the sight on the end of the barrel.—Contributed by James M. Kane, Doylestown, Pa.



### Cutting Packing on Wood Mandrels

The following hints may be of practical assistance to some engineers in cutting packing on wooden mandrels, says a correspondent of Power. As a rule, the space between the ends of a ring should be about ⅛ in, for every




Packing on the Mandrel

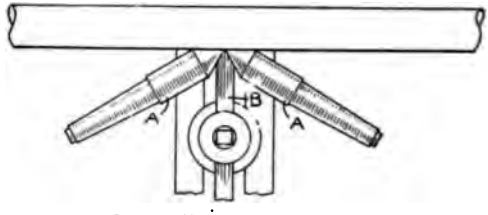
1 in. diameter of the rod. Using that as a basis, the following sizes of wooden mandrels are necessary for winding the coil packing to cut it for the various sizes of rods:

| Diameter of Rod | Diameter of Mandrel | Diameter of Rod | Diameter of Mandrel |
|---|---|---|---|
| ¼ | ⅝ | 1⅛ | 1⅝ |
| ⅜ | ⅞ | 1¼ | 1⅞ |
| ½ | 1⅛ | 1⅜ | 2⅛ |
| ⅝ | 1⅜ | 1½ | 2⅜ |
| ¾ | 1⅝ | 1⅝ | 2⅝ |
| ⅞ | 1⅞ | 1¾ | 2⅞ |
| 1 | 2⅛ | 1⅞ | 3 |
| 1⅛ | 2⅜ | 2 | 3⅛ |
| 1¼ | 2⅝ | 2⅛ | 3⅜ |
| 1⅜ | 2⅞ | 2¼ | 3⅝ |
| 1½ | 3 | 2⅜ | 3⅞ |
| 1⅝ | 3⅛ | 2½ | 4 |
| 1¾ | 3⅜ | 2⅝ | |
| 1⅞ | 3⅝ | 2¾ | |
| 2 | 3⅞ | 2⅞ | |
| 2⅛ | 4 | 3 | |

Nail one end of the packing on the mandrel. Wind the packing spirally around the wood and nail the other end. Mark two lines, A, parallel to the axis of the mandrel and about 1¼ times the thickness of the packing apart. The packing is cut into rings by cutting obliquely between the parallel lines, as shown by the dotted lines B. This will make about the right allowance for the end expansion of the packing. Before inserting the rings, they should be dipped into cylinder oil and placed in position so that the open spaces are staggered and do not fall one on top of the other.

### To Set a Lathe Tool

In preparing to cut a thread one day, I could not find the center gauge and, to set the threading tool B, I made use

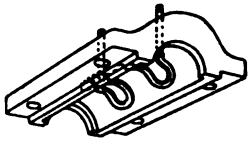



Setting Tool at Right Angles

of two other centers, A A, as shown in the sketch. The angle of both centers and the threading tool combined made 180 deg., so that the threading tool B was thus set at right angles to the work.—Contributed by H. Robinson, New Bedford, Mass.

### Water-Cooled Bearing Cap

The accompanying sketch shows how a large, high-speed, heavy-duty bearing cap, which ran hot very often, was effectively cooled with water. As may be seen, the cooling was accomplished by placing a coil of pipe in the babbitt space. The babbitt was subsequently poured over the coil, completely imbedding it. Although the thickness of the babbitt over the coil was much less than ordinary, no



difficulty was experienced, and the overheating of the bearing was effectually stopped.—Contributed by J. J. O'Brien, Buffalo, N. Y.

### To Straighten or Bend a Shaft

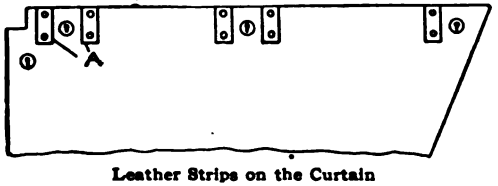
The principle of the method of bending a shaft here described applies to the straightening as well as the bending of bars, shafts or castings. In the sketch is shown a shaft which it is desired to bend in the direction of the dotted line. It is held in the center of a lathe, a pinch bar is pressed against


Bending a Shaft

the under side, and while thus sprung, the upper side is given repeated blows with a hammer, the heft of the blows depending on the size of the shaft. In this way it is easy to give a permanent "set" to a piece. The piece may be held or clamped in any position or manner that suggests itself or is most convenient, the point of the trick being to hammer on the high side while in the sprung position. Heavy bars are easily set.—Contributed by D. A. Hampson, Middletown, N. Y.

### Reinforcing Side Curtains on Buggies

The side curtains of a buggy top will in time become sagged and, in that condition, do not present a neat ap-

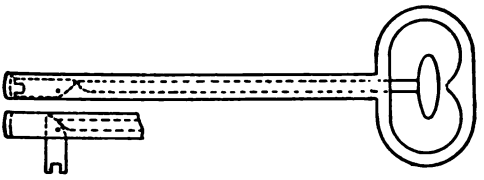



Leather Strips on the Curtain

pearance, nor will they keep out rain or snow. I remedied this by fastening pieces of sole leather, 1 in. wide and 2 in. long, one on each side of the buttonholes as shown by A in the sketch. These should be put on while the side curtains are new and not much used. —Contributed by Bennett Vanfossan, Cove, O.

### Door Key for a Round Hole

The illustration shows the construction of a key to fit a round hole. The main feature of this key is to prevent

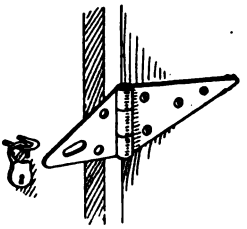


Movable Tumbler-Turning Projection

the use of skeleton keys in the lock. The key is inserted in the hole, then the plunger or rod is pushed in, which forces the tumbler-turning projection out into position.—Contributed by Francis Chetlain, Chicago.

### Hasp Made of a Hinge

Requiring a hasp and having none handy, I made one from an old strap hinge, as shown in the illustration. This served the purpose as well as the ordinary hasp. To still better prevent interference, the part screwed to the door can be bent over the edge, and the screws turned in from the back side.—Contributed by Oscar N. Anderson, Canby, Minn.



### An Electrician's Pipe Wrench

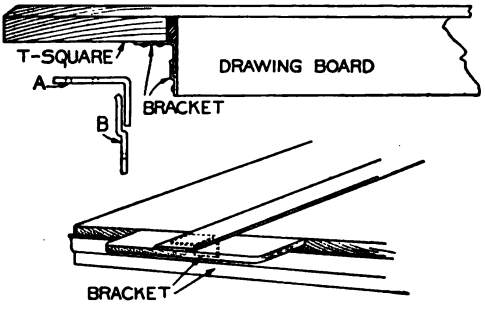
A wrench that will be handy for putting up gas or combination fixtures can be made of a common alligator wrench and a piece of steel to form an offset handle. The manner of construction


Extension Handle on Wrench

and dimensions for the handle are shown in the illustration.—Contributed by E. G. Backus, Hackensack, N. J.

### T-Square Attachments for a Drawing Board

The attachments are used to hold the T-square firmly against the edge of the drawing board. The end of the

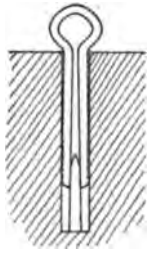



Parts Attached to the Board

board is fitted, for its whole length, with a brass strip 1 in. wide and $\frac{1}{16}$ in. thick. This strip is bent as shown at B. A small piece of brass is shaped as shown at A and two holes drilled for screws to fasten it on the head of the T-square. The long brass strip is also drilled, and fastened to the board with screws. The lower bracket or strip bears against the small angle A and keeps the square in the right position, while at the same time allowing it to be freely moved up and down the board.—Contributed by Chas. Homewood, Waterloo, Iowa.

### A Substitute for an Expansive Bolt

If in need of an expansive bolt when there is none at hand, use an ordinary cotter. Pick out a pin a little smaller than the hole bored to receive it. File a few grooves in the outer surface and insert it in the hole with a wood wedge between the legs. As the wedge strikes the bottom of the hole it forces the legs of the cotter apart and expands it against the sides of the hole. Small metal rings can be very easily fastened to sidewalks or walls in this manner.—Contributed by G. H. Holter, Jasper, Minn.

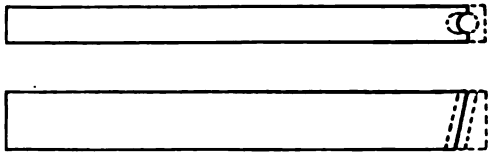


### Inflating a Bicycle Tire without a Pump

When going out for a ride on my bicycle one day, I found that a tire was without air, and I had no bicycle pump. The idea occurred to me to use the water pressure from the hydrant. I drained the garden hose and made a tight connection between the nozzle and the tire valve. I then turned on the water which forced the air in the hose into the tire. When the desired pressure was obtained, I broke the connection and turned off the water.—Contributed by James Leslie, Arrowrock, Idaho.

### Forming a Lathe Tool

A number of cam rolls with a rounded face had to be made, and not desiring to spend much time on them,



Showing Part Cut Away

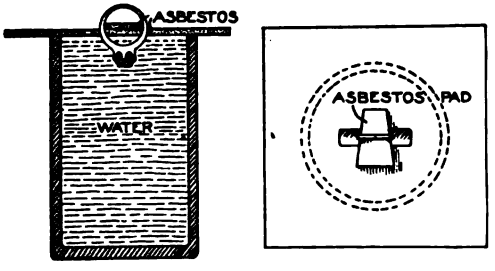
I avoided making a template from which to file a tool in the following manner: The stock for the tool was tilted at an angle of 10 deg. and a hole drilled of the proper diameter. The surplus metal shown by the dotted lines was then removed from the front of the tool.—Contributed by Jos. C. Wilson, W. Lynn, Mass.

### How to Drive Nails to Avoid Splitting

When it is necessary to drive nails in places where there is danger of splitting, and a drill of the proper size is not at hand for starting a hole, simply file or grind the point of the nail to a chisel edge instead of the regular four-sided point, and drive the nail with the sharp edge thus made cutting across or at right angles to the grain of the wood.—Contributed by Aug. Gertenbach, Quincy, Ill.


## Hard-Soldering a Stone-Set Finger Ring

A method of soldering a stone-set ring without danger to the stone from the heat is illustrated in the sketch. An earthenware jar is filled with water and a piece of sheet asbestos having a hole in the center is placed on top of the jar. The ring is put in the hole with the stone downward in the water and a tapering piece of asbestos is slipped in the opening as far as it will go, for a support. Apply borax and water with the solder to the joint and the ring will stand the hottest flame

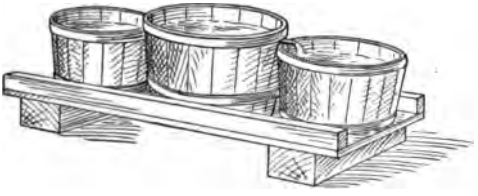



Jar with Asbestos Cover

without damaging the settings.—Contributed by Wm. A. Jones, Raleigh, North Carolina.

## Watering Tanks

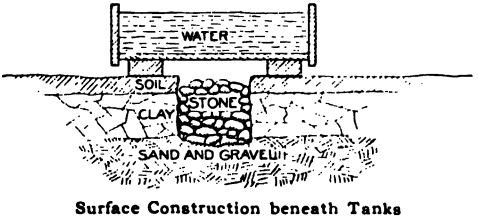
Some animals like to splash the water after they have quenched their thirst. This will render the water unfit for use of other animals, and also causes a muddy place near the tank. I have prevented this by making the arrangement shown in the sketch. Iron-hooped barrels were used for tanks. They were sawn in the center and the half barrels set on a broad platform made of several planks. The one shown is made of three half barrels, the center one being a little larger



Half Barrels on Base

than the other two. They were held in place on the planks with a piece of 2 by 4-in. material bolted at each edge. Their inner surfaces were notched to fit the barrels. Two short pieces of pipe connect the center tank to the other two. The center tank receives the water from the source of supply. A small stream of water, kept flowing in and out all the time, keeps the water from becoming stagnant.

The earth can be kept dry about water tanks of any kind by preparing the base as shown. The overflow or leakage will drain away and prevent a mud hole. Many times ashes or dirt are thrown about a tank to absorb the moisture which makes the leakage flow back under the tank. The constant

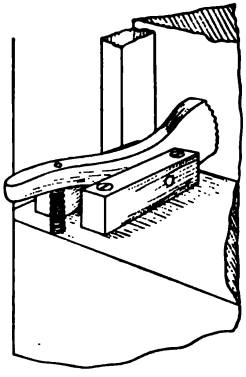



Surface Construction beneath Tanks

dampness rots the wood and renders the foundation insecure.—Contributed by J. G. Allshouse, Avonmore, Pa.

### A Window Lock

A combined window lock and stop that is handy for the summer time is made of wood or metal as desired and attached to the upper part of the lower sash with screws. The serrated edge of the lever is kept in close contact with the upper sash by a coil spring placed under its outer end. Either sash can be adjusted and locked at any point. The stop also keeps the sash from rattling.—Contributed by S. Yamaskita, Hoquiam, Wash.



### How to Make a Concrete Settee

A concrete settee for the summer house, cemetery or lawn, can be easily made over an old discarded wood settee. The one described was made over an old depot seat, which was 10 ft. long, with a cast-iron frame and wood slats for the back and seat. The seat was cut to make it 6 ft. long. This was done by removing the screws holding the slats and sawing the slats to the proper length, then securely fastening them again.

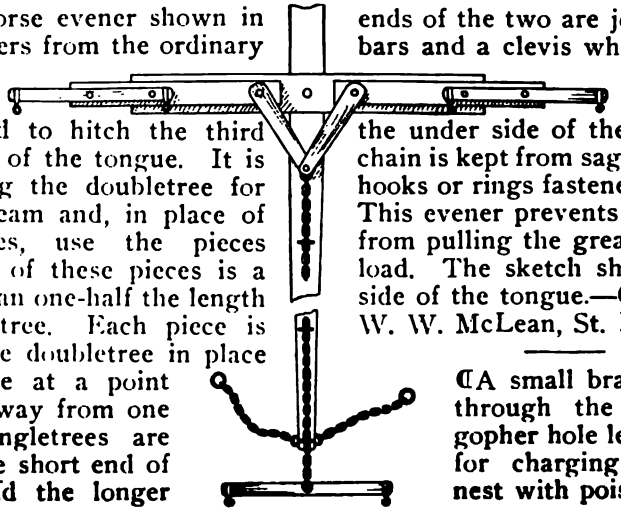
The back was reinforced with two ⅜-in. rods crossing it in the form of an X, which were passed through small holes drilled in the casting behind the slats, and drawn up tightly. Similar rods were crossed under the seat. This made the frame very rigid and the whole thing was then covered with expanded metal such as used for stucco houses. This was nailed to the slats and wired to the legs and other metal parts. The entire settee now appeared as if it were made of expanded metal.

A stiff mortar of sand and cement, with about two parts of sand to one of cement, was applied to the metal lath, care being taken to fill all the openings in the meshes. The mortar was applied until the metal was all covered, then a smooth coat put over it. This made a solid settee that would stand any kind of weather.—Contributed by W. E. Morey, Chicago.

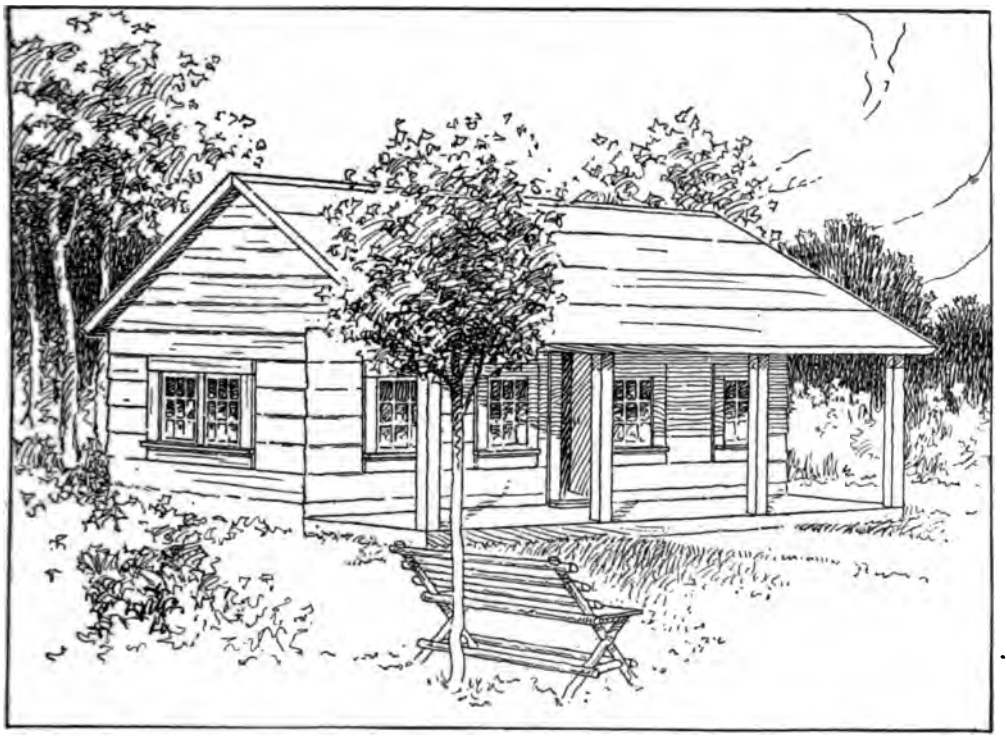
¶A white spot on furniture varnish may be removed by holding a hot iron over it.

## A New Three-Horse Evener

The three-horse evener shown in the sketch differs from the ordinary kind in that extension parts are used to hitch the third horse in front of the tongue. It is made by using the doubletree for a two-horse team and, in place of the singletrees, use the pieces shown. Each of these pieces is a little longer than one-half the length of the doubletree. Each piece is fastened to the doubletree in place of a singletree at a point one-third the way from one end. The singletrees are fastened to the short end of the pieces, and the longer ends of the two are joined with two bars and a clevis which is attached to a chain running on the under side of the tongue. The chain is kept from sagging by several hooks or rings fastened in the wood. This evener prevents the lead horse from pulling the greater part of the load. The sketch shows the under side of the tongue.—Contributed by W. W. McLean, St. Louis, Mo.



¶A small brass tube forced through the earth into a gopher hole leaves a channel for charging the animal's nest with poison or gas.



# How to Build a Permanent Camp

By FRANK L. RUSSELL

To the man who delights in the woods or takes pleasure in spending an occasional week in pursuit of the elusive game fish, but whose time is limited, and whose purse has not yet reached proportions which make it burdensome, a permanent camp, at some favorite spot where the smell and soot of soft coal have not entirely driven off the invigorating fragrance of the pine and hemlock, is a great source of enjoyment.

A camp of this sort need not be expensive, if a person has had some experience with tools, and has ingenuity to overcome the trifling problems presented by local conditions. The comfortable camp which I am about to describe need not cost over $200 at the outside, and by the judicious selection of material may be built for as low as $125. While this little house of mine was built for a camp, it would make a far better home for a pioneer farmer than many I have seen that cost three times the amount that this one does.

In making up the accompanying list of materials, however, nothing necessary for the construction is omitted, but the builder can substitute for porch posts or corner posts lengths of small trees dressed to take the siding or porch floor plates.

The roofing can be made up of 16-ft. boards, laid horizontally, with the joints staggered. The appearance of the interior will be greatly enhanced by having the roofing boards of matched lumber, surfaced on both sides, and one side beaded. The studs, plates, tie joists and rafters will also add to the appearance, if they are surfaced on all sides.

The amount given in the material list for flooring will figure more than the actual surface. This is for waste

## List of Materials

**FOUNDATION POSTS**
12 posts, 6 in. or more in diameter and from 4 to 6 ft. long.

**FLOOR JOISTS**
31 pieces, any inexpensive wood, 2 by 10 in., 12 ft. long.
14 pieces, 2 by 10 in., 10 ft. long.
3 pieces, 2 by 10 in., 16 ft. long.

**STUDS**
46 studs, 2 by 4 in., 6 ft. long.
3 studs, 2 by 4 in., 16 ft. long.

**PLATES**
20 pieces, 2 by 4 in., 16 ft. long.
12 pieces, 2 by 4 in., 12 ft. long.

**UPPER JOISTS OR TIES**
13 pieces, 2 by 4 in., 12 ft. long.
13 pieces, 2 by 4 in., 8 ft. long.

**RAFTERS**
26 pieces, 2 by 4 in., 14 ft. long.

**SIDING AND PARTITIONS**
65 boards, ⅜ by 12 in., 16 ft. long, S-4-S.

**ROOF**
Sufficient lumber to cover 1,000 sq. ft.

**FLOOR**
Sufficient tongue-and-grooved boards to cover 700 sq. ft.

**ROOFING**
Sufficient prepared roofing material to cover 1,000 sq. ft.

**EAVE-FINISHING MATERIAL**
4 boards, ⅜ by 4 in., 16 ft. long, S-4-S.
4 boards, ⅜ by 4 in., 14 ft. long, S-4-S.

**WINDOWS**
2 double casements.
6 single casements.

**DOORS**
88 sq. ft. of ⅜-in. tongue-and-grooved material, S-2-S, in 14-ft. lengths.

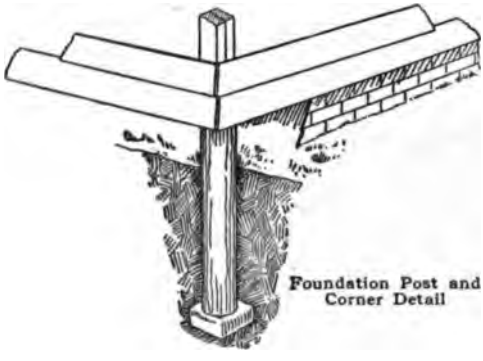
**DOOR CASINGS**
6 pieces, ⅜ by 6 in., 7 ft. long, S-4-S.
1 piece, ⅜ by 6 in., 16 ft. long, S-4-S.
6 pieces, ⅜ by 1 in., 7 ft. long, S-4-S.
1 piece, ⅜ by 1 in., 16 ft. long, S-4-S.

**HARDWARE**
15 pairs of hinges.
2 chain bolts.
3 locks.
10 sets of hooks and eyes.
About 50 lb. of 20 d nails.
50 lb. each 10 d and 8 d nails.
Screws for locks and hinges.

and loss in matching the boards. The same will hold true with the roofing material.

There are several kinds of prepared roofing material. Some of it is a good imitation of red shingles. The nails and washers are furnished with the roofing. Be sure to have the nails shorter than the thickness of the roofing boards.

The windows can be purchased complete with sash and frames, including



Foundation Post and Corner Detail

the outside trim. The size to purchase is sash having 9 lights of 8 by 10-in. glass.

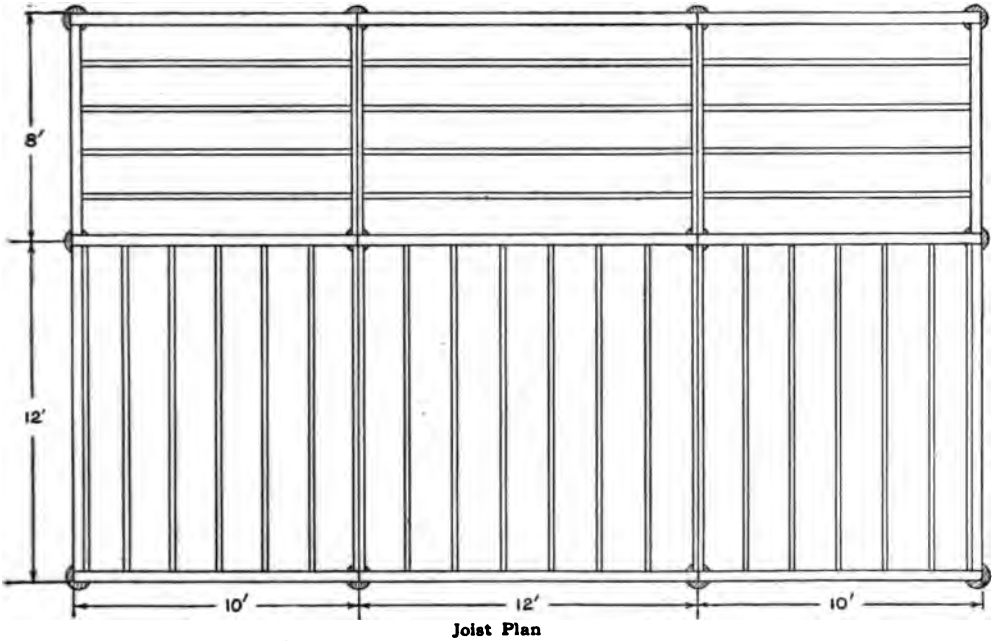
A full set of carpenter's tools is not necessary. A hammer, crosscut saw, rip saw, square, level, chalkline, block plane, screwdriver, one ¼-in. and one ½-in. chisel, a mallet, brace, and set of bits are the tools most necessary.

The first thing to do is to locate a level site and lay out the ground plan with stakes and the line. Square this up so as to form a perfect rectangle, 20 ft. by 32 ft. Locate the foundation posts and dig holes for them. Allow their upper ends to project 6 or 8 in. out of the ground. The posts are set in the holes as shown in the sketch. A few stones or flat rocks placed in the bottom of each hole will make a firmer foundation. Before tamping in the earth about each post be sure it is in its proper place. This can be determined by the line.

A 12-ft. straightedge should be made from one of the flooring or finishing boards and used with the level in lining up and leveling the top ends of the posts. After marking the tops with the aid of the level and straightedge they are sawed off and the joists placed on them as shown in the joist plan. The ends of each joist are kept in place with spikes driven through the stringers. The location of the joists can be found by laying out the divisions given in the plan. They are bridged through the center as shown in the detailed sketch.

After the joists are all in place lay three lines of floor plates for the studs,

two on the long sides and one on the line of the wall back of the porch. These are squared to fit in place and spiked to the joists. A few boards are laid temporarily on the joists and the studs made ready for raising. It would be well to purchase a dozen or more rough boards 16 ft. long for this purpose and for staging where required. The studs are measured, squared, and sawed to length.

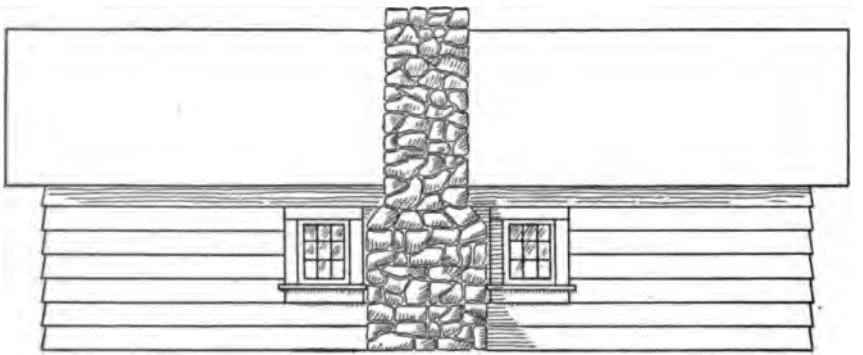


Joist Plan

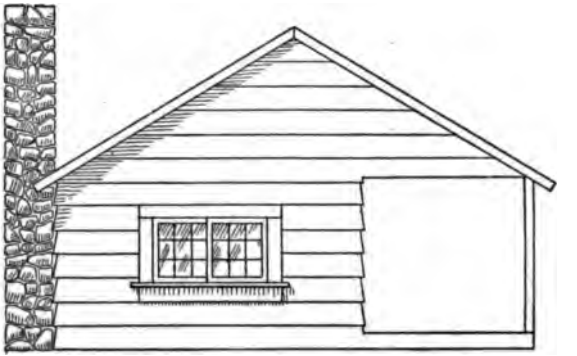
The location of each stud is laid out on the floor plate; first measure the width of the window frame which is set between studs, and locate them to fit the frame. After marking these plates, the upper plates that go on top of the studs are laid out by the floor plates and marks made to locate the studs in exactly the same positions. Each pair of plates should be similarly marked. As the top plates consist of double pieces, they are cut with the joints staggering, and after spiking one plate to the top ends of the studs, the other one is then spiked on top of the first. This operation is done while the studs and top plates are lying on the temporary floor. After accomplishing this bit of work, the entire side is raised and braced to the joists, after which each stud is plumbed and braced to keep it in the right place until other work is finished. Both sides and porch posts are raised in like manner and the tops joined by the upper joists or tie pieces. The locations of these are laid out on the top plates, as shown by the rafter plan. Each piece is placed on the outside of each rafter location, beginning in the center until the ends are reached, then each end tie is placed on the inside of each last rafter. They are toe-nailed to the plates. Be sure to properly brace the studs both ways and keep them plumb as the work progresses.

The rafters are now laid out and cut, then raised in pairs in the positions designated, the upper beveled ends being spiked together. The lower ends are spiked to the plates. They are then braced to keep the space between them equal. It may be well to state that the bracing for the studs and rafters is only temporary and a few of the flooring boards may be used for this purpose.

The end studs are now cut and put in place with top plates. Be sure to measure the window frames before locating the studs on the plates. The

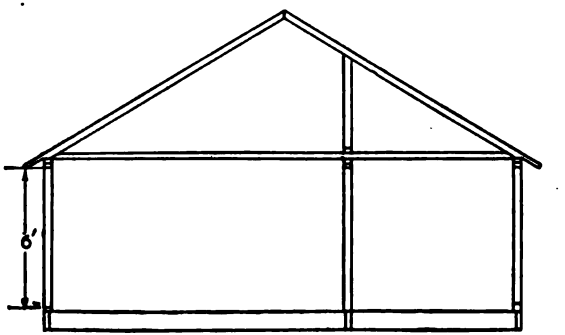


Back Elevation

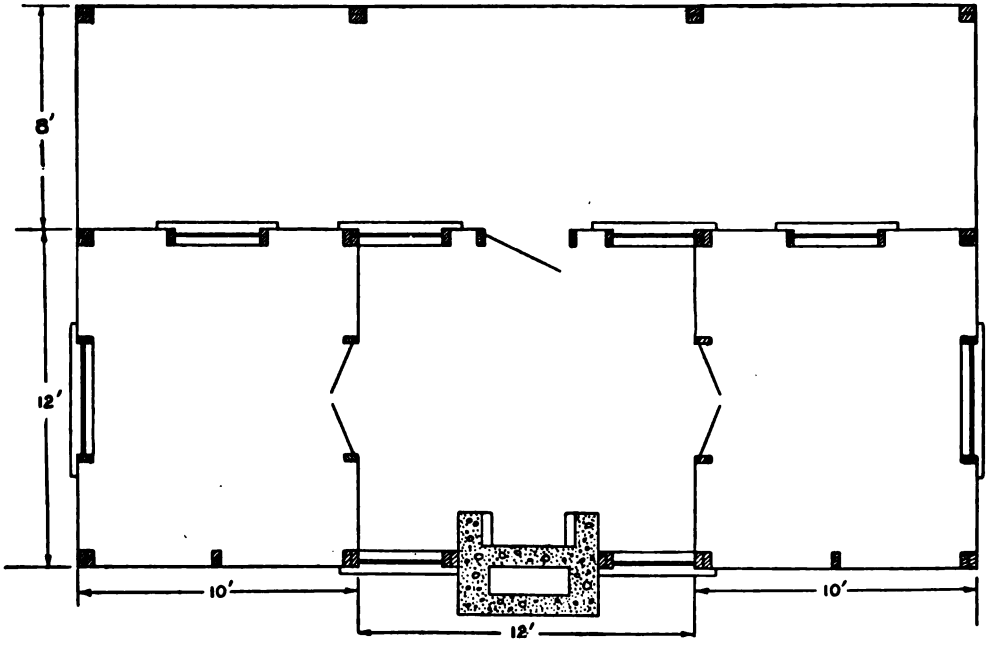


End Elevation

Front Elevation




Section through Center



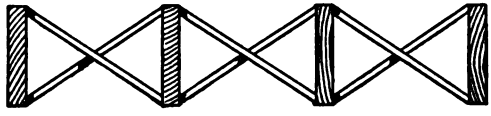

Floor Plan

plates are cut to fit in between the ends of the plates running the long way of the building, or they may be lapped at the corners, one crossing the other, if desired.

The roofing boards are next laid on the rafters. If beaded material is used, the beaded surface is turned down. Start at the bottom and lay the boards toward the top, staggering the joints and cutting them to match on the rafters. Be sure to draw the tongue closely in the groove before nailing each board. Allow the ends to project about 13 in. over the end rafters. When this is complete mark the projecting ends of the boards on the gables at the ridge and the eaves 12 in. from the outside surface of the location of the siding. Chalk the line and snap it full length on both sides of the roof at each end on the 12-in. mark. Saw the ends of the boards off square on the chalked line and proceed to put on the finishing boards.

The finishing boards are nailed to the ends of the rafters at the eaves, and to the ends of the roofing boards on the gables. The boards are now ready for the roofing, which is cut in horizontal lengths. Each length is put on and nailed down with the roofing nails and washers, placing them only in the lower edge of each piece. Begin at the bottom on both sides and lay the lengths the same as shingles, overlapping the edges 3 or 4 in. The lower edge of the first length is turned over and nailed into the eave-finishing boards, and the ends turned over and nailed into the gable-finishing boards.

Nailing the siding in place is next in order. A 1-in. strip is nailed at the bottom edge of the stringers and joist to make the slant for the first row of



Joist Bridging

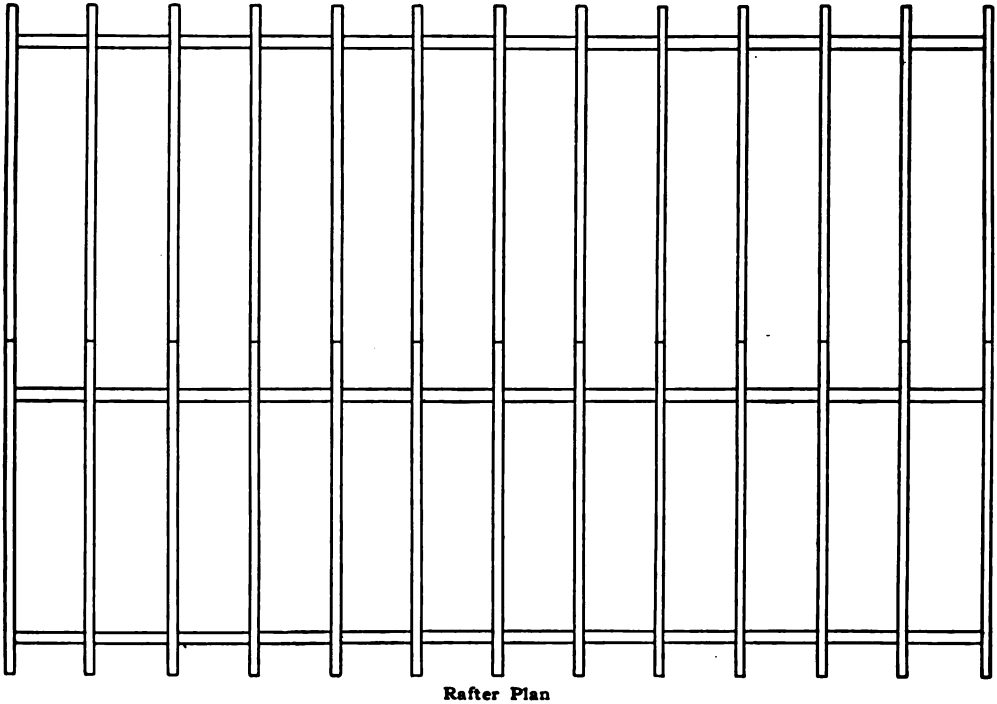
boards. These pieces can be cut from any rough material. The siding boards are lapped about 1 in. This lap can be determined by stepping the divisions—seven for the space up to the top of the upper plates—on the corner and window studs. The boards are so cut as to have them project a little over into each window space. When

the boards are all on, this allows sufficient end for making a chalked line and sawing to closely fit the window frame.

The ends at the corners are cut on a bevel, so that the boards will fit without upright corner-finishing boards. The detail sketch of the corner shows how the joint is made. Commence nailing the boards on at the bottom and finish the course around the building before starting the next course. After nailing the siding on, plumb and make chalked lines for the window frames and saw off the projecting ends of the boards. Put in the frames and hinge the sash at the top or sides as desired.

The flooring is now laid. Be careful to draw the tongue-and-grooved edges close together. After laying both porch and inside floor, lay out the location for the partitions and set the studs. The partition boards are not lapped. They are only nailed on to cover the space up to the top of the plate, the upper part being left open for ventilation. A plate is nailed on the upper joists or ties just over the wall studs back of the porch, and studs cut and nailed into place connecting the rafters to make the wall extend to the roof.

The open part on the outside below the joist can be covered with metal,



Rafter Plan

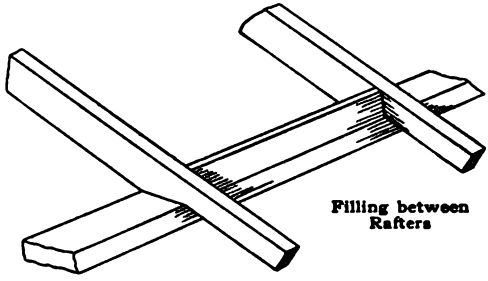
made to imitate brick or stone, to keep vermin out. If an oil stove is used for cooking, there is no need of a chimney, but if a stove is used a chimney can be constructed of terra-cotta sewer tile. If a fireplace is wanted, one can be put in with field stone or brick. The one shown is of field stone picked up in the vicinity of the building. In building the fireplace, the stringer on the back side of the building is cut out, the ends of the joists cut off and a header put in, back far enough for the front of the fireplace, and the stone or brick started on the earth and built up through the opening, carrying it up and finishing with a chimney. When putting in the fireplace it is best to provide four extra foundation posts to set at the ends of the header and at the ends of the stringer where it is cut.

The boards for the doors are placed

on two timbers having a level surface, and they are drawn closely together with clamps, or they can be placed between blocks spiked to the timbers and drawn together with wedges. After the tongues of the boards are drawn closely in the grooves, two battens are nailed across the boards, one near each end, and one batten is nailed diagonally between them. Use short nails, driven in on a slant, so that they will not pass through the boards. Be sure to have enough boards to make the full size of the door with a surplus sufficient for dressing to fit the opening. The doors are then fastened to the casing the same as an ordinary door.

It is best to paint the outside with three coats of paint, allowing each coat to dry thoroughly before the next is applied. If surfaced material is used, the interior can be stained to produce a pleasing effect.

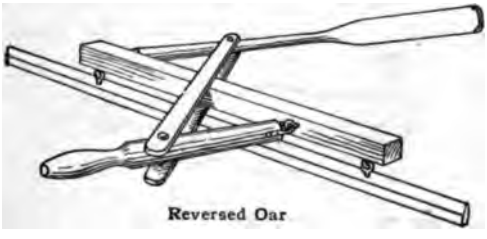
The size and construction of this




house may be somewhat modified, but the general scheme is especially adapted for a permanent camp in the woods, or near a river or lakeside.

## Attachment which Permits Oarsman to Face Forward

When a person rowing wants to face in the direction he is traveling, the



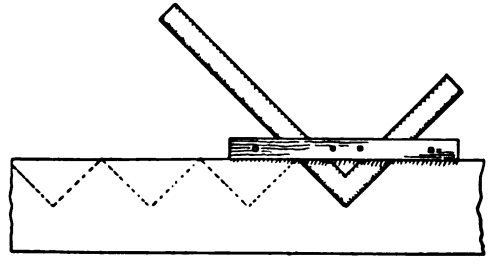

attachment for each oar shown in the sketch will serve his purpose. The oar is cut in two at the place where it rests in the oarlock of the boat. Each part of the oar is hinged to a piece, which is also hinged to the gunwale of the boat. The oar parts are connected with two straps of metal. The construction is clearly shown.

## How to Sharpen Old Files

A method to sharpen old files that has proven quite satisfactory, although it is rather odd, is to clean them of all grease and foreign matter and suspend them from a metal plate, by a piece of bare wire, in a bath of 3 parts of sulphuric acid, 6 parts of nitric acid and 100 parts of water. Several plates of carbon should be immersed in the same bath and connected by bare wires to the metal plate supporting the files. The cavities in the file are eaten deeper, and the edges are made almost as sharp as if worked by a file cutter.

## Laying Out Stair Strings with a Square

In laying out stair strings I find that time will be saved if I attach two 7/8-in. strips of wood, one on each side




of the square, as shown in the sketch, so as to obtain the desired rise and run. All treads can be quickly and accurately marked with this device.—Contributed by C. Elmer Boehmer, Pittsburg, Pa.

### Small Clamp for Woodworkers

Cut two pieces of $\frac{3}{16}$-in. sheet metal, 2 in. wide and $3\frac{1}{2}$ in. long as shown at A, Fig. 1. Make a slot at

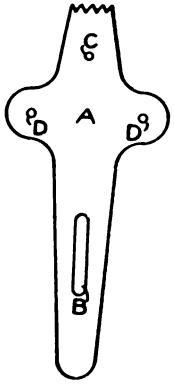



Fig. 1

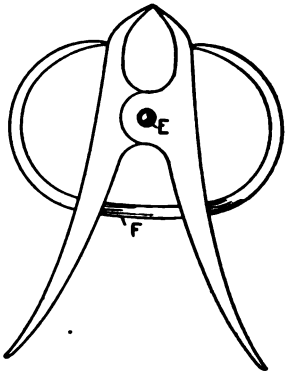



Fig. 2

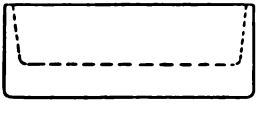
Woodworker's Clamp

B, a little over $\frac{3}{4}$ in. long by $\frac{1}{8}$ in. wide. Drill $\frac{1}{16}$-in. holes at points DD, and make a dent at C. File small notches in the end as shown.

Bend or hammer the plates to the shape shown in Fig. 2 and fasten them together with a rivet E. The spring F passes through the slot B in each jaw and the points are set in the dents made at C. This makes a very handy clamp for small woodwork.—Contributed by W. B. Matthews, Rochester, New York.

### Melting Pot for Cyanide of Potassium

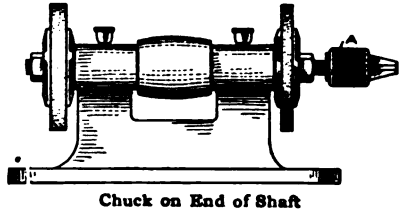
For ordinary casehardening (other than the slow process called pack hardening), I have found a most useful adjunct in the cast-iron melting pot shown in the figure. As will be noticed, it has a relatively thick bottom. This is an advantage over ladles and similar thin receptacles because it is not easily burned through in the forge fire, it retains the heat when once brought to a red, and it does not readily warp. Enough cyanide should be put in to fill the pot about half full when melted. Then it is only necessary to drop in small pieces to be hardened, leave them a couple of minutes, and dip in water. An article immersed in a red-hot liquid heats up more quickly than if in a red-hot coal fire, because of the more complete contact of the source of heat.



When casehardening for colors, this pot turns out work perfectly clean. If it is possible to have running water, an air jet in a tank of water or a water jet, the full benefits of the melting pot are realized and one is rewarded with fine mottled surfaces. The pot is round in shape and may be made of any size proportional to the work at hand. For small screws and nuts, a pot 4 in. inside diameter by $1\frac{1}{2}$ in. deep is sufficient.—Contributed by D. A. H.

### Combined Emery Stand and Speed Lathe

The ordinary emery stand can be used as a speed lathe by boring a hole in the end of the spindle and inserting a chuck, A. This can be used for filing




Chuck on End of Shaft

pins, polishing and lapping bushings for jigs, and for a number of small jobs that have to be done on a regular speed lathe.—Contributed by F. G. Marbach, Cleveland, O.

### Rubber Stamps Used on Tracing Cloth

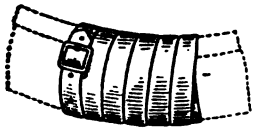
Sometimes a number of blueprints are needed for announcements or other purposes, and to make the tracing by the usual method would take several hours of time. With a set of rubber type and a pad of heavy-body black ink one can do the work very quickly and better than if the letters were drawn.

The tracing cloth or paper is placed

upon the board as usual, and the spaces for the letters marked with a hard pencil. The rubber types, thoroughly inked, can then be applied in their proper order. If an imperfect print of the letter is made, a very soft eraser used at once will easily remove the ink. A simple border can be drawn around the letters, if desired. The cloth or paper will dry in a few minutes and the blueprints made therefrom will be as good, if not better than when made in drawing ink with a pen.

### Repairing Tire-Casing Blowout with a Strap

Every person running an automobile will at some time have a blowout in the outer casing. When this happens in the country or away from home, a casing of the required size cannot always be secured at small shops, so the autoist must make some kind of a repair. I have found that a strap about



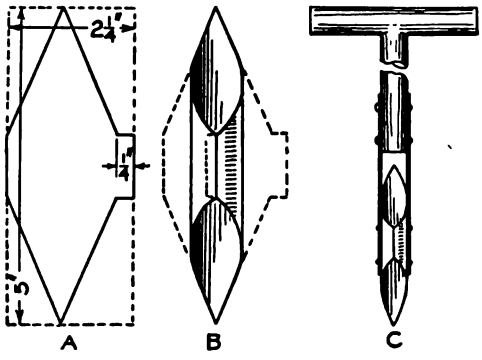
1 in. wide and long enough to reach seven or eight times around the tire makes a very satisfactory repair covering in emergencies.

The strap should have a buckle and a keeper at one end and a number of holes at the other. In placing the strap, a portion of the air is let out of the tire; then the strap can be wrapped tightly. After the strap is in place, inflate the tire and it will give from 300 to 500 miles' service. A strap can usually be secured at any farm house.

### How to Make a Weed Puller

The puller is made of a piece of heavy galvanized iron, 5 by 2½ in., cut as shown at A, and bent into the shape B. After shaping the metal, the small ¼-in. projection is placed under the opposite side and then soldered. The tube-shaped metal is then fastened to a handle with two pieces of strap iron, using bolts and rivets as shown at C.

The puller is used by pushing the

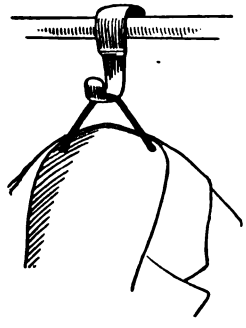



Pattern and Shaped Metal

sharp point of the metal into the earth, having first inserted the stalk of the weed in the hole. Then turn the handle and draw the puller out, and the weed with all its roots will be removed.—Contributed by Arthur L. Chetlain, Chicago.

### A Coat Hanger

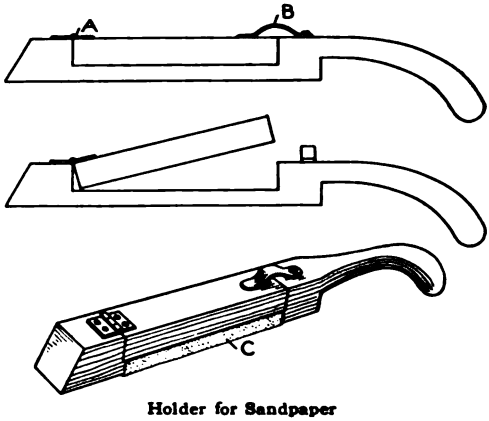
When attending a meeting or social assemblage where no accommodation is made for wraps, I find it very handy to take along an ordinary picture hanger. The broad end can be hung over any window sill, door or any protruding object and the coat hung on it as shown in the sketch.—Contributed by J. A. Whamer, Schenectady, N. Y.



¶Aluminum surfaces may be cleaned with a stiff-bristled brush and a solution of from 5 to 8 parts of water to 1 part of sulphuric acid. Then a mixture of fine emery and turpentine should be applied vigorously with the same brush.

### A Sandpaper Holder

The accompanying illustration shows the construction of a sandpaper holder used by a carpenter. The



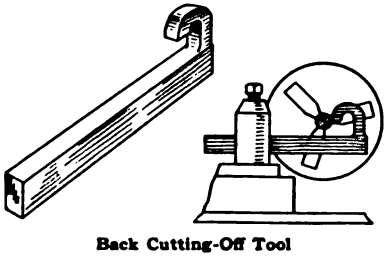

Holder for Sandpaper

hinge A and lock B are of iron, the other parts are of wood. After the sandpaper C is placed around the bottom of the holder, it is folded up and over the space covered by the holding block. The lock is swung around on the pivoting screw, fastening the block and holding the sandpaper securely.—Contributed by Jas. M. Kane, Doylestown, Pa.

### A Back Cutting-Off Tool for a Lathe

When cutting off drill rods or small wire in the lathe with an ordinary cutting-off tool, much trouble is experienced owing to the fact that the tool will either dig into the work or else the work tries to climb on top of the cutting-off tool.

A tool made like that shown in the



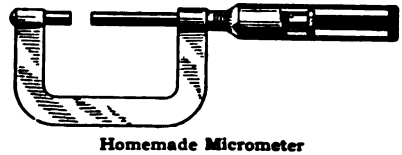
Back Cutting-Off Tool

sketch will work extremely well. The only difference between this and the ordinary tool is that the work is cut off from the back instead of in front. The tool will spring away from the work instead of digging into it and when the piece is cut off, it will have a nice smooth face and be straight.—Contributed by Chas. Homewood, Waterloo, Iowa.

### How to Make a Micrometer

A caliper that will read in thousandths of an inch is a very handy tool, but its high price prohibits many amateurs from possessing one. However, by following the directions closely, one that will fill all the requirements of the most expensive instrument can be made at a nominal cost.

The frame is cut from heavy sheet metal and the ends rolled over to form openings ¼ and ⅜-in. in diameter. A piece of brass tubing, ⅜ in. outside diameter and 2 in. long, is fastened securely into the larger opening. On the other end of this tube braze a nut tapped with a ¼-in. tap, having 40 threads. The sleeve is made of an-



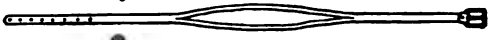
Homemade Micrometer

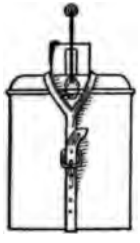
other piece of tubing large enough to go over the nut. Fit a bushing in one end of this sleeve and bevel the other to about 45 deg. Divide the bevel on its circumference into 25 parts, numbering every fifth graduation, beginning with zero. Thread a 4-in. rod about half way to fit the nut and fasten it in the outer end of the sleeve with a bushing. The anvil is a piece of ¼-in. rod fastened in the opposite frame opening, allowing it to project inside the frame ½ in. Run the sleeve down until the screw comes against the anvil and make a mark on the stationary tube to register with the zero mark on the sleeve and at right angles to it. Turn the sleeve one revolution and make another mark. Continue this operation until the caliper is

opened to its full capacity. One complete turn of the sleeve represents 1/40 in. One twenty-fifth of a turn equals 1/25 of 1/40 or 1/1000 in. Half and quarter thousandths can be readily estimated.—Contributed by A. Weaver, Clemmons, N. C.

### Strap for a Metal Lunch Pail

One day I noticed that the lunch pail carried by a workman had a leather

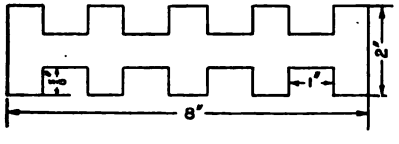




strap, cut in the center and placed around the lunch pail as shown. This is a very good idea for anyone that wishes to carry the lunch pail so that the cover is held tightly and safely in place.—Contributed by Jas. E. Noble, Toronto, Canada.

### Carrier for Lead Fuse Wire

An exceedingly handy and simple arrangement for carrying fuse wire in a kit can be made of a leather strap, 8 in. long and 2 in. wide. Cut four notches on each side of the strap, each pair of notches being directly opposite. The notches are 1 in. wide and 5/8 in. deep. Four sizes of wire can be kept

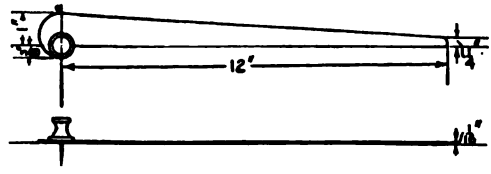



Notches in Leather Strap

on this strap, where it will not get twisted and is always easily found.—Contributed by G. B. Pollock, Chicago.

### Drawing Points on the Circumference of a Circle

When it is necessary to draw a number of locations for bolts, studs, rivets, etc., on the circumference of a circle in drafting, the spaces are generally stepped off with the dividers and their center lines drawn with an angle. This is a very tedious job and I therefore constructed a straightedge of celluloid, as shown in the sketch, to draw these

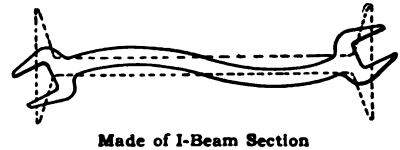



Straightedge for Drawing Points on a Circle

lines rapidly. It is held to the center of the circle by a glass-head push pin, while the bar is being swung around to any point on the circumference to draw the centerlines. The hole for the pin is made an easy fit.—Contributed by C. P. Caulkins, New London, Conn.

### How to Make an S-Wrench

Secure a piece of 10-in. I-beam, ½ in. thick, and heat the flanges and turn them outward to fit over nuts of the desired size. Bend the web into S-shape as shown, and finish as desired. This

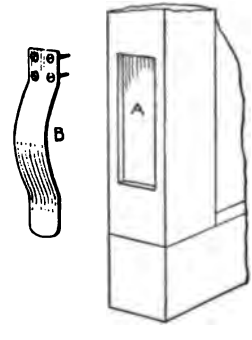


Made of I-Beam Section

is a simple way of making a very good wrench, which, being of the best material, is also very strong.—Contributed by W. H. Ruchlein, Soldier, Idaho.

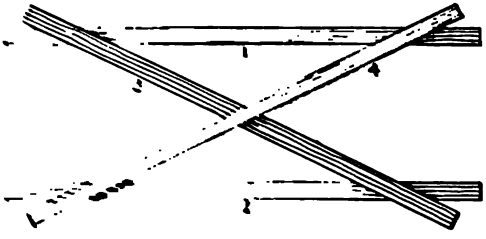
### Substitute for Window Weights

Cut a groove in the window sash on one or both sides, as shown at A in the sketch, and fasten a good stiff spring, B, in the recess with screws. The outward pressure of the spring will hold the window at any desired point, while the sash can be raised or lowered without the least difficulty.



### Piling Lumber for Drying

When piling lumber outside to dry, lay it up as shown in the sketch instead of in the usual triangular pile.



Method of Laying the Boards

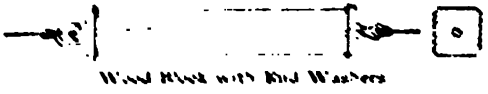
Lay the boards on in the way they are numbered to the full height of the pile. —Contributed by C. R. Poole, Los Angeles, Cal.

### To Hold a Bandage in Place

Use two or more strips of adhesive plaster applied up and down on the wrapping at equal distances apart. These will hold the turns of the bandage in place as well as making a support. This will apply to a bandage on a finger as well as to one on the arm or leg.—Contributed by Mrs. Homer S. Smith, Westerville, O.

### Cleaning Out Conduits

The sketch illustrates a mandrel which I consider to be the best I have ever seen for cleaning out conduits. It

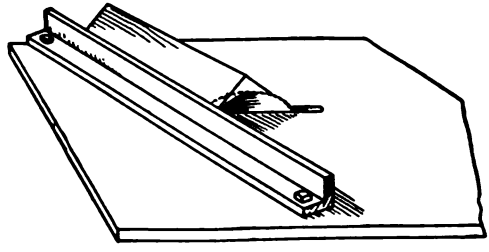


Wood Block with Rod Washers

is designed to be pulled through vitrified ducts to remove any stone, concrete or other obstruction which may have entered during the construction of the duct. For this reason the leather washers at each end should always fit the duct snugly and should be changed when worn, so that they will always have such a fit. If a pulling line of 3/8-in. stranded wire is used, almost any obstruction which may have entered the duct can be removed. A line should be fastened to the rear end of the mandrel as well as to the forward end. This allows for pulling the mandrel back and forth, when it is necessary to remove some obstruction by the "bumping" method.—Contributed by Geo. M. Petersen, Buffalo, New York.

### Cutting Coves on a Saw

On one occasion it was necessary to make some large coves to place on forms for concrete work and as we had no sticker or knives large enough to cut the arc, I suggested that the cove could be successfully made on a ripsaw so constructed that it may be raised and lowered by turning a screw. A guide was placed diagonally on the table as shown, and the saw lowered

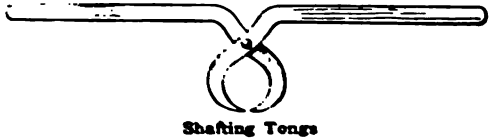


Manner of Setting the Gauge

so that it projected about ¼ in. above the table top. The timber was pushed over the saw for the first cut. The saw was raised a little each cut and a perfect cove was thus made. Almost any size cove can be cut by placing the guide at different angles.—Contributed by S. Stackey, Niagara Falls, Ont.

### Tongs for Carrying Large Shafting

It is unsatisfactory to carry large shafting by hand as it cannot be laid down without the risk of injuring a finger. Tongs made as shown in the



Shafting Tongs

sketch are very convenient, as four men can carry large shafting, easily picking it up or laying it down.

### To Keep Vines out of a Scythe Crotch

About 5 in. from the butt end of the scythe blade and in the center drill a ¼-in. hole. Bend a piece of $\frac{3}{16}$-in. iron, 10 in. long, into a small hook at one end and make a small loop at the other. Place the hook in the hole in the blade and fasten the loop end on the snath. This will keep vines from getting fastened where the blade joins the snath.—Contributed by Jos. E. Thompson, Griswoldville, Ga.

### Making a Curved Hole in a Shaft

A certain piece of work called for a 1-in. shaft, 7 in. long, with a ⅜-in. hole in the center of it for about two-thirds of the way, then abruptly ending and opening out on the surface. The hole was made in the following manner: A 1⅛-in. shaft was procured and bent

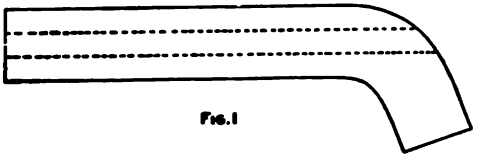


Fig. 1

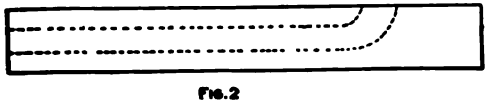


Fig. 2

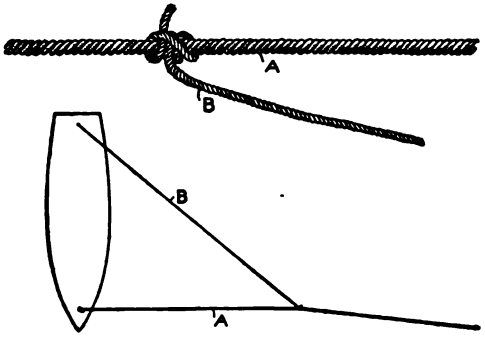
Curved Hole in Shaft

at about one-third of its length as shown in Fig. 1. A ⅜-in. hole was drilled through the center of the shaft so it would come out on the bend. The shaft was then heated and straightened out, after which it was turned down to 1 in. in diameter, as shown in Fig. 2.—Contributed by Chas. Hattenberger, Buffalo, N. Y.

### A Fisherman's Bridle

The fisherman when fishing for mackerel finds it very important to bridle the boat and make the craft lie broadside or crosswise to the tide or current.

The chum or stosh which is thrown on the water to attract or bait the fish will eddy around on the lee side of the boat and will not drift away with the tide so rapidly. The slick on the surface of the water which is produced by the oily chum will generally go the way the wind drives it. The anchor line A is attached to the bow of the boat and the bridle line is shown at B. The sketch also shows the bridle hitch which will not slip or gain when in use. This bridle line is attached to the stern of the boat and is adjusted to suit the fisherman's fancy.

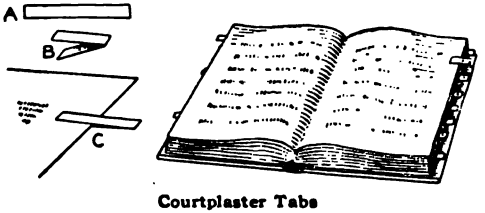



Bridle on a Boat

Bridling the boat for snapper blues or other fishing is found to be quite an advantage to the angler.

### Tabs for the Leaves of a Book

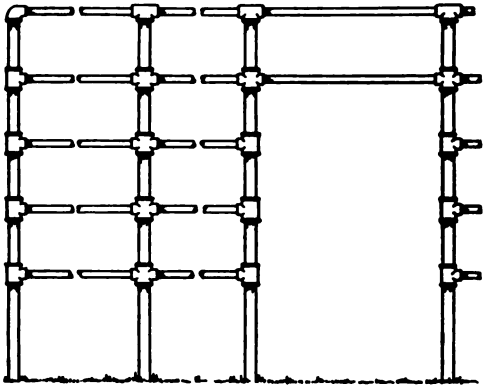
In books containing any special information, markers are very desirable to make it possible to refer quickly to some particular subject. I have found that strips of courtplaster, A, doubled, B, and applied to the leaf, as shown at C, make good markers. They do not injure the book and can be soaked off when desired. Even a thumb index can be made this way.—Contributed by A. S. Thomas, Gordon, Ontario.




Courtplaster Tabs

### Grape Arbor of Gas Pipe

A very substantial grape arbor can be made of pipe and fittings, the posts or uprights being 2-in., and the horizontals, 1-in. pipe. The holes for the uprights are dug, and after the pipes are all in the fittings, the entire arbor is raised and the lower ends of the pipes set in the holes. It is then plumbed and propped, and concrete is tamped in the holes. This will make an arbor that will be solid and last a long time, if kept well painted.—Contributed by R. M. Peffer, Camp Hill, Pennsylvania.



Gas-Pipe Arbor

### A Disinfectant for Shops

To disinfect a room having machinery in it is difficult to do by the ordinary means. Sulphur cannot be used as it injures the machinery, and corrosive sublimate is harmful to the finish on the metal. The following method will be found satisfactory: The room should be saturated with steam and tightly closed. In a few minutes a goodly amount of formaldehyde gas should be liberated by a formalin lamp, which can be secured at any drug store, or if this cannot be had, a quantity of 40-per-cent formalin may be purchased —an ounce for each room—and placed in a tin pan and heated by setting the pan on hot sand or clay. The best method is to heat the sand in an oven while steaming the room. After the room is well moistened the sand holding the pan should be placed in the room and all openings tightly closed. After a few hours the room should be well aired.

The quantity of formalin to be used is governed by the size of the room. Enough should be used to saturate the steam. One ounce of 40-per-cent formalin should saturate a very large room.—Contributed by Loren Ward, Des Moines, Ia.

### Locating a Ground on a Circuit

Often in the operation of a circuit it will, in some way, become connected to the earth, or "grounded" as it is termed, which may result in the circuit being thrown out of use until the ground connection is removed.

A simple and fairly accurate method of locating a ground is as follows: Assume that a circuit is composed of two wires, AB and CD in the diagram, of the same material and the same cross-section, and that one of these wires, say, CD is grounded, but the location of the ground unknown. Join the distant ends of the two wires together between B and D by means of a heavy copper lead so as to introduce a very small resistance in the circuit. Obtain a piece of resistance wire, having a uniform cross-section, and connect its ends to the ends A and C of the wires as shown in the diagram. Now, by means of a battery or generator, send as large a current through the grounded circuit as the wires will safely carry. There will be at the same time a current in the resistance wire. The rheostat E shown in the figure is introduced so as to regulate

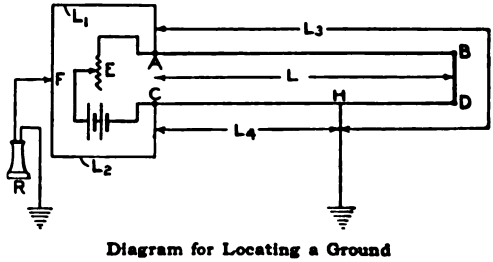



Diagram for Locating a Ground

the current. While the current is turned on, take an ordinary telephone receiver, R, and connect one of the terminals to the ground and touch the other terminal at various points along the resistance wire until a point, F, is found, where a minimum click is heard in the receiver when held to the ear. Measure the distance of this point, F, along the wire from the points A and C. If the lengths of the two wires, AB and CD, are known, the ground can now be located. The same relation exists between the two parts of the resistance wire, EA and EC, as exists between the resistances ABDH and CH. The relation of the resistances EA and EC is the same as their respective lengths, which we shall call $L_1$ and $L_2$, since the wire is uniform in cross-section. Likewise the resistance ABDH bears the same relation to the resistance CH as exists between their lengths, which we shall call $L_3$ and $L_4$, of these respective parts of the circuit. Then

$$\frac{L_1}{L_2} = \frac{L_3}{L_4}$$

Let us now express $L_3$ in terms of the length of one wire, which we shall call L (and the length $L_4$) and we have $L_3$ equal to $2L - L_4$. Then

$$\frac{L_1}{L_2} = \frac{2L - L_4}{L_4}, \text{ or}$$

$$L_1 L_4 = 2L L_2 - L_2 L_4$$

transposing

$$L_1 L_4 + L_2 L_4 = 2L L_2$$

factoring

$$L_4 (L_1 + L_2) = 2L L_2$$

and

$$L_4 = \frac{2L L_2}{L_1 + L_2}$$

The above expression then gives the distance in feet to the fault, or ground, when all other measurements are made in feet.

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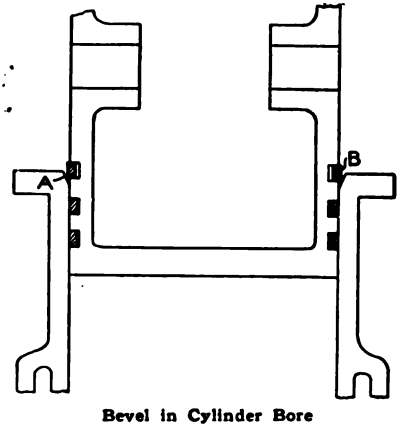
¶A length of hose having holes punched in its sides greatly facilitates the speedy sprinkling of a lawn, the end of the hose being plugged.

## Piston Rings Easily Placed by Taper Bore in Cylinder

A manufacturer of small gasoline engines found it quite an advantage and selling point to prepare the cyl-




Bevel in Cylinder Bore

inders of each engine to receive the piston rings without clamps or other devices to hold the rings in their grooves while the piston is slipped into the bore. An angle, A, was turned out while boring the cylinder to size. The ring B will slip down the angle as the piston enters the bore.

The angle is easily turned when making a new cylinder as well as when reboring an old one, and the time taken will be gained many times over when replacing pistons.—Contributed by L. B. Green, Cleveland, Ohio.

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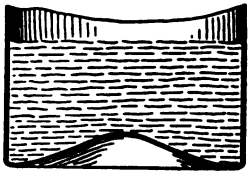
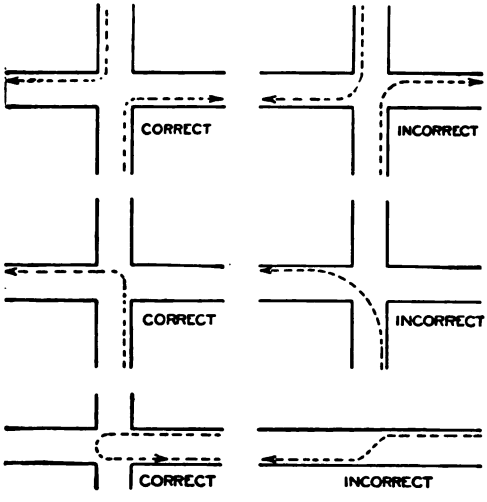
## Raised Bottom in a Pail

A quart of water may be boiled from the flame and heat of a burning newspaper by having the bottom of the utensil made like that of a wine bottle. To have the bottoms of cooking utensils fixed in this manner is a great boon for campers. The bottom being raised causes the heat to strike the center of the water.—Contributed by W. D. Brooks, Paterson, N. J.



### Driving Automobiles in Cities

Owners of automobiles in the country as well as some of the city owners, for that matter, may not be familiar




Street Corner Diagram

with the correct way to drive in cities and main traveled roads, says the Automobile Dealer and Repairer. The accompanying diagram shows the right way to drive on streets and of turning corners.

### How to Fasten Loose Spectacle Lenses

Persons using spectacles are sometimes annoyed by a loose lens—one that persists in dropping out of the frame. This trouble is caused by some slight defect in the edge grinding of the lens or to an imperfection in the size of the eye wire of the frame.

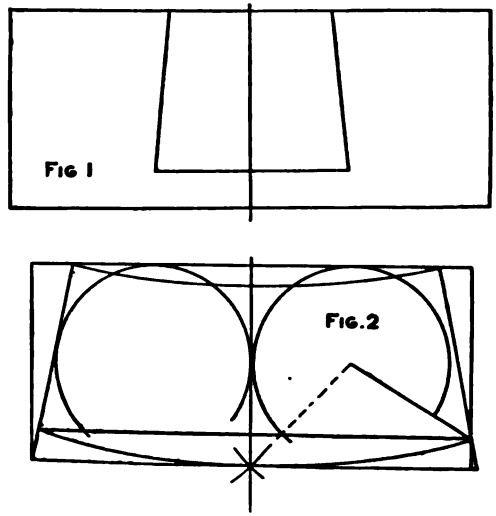
If the spectacles cannot be taken to an optician or spared to be sent for repair, simply place a strip of tinfoil in the groove of the frame, reset the lens and trim off any tinfoil that may remain in sight with a sharp knife. When this is carefully done, the foil will not show and the lens will be held securely in place.

Rimless spectacles and eyeglasses frequently give trouble as the lenses are apt to become loose and wiggle disagreeably in the mountings to which they are attached. This trouble may be traced to a loose screw, or the back of the straps that grasp the lenses may not be set sufficiently close to the lenses. Remove the lenses, bend the straps so that they will engage the edges of the lenses properly, replace the screws carefully, and the trouble will be remedied.—Contributed by Rem A. Johnston, Ossian, Ind.

### Layout of a Taper Sheet

The simple method here shown of laying out a taper sheet will prove especially acceptable to boilermakers who are not expert with figures. It is contributed to The Boilermaker by John A. Higgins:

Select a sheet 2 or 3 in. wider than the height and draw a center line in the sheet, as shown in Fig. 1; also draw a full-size view of the cone, as shown in Fig. 1, and find the circumference of the top and bottom ends by multiplying the respective diameters by 3 1/7. Lay off one-half of the circumference of the small end on each side of the center line. Measure off the height of the cone on the center




Laying Out a Taper Sheet

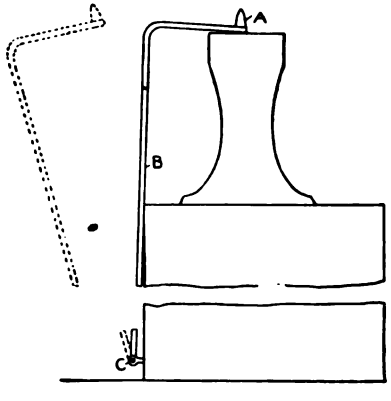
line, draw a line across the sheet at this point, and on this lay off the circumference of the large end as before, and strike in the side lines.

Now find the center of a circle which will strike three sides of the layout, as shown in Fig. 2, and from that center spread the trammels to the high corner and bisect the center line. You have then found the chord of the arc, and with a batten held at the outer points and sprung in the center to touch the point on the center line, draw in the curve around the batten. Now lay off the height of the cone on the center line and transfer the batten to the top and draw in the upper curve. The top and bottom lines are the lines to which the pattern should be cut, while the side lines locate the centers of rivet holes.

With a little care on the part of the layer-out, this method will be found satisfactory, and it will give sufficiently accurate results.

### Anvil Hardy Holder

After using a hardy on an anvil it is sometimes in the way for finishing the work in hand. I devised a hardy holder which I attached to the anvil block as shown in the sketch. The hardy A, or a similar tool, fits in a hole in the upper end of a bar of iron B, which is made of 1 by 1-in. stock, and the lower end is hinged at C to the anvil block. When needed, the

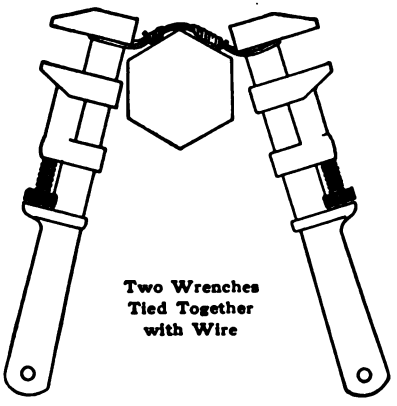



Holder Attached to Anvil Block

hardy can be quickly pulled into position without taking the hands from the hammer and tongs.—Contributed by J. A. Polk, Mansfield, O.

### Emergency Wrench for Large Work

As I desired to remove the base nut from a large hand pump and had no wrench large enough to fit over it, I




used two small wrenches, tied together with wire as shown in the sketch. The handles were drawn tightly together as they were turned. The nut was easily removed.—Contributed by Jas. J. Reeves, Chicago, Ill.

### Drilling with Small Drills

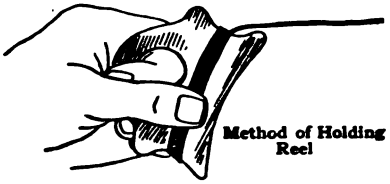
A small drill is very apt to break off while being used, especially in a breast drill. I remedy this trouble by having two drills of each size, one of which I break off, saving some of the twisted portion of the bit and grinding a point on it. This is used exclusively for drilling through thin metals, and for starting holes in thicker metals.

Small drills also break easily when applying too much feed, but a short drill will stand more pressure. The full-length drill is substituted when the hole is drilled as deep as the short one will cut.

The center web of a drill being thicker back of the point, a drill broken off and then sharpened will not cut quite so easily or quickly as the point of a new full-length drill, but in cutting with a short drill, the elimination of that fear of its breaking will more than make up for the extra time spent. —Contributed by C. W. Goddard, Bellaire, Mich.

### Chalkline Reel

A simple chalkline reel can be made of a thin board cut as shown in the

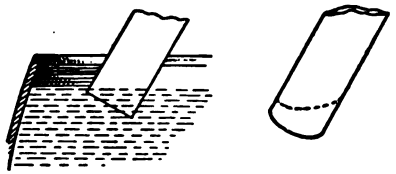


Method of Holding Reel

illustration. This reel makes a rapid and easy way to wind up the line. The line will also reel out as easily as if it were on a roller.

### Marking a Miter for Cutting Sheet-Metal Pipe

While putting up some galvanized sheet-iron rain pipe, I had occasion to make a miter joint, and as the pipe was formed, I secured the miter line as follows: The end of the pipe was

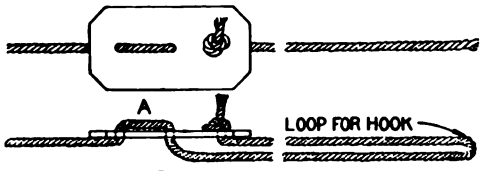


Angle Marked with Water

submerged in a barrel of water until the mark for the miter was at the surface of the water. I cut the pipe on the water line and thus secured the proper miter.—Contributed by Geo. M. Mock, Buffalo, N. Y.

### Adjuster for a Plumb-Bob Line

The length of a plumb-bob line may be quickly adjusted by the clip shown in the illustration, which was redrawn

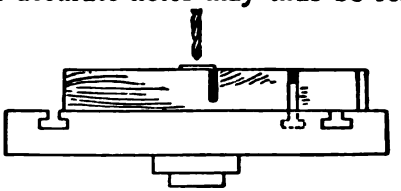



Clip for Plumb Line

from the Engineering and Mining Journal. The clip was made of a piece of brass or copper with three holes drilled in a line and as close together as possible. The clip should also be as small as possible to prevent it from throwing the bob off center.

### Drilling Holes in Angle Iron

Among the many devices used for holding angle iron while drilling, one of the quickest and easiest methods is to make a groove in a block of wood to receive one wing of the angle and fasten the block to the faceplate. True and accurate holes may thus be read-

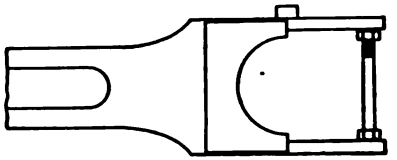


Wood Block on Faceplate

ily drilled in the angle.—Contributed by Geo. Lundberg, Huron, S. D.

### Removing Close-Fitting Brasses

In the accompanying illustration is shown an easy way to loosen brasses in main connecting rods. After removing key, block and bolt from the rod and finding the brass tightly wedged in, use a bolt of 1-in. diameter having sufficient length to fit between the



Bolt between Jaws

jaws. Place the bolt as shown and turn the nut in the direction to spread the jaws. It is necessary to use two wrenches, one to hold the bolt from turning and one to turn the nut. This gives sufficient pressure to loosen the brass, but not enough force to distort the jaws.—Contributed by Oliver S. Strout, Harrisburg, Pa.

¶Any lost motion should be quickly taken up on the bearing of any machine.

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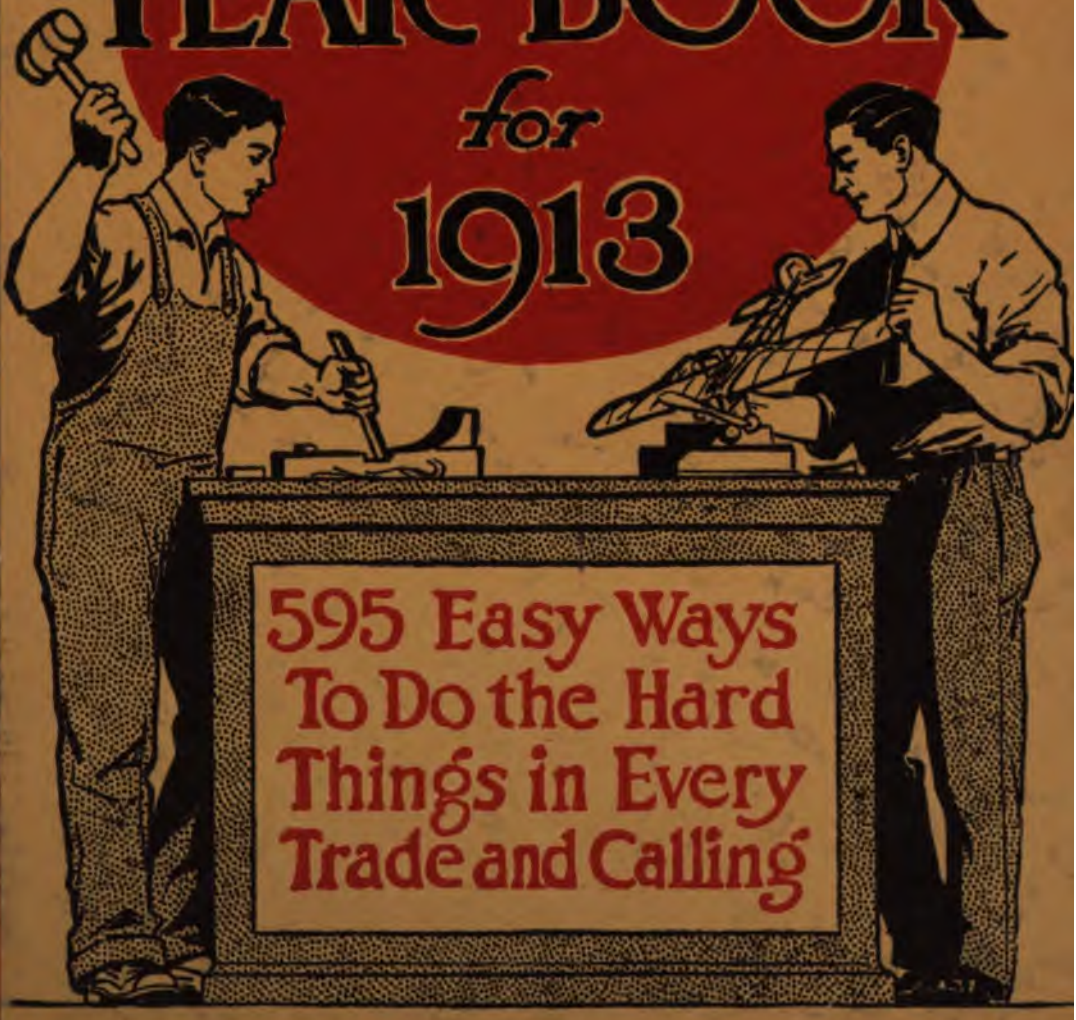

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