POPULAR MECHANICS

# SHOP NOTES

FOR

# 1909

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EASY WAYS TO DO HARD THINGS

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OF DAILY USE TO EVERY MECHANIC

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*Volume V—Table of Contents, Pages 1015-1022*

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**Price 50 Cents**

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POPULAR MECHANICS, CHICAGO

This Volume is Reprinted from the

# Shop Notes Department of Popular Mechanics

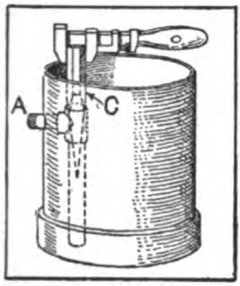
As Published Monthly During 1906

Edited by H. H. WINDSOR

# SHOP NOTES

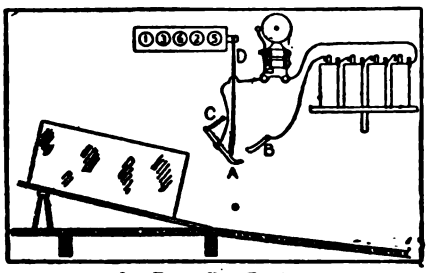
## Unscrewing Pipe with a Chisel

The pipe in an oil filter became very tight after considerable use and as the filter was only 8 in. in diameter no wrench could be used to turn the pipe. After removing the nipple A, as shown in the sketch, a cape chisel, C, was inserted through the tee and into the pipe. With a wrench placed on the upper end of the chisel, the pipe was removed with ease.—C. H.




## How to Make an Ice Block Recording Device

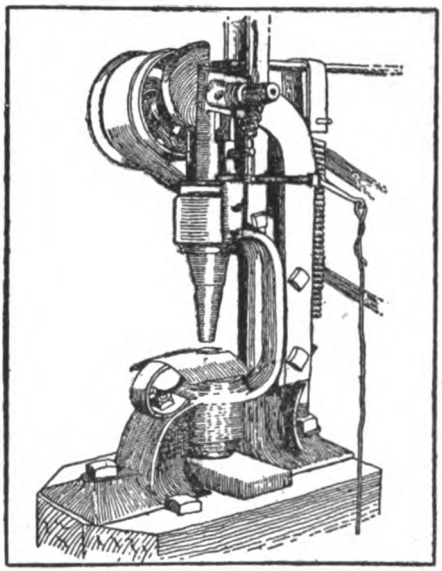
Managers of ice storage plants find it not easy to keep a correct record of the number of ice blocks stored. A small device can be made so the blocks of ice will do their own counting while passing a certain point in the course. The device consists of a small job press counter, which can be purchased at small cost, and a large vibrating bell, says a correspondent in Southern Engineer. Some dry batteries and insulated wire are also needed. The accompanying sketch shows the arrangement. The cake of ice when passing beneath A presses this lever against B, which closes the circuit and causes the bell to ring, also operating the recorder by the small rod, D. After the cake of ice is passed, A is returned to its original position by means of the spring C. If it is not necessary to have a bell to ring, the electric bell and batteries may not be included.




Ice Recording Device

## Home-Made Riveting Machine

To construct a small riveting machine usually requires special patterns for castings and considerable machine work. The accompanying sketch shows how a small machine is built from a shaft hanger and a few easily made forgings, which does not require much time to construct and is efficient when put in operation. The plunger drop is 2¼ in. The cam should be made of tool steel and the working part or face

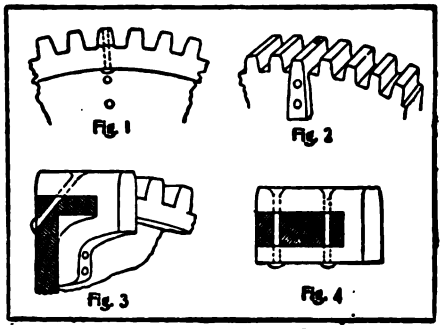


Riveting Machine

hardened. It will handle a ¼- and $\frac{5}{16}$-in. rivet nicely at 360 r. p. m.—Contributed by Jeane Carbon, Warwood, W. Va.

## How to Insert a Cog in a Gear

A good method of placing repair cogs in a cast wheel is shown in the sketch. Hammer out a piece of wrought iron and bend it at an angle, leaving enough material to reach down on the web of the wheel twice the length of the cog (Fig. 2). Holes are drilled, and rivets placed in, as shown




Inserting a Cog in a Gear

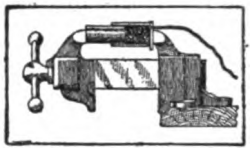
in Figs. 1 and 2. No groove is needed for the cog. If the projecting part interferes with the turning of the wheel, place the angle of the cog on the other side of the wheel (Fig. 3) and cut a notch in the side of the rim to make the cog come even with the outer edge of the rim. Bend the angle in to the web and rivet as before. If it is an open wheel, make the cog shaped like a U and let the rivets pass through as in Fig. 4.

## Removing a Stuck Fountain Pen

Another way to remove a fountain pen when stuck is to wrap a wide rubber band around the nozzle several times, which will stick tightly to the hard rubber of the pen and furnish a good grip for the fingers. The pen can easily be unscrewed.—Contributed by Albert E. Welch, New York.

## Making Vents in Cores

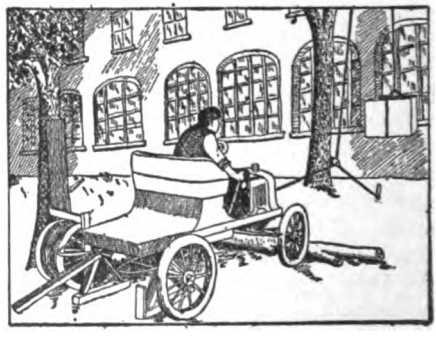
Select a piece of metal tube about 3 in. in diameter and 4 or 5 in. long, to which solder a metal plate over one end. Fit a plunger in the other end the same length as the tube. Drill a



small hole about $\frac{1}{16}$ in. or smaller through the metal plate close to one side of the tube. Fill the tube with molten wax and when partly cool place the plunger in the tube and place the whole in a vise as shown in sketch. Turning the vise screw will push the plunger into the tube, forcing the wax through the small hole which will make a wax string. These wax strings are moulded into the body of the core and when the core is baked the wax is burned, leaving a hole in the place of every piece of wax.—Contributed by Fred McVittie, Lima, N. J.

## Automobile Used as a Hoist

The roof of a factory building was damaged by the falling of a tree and they decided to use the owner's automobile as a hoisting engine. This proved so successful that all the repair supplies were rapidly hauled on top. It may be suggested that the motor car might be made pay for itself on the farm by sawing wood, while on Sunday it could replace the old top buggy and take the entire family to church.



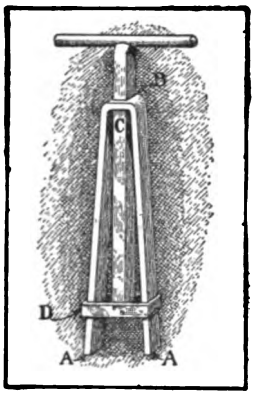
Hoisting with an Auto

### A Simple Mission Stain

Mix boiled linseed oil and asphaltum together in portions of half and half and apply with a brush. In one or two minutes rub off with a rag and one of the finest mission stains is obtained. This may be varnished. One gallon will cover about 600 sq. ft. of smooth lumber.

### How to Make an Adjustable Socket Wrench

Bend a piece of steel in the shape shown at A and make a square hole in it at the bend, B. Fit a square piece of iron, C, in this square hole. Rivet a band, D, to the lower end, and weld a handle on the upper end of the iron, C. When using this wrench the jaws, AA, are pushed through the band, D, and placed on the nut in the socket. Pressure on the handle in turning will cause the jaws to grip the nut. The wrench can be made in various sizes to suit the requirements.

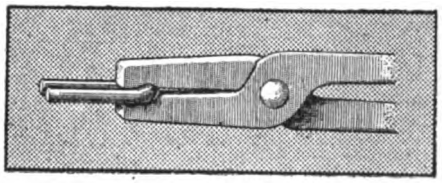



### Quick Repairs on a Gas Generator Furnace

"One of our water-gas 'springer' sets burned the lining out of the firebox on New Year's day," says a member of the Pacific Coast Gas Association. "We had no time for ordinary repairs to the generator, so it was a question of immediate repairs. We pulled out the fire and made a protection from the heat above of sheet asbestos, doubled, so there would be an air space between. We then placed electric fans at the ash doors and with a relay of masons replaced the lining, covering an area of about 10 sq. ft. In spite of the tremendous heat and the confined limit in which the work was done, a fire was started in the machine at 1:30 a. m., January 3rd, and gas was being made on the morning of the 4th.

### Tongs for Holding Chain Links

Make a pair of common straight-jawed tongs, says a correspondent in the Blacksmith and Wheelwright. After heating the jaws to a working heat,

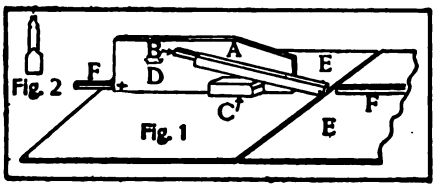


Chain Tongs

place a chain link between them and hammer enough to imbed the link in the jaws and let them cool.

### Fitting Balusters to the Lower Porch Rail

A good way to saddle porch balusters to fit the beveled top of the lower rail is to make a device as shown in Fig. 1. EE is the saw table and D is a board with one corner cut off and block C nailed to one side along the lower edge, as shown. Put on a small saw




To Saddle Balusters

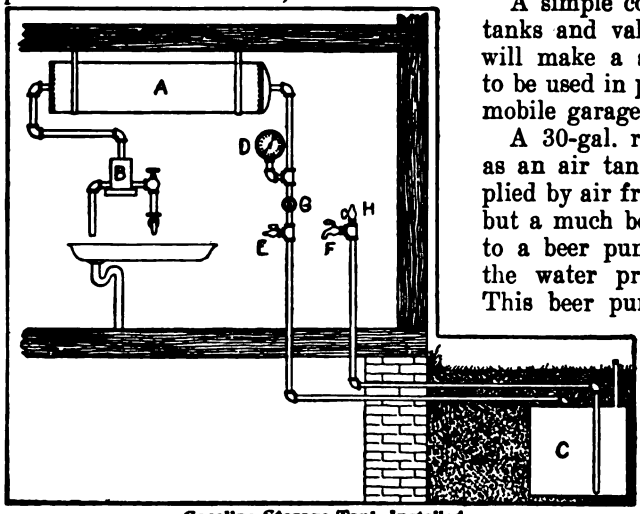
and place the board D against the guide FF, moving it along the guide until it is in position, so that when baluster, A, is placed in the position shown the saw will cut the desired bevel, says The Wood-Worker. Fasten the board D to the guide with a clamp.

Lower the saw or raise the table so that the saw cuts just half way through the baluster. Clamp the block B to the

board for a stop to put the end of the baluster against, as shown. Turn the baluster over and cut the other side. Balusters can be saddled this way in less time than they can be marked for sawing on a band saw. Fig. 2 shows the end view of the baluster and rail fitted together.

### Cost of Reinforced Concrete Posts

A tract of land near Chicago, containing 62 acres, has just been fenced with 1,500 concrete posts, 1,000 of which were 9 ft. long and the remainder 7 ft. The average cost of the 9-ft. posts was 65 cents each, based on the following prices: Cement, $2 a barrel; screenings, 75 cents a cubic foot; reinforcement steel, 3½ cents a pound, and the two laborers, $2 a day each.



Gasoline Storage Tank Installed

Each post was reinforced by four ¼-in. corrugated bars, one on each corner. In casting a post, a layer of concrete was placed in a form, then two reinforcement rods were set in position, followed by another layer of concrete, the two other rods and the balance of concrete. The posts were kept wet three weeks after making, the first week of which they were covered. Two laborers were employed on the work, making an average of 40 posts a day, as well as mixing the concrete, and moving and watering the posts.

### How to Prevent Wooden Faucets from Cracking

Place the faucets in melted paraffin that is heated to a temperature of 212 deg. F., and let them remain until the bubbles cease to rise from the wood. The whole is then allowed to cool to about 120 deg. F., when the faucets are taken from the bath and the adhering paraffin is removed by rubbing with a dry, coarse piece of cloth.

### Gasoline Storage Tank

A simple connection of a few pipes, tanks and valves, as shown in sketch, will make a supply tank for gasoline to be used in plumbing shops and automobile garages.

A 30-gal. range boiler may be used as an air tank, A, which can be supplied by air from a common foot pump, but a much better way is to connect it to a beer pump which is operated by the water pressure from the mains. This beer pump, B, is placed near a sink and connected to the water supply pipe and the discharge piped to run into the sink. The gasoline tank, C, is placed in the ground outside of the building and fitted with a pipe that will reach to the surface for filling. An air gauge, D, a globe valve, G, and a pet cock, E, are placed in the pipe between the two tanks. A faucet, F, and a pet cock, H, are connected on the end of the pipe leading from the gasoline tank.

The pump is started and the air tank filled (2 or 3 lb. pressure will raise gasoline) and everything is ready for use. The pet cock, E, is closed and the globe valve, G, opened, which brings the gasoline to the faucet, F. When not in use the globe valve, G, is closed and the pet cock, E, opened to relieve the gasoline tank of any air pressure.—Contributed by W. L. Brown, Seattle, Wash.

### Etching on Steel

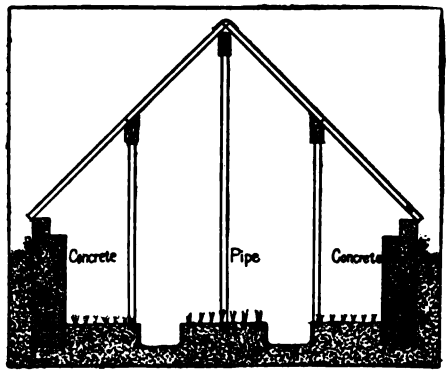
Take a piece of blue vitriol the size of a walnut, one tablespoonful of common salt, and mix with 8 oz. rain water. Let this solution stand for 8 or 10 hours and it is ready for use. Cover the part of the tool to be marked with paraffin or soap and scratch the name with a steel pen. Put on a few drops of the solution and let it remain for one minute and then rub off the solution and paraffin, or soap.

### A Home-Made Greenhouse

A small house 36 ft. long, of even span, made in the following way, will prove useful and inexpensive. The foundation may be made of brick, concrete or grout, whichever is most convenient to build, and should be 12 in. wide and 3½ ft. high, of which 3 ft. is in the ground.

On this is built a frame the length of the house and high enough to hold a 14 by 24-in. pane of glass, the sash bars being set at right angles to the foundation. The top of the side frame is made of 4 by 4-in. stud, planed and finished like a hot bed sash frame, to hold the sash bars. The ridge, made of 2 by 4-in. material, is supported on iron pipe posts, which are strong and light. There are two rows of sash on each side of the house. Half of the distance between the ridge and the side there is a 2 by 4 running the length of the house and supported in the same manner as the ridge with pipe posts. The sash, 6 by 3 ft., glassed with 10 by 12 panes are just laid on and then held in place by two wood screws, which pass through the sash and take hold of the wood beneath.

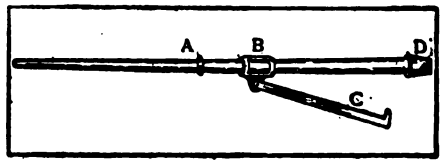
Provision is made for ventilation by making every third sash of the upper row on each side of the house movable at its lower end. This admits fresh air just over the walks on both sides of the house. These ventilating sash are hinged to the opposite sash at the upper end, says The Country Gentleman. The joints of the sash are covered with weather strips to keep out the cold, and along the peak of the roof where the sashes come together there is nailed a strip of roofing paper, which turns the rain and snow. The beds are made directly on the ground, three in number, separated by sunken walks, a little over a foot in width and a foot deep. From the top of the middle bed to the peak is 6 ft.




End View of Greenhouse

### How to Make a Bolt Holder

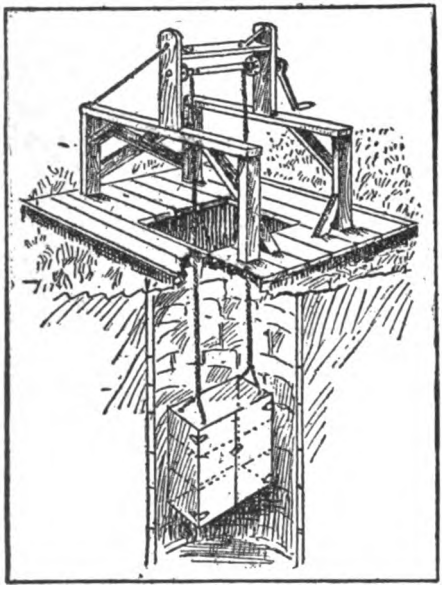
The accompanying illustration shows a very serviceable bolt holder for holding plow bolts and many other bolts that you want to hold, says a correspondent in the American Blacksmith. The bar consists of a piece of ⅝-in. round iron, 12 in. long, welded to a piece of ⅝-in. square steel about 15 in. long. The point of the welding between the iron and steel carries a shoulder, A. A slide as shown at B is made to slide over the piece of ⅝-in. square steel. The dog, C, is 6 in. long and the turn on the end is 1 in. long. The point of the bar at D is 2 in. wide and drawn to a chisel edge and tempered.




Bolt Holder

### Using a Well to Cool Milk and Butter

On farms where ice cannot be conveniently obtained, or where facilities are not at hand for storing ice, the well



Milk and Butter Cooler

may be made into a very fair substitute. The accompanying cut shows how this may be done. A windlass is placed on a frame made of 2 by 4-in. material securely braced to prevent shaking, says Hoard's Dairyman. The size of the box depends on the size and shape of the well. The box is hung by two ropes to prevent its turning and should be strengthened with galvanized iron at the corners. If milk is to be cooled, it should be so placed that the box can be lowered into the water, otherwise the milk will not cool rapidly enough and may cause trouble from souring.

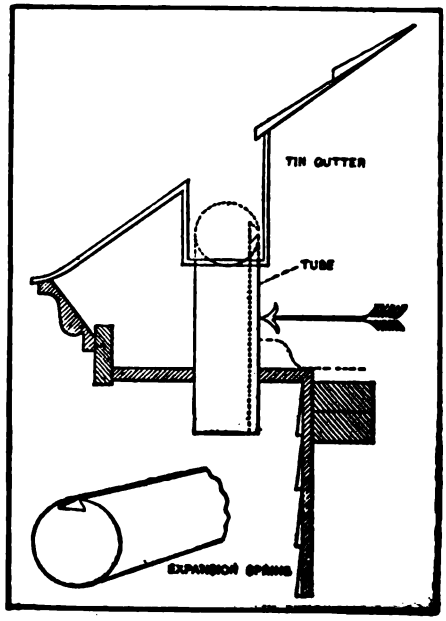
### How to Make a Ground Glass

Take two old plates and remove the film. Cut them to fit the rabbeting in the ground glass frame of the camera by using a common glass cutter. Use flour of emery between the glass and grind by giving them a rotary motion. If no flour of emery is at hand, use some fine emery cloth or paper soaked well in water and rubbed on one of the plates. A quantity of the emery will stick to the plate and the grinding is done in the same manner.—J. J. V.

### To Prevent Leader Tubes from Bursting

The bursting of conductor pipes by the freezing of the water in them is not an uncommon occurrence. Schemes have from time to time been developed for securing a form of pipe that would allow for the expansion of the water in changing to ice, but these have failed in the long run, says The Metal Worker.

The cut shows a leader tube draining the valley back of a cornice. The elasticity of the tube, allowing it to expand when needed and yet to take its original form when possible, is effected by giving the sheet metal a re-entrant angular seam, the construction being indicated in the sketch. The expansion ring is also arranged outside of the pipe, where it is found to be equally ef-



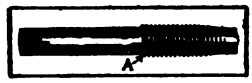

Expansion Leader Tube

ficient, with the additional valuable feature that it affords a means for the fastening to the building. In other words, when the spring is on the outside of the pipe, it is suitable for use as a regular conductor pipe, and when it is within the pipe the pipe can be passed through a circular hole in a cornice, as illustrated in the cut. It is in this part of the roof drainage system that most of the leakage troubles occur, the successive freezing and thawing usually bursting the tube at about the point shown by the arrow.

The leaders are made of copper and of galvanized iron or tin and where for architectural reasons it is desired can also be rectangular in section, the expansion spring being provided in the same way.

### How to Keep a Tap from Breaking

A great many small taps break just where the thread and shank meet. This point can be overcome almost entirely, says American Machinist, by drawing the temper at the point A as shown in sketch with a torch, a pair of hot tongs, or by dipping the shank into hot lead and letting the blue just begin to run into the thread.




### How to Figure Radiation

A good rule for estimating radiation is as follows:

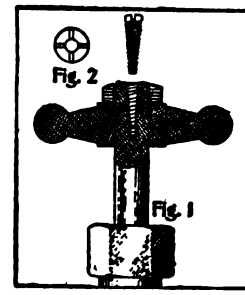
For water: 1 sq. ft. of radiation to every square foot of glass; 1 sq. ft. of radiation to every 10 sq. ft. of wall; 1 sq. ft. of radiation to every 150 cu. ft. of the contents of the room.

The foregoing rule refers to rooms with one exposure, says Building Management. In rooms with two exposures the ratio of cubical contents should be 1 to 100. For steam, take two-thirds of the above results for radiation.

It is best for a water and steam job to figure out the work as if it were to be for water, using the above water rule, and then for steam, take two-thirds of that result.

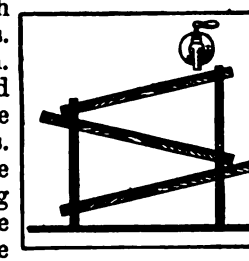
### A Substitute for a Lock Nut

When a valve stem requires a lock nut but cannot be lengthened sufficient for one; also, when the single nut is too close to the end to admit another, drill a hole in the end of the stem and tap with a tapering tap as shown in Fig. 1. Slit the end of the valve stem with a hack saw (Fig. 2), and place a conical screw in the threaded hole as shown.




### Home-Made Negative Washer

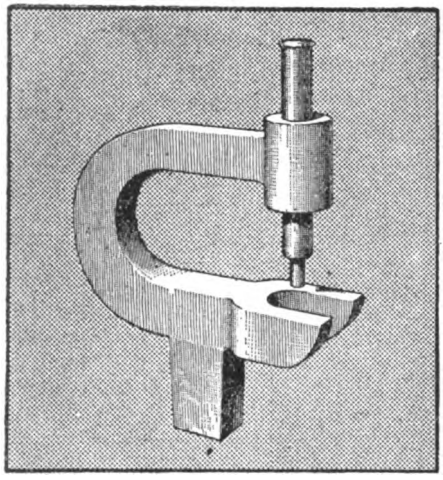
A very simple and efficient negative washer can be made of two or three boards the width of the negatives. A ledge ¼ in. high is fastened along each side of the boards. One end of one board is hung just below the tap and the water is allowed to run down it in a gentle stream, says American Photography. The upper end of the second board is placed just below the lower end of the first board, and so on for as many boards as desired and will fit under the tap and in the sink. The water runs from the first board on the succeeding boards and into the sink. The arrangement is shown in the sketch. The plates are laid, film side up, on the boards.



Denver has the largest American flag in the world. It measures 115 ft. in length and 58 ft. in width.

## A Light Punch for Removing Rivets

The accompanying sketch shows how a punch may be made that will save the assistance of a helper, says the Blacksmith and Wheelwright. The

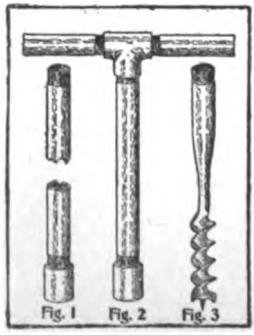


For Punching Rivets

body of the tool is forged out of a piece of iron with a projection on the bottom to fit the square hole in the anvil. The punch is a ⅜-in. steel rod drawn down to $\frac{5}{16}$ in. on the end, and is made to fit the hole in the arm a little loose. This makes a handy tool for removing rivets from light work.

## A Home-Made Well Auger

Pumps are usually furnished with a 1¼-in. pipe below the cylinder and in sinking the well it is found better to bore a hole to gravel before driving the joint. An auger to bore this hole may be made out of an old wood auger 2 in. or more in diameter welded into a piece of ¾-in. pipe as shown in Fig. 3. Make a handle by fitting two pieces of pipe in a tee as shown in Fig. 2. Cut several pieces of ¾-in. pipe about 6 ft. long to use in extending the handle as the hole is bored.

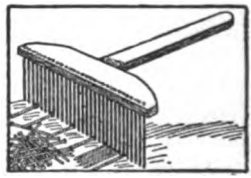



## Utilizing Heat from a Gas Engine Exhaust

An enterprising laundryman recently had installed a 15-hp. gas engine to take the place of the steam engine he had been using. After installing the engine he connected the exhaust with the pipe which he had used for steam to heat a large mangle. It was a successful experiment, and saves the fuel otherwise necessary for that purpose.

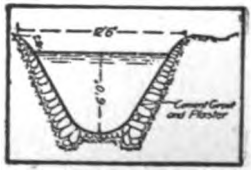
## How to Make a Handy Nail Picker

Cut a piece of hard wood ½ in. thick and about 6 in. long in the shape as shown in the sketch, and attach a handle to it. To keep the wood from splitting, drill small holes in the edge of the wood in which to drive the nails as shown. Pulling this device through a bunch of nails will arrange them all straight and with the heads one way so they can be picked up by the hand ready for use.—Contributed by E. Kane.



## Cobble Stones for Ditch Lining

The protection of earth slopes by means of a wall paved with cobble stones and plaster is proving effective in a number of irrigation canals constructed in this manner in California.

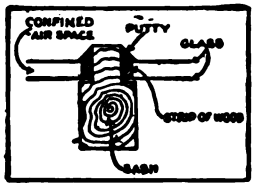



By this method the canal is lined with large cobble stones and small boulders, the stones of the side

walls imbedded in mortar and faced with cement to prevent loss of water by leakage. The larger cobble stones are placed at the base of the walls, gradually growing smaller as the top is reached. The walls are laid in irregular layers, cement mortar and stones being used for two-thirds their thickness and the rear third filled with slightly wetted earth.

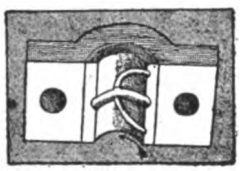
### How to Place Glass for Small Greenhouse

The accompanying sketch shows how to place two sets of glass for a greenhouse or hot bed. The first set of glass is embedded in the sash with putty, says The Rural New-Yorker. A small square strip of wood is then fastened to the sash and on the first set of glass as shown. The second set of glass is then laid in putty, placed on the strip of wood, and then finished with putty in the usual manner.




### Cutting Channels in a Bearing for Graphite

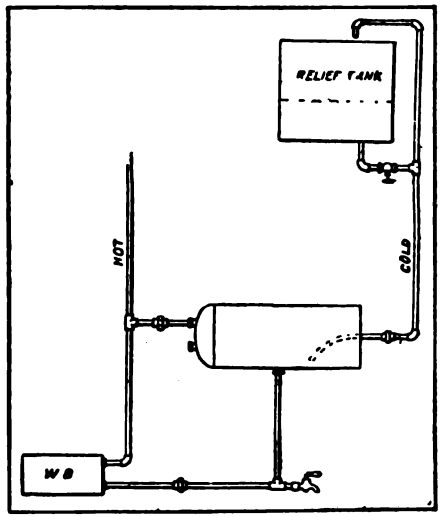
If flake graphite is to be used in a bearing, cut the channels in the babbitt as shown in the sketch. The side grooves should lead into the center groove in the direction the shaft turns. The center channel is the one to be filled with the graphite. Channels cut in this manner will give proper lubrication, also prevent the graphite from working out at the ends.



A German mechanic has built the smallest motor in the world. It is used as a scarf pin and is run by a battery in his pocket. He keeps it in constant operation.

### Connecting a Horizontal Kitchen Boiler

A great many ways have been suggested in regard to connecting a kitchen boiler horizontally placed. Some of the ways are good ones, yet improvements

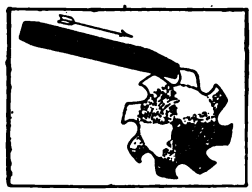



Connecting a Horizontal Boiler

can be made. The accompanying sketch shows a system of connections which is the most satisfactory way of connecting a range boiler in a horizontal position, says The Metal Worker. Making the connections in this manner provides a way to entirely empty the boiler, which is necessary on account of sand or sediment that will accumulate in the bottom.

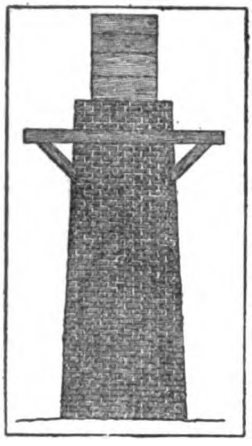
### How to Make a Worn Reamer to Size

Anneal the reamer and with a flat end set drive against the cutting edge as shown by the direction of the arrow in the sketch. This will drive up a ridge that can be turned to size and then tempered.—Contributed by Charles W. Partridge, New Haven, Conn.



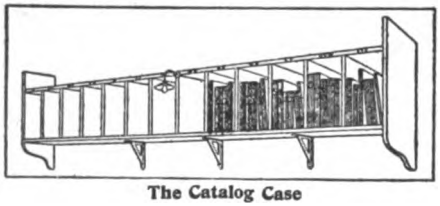
### Extending a Brick Stack

The accompanying illustration shows how a brick stack may be raised while the power plant is kept in operation. The scaffold is bolted to the top of the stack with braces fastened into the side as shown. A wooden flue is made to fit the interior of the stack for the purpose of carrying away the smoke and gases which makes it possible for the brick layers to work. The wooden flue is raised as the work progresses. This method was recently used to raise a brick stack from 60 ft. to 90 ft. high.—Contributed by C. R. McGahey, Cedartown, Georgia.



### Catalog Case for Everyone

Catalogs are valuable text books, and it pays to make a case to keep them in. Take two pine boards about 1 in. by 10 in. by 12 ft. Make a shelf by fastening one of the boards to the wall with three 8-in. by 10-in. steel shelf brackets. Place the second board



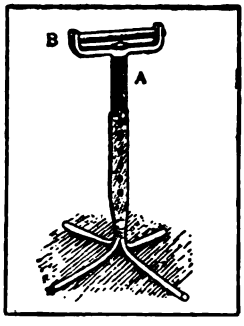
The Catalog Case

14 in. above the first and fasten to the partitions ¾ in. thick, dividing each section. Sandpaper until smooth, then oil, shellac and varnish. Neatly letter each division and place catalogs in section bearing the initial of maker's name. It is preferable to have one long shelf, but if crowded for room divide into two.

Some salesmen are more valuable than others because they are familiar with the catalogs of the lines carried and know where to find the right book at the right time.

### How to Make a Handy Shop Stand

A stand to be used in connection with the drill press when drilling long stock can be made as shown in the sketch. The body is made from 1-in. gas pipe flattened to receive the bar of iron, A. Four pieces of ¾-in. round iron are welded in the bottom of the gas pipe and bent outward to form feet. The top, B, is made on a swivel attached to the bar, A, and is fitted with a roller. Holes are drilled through the gas pipe and the bar A in which to place a bolt for adjustment.

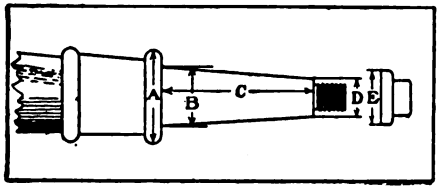



### Removing Dents in a Gas Holder

A flood caused some damage to a gas holder, taking away the guide frames and making numerous leaks with some indentations in the holder itself, says a member of the Pacific Coast Gas Association. As the holder was an old one it was a question if the indentations could be removed. Temporary guide frames were erected and the holder raised up by a block and tackle with specially made hooks grasping the lower rim of the holder. While preparations were being made to force out the sides of the holder to their proper shape one of the blocks holding up the holder gave way, causing the other blocks to do the same, and the holder dropped back into the water of the tub. The air inside of the holder was compressed with such force that the indentations were removed by the pressure on the sides—doing gently and efficiently what was planned to do at considerable expense.

## How to Measure a Wagon Skein

When ordering wheels to fit old or new skeins all the dimensions needed are those that are shown in the accompanying sketch. The diameters

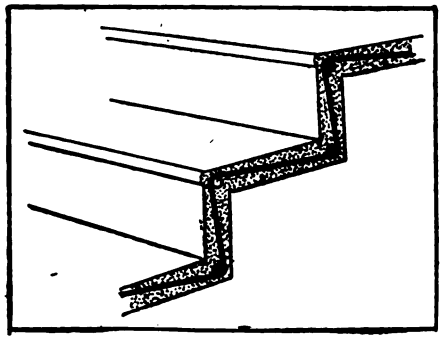



must be given at the largest part of the axle, B, and the smallest part, D, with the length, C. The diameter of the round part of the nut, E, should be given as well as the raised part at A.

## How to Make Concrete Steps

Concrete may be used in the construction of steps, particularly in damp places, and in the open or where the ground is terraced, concrete steps and walks can be made exceedingly attractive. Where the ground is firm it may be cut away in the form of steps, with each step cut 2 or 3 in. lower than its finished level.

Where the nature of the ground will not admit of its being cut away in the form of steps, the risers are moulded between two vertical forms. The front one may be a smooth board, but the other should be a thin piece of sheet metal, which is more easily removed after the earth has been tamped in behind it, says the Concrete Review. A simple method of reinforcing concrete

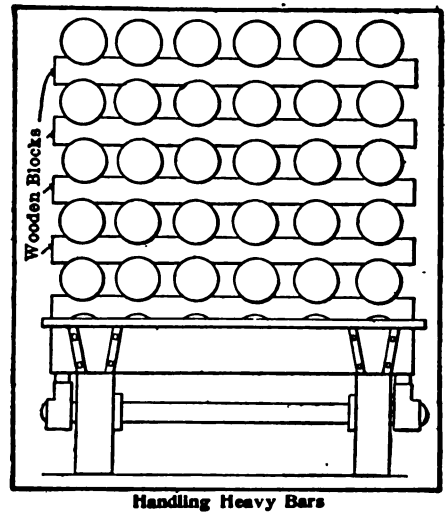


Reinforced Concrete Steps

steps is to place a ½-in. steel rod in each corner, and thread these with ¼-in. rods bent to the shape of the steps, as shown in the sketch, placing them about 2 ft. apart. For this class of work a rich Portland cement concrete is recommended, with the use of stone or gravel under ½ in. in size. Steps may be given ½-in. wearing surface of cement mortar mixed in the proportion of 1 part cement to 2 parts sand. This system is well adapted for stairways in houses.

## How to Handle Heavy Bar Stock

Short, heavy bars are not easy to handle, and are dangerous to a workman's toes and fingers in a machine

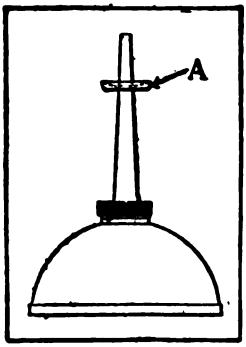



Handling Heavy Bars

shop. Such bars are generally piled up in the form of a pyramid, and in that shape they are difficult to handle, says American Machinist. A certain firm uses a great quantity of short, heavy steel bars. These bars are piled around the different departments of the shop mainly on trucks, as shown in the accompanying cut, which gives the end view of a truck load. Pieces of timber running across the truck are grooved to fit the bars and holding the bars apart, so that the workman can get his hands under them or pass a leather loop around them to lift with a hoist.

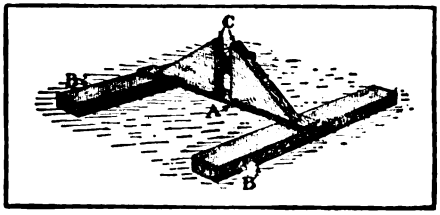
## How to Prevent an Oil Can from Dripping

The accompanying sketch shows a kink in regard to oil cans. A leather washer is placed on the spout as shown at A, says a correspondent in American Machinist, which will prevent any oil from running down the outside of the spout on the bench, or wherever the can happens to be.




## Quickly Made Door Jack

Make two blocks 8 in. long from 2 by 4 in. material and nail a common lath across them as shown in the sketch at A. Fasten two triangular blocks, C, made from a piece of 2 by 8 in. wood, to the lath, leaving a space between them. The door placed in this space with its weight on the lath, will bend




Door Jack

the lath down, bringing the tops of the angle blocks together like a vise. Lifting on the door opens the angle jaws and releases the door.—Contributed by E. E. Harriman, Los Angeles, Cal.

## Building an Ice House

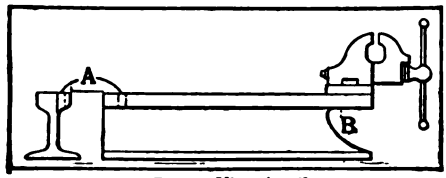
It is not necessary to have an expensive building for an ice house, but certain essentials must be observed, and the ice properly packed. In the first place the house should be tight and well drained at the bottom. How to accomplish this depends somewhat on the conditions in each case.

The house in question was built on a clay bank. An excavation was made about 18 in. deep and some old railroad ties used for sills, with gravel to fill up the inside, and a porous draintile put in around the outside and down the bank, the soil being well packed around the outside. The structure is on a frame of 2 by 4 in. studding, 14 ft. long. The house was sided with 12-in. barn boards, put on like clapboards and lapped 1 in. The roof is of ordinary tar felt. As an ice house must be well ventilated at the top, so that the packing will keep dry, a slatted ventilator 2 by 4 ft. was put in the roof, a floor laid loosely 10 ft. from the bottom and a layer of straw placed on this floor. The house is 18 ft. square.

By all means use sawdust for the packing, says The Country Gentleman. The ice is cut in cakes longer one way than the other, so that, in placing one layer on the other, joints may be broken; 22 by 28 in. is a good size. Sawdust is placed on the bottom about 6 in. thick and the cakes of ice are placed on this sawdust, keeping them away from the sides of the house about 1 ft. The cakes should be laid to fit as closely as possible and all the cracks and corners carefully chinked with fine particles of ice tamped in with a bar or some convenient tool. The next layer is placed in the same manner, taking care to break joints. When the house is packed the last melting will cause the whole mass to freeze in one solid block. As each layer is put in the house sawdust should be packed around the sides as firmly as it can be tamped down. About 2 ft. of sawdust is placed on top as the ice will gradually settle and need occasional packing around the sides. Remember to get the ice as clear as possible, and that the crop harvested in zero weather will keep much better than when gathered near the freezing point. Ice from 10 to 12 in. in thickness is the most convenient to handle, and there will be least waste.

## Bench Vise Anvil

The accompanying cut shows a very handy bench vise anvil for the tool room, model-maker, or amateur mechanic. The anvil is made from a piece of steel rail about 12 or 15 in. long, and as heavy as can be obtained, and the top, edges and ends are planed smooth,

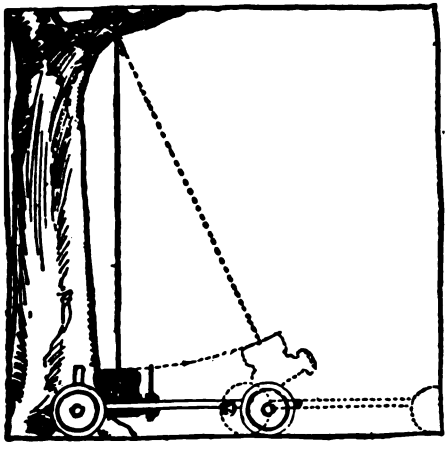



Bench Vise Anvil

true and square. The web is cut out, as shown at B, so a clamp or swivel vise of about 1½ or 2 in. length of jaw, can be fastened to the end of the rail. A taper hole is made at A for the different shaped stakes. The top and edges may be case-hardened if so desired. This makes a handy outfit, says Machinery, as the top of the rail is a good place for straightening work, and the edges for bending work.

## Lifting out a Motor

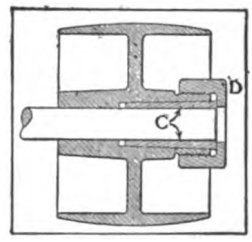
A good example of the ingenuity that is more often born of the lack of facilities than of repair shop necessity is sketched herewith. The problem in this case was to lift a 400-lb. motor out of a car which had to be dismantled a good many miles from the nearest block and tackle, says Motor Age. The engine was first freed of all piping and wiring, and unbolted from the frame. One end of a rope was tied about the engine, the other end being given a couple of turns around a horizontal limb of a tree directly overhead. All slack being taken out of the rope, one man maintained a slight tension on its free end, meanwhile keeping one hand on the motor to prevent its bumping around as it came loose, while another pushed the car back down a grade. As the rope swung out of the vertical, the engine had to lift until it was free from the frame, and after a few oscillations in the air it came to rest hanging like a pendulum from the limb. Easing up on the rope, the engine was brought to the ground.



Lifting out a Motor

## How to Tighten a Pulley on Shaft

A certain electric motor gave trouble on account of the pulley tearing away the side of the keyseat, until at last the side of the groove gave away entirely. The shaft being of small diameter, another keyway would have weakened it still more, and the turning of another shaft would have compelled the dismounting of the machine. This was avoided by adopting the method shown in the sketch, says American Machinist.

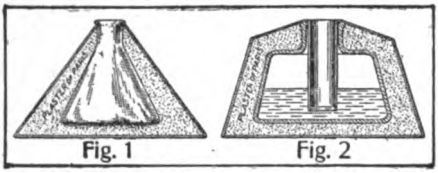



The hub of the pulley was tapered internally and threaded externally for a certain length. Three wedges, C, were obtained by cutting a solid piece with a hole of the diameter of the shaft and turning the outside taper to fit the taper in the pulley hub. These projected about ¼ in. and were forced between the pulley and the shaft by the

threaded collar, D. This simple arrangement will make a strong and sure grip on the shaft.

## How to Make an Acid Receptacle

As glass is the proper material for a receptacle to hold acid, take an ink or mucilage bottle and encase it in sheet metal, as shown in Fig. 1, filling the space between the glass bottle and the metal casing with plaster of paris,

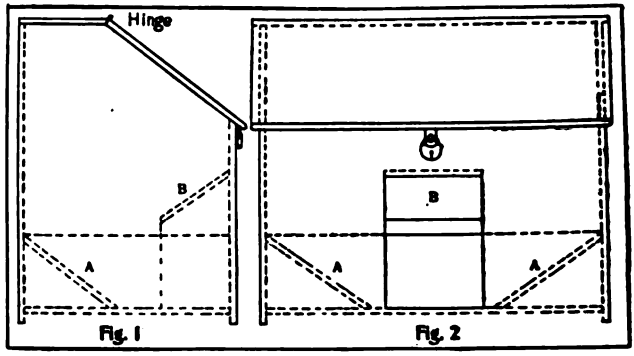



Will Not Tip Over

which will prevent the bottle from being broken or upset, says The Metal-Worker. The bottom is then soldered to it. If a bottle or mug can be obtained with an opening large enough to make a receptacle as shown in Fig. 2, it can be upset or fall from a roof and the acid will not be lost.

## A Coal Bin for a Narrow Porch

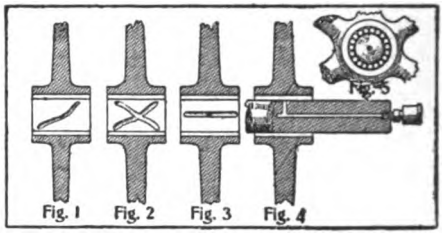
A coal bin made as described makes a most excellent one for use on verandas of tenement buildings. In the sketch the bottom, A, is shown pitched from all sides toward the opening. This throws the last pieces of coal where they can easily be reached with a shovel, and without scraping around the corners. An inclined board, B, is placed over the opening which prevents the coal from falling and scattering over the floor. This board should not be less than 12 or 14 in. wide.—Contributed by Albert Pott, Waterbury, Conn.




Details of Coal Bin Construction

## Lubricating Loose Pulleys

It is not always easy to properly lubricate loose pulleys. A correspondent of the Wood-Worker states that he had a loose pulley on a saw bench,




Prevents Hot Pulleys

even though it had an oil channel, that gave trouble. The pulley was fitted with a grease cup, so the grease could be forced in. The wheel would go for a while, but would soon get hot. When taken off, the end next the tight pulley was quite dry, the other end well greased. The oil channel was cut in the wheel, not straight through, but screw-wise, as shown in Fig. 1, and was drawing the grease away from that end. By cutting another channel in the opposite direction (Fig. 2) the trouble was overcome. The lesson taught is that straight through is the best line for an oil channel in loose pulleys (Fig. 3). Another plan, adopted as a makeshift, but seeming to answer well, is to remove the lining metal and fill the space with short rods of ¼-in. round steel (Fig. 5).

A very good system of lubricating loose pulleys is to drill a hole from the

end of the spindle to the middle of the place where the loose pulley runs, then drill a hole from the side to meet it (Fig. 4). The grease cup is fastened in the end of the spindle so the grease can always be supplied where most wanted; that is, when the machine is idle and the loose pulley at work. There are cases where this arrangement is hardly practical, but it could often be adopted with advantage.

### A Door Bell Substitute for the Deaf

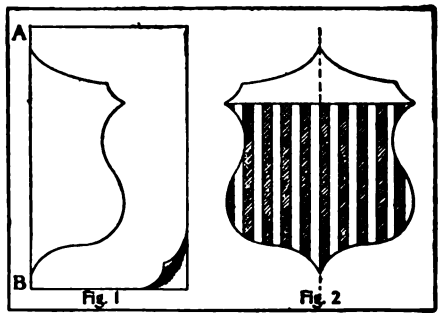
As red lights can be noticed any time during the day or night a little device constructed as shown in the sketch, to place in connection with the bell circuit, will make a fine arrangement for those that do not have good hearing.

The front view of the device is shown in Fig. 1, and the end view, Fig. 2. In this instance three drops are needed—for the front door, hall door and the side entrance. As the rooms have electric lights, the lights in each room are wired to the panel box by breaking one wire and connecting as shown in Fig. 1. When the circuit is closed on one of the bells, it also operates the magnet holding the drop in the same circuit. This releases the drop and the knife switch, K, closes the light circuit.

The sketch shows one of the drops complete at A, Fig. 1. The drops are returned to their position by the crank, D, and the little projections, E.—Contributed by H. B. French, New York.

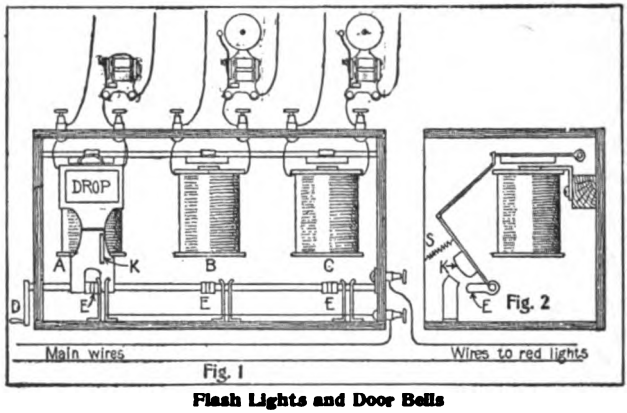
### A Kink for the Sign Writer

To draw an object that has two sides alike is one of the hard things encountered by the sign writer. A good way to do this is to take a piece of paper, a little larger than the object to be drawn, and fold it in the center,




Pattern with Two Like Sides

as shown at AB Fig. 1. Commencing at the fold cut out one side of the object. Unfold the paper and the part cut out will make a pattern with both sides alike.




Flash Lights and Door Bells

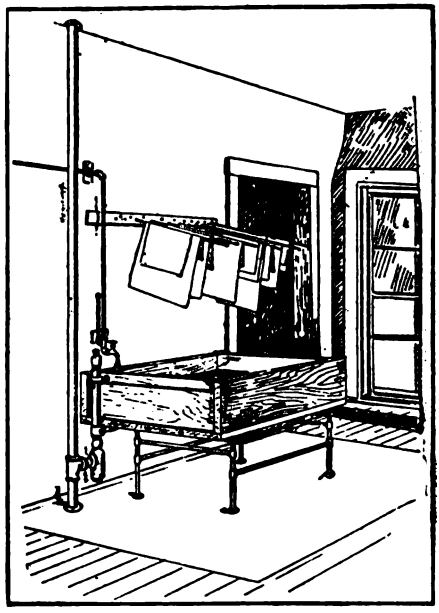
### Trouble in Starting a Gasoline Engine

The bucking and snorting refusal in starting a gasoline engine is often due to moisture in the cylinder, states Power and Transmission, preventing the regular ignition until dried by the heat of several explosions. The difficulty may be overcome by shutting off the cooling water a few minutes before starting of the engine and not turning it on again until after the engine begins to explode regularly when again started. The hint here contained may be of use to the autoist who has trouble of this nature in cold weather where extra cylinders next to fire are left full of gasoline vapor and air, which condenses when the cylinder

walls get thoroughly cold and deposits considerable moisture.

### Blueprint Washing Tank

The capacity of cylindrical machines for printing blue and sepia papers is so great that special preparation for



Blueprint Washing Tank

developing the prints is necessary. A wood sink 5 ft. long, 40 in. wide and 12 in. deep, inside measure, lined with zinc, seems to meet every requirement. There should be no standing overflow plug or other obstruction inside to interfere with floating the paper. The boards may be of any clear 1¾-in. material with the ends mortised into the sides 2 or 3 in. from the ends. The bottom can be nailed flat to the frame. One ½-in. tie rod near the top at each end, in addition to good nailing will keep the frame in good shape, says The Metal Worker. The bottom pieces should not be over 8 in. wide, grooved and stripped, and not nailed nearer than 2 in. from the joint. Bevel the frame inward at the top so as to make the depth ½ in. less at the inside edge than from a line stretched over the top. If the zinc lining is held snugly to the bevel and evenly bent at both angles and tacked to the outside, shrinkage of the frame in height will merely square up the top to some extent, while if the lining is bent over a square top, shrinkage soon inclines the top outward so that drippings run on the floor and the acute angle without support is more easily injured. The sketch shows a ¾-in. pipe frame support under the tank. No better means than pipe will be found, but in any event the tank or sink should rest on strong cleats or girders that entirely cross the bottom. Cast soil pipe or galvanized wrought pipe will do for the waste. The trap should hold a good body of water.

To control the waste outlet and maintain the level desired (nearly full), a standing bath waste gives the best service. A standing waste as purchased has the overflow too high, but it is only necessary to drill some holes in the stand pipe at the proper level, after the waste is in place.

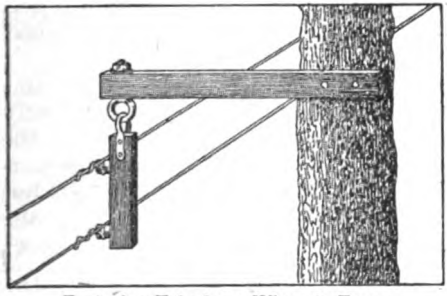
### Setting Electric Light Poles in Frozen Ground

The following method was used in placing electric light poles in frozen ground: Steam was obtained from the boiler of an ordinary traction engine and conveyed through a pipe to a vertical jet pipe, says Engineering-Contracting. The jet pipe was connected by a tee to a horizontal pipe, 24 in. long, capped at one end and connected at the other by nipples and four elbows to the steam pipe. The nipples and elbows were placed to allow the necessary play in handling the appliance. The jet pipe was manipulated by two wooden handles 10 ft. long, connected by stirrups to the two ends of the 24-in. horizontal pipe. The jet pipe was forced down by two men pressing on the handles, and as the earth thawed, the steam would carry the particles out alongside the pipe. As the depth increased, more steam would be condensed in the hole, until finally the overflow was liquid mud.

# SHOP NOTES

## How to Support Telephone Wires on Trees

Sometimes trees are in line with the poles used for constructing a telephone system. A tree may be used instead of a pole by attaching the device as shown in the sketch. A piece of 2 by 4-in. material is spiked to the tree in a



Fastening Telephone Wires to Trees

horizontal position with an eye bolt placed in the projecting end. Suspended from the eye bolt is another shorter piece of wood, to which is attached the insulators that hold the wires.—Contributed by Chas. Lederer, Sr., Pierce, Neb.

## How to Make a Truss for a Pipe

A good method of making a truss for a pipe is by fastening rods in a

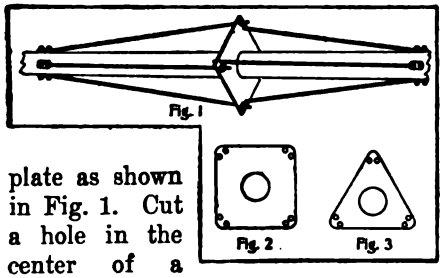
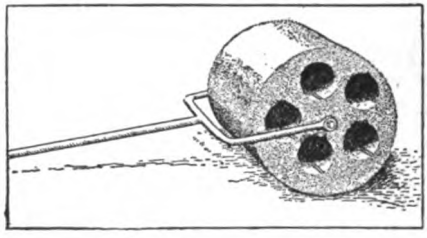



plate as shown in Fig. 1. Cut a hole in the center of a plate of metal a little larger than the outside diameter of the pipe. Drill two small holes in each corner as shown in Fig. 2 for the rods. Place four rods through from each side of the plate and fasten them as shown. If only six rods are wanted, cut the plate as shown in Fig. 3.

## How to Make a Concrete Lawn Roller

As solid concrete rollers are too heavy for the purpose, follow out these instructions and you will have a satisfactory article: Saw out a board with a diameter of 22 in. as a form. Bore a hole through the center and insert a piece of ¾-in. gas pipe. Get five lengths of 5-in. stove pipe and fasten them to the circular board form with nails, placed inside the pipe. To set these pipes evenly lay off circles for them first with pencil. Have a tinner roll



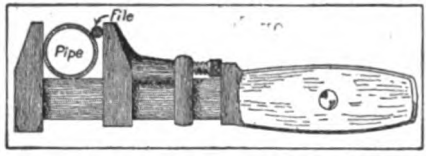
Concrete Lawn Roller

and rivet up a light sheet iron drum to fit around the circular board form. Fill concrete in around the five stove pipes and allow to set. If stove pipes are too long they can be easily cut off after the concrete has set. Cut from inside outward at an angle. The concrete must be well tamped in layers about 3 in. thick if a dry mixture is used—that is, a mixture of about the consistency of garden earth.

There are 25,000 gasoline motor boats, large and small, on the lakes and streams of the United States. Many of these are river freighters.

## Utility Pipe Wrench

The following description gives a very simple method of turning pipe without tongs or pipe-wrenches: Use

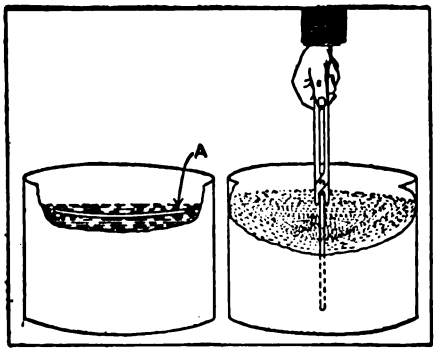



Simple Pipe Wrench

a common wrench and a piece of an old round file. Place the wrench on the pipe and set it so as to leave a little space between the pipe and the jaws of the wrench. Place the piece of file as shown and the wrench is ready to turn the pipe. Two wrenches may be used the same as two pipe wrenches by reversing one of them, or using them so as to grip in opposite directions.

## How to Temper Thin Steel Without Warping

There is nothing quite so discouraging as to have a piece of steel come from the bath warped out of shape, as it must be annealed, straightened and tempered again. The most trouble comes from too high a heat, and also from moving the piece sideways in the bath, thereby coming in contact with cold water on one side and hot water following up the other side. The side that chills the quickest will be convex, for instance: Place a piece in the bath

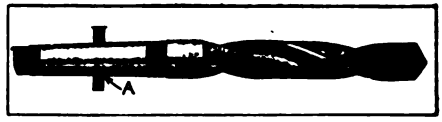



Tempering Thin Steel

as in Fig. 1 and the ends will come up as at A. The same results are obtained if the piece is put down endways and moved about in the bath. Make a bath by adding as much common salt to the water as the water will dissolve. Heat the piece to be hardened at as low a heat as it will harden. This, of course, must be determined by the amount of carbon in the metal. The salt water chills the piece at a lower heat and does not allow steam formation on the body of the steel. When about to dip the piece, stir the water with a stick and make it whirl rapidly and place the piece in endways in the center of the whirling fluid, as shown in Fig. 2, and hold still until chilled sufficiently. Remove the piece and place it in a tank of fish oil and let it remain until cold.—J. F. S.

## Round Shank Drills Used in a Hand Brace

A good way to fix round shank drills so they can be used in a hand brace is




For Use in Hand Brace

to drill a small hole through the shank of the drill and insert a small pin, A, as shown in the sketch. This pin will fit in between the jaws of the chuck and cause the drill to turn as well as if it were a tapered square shank drill. The round shank drills are not as expensive as the ones with the square shank.—Contributed by W. E. Turner, Chicago.

## Fitting Keys to Door Locks

Secure a blank key and file the end until it will start in the lock. Hold the blank key over a lighted candle or a match until it is well smoked. Place this smoked blank in the lock and try to turn it, and by so doing the part that must be filed out will appear

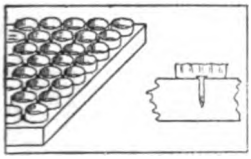
bright when the blank is removed. Repeat this operation several times and a key can be made with very little work.

### How to Remove Paint from Tiles

There is nothing more unsightly than spots and splashes of paint left on the floors and tiles of buildings. Most tiles will allow a wash of caustic soda being put over them, which will remove the paint without the necessity of using an after wash of acid to destroy the effects of the potash, water only being required, says Modern Building. But if the tile is likely to stain with the potash, a wash of diluted ammonia will remove the paint spots, which in turn can be washed off with clean water.

### Home-Made Door Mat

Secure some patent bottle covers, such as are found on pop and beer bottles, and nail them to a board with the rims upwards. The covers may be placed in rows or laid in some neat pattern. The board used should be about 1 in. thick and can be made in any shape or size desired.—Contributed by J. P. Clifford, St. Paul, Minn.

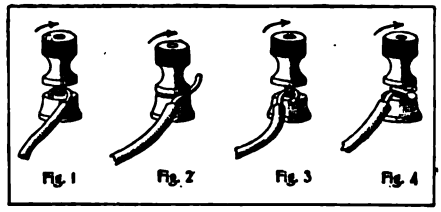


### How to Make a Furniture Cream

Cut into small pieces ¼ lb. of yellow wax, melt it and add 1 oz. of well powdered black resin. The wax and resin being melted, pour in slowly, quite warm, 2 oz. of oil or spirits of turpentine. Keep in a covered tin or earthen vessel, says The Furniture Journal. After the furniture is well dusted and cleaned this mixture may be applied by spreading a little on a woolen cloth and rubbing the wood with it. In a few days the gloss will be as firm and fast as varnish.

### Connecting Wires to Binding-Posts

The accompanying sketch shows the incorrect and the correct methods of attaching wires to binding posts. In

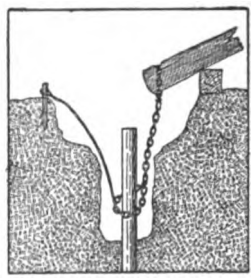



Attaching Wires to Binding-Posts

Fig. 1 is shown the manner in which through carelessness the wire is given a turn in the wrong direction, which will cause it to straighten out when the nut is turned down, as shown in Fig. 2. In Fig. 3 is shown the correct way to turn the wire in the direction the nut turns on the post. When the nut is turned down in this case the tendency is to wind the wire around the binding-post (see Fig. 4) instead of spreading it.

### Removing a Chain Grip on a Pipe

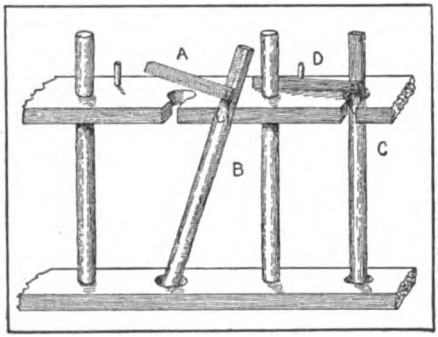
Sometimes when a pipe is driven for a shallow well it is found that the point has been placed too deep for a good supply of water and in order to lift it a few feet a chain with a loop is placed around the pipe and around the end of a long lever, as shown in the sketch. The hole about the pipe is generally too small to allow a person's hand to loosen the grip of the chain when the pipe has been lifted to the proper place. As the chain is given slack it slips lower on the pipe and grips a new hold. To remove the chain when desired, fasten a piece of wire in the loop on the opposite side



from where the chain pulls and by holding this wire and giving the chain slack the loop may be taken off the pipe.

## How to Make a Cattle Stanchion

A cattle stanchion that is easily operated and will stay in place when set

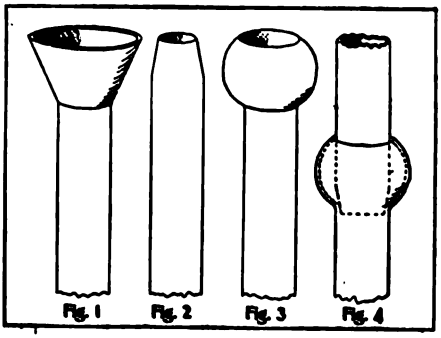



Easily Operated

is made as shown in the illustration. The post B is placed in position by turning the small lever A so the square or thin part of the post B will enter the notch. The small lever A is then turned as shown in the second position, C, and the pin D inserted.

## How to Make a Soldered Joint

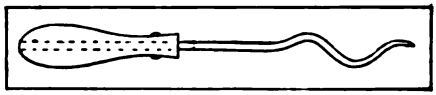
The accompanying sketch shows how to make a soldered joint that will stand more hydraulic pressure than the ordinary wipe joint. Anybody who can use a plumber's torch can make this joint, and if considerable care is taken, it may be done with a soldering iron. Prepare the end of one lead pipe as shown in Fig. 1 by using a tampion. Make the opening as wide as possible. Clean the inside as far as it has been opened and close the end by using a dresser or flat piece of wood until it is the shape shown in Fig. 3. Rasp down the end of the other lead pipe, (Fig. 2) and clean it all around with a knife for the length of about 2 in. Place the ends of the pipe together as shown in Fig. 4 and pour in the melted solder. The pipes should be heated before turning in the solder so as to make them tin well.—Contributed by R. Doyle, New York.




Will Stand Great Hydraulic Pressure

## A Quickly Made Furnace and Stove Poker

The accompanying sketch shows an easily made furnace and stove poker.



Furnace and Stove Poker

For furnace use, make it of ½-in. round iron and 36 in. long, says the American Blacksmith. For stove use it may be made of ⅜-in. round stock and 20 in. long. The handle may be made of any wood stock and bolted or riveted to the rod as shown.

## Brazing Compound for Steel

The following formula makes a good compound for brazing steel and when the brazing is completed but little filing is necessary, as the scale formed is very loose:

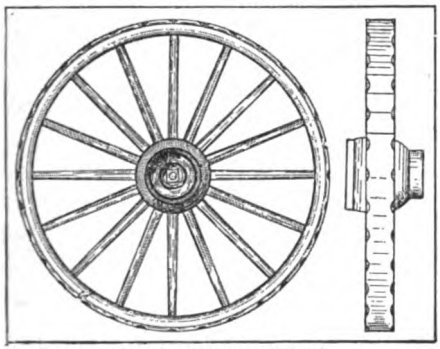
Boracic acid..... 3 parts by weight
Borax powdered ..... 1 part by weight

The borax must be calcined or melted before mixing. Use a ladle in melting the borax, and after it cools reduce to a powder. Mix with the acid and apply as a paste with water.

To keep the spelter from flowing over parts of the steel where not wanted coat them with a mixture of graphite and thick oil or grease.—Contributed by J. M. Derr, Shortsville, N. Y.

## To Make Wagon Wheels Climb Car Tracks

The accompanying sketch shows how to fix wagon wheel tires to prevent the wheels from gliding along street car tracks when crossing at an angle, or climbing out when driven parallel with them. Make notches about 6 in. apart on both sides of the tire by using

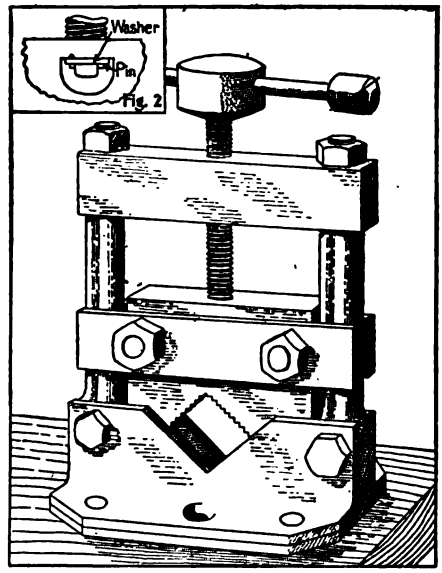


Notched Wagon Wheel

a 14-in. half-round file. The notches striking the rail will at once cause the wheel to climb and cross it.—Contributed by W. C. Wefel, Denver, Colo.

## A Home-Made Pipe Vise

The accompanying sketch shows a pipe vise constructed from scraps and made by a correspondent of the Model Engineer, London. It consists of an iron base, to which are riveted two angle irons. To these angle irons is bolted on each end an upright, as shown. The uprights have a shoulder turned on the top to carry the cross-piece or yoke. The yoke is held down by nuts screwed on the turned portion of the uprights. The top jaw is a piece of iron drilled to take the bolts that secure the guiding strips on each side. The guiding strips cover the hole in the top jaw. This hole, which




Pipe Vise Made of Scraps

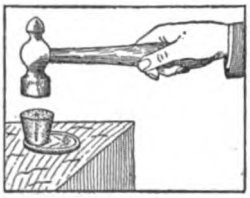
is first drilled and filed out, Fig. 2, is to admit the washer put on and the pin through the end of the screw. This arrangement is to enable the top jaw to be lifted by the screw. The screw is a round-headed bolt turned down to $\frac{3}{8}$ in. and tapped. The bottom end is turned to $\frac{1}{4}$ in. to pass into the top jaw, as shown in the sketch, Fig. 2. The handle is a steel rod with two iron ends screwed on as shown. The gripping portion of the top jaw is filed to make teeth and afterwards case-hardened.

## Home-Made Bit Gauge

A simple yet effective way to bore a hole to a certain depth in a board is to make a hole the size of the bit in the center of a common cork. Place this cork on the bit as shown in the sketch at a certain place and several holes may be bored to the same depth. In boring a number of holes do not allow the cork to touch the board, as this may change its position.—Contributed by Henry R. Bowman, Freeland, Md.

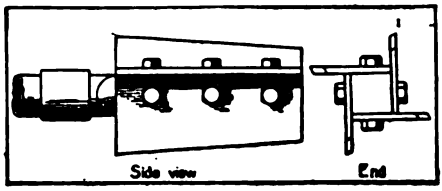
## How to Produce a Minute Hole in Metal

Although not of much practical value, but as a trick it may be interesting to know how an exceedingly small hole may be made through a medal or other metal that may not be too hard. On the end of a block of hard wood, the fiber being in a vertical position, lay the medal or other metal. Take an ordinary bottle cork and a fine but straight sewing needle, run the needle lengthwise through the cork from the top and far enough so the point is just visible underneath and no farther. Give the needle a slight kink at the top, thus snapping it off even with the surface of the cork, says the Woodworkers' Review. Stand the cork on the metal to be punctured, with the point of the needle downward, and strike a moderate blow with a hammer squarely on the upper end of the cork, and the needle will instantly be driven through the metal, where it can be removed by a backward blow, thus leaving the minute hole, as desired.



## How to Make a Locomotive Exhaust Nozzle Reamer

The accompanying sketch shows how to make a reamer for cleaning the exhaust nozzle of locomotives without opening the front end. The reamer is fastened to a long 1-in. pipe with a tee at the end through which a bar is placed to turn the reamer, and is then placed in the exhaust nozzle through the stack. It may be made of such a size that the reamer will fit all the exhaust nozzles on the engines running on the division.—Contributed by W. W. Updegraff, Fruitvale, Cal.




Exhaust Nozzle Reamer

## Making Concrete in Freezing Weather

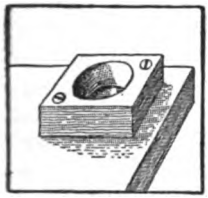
Concrete may be mixed and placed during freezing weather with perfect safety provided that certain precautions are taken. In mass work, where only light loads will come upon the concrete until such time as it has an opportunity to thaw out and reharden, no precautions need to be taken to prevent freezing. In cases where freezing must be prevented until at least the initial set has taken place, three different methods may be used, separately or in combination, viz.: First, the concrete aggregate may be heated, or hot water or steam may be used in the mixing, which will hasten the set; second, sodium chloride, calcium chloride or other chemicals may be added, so as to lower the freezing point of the water; third, the work may be inclosed and the interior of the inclosure maintained above a freezing temperature until the concrete sets naturally.

The heating of the aggregate is always advisable so as to preclude the possibility of frozen lumps of sand getting into the completed work. When boiling hot water is employed, the mixing process does not usually occupy enough time to thaw out the frozen lumps, even of small size. The sand or other material should always be heated. It is always best to heat the water also, says the Concrete Review. A small expenditure will cover the cost of the apparatus necessary for this purpose, and the fuel bill is relatively small. If steam is employed for this purpose, it will be found quite profitable to lead a pipe or hose to the point of deposit and heat and clean the forms, and the reinforcement, if used. For mass concrete work the use of chemicals added to the water may be advisable where

the temperatures do not fall much below the freezing point. Common salt used for this purpose has shown good results in several experiments, and no detrimental results in actual work.

### A Draftsman's Ink Bottle Holder

Draftsmen and students of home study schools will appreciate the little device here illustrated. As few drawings are made the full size of the drawing board, this ink bottle holder can be attached to the upper right hand corner of the board, leaving a little space from the edge when necessary to place the board in a rack. The holder is made from a ⅜-in. thick board, 2½ in. square, with a hole cut in the center 1⅛ in. in diameter.—Contributed by C. E. McKinney, Jr., Newark, N. J.



### How to Sharpen Dentist's Tools

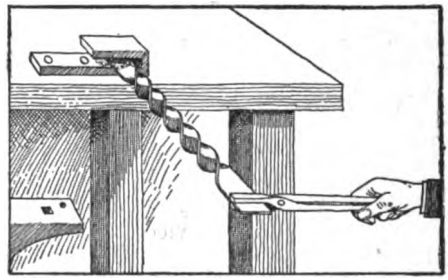
Place the points of the tools in nitric acid for about two seconds, remove and immediately dip in water. Examine the edges under a magnifying glass and if they are not sharp, repeat the operation. When the tools are sharpened they can be polished with a tooth brush and some metal polish.

### Tempering Self-Hardening Steel

Self-hardening steel was used for drills on a certain class of work where they had to be run with great speed in order to make time. As some castings were quite hard, the drills would not do the work running at high speed. The drills were heated to a dull red and driven into a chunk of lead for about ½ in. and left to cool. The drills treated in this manner retained their cutting edge well on hard castings. The steel must not be heated too hot, as this will cause it to crumble.—Contributed by W. J. Vrooman, Lake Geneva, Wis.

### How to Form Coal Drills

Coal drills may be given the proper twist with ease and rapidity by using a piece of metal formed in the shape shown in the sketch. The device is made from ⅝-in. by 1¼-in. material



Turn with Tongs

which is fastened to a bench or other suitable support near the anvil. The material for making the drills is heated and one end placed in the hook while the other end is turned with the tongs.—Contributed by John Mikesell, Des Moines, Iowa.

### Saving a Hack-Saw Blade

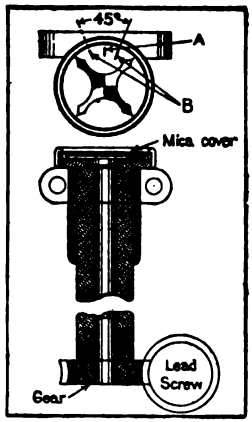
Most machinists have doubtless noticed that when one or more teeth break from the blade of a hack-saw others will soon follow. This is especially true when the piece being sawed is narrow, says Machinery, as the saw drops when the space made by the broken teeth passes over the work. Other

Saving a Hack-Saw Blade

teeth can be prevented from breaking by grinding two or three teeth on each side of the broken part, as shown by the dotted line in the cut. This will prevent the teeth which are next to the broken part from striking abruptly against the work.

### Screw-Cutting Indicator for Lathes

Anyone working with a lathe knows that in cutting threads it is necessary to stop and reverse the machine, allowing it to run backward in order to make the carriage return to the exact place for the tool to take the next cut. The indicator described and illustrated in this article can be attached to the lathe carriage so that the small gear of the device will mesh with the lead screw of the lathe, which will cause the indicator to show the point where to place the tool each time without returning the carriage by reversing the machine. It consists of a mica covered dial under which revolve four arrow points, each point having a different color. This arrow wheel is attached to a shaft which is turned by the small gear. Three marks are made on the dial, as shown at A and B, and by referring to the following five rules the tool may be set at the exact place by returning the carriage by hand:




1. For cutting any even number of threads per inch, not fractional, close the nut on the lathe screw with any arrow under either line B on all cuts.

2. For any odd number of threads per inch, not fractional, close the nut on the lathe screw with any arrow under line A on all cuts.

3. For any number of threads per inch containing the fraction ½ close the nut on the lathe screw with same colored arrow under line A on all cuts.

4. For any number of threads per inch containing the fractions ¼ or ¾ close the nut on the lathe screw with the same arrow under line A on all cuts.

5. All threads which are multiples of the lead screw thread can be caught at any point.—Contributed by W. C. Deibert, Clifton Forge, Va.

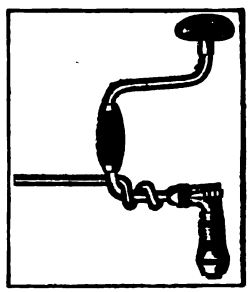
### How to Mix White Lead

When a keg of white lead has stood for some months the lead becomes denser, owing to the soaking away of the oil into the wood. It is more difficult to work up into a smooth paint when in this condition, although it may have improved in quality. To remedy this to a great extent, take a stout, narrow paddle and put it into the lead until it strikes the bottom of the keg, then work the paddle back and forth from side to side for a few times, and the mass will soon become quite plastic, and then it may be removed into pots for further breaking up and thinning for use. This will save much time over the usual way of first taking the lead out of the keg and breaking it up in the pot, says The Master Painter.

White lead should always be beaten up before adding thinners, and then the japan should be added and well beaten up with the lead. If possible let the mass stand a few hours and then the thinners may be added to the desired amount. This will render the straining of the paint unnecessary unless the skins are present. If colors are to be added, beat them up separately and thin out so that they will unite readily with the paint.

### An Extra Handle for a Hand Brace

While boring some holes through a hard maple floor I found it such hard work that it was almost impossible to accomplish the task. I conceived the idea of attaching a handle on my ratchet brace in some manner. The accompanying sketch shows



how the handle was made to attach to the brace by turning it on like a screw.—Contributed by A. Mueller-weiss, Sebewaing, Mich.

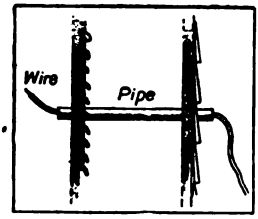
### Wind Pressure per Square Foot

From the tables compiled by the United States Weather Bureau the wind pressure per square foot is as follows, according to the velocity of the wind per hour:

| | |
|---|---|
| 10 miles... .37 lb. | 50 miles... 6.66 lb. |
| 20 miles...1.27 lb. | 60 miles... 9.22 lb. |
| 30 miles...2.64 lb. | 70 miles...12.05 lb. |
| 40 miles...4.44 lb. | 80 miles...15.50 lb. |
| | 90 miles...19.20 lb. |

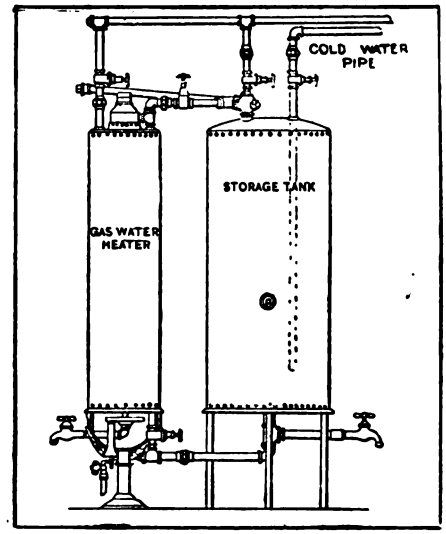
### To "Fish" Electric Wires Through Walls

Electricians often experience difficulty in "fishing" wires through drilled holes, and especially if there is an intervening space: a hollow wall for instance. This trouble may be overcome by first inserting a piece of tubing or pipe—long enough to reach through both holes. The wire then may be pushed through this tube and the latter withdrawn. A tube or pipe having a $\frac{5}{16}$-in. hole and 2 ft. long will do for general work. For bell wires a smaller one may be used. This little device will prove a time-saver for the electrician.—Contributed by W. J. Travers, Buffalo, N. Y.




### How to Store Hot Water

At the last meeting of the Pacific Coast Gas Association a method was discussed for storing hot water in connection with a kitchen boiler supplied with heat from a gas burner. In the accompanying sketch is shown the combination of this boiler connected to a larger boiler in which the water is stored. The arrangement is suggested



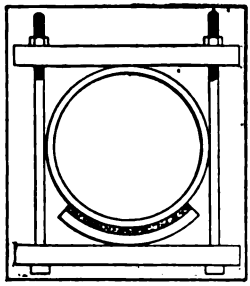

Hot Water Storage

as one already being used in apartment houses where, for example, a 200-gal. storage tank is connected to two boilers, furnishing hot water for fifty basins, four baths and wash trays. The boilers were installed after oil burners and coal heaters had failed to give satisfaction. It will be seen that the hot water from the gas heater can be delivered directly into the hot water service pipe, or it can be sent to the storage tank alongside, valves being provided in both of these delivery pipes. Naturally it will require that the user understand the scheme of the connections, else the case might happen when all the water pipes to and from the heater were shut off by the valves, with the result that when heating is begun there will be an expansion of the water, the development of a dangerous pressure and bursting of the tank. It will be seen that the cold water supply is brought to the storage tank, and that a pipe leads from the storage tank to the hot water heater. Sediment cocks are provided for both the storage tank and the gas heater. Above the gas heater is a so-called vent cap discharge for the products of combustion from the gas burner, which is shown below the boiler with an air mixer. Behind the pipes of the gas-heated boiler will

be seen a pipe slanting upward from the storage tank. This is to indicate how a pipe from a second heater would be connected to the cross at the top of the storage tank.

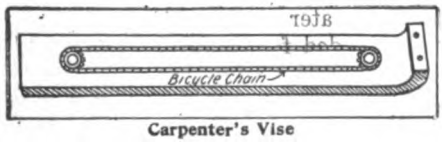
### How to Repair a Leaky Pipe

When a pipe bursts or springs a leak, the usual way is to shut the proper valve, and after taking the size and length of the defective part, replace it with a new piece. This plan works well where there is plenty of time, but sometimes time is valuable, says a correspondent in Engineers' Review. An arrangement can be made quickly to assist in such cases which will give good service for several years. The device can be briefly described as a clamp. It is made of flat iron having a thickness of $\frac{5}{16}$ in. and varying in width, according to the size of pipe for which it is intended. One piece of iron must be bent to fit on the pipe and a piece of packing placed between it and the pipe and over the break, as shown in the illustration.



### How to Make a Carpenter's Parallel Vise

The accompanying sketch shows how to construct the outside jaw of a carpenter's vise so as to have a square jaw for the work at all times. Fasten to the screw that opens and closes the vise, the small sprocket wheel that is used on a bicycle, say about 12 teeth. At the bottom of the vise another screw




Carpenter's Vise

and sprocket wheel is fixed in the same way. The number of sprockets should be the same on both wheels. These two sprocket wheels are connected with a common bicycle chain, so that when the top screw is turned by means of the handle, the bottom screw turns also, says a correspondent in Modern Machinery. This will cause the outside jaw to open and close in parallel with the one attached to the bench.

### Drilling Large Holes with a Small Bit

Some 9-in. holes had to be drilled for steel anchor posts for a railroad company along the lakes and the contractor had 5-in. bits, only. He did not care to change his bits to 9 in. in order to make the few holes, says a correspondent in the Drill Hole. The holes were to be 23 ft. deep—15 ft. in dirt and 8 ft. in bed rock of massive bedded shale. A 12-in. hole was dug with a spade to the depth of $1\frac{1}{2}$ ft. Owing to the play the tools had above, it was easy to spud the sides of the hole down nearly straight, but as the anchor posts had to fit pretty snug in the shale, the hole was tapered from the top so that when the shale was reached the hole was reduced to 10 in. The hole was started in the shale at 10 in. and the swinging of the top of the tools in the 12-in. opening enabled the operators to carry the hole down at a diameter between 9 and 10 in.

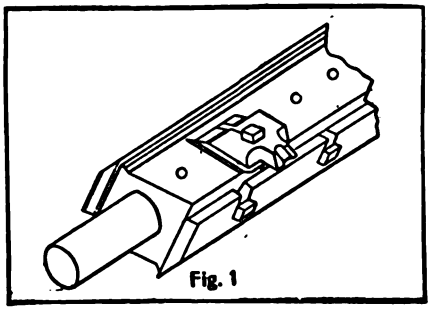
It was found necessary to keep perfectly square corners on the bits and to keep the top of the tools moving so that the bit cut full size of the hole.

In drilling the holes 4 ft. of lake sand was struck which was mixed with water sufficient to make it run like quicksand. Some good stiff clay was procured and chopped up fine and dumped in the hole, with the addition of enough water to make a nice thick batter. By keeping the batter at the right thickness the tools were put in and no trouble was encountered in reaching bed rock. The only thing that had to be guarded against was to keep from getting too much water in the hole at one time, as an excess of water

washed the clay from the sides of the hole and let the sand run.

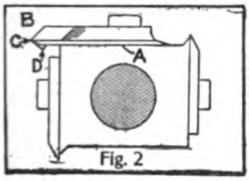
### Beading with a Planer

It often happens, particularly in the jobshop, that a bead of some kind of a




Beading Tool

light moulding shape is required near the middle of a wide board. It is quite

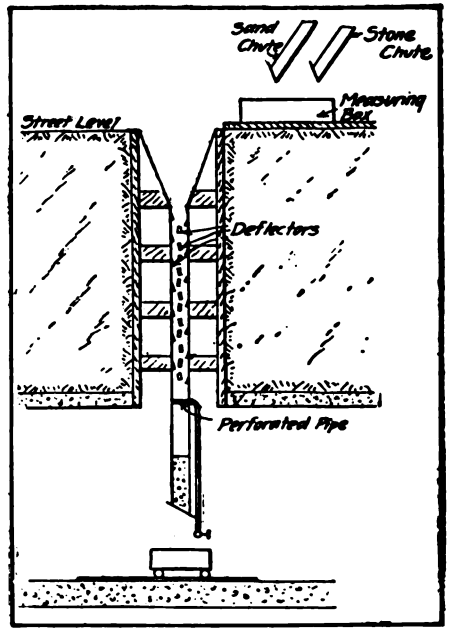



a task to set up a four-side machine just for a 1-in. strip down the middle of ten or eleven 10-ft. boards, and if the job could only be done on the double surfacer it would be a great convenience. For this purpose a correspondent in Woodcraft designed the little device which is shown in Fig. 1. Briefly stated, it consists of a cutter of the required shape to do the work, an adjustable chip breaker placed underneath the little cutter, and a bolt for holding the cutter in place. Several holes along the head are provided for fastening the beader in place anywhere along the length of the cutterhead. The chip breaker is shown at A and the cutter at B, Fig. 2.

The proper arrangement of beader cutter and its chip breaker is more plainly shown in Fig. 2, in which the end or sectional view of the cutterhead is presented. In this sketch the cutting portion of the tool, B, is shown projecting from circle C to circle D; the distance radially between those two circles will be the depth to which the beading tool will cut.

### How to Make a Gravity Concrete Mixer

The accompanying sketch shows a simple gravity mixer which was used in mixing the concrete for a tunnel lining. The arrangement was placed in a shaft and consisted of a hopper connected to the top of a vertical 12 by 20-in. rectangular chute. At intervals of 24 in. inclined baffle plates made of iron plates and wooden backing blocks were placed in the chute. The baffle plates were staggered on opposite sides, those on two sides of the chute being set at an angle from the vertical and the spaces between them interrupted by through bolts which served to deflect and displace the falling materials. About 16 ft. from the top, water was admitted to the chute through two horizontal pipes controlled by a valve in the bottom of the tunnel. The chute



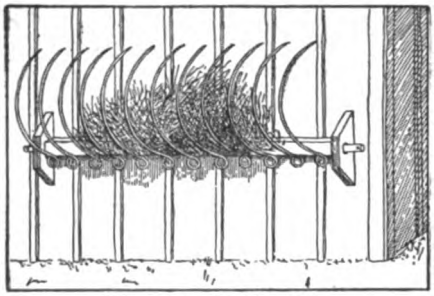

Gravity Concrete Mixer

was about 30 ft. long and had its lower end closed by a balanced valve, says Engineering-Contracting. The sand and broken stone were drawn from bins through chutes into the measuring box, which had neither top nor bottom, but

rested on a smooth floor. The box was filled and leveled to the required height with broken stone, the required amount of sand was then added, and the cement placed on top. The box frame was then lifted and the mass shoveled into the chute. About 1 cu. yd. of concrete was mixed at a time.

### Quickly Made Feed Rack

During the winter months the hay rake may be put into service as a feed rack by attaching two blocks of wood, which have holes bored in them to receive the axles of the rake, to the wall

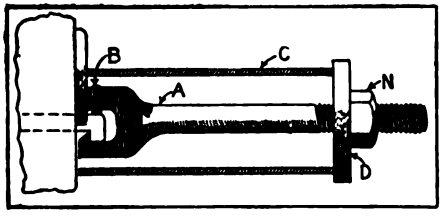


Winter Use for Hay Rake

of a shed or barn, as shown in the illustration. In many cases it is better to have the rake used in this manner than to be standing in the field.—G. McV.

### Handy Tool for Removing Keys

Make a hook on one end of a piece of cold-rolled steel, as shown at A in the sketch, and thread the other end for a nut. A small set screw, B, is fitted in the hook end with its head flush with the metal, which serves to hold the hook in place when in use.




A tube, C, is cut to the proper length and fitted with a washer, D, through which the end of the hook, A, is inserted and the nut placed in position. Turn the nut and the key will be removed with ease.

### Repairing a Worn Lathe Lead Screw

The lead screw on a lathe became worn so that it had to be replaced with a new one or repaired in some way. A plan was devised to make the old screw larger and recut the threads. The screw was taken out and cleaned from all oil and grease and laid on a piece of sheet iron. After putting some clay around the screw it was placed in the fire and spelter melted and run in the threads. It was taken from the fire while hot and the surplus metal removed by wiping with waste. A part of the threads were left at one end without being brazed on, which was to adjust the die for recutting the threads. The die was run over the screw, which made it as good as new.—Contributed by Frank G. Lilja, Indian Orchard, Mass.

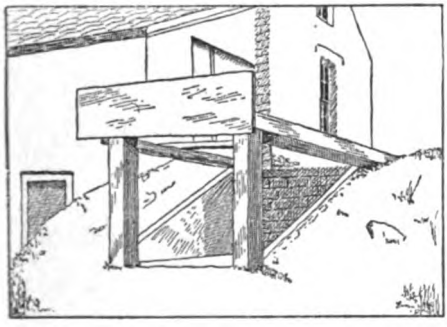
### Floors for Erecting Shops

Floors with a top wooden surface are much to be preferred, as they are more agreeable for the men standing upon them. This floor, however, must be protected from rot by a proper substructure. A recent specification called for the ground to be well tamped to a level 14 in. below the finished floor line and then covered to a depth of 6 in. with broken stone, the voids being filled with small stones and the whole being well rolled or rammed into place. This surface was to be liberally covered with hot coal tar, and after setting it was to be brought to a level by 1 in. of sand and tar, the sand being heated and thoroughly incorporated with a mixture of two parts of coal and one part of coal tar pitch. On this were to be placed 3 by 4 in. yellow pine zinc-treated sills, the spaces between the sills being filled

with tarred sand and packed while hot to a level with the top of the sills. Over this was to be laid a course of 2¾-in. treated yellow pine, this being covered with a layer of roofing felt, and finally a course of 1¼-in. hardwood boards. While such floors are expensive they are very permanent, and we have heard of cases where they have been in use for 20 or 30 years.—George R. Henderson, of New England Railroad Club.

## Quickly Made Automobile Pit

Constructing the ordinary type of dugout automobile pit is an undertaking that the average autoist hesitates to tackle. A substitute pit is easily constructed by the amateur as described by a correspondent in Autocar. It is constructed, as may be seen from the sketch, as a sort of pier off the hillside. It can be easily protected by a light roof if desired, and when so covered it would be very light to work in, even in dull weather. The rails are 12 ft. long, 11 in. wide between the raised edges and 4 in. thick. The track is about 3



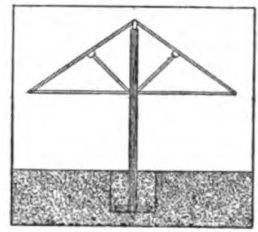
Automobile Pit

ft. inside measurement and 5½ ft. outside. The track is about 4½ ft. above the pit floor at the outer end of the rails. The pit is 9 ft. long and 4½ ft. wide and paved with cement. The supporting uprights at the outer end of the track are 10 in. in diameter.

A French invention, consisting of bulb thermometers, predicts at sundown whether there will be a frost.

## How to Make an Umbrella Shed

A large umbrella shed was constructed at Pier 36, North River, New York, for the purpose of temporary storage and used especially for produce for the city markets which it handled daily. In building this shed it was considered necessary to avoid obstruction by columns along the side, and the structure was made with a light roof carried entirely by a single row of vertical columns 20 ft. apart. The floor space was paved with asphalt, in which six 4 by 4-ft. pits were excavated to a depth of about 5 ft. Vertical posts 10 by 10 in. and 25 ft. long, with cross-pieces 10 by 10 in. and 6 ft. long, bolted to their bottom ends, were placed in these holes. These cross-pieces were thoroughly bedded, and the hole entirely filled with concrete. These posts were carefully plumbed and served to carry the entire superstructure. At their upper ends they are connected by a 3 by 10-in. mortised ribbed purlin which supports the trussed rafters.



Each truss is a triangular framework of 2½-in. screwed steel pipe, 2½ in. in diameter for the top piece and 3 in. in diameter for the bottom. The truss has a depth of 8 ft., and each side of the top piece, or each rafter, is a single length of pipe fitted at the upper end with an oblique screwed flange. The flanges of the two connected pieces are bolted together through the top of the post. The lower end of the top piece is screwed into a casting into which there is also screwed the end of the bottom pipe, which at the opposite end is also flange-connected to the vertical post through which it is bolted. The castings at the ends of the bottom pipes also received the screwed ends of horizontal eaves struts of 2½-in. pipe which support the intermediate rafters of 2 by 6-in. timbers 4 ft. apart with loop con-

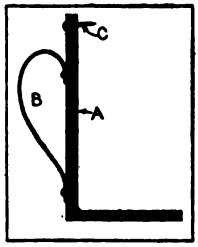
nections of flat iron engaging the struts. The upper ends of these rafters are mortised in the usual way into the ridge purlin. Half way between the ridge and the eaves purlin there is a 2 by 6-in. intermediate purlin supported by a bent strap engaging the top pipe of the roof truss.

The framework thus provided is covered with a continuous sheet of paraffined heavy canvas with transverse breadths sewed together sail fashion to make one large sheet or tarpaulin. The side walls are formed of vertical curtains of the same material mounted on rollers at the eaves strut, which may be rolled up and give an entirely clear opening under the roof, says the Engineering Record.

As the structure is very light and may be exposed to severe wind, extra bracing is provided by four inclined 4 by 5-in. struts, radiating from the intersection of the vertical post and its lower pipe to the intermediate purlin, where they are knee-braced to secure stiffness and transmit the possible stresses on the main rafters.

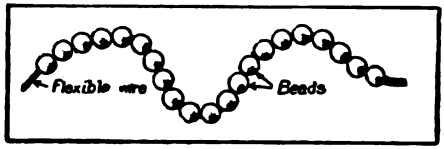
## Home-Made Flash Sheet Holder

A great many persons use flash sheets for making interior views or night pictures. The usual method is to tack the sheet to some piece of furniture or doorcase. The accompanying sketch shows how to make a flash sheet holder that is not only convenient but can be held in any position desired. Secure two thin boards, both 4 in. wide, one 8 in. and the other 3 in. long. Fasten these together with brads forming an L-shaped object. Line the inside part, A, with thin metal and insert a small nail, C, leaving a part of the nail projecting on the metal side, which is used to hold the flash sheet. A handle, B, is formed from the thin metal and attached to the back side.—Contributed by Ralph Farnham, Cleveland, O.




## Glass Beads Make Good Insulation

While recently engaged in the construction of electrical projective apparatus, which required a flexible electrical conductor, to be used under comparatively high temperatures, we discovered that the ordinary rubber insulation soon melted and thus allowed the flexible wire to make a "ground" on the metallic frame of the machine. We had about decided to use mica washers with asbestos separators, when we were advised of a much cheaper method, and one which answers the purpose perfectly.

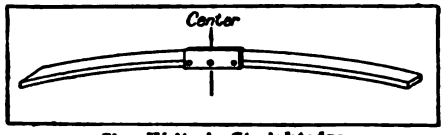


Beads Strung on Wire

We simply strung a number of glass beads on the wire, as shown in the sketch, thus giving it a high insulation without impairing its flexibility. We are under the impression that the same scheme is used in certain arc lights, but it will probably be new to some readers, as it was to us.—E. D.

## How to Make a Sign Writer's Straightedge

Dress a lath true and thin. Make a hand hold out of a piece of board ½ or ⅜ in. thick and about 6 in. long. Find the exact center of the lath and the hand hold and drive a nail so as to meet both centers. Bend the lath to a slight bow and drive two more nails, one at

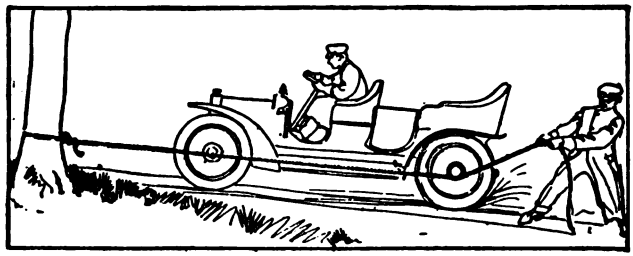


Sign Writer's Straightedge

each end of the hand hold. When this straightedge is placed for striping, or penciling lines of any kind, it will not slip when held with one hand.

## A Method to Make Slipping Automobile Wheels Pull

When the wheels of a car slip for lack of traction, as in the case of a muddy surface on a grade, or a deep mire, then it is that the average motorist looks about for some assistance. If a rope is at hand it may be placed around the hub of one of the driving wheels in the manner of a hoisting drum, wrapping it with a turn or two, one end of which is attached to a tree or any other convenient solid object in front of the car. Using the low gear, and with someone to maintain a tension on the rear end of the rope, an enormous pull is secured, which is certain to uproot something. The rope must be applied to the wheel that spins most freely, the differential action usually causing one to hold while the other slips, says Motor Age. When no tree or other attachment for the rope is available, a stout stake may be driven in the ground.



Simple Remedy for Slipping Wheels

## How to Paint Iron, Zinc, Etc.

The time for painting new iron is at the foundry as soon after casting, or being wrought or rolled, as possible, says The Master Painter. Do not paint it in the early morning or damp evening but when a dry wind or warm sun will act upon it. See that the iron is thoroughly dry and free from rust, and then coat with red lead and linseed oil a thin coat, just enough to penetrate the pores of the iron. The first coat must dry hard. Follow up with three other coats containing red or white lead in as great proportion as possible.

To paint old iron, burn off all rust and scale, brush with turpentine or paraffin and proceed precisely as with new iron.

For zinc, the first coat should consist of white lead, red lead and turpentine, tempered with varnish. Wash new rolled sheet zinc with a solution of a tablespoonful of hydrochloric or nitric acid to a gallon of water, or scratch the surface with No. 2 glass paper before painting.

Treat galvanized iron the same as zinc, but do not use the acid preparation, nor scratch. Very smooth, bright tinplate must be first dulled or scratched and the first coat should be oilless.

## A Short Method of Testing Electric Circuits

In testing out electric circuits the following method is sure and simple: Twist the ends of the line together and attach two double-bladed knives to the terminal wires of the test box by closing the large blade of each knife, one on each wire. Open the little blades and cut through the insulation close to where the connections are made to the main line and test. The bell will ring when the work is done properly.

Ink spots may be removed from hardwood by applying spirits of nitre. When the surface turns white, clean it with a cloth. No trace of the ink will be seen after a few applications.

A solder that will fuse at a low temperature and used in uniting soft metals is made by adding 3 drops of mercury to each ounce of common solder.

Design for Frieze Border—From the London Decorator

### Attaching New Concrete to Old

In a foundation or other structure where the strain is chiefly compressive, the surface of the concrete laid on the previous day should be cleaned and wet, but no other precaution is necessary. Joints in walls and other locations liable to tensile stress are coated with mortar, which should be richer in cement than the mortar in the concrete, proportions 1 to 2 being commonly used.

The adhesive strength of cement or concrete is much less than its cohesive strength, hence in building thin walls for a tank or other work which must be watertight, the only sure method is to lay the structure without joints. If the wall is to withstand water pressure and cannot be built without joints, both horizontal and vertical joints must be first thoroughly cleaned of all dirt and powdery scum, and then wet and covered with a very thin layer of neat cement or 1 to 1 mortar, according to the nature of the work. As an added precaution, one or more square or V-shaped sticks of timber, say 4 or 6 in. on the edge, may be embedded in the surface, or placed vertically at the end of a section, of the last mass of concrete laid each day, says The Concrete Review. In some instances, large stones have been partially embedded in the mass at night for doweling the new work next day. Roughing the surface after ramming or before placing the new layer will aid in bonding the old and the new concrete.

### Twisting Square Bars in a Bolt Machine

The accompanying sketch shows the unusual product of a bolt-cutting machine. The material used was ⅝-in. square wrought iron. One end of the bar was held in the jaws of the tap chuck, and the other end in the jaws for holding the pipe. After counting the revolutions of the spindle for the first piece, all succeeding pieces came the same by making the same number of turns, says the American Machinist.

Twisted in a Bolt Machine

The work was done cold, and no trouble experienced in making the twist uniform. The job is a good illustration of how a machine is often called upon to do something entirely different from that for which it is intended.

Place gold bronze in a ladle and heat it to a cherry red and a new copper bronze is obtained. Heat to a white heat for old copper. With a little practice in heating any shade may be obtained.

## Telephone Troubles

Bell will not ring: Cause—Broken wire in bell box, line or ground wire, short circuit if bridging is metallic, or grounded if bridged lines.

Receives and transmits a ring feebly: Cause—Bad connections in bell box or poor ground, resistance cross if bridging metallic, resistance ground if bridged grounded line.

Rings other bells strong but its own bells weak: Cause—Ringer magnet weak or armature adjustment bad.

Rings other bells feebly but its own bells strong: Cause—Generator weak or armature adjustment bad.

Receives a ring but will not ring its own bells: Cause—Wire broken in generator or armature short circuited.

Rings but cannot talk: Cause—Broken cord, bad connection or hook does not go up to place, line open if bridged.

Can ring but can get no response: Cause—Line badly grounded or broken and grounded, if bridged line open.

Cannot ring or receive a ring: Cause—Wire broken in office or line, short circuit if bridged metallic, grounded if bridged to ground.

Bell rings frequently without apparent cause: Cause—Swinging cross with telegraph or other lines.

Receiver weak: Cause—Bad connections, diaphragm bent or dirty, position of diaphragm not correct (should be 1/32 in. from magnet), or permanent magnet weak.

Speech received is strong but transmitted is weak: Cause—Speaker stands too far from telephone or the battery is weak.

Speech indistinct with a bubbling, buzzing sound: Cause—Loose connection at microphone.

Spluttering or grating noise in telephone receiver: Cause—Loose connection at battery, transmitter or hook.

Can hear but cannot talk: Cause—Primary circuit open.

Two bells ring together or two switchboard-drops fall: Cause—Office wires or line wires crossed if on common return wire, return wire broken or annunciator ground broken.

Be sure batteries are properly connected and keep them in good condition, according to the instructions posted on them. Connect one battery wire with zinc pole of battery; the other with carbon pole of battery. In connecting two batteries together connect from carbon to zinc. Never connect carbon to carbon or zinc to zinc. Battery zinc must be kept clean and free from crystals and renewed if badly eaten. The battery cell should be free from crystallized sal ammoniac and the solution should reach the neck of the jar. Battery wire connections must be carefully guarded against corrosion.—Contributed by O. R. Clark, Rockford, Ill.

## Quickly Made Sound Magnifier for Machine Lapping

When employing a power-actuated lap, the little instrument shown in the sketch is useful in determining the instant when the lap touches the work. By placing the forked end on the work

Sound Magnifier

and the wooden part to the ear, the sound is greatly magnified, and it makes it much easier to determine the precise point of initial contact, says Machinery. If one depends upon the naked ear to tell when the lap touches the work, he is liable to crowd the lap too much, and scratch the work or strip the lap. With this instrument the mechanic will know the instant the lap just touches the work, and this is the position where its work should be done. In short, the lap should not work under any pressure, but should simply touch the work. This makes it desirable to have some means of magnifying the sound, instead of depending upon the naked ear.

# READY LUMBER TABLE

**Showing the Board Feet in One Linear Foot for Each Dimension Given. One inch to 15 inches, by half inches.**

Contributed by E. W. Bowen.

| Inches | 1 | 1½ | 2 | 2½ | 3 | 3½ | 4 | 4½ | 5 | 5½ | 6 | 6½ | 7 | 7½ | 8 | 8½ | 9 | 9½ | 10 | 10½ | 11 | 11½ | 12 | 12½ | 13 | 13½ | 14 | 14½ | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .083 | 1½ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1½ | .125 | .188 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | .167 | .250 | .333 | 2½ | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2½ | .208 | .313 | .420 | .520 | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | .250 | .375 | .500 | .625 | .750 | 3½ | | | | | | | | | | | | | | | | | | | | | | | |
| 3½ | .292 | .438 | .580 | .730 | .880 | 1.02 | 4 | | | | | | | | | | | | | | | | | | | | | | |
| 4 | .333 | .500 | .666 | .830 | 1.00 | 1.17 | 1.33 | 4½ | | | | | | | | | | | | | | | | | | | | | |
| 4½ | .375 | .563 | .750 | .940 | 1.13 | 1.31 | 1.50 | 1.69 | 5 | | | | | | | | | | | | | | | | | | | | |
| 5 | .417 | .625 | .830 | 1.04 | 1.25 | 1.46 | 1.67 | 1.88 | 2.08 | 5½ | | | | | | | | | | | | | | | | | | | |
| 5½ | .458 | .688 | .920 | 1.15 | 1.38 | 1.60 | 1.83 | 2.06 | 2.29 | 2.52 | 6 | | | | | | | | | | | | | | | | | | |
| 6 | .500 | .750 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.50 | 2.75 | 3.00 | 6½ | | | | | | | | | | | | | | | | | |
| 6½ | .542 | .813 | 1.08 | 1.35 | 1.63 | 1.90 | 2.17 | 2.44 | 2.71 | 2.98 | 3.25 | 3.52 | 7 | | | | | | | | | | | | | | | | |
| 7 | .583 | .875 | 1.17 | 1.46 | 1.75 | 2.04 | 2.33 | 2.63 | 2.92 | 3.21 | 3.50 | 3.79 | 4.08 | 7½ | | | | | | | | | | | | | | | |
| 7½ | .625 | .938 | 1.25 | 1.56 | 1.88 | 2.19 | 2.50 | 2.81 | 3.13 | 3.44 | 3.75 | 4.06 | 4.38 | 4.69 | 8 | | | | | | | | | | | | | | |
| 8 | .666 | 1.00 | 1.33 | 1.67 | 2.00 | 2.33 | 2.67 | 3.00 | 3.33 | 3.67 | 4.00 | 4.33 | 4.67 | 5.00 | 5.33 | 8½ | | | | | | | | | | | | | |
| 8½ | .708 | 1.06 | 1.42 | 1.77 | 2.13 | 2.48 | 2.83 | 3.19 | 3.54 | 3.90 | 4.25 | 4.60 | 4.96 | 5.31 | 5.67 | 6.02 | 9 | | | | | | | | | | | | |
| 9 | .750 | 1.13 | 1.50 | 1.88 | 2.25 | 2.63 | 3.00 | 3.38 | 3.75 | 4.13 | 4.50 | 4.88 | 5.25 | 5.63 | 6.00 | 6.38 | 6.75 | 9½ | | | | | | | | | | | |
| 9½ | .792 | 1.19 | 1.58 | 1.98 | 2.38 | 2.77 | 3.17 | 3.56 | 3.96 | 4.35 | 4.75 | 5.15 | 5.54 | 5.94 | 6.33 | 6.73 | 7.13 | 7.52 | 10 | | | | | | | | | | |
| 10 | .833 | 1.25 | 1.67 | 2.08 | 2.50 | 2.92 | 3.33 | 3.75 | 4.17 | 4.58 | 5.00 | 5.42 | 5.83 | 6.25 | 6.67 | 7.08 | 7.50 | 7.92 | 8.33 | 10½ | | | | | | | | | |
| 10½ | .875 | 1.31 | 1.75 | 2.19 | 2.63 | 3.06 | 3.50 | 3.94 | 4.38 | 4.81 | 5.25 | 5.69 | 6.13 | 6.56 | 7.00 | 7.44 | 7.88 | 8.31 | 8.75 | 9.19 | 11 | | | | | | | | |
| 11 | .917 | 1.38 | 1.83 | 2.29 | 2.75 | 3.21 | 3.67 | 4.13 | 4.58 | 5.04 | 5.50 | 5.96 | 6.42 | 6.88 | 7.33 | 7.79 | 8.25 | 8.71 | 9.17 | 9.63 | 10.08 | 11½ | | | | | | | |
| 11½ | .958 | 1.44 | 1.92 | 2.40 | 2.88 | 3.35 | 3.83 | 4.31 | 4.79 | 5.27 | 5.75 | 6.23 | 6.71 | 7.19 | 7.67 | 8.15 | 8.63 | 9.10 | 9.58 | 10.06 | 10.54 | 11.02 | 12 | | | | | | |
| 12 | 1.00 | 1.50 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 5.00 | 5.50 | 6.00 | 6.50 | 7.00 | 7.50 | 8.00 | 8.50 | 9.00 | 9.50 | 10.00 | 10.50 | 11.00 | 11.50 | 12.00 | 12½ | | | | | |
| 12½ | 1.04 | 1.56 | 2.08 | 2.60 | 3.13 | 3.65 | 4.17 | 4.69 | 5.21 | 5.73 | 6.25 | 6.77 | 7.29 | 7.81 | 8.33 | 8.85 | 9.38 | 9.90 | 10.42 | 10.94 | 11.46 | 11.98 | 12.50 | 13.02 | 13 | | | | |
| 13 | 1.08 | 1.63 | 2.17 | 2.71 | 3.25 | 3.79 | 4.33 | 4.88 | 5.42 | 5.96 | 6.50 | 7.04 | 7.58 | 8.13 | 8.67 | 9.21 | 9.75 | 10.29 | 10.83 | 11.38 | 11.92 | 12.46 | 13.00 | 13.54 | 14.08 | 13½ | | | |
| 13½ | 1.13 | 1.69 | 2.25 | 2.81 | 3.38 | 3.94 | 4.50 | 5.06 | 5.63 | 6.19 | 6.75 | 7.31 | 7.88 | 8.44 | 9.00 | 9.56 | 10.13 | 10.69 | 11.25 | 11.81 | 12.38 | 12.94 | 13.50 | 14.06 | 14.63 | 15.19 | 14 | | |
| 14 | 1.17 | 1.75 | 2.33 | 2.92 | 3.50 | 4.08 | 4.67 | 5.25 | 5.83 | 6.42 | 7.00 | 7.58 | 8.17 | 8.75 | 9.33 | 9.92 | 10.50 | 11.08 | 11.67 | 12.25 | 12.83 | 13.42 | 14.00 | 14.58 | 15.17 | 15.75 | 16.33 | 14½ | |
| 14½ | 1.21 | 1.81 | 2.42 | 3.02 | 3.63 | 4.23 | 4.83 | 5.44 | 6.04 | 6.65 | 7.25 | 7.85 | 8.46 | 9.06 | 9.67 | 10.27 | 10.88 | 11.48 | 12.08 | 12.69 | 13.29 | 13.90 | 14.50 | 15.10 | 15.71 | 16.31 | 16.92 | 17.52 | 15 |
| 15 | 1.25 | 1.88 | 2.50 | 3.13 | 3.75 | 4.38 | 5.00 | 5.63 | 6.25 | 6.88 | 7.50 | 8.13 | 8.75 | 9.38 | 10.00 | 10.63 | 11.25 | 11.88 | 12.50 | 13.13 | 13.75 | 14.38 | 15.00 | 15.63 | 16.25 | 16.88 | 17.50 | 18.13 | 18.75 |
| Inches | 1 | 1½ | 2 | 2½ | 3 | 3½ | 4 | 4½ | 5 | 5½ | 6 | 6½ | 7 | 7½ | 8 | 8½ | 9 | 9½ | 10 | 10½ | 11 | 11½ | 12 | 12½ | 13 | 13½ | 14 | 14½ | 15 |

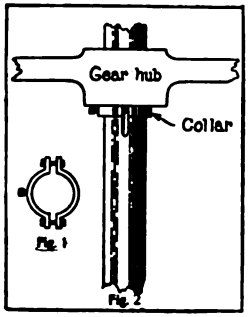
## A Substitute Boiler Compound

A contractor's plant was situated at a place where transportation facilities were not very good, and it was many miles from a manufacturing city which was their source of supply. The water used in the boilers contained so much alkali that it was impossible to run very long without cleaning the boilers from scale. No chemical or compound was at hand to be used. The engineer happened to notice some small shrubs known as sumac. He secured a quantity of the berries that are found on these shrubs and cooked them with steam in a tank, making a fluid which was used in the boilers and kept them satisfactorily clean.—Contributed by C. W. Greenleaf, Somerville, Mass.

# SHOP NOTES

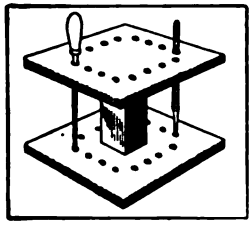
## Holding Up a Gear on a Vertical Shaft

The large wheel of a gear drive on a vertical shaft was put on with a key without a set screw, and consequently it would keep slipping down on the shaft and had to be raised every three or four weeks. As it was impossible to take it off and fix it, we had a blacksmith make a collar as shown in Fig. 1. Two pieces of iron about 3 in. long and § in. thick, bent to fit the shaft, leaving a space between the ends, were used. A set screw was placed in this collar and two ½-in. bolts passed through the ends to clamp it on the shaft. The wheel was raised to the proper place and the collar adjusted so the key on the shaft came between the ends of the collar, and the place was marked for the set screw. A small cup was cut in the shaft to receive the set screw. When placed in position and tightened up, no more trouble came from that source.—Contributed by L. F. Groger, Concord, Mich.



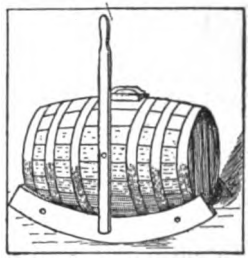

## How to Make a Tool Stand

Two boards about 16 in. square are fastened one on each end of a square post or centerpiece. An equal number of holes are drilled in each board to receive the tools as shown. The top board may be a little larger than the bottom and the holes made to slope toward the center at the bottom. If a handle be placed in the middle of the top board, this device can be used on a bench or floor, as desired.—Contributed by Harold Beecher, Toronto, Canada.



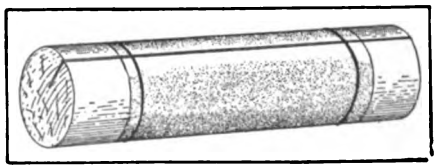
## A Home-Made Washing Machine

Secure a good water-tight cask, thoroughly cleanse it and cut a hole for a lid. The cask should then be mounted on two good rockers whose arc is small enough to give the machine a good tip downward, says the Pathfinder. A handle is nailed on to one rocker and the machine is ready. Put into the cask the warm washing solution and then follow with the laundry; clap the lid on tight, and begin to rock the machine. The cleansing is accomplished simply by the shock of the laundry and water against the ends of the cask as it tilts back and forth.



## A Sandpaper Kink

Turn an ordinary straight spindle and saw a slot in the middle on a bench saw. Place one end or side of the sandpaper in this slot and turn the sheet

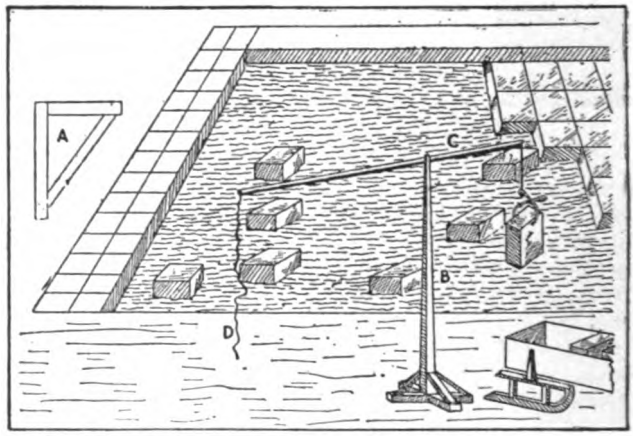


Sandpaper Kink

around the spindle. A rubber band is placed on each end to hold the sandpaper in place, says a correspondent in Woodworkers' Review. This spindle is placed in an ordinary lathe, with the sandpaper turning in the proper direction, for use in sanding irregular surfaces.

### Cutting and Storing Ice

Many farmers go without ice all summer because they think it too hard work to secure it safely packed in some sort of an ice house or shelter. Some who have the houses or sheds fail to harvest a crop on account of the cost for hired help. But the work can be done to advantage with two men if a derrick is used.

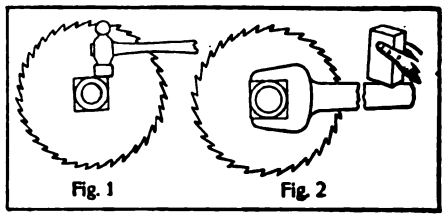



We used a regular crosscut champion tooth saw, detaching one handle therefrom, says a correspondent in Hoard's Dairyman. A square was made of two pieces of narrow fence board as shown at A in sketch, with a brace to make it rigid. This, with a 16-ft. 2-in. plank, was used to lay out and mark the squares of ice. The derrick was made by using two strong white oak poles to make the vertical post and the sweep. The vertical post, B, may be cut from any strong piece of lumber, or made up by spiking together two pieces of 2 by 4-in. studding. It should be about 15 ft. long and braced at the base as shown in the sketch. The bottom should be smooth in order to slide freely over the ice. The sweep, C, should be about 16 ft. long, or over, with a rope attached to each end as shown. The sweep is pivoted on top of the vertical post, B, from one-quarter to one-third projecting over to the side, where the ice tongs are attached to the lower end of the rope. The rope, D, at the opposite end allows plenty of leverage to handle and swing the heavy cakes up and around into the box.

After a lot of cakes have been cut loose from the ice, one man seizes the tongs and gets a cinch on the first one that comes along. The other man pulls down on the rope and elevates the cake very easily. The sketch shows how the work is done, and a load is quickly made ready for hauling to the ice house.

### Turning Nuts on Mandrels

A great many persons use a hammer to turn a nut on a mandrel where it is necessary to have a close fit. In the case of setting a nut on a saw mandrel, if a hammer is used as shown in Fig. 1, the blow would be a good many hundred pounds. The striking force of any falling body is equal to the weight multiplied by the square of its velocity, says Wood Craft. A hammer should never be used to turn a saw mandrel nut. Procure a solid end wrench that will fit the nut closely, put the wrench




Use a Solid End Wrench

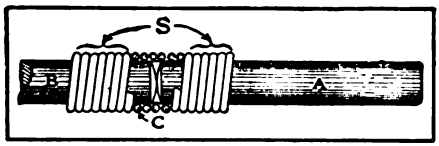
in position as shown in Fig. 2, and strike on the end of the wrench with the hand, or with a bit of wood—almost any block will answer—and the nut will be started quickly.

### How to Remove Stumps

A soft wood stump may be removed by boring a large hole, say 1 in., in a downward direction to a depth of 16 or 20 in. Fill this hole with kerosene, and as the oil penetrates the wood fill the hole again. After each filling cork the hole with a wood plug. After a month or two apply fire to the oil in the hole, which will entirely consume the stump.

### Flexible Drive for Small Boring Bar

It is sometimes desirable, when using a drill or boring bar, in cases where the bar is used in connection with guide bushings in a fixture to provide a flexible drive in order to avoid any tendency to cramp the bar. The accompanying sketch shows a simple and inexpensive form of universal joint which has been used successfully for driving small boring bars and drills

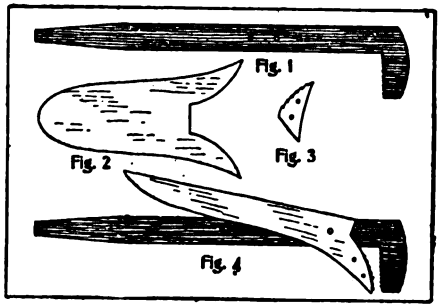



Inexpensive Universal Joint

in cases where the fixture bushings have been more or less out of line with the driving spindle. It consists of a drill or boring bar, B, and the short shank, A, the ends of each being slightly convex as shown. The spring, C, is wound close, slipped over the joint and soldered at each end as shown at S. The spring should be wound so as to fit the cores, and in such direction as to cause it to have a tendency to close tighter on the cores from the resistance of the cut, says American Machinist. The ends of the bar and shank being convex, the flexibility of the spring will readily permit of considerable deflection in the alignment of the bar and driving spindle.

### An Ever Ready Wrench

Forge an old file into the shape shown in Fig. 1, forming a screwdriver on the handle end. Cut a piece of sheet metal in the shape shown in

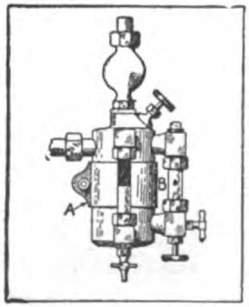



Handy Pipe Wrench

Fig. 2 and make a small piece of steel the same thickness as the handle and with small notches as in Fig. 3. Bend the sheet metal to fit around the handle and rivet the small piece of steel in between the curved ends. This piece is then placed on the handle, as in Fig. 4, and a pin inserted in a hole to suit the work at hand. This will make a handy tool for any light work.—Contributed by R. Doyle, New York.

### Repairing a Bursted Lubricator

Recently I had my 1-pt. lubricator freeze and burst, which bulged it out so at the point marked B in sketch that it was useless. After removing the body from the fittings, I placed it on an anvil and hammered it back to the original shape by light careful blows. A clasp was found which

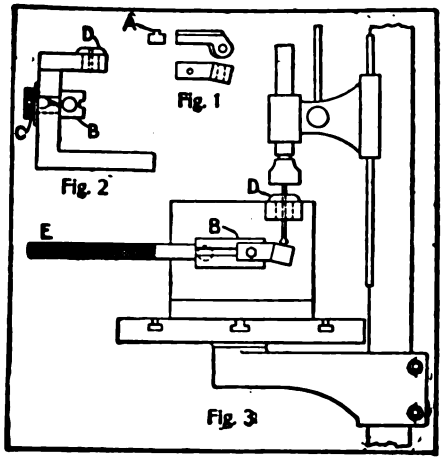



Bandaged Lubricator

I used as a bandage, A, with a piece of leather for a gasket. The lubricator worked as well as ever after placed in position, and saved the cost of a new one.—Contributed by P. W. Ostwald, Bayfield, Colo.

## How to Drill Curved Holes

The accompanying cut illustrates a method of drilling holes that follow the arc of a circle. Fig. 1 shows the piece after it is finished. The tongue-piece, A, is milled so it fits into the groove of the holder, B, Fig. 2. This holder fits closely into a hole in the angle



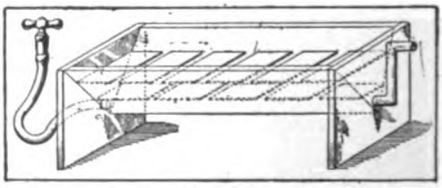

For Drilling Curved Holes

plate, and it is held against the plate by the nut C, which is just loose enough to permit the holder being turned on its axis. The drill bushing, D, is located above the work as shown. The hole through the bushing which guides the drill is made to fit the shank of the drill instead of the point, says Machinery. The drill is flat-pointed, and its shank is much smaller than the point, so that it will allow the work, when being drilled, to turn without rubbing against the shank. The reamer is of the ball type, and it is essential that the ball be round if the hole is to be accurate. The shanks of both drill and reamer are ground and lapped to fit the hole in the bushing D.

Fig. 3 illustrates the way in which the jig and the work are placed on the drill-press. The work is fastened to the holder by a bolt, as shown, and its position located with a height gauge. By pressing down on the handle, E, the work is fed against the drill, and the hole is drilled on an arc, the radius of which will depend upon the distance from the axis of the holder to the drill.

## A Simple, Effective Negative Washer

The device consists of a V-shaped trough with the end pieces square to furnish a support. It should be made of sufficient dimensions to accommodate the sizes of plates being used. A few coats of some good waterproof paint will make it practically indestructible. If for 5 by 7-in. plates the sides should measure 30 by 7½ in. and be joined together at right angles at the bottom, says Camera Craft. The water enters the washer through a piece of hose attached to the tap and fitting over a short piece of pipe at the end. After passing through the washer it leaves through a siphon formed of piping at the other end. This pipe should be a trifle larger than the inlet pipe and then there will be no danger of overflow. The plates should be placed in the washer as shown with their film sides down. Sediment or dirt cannot come in contact with the film, and instead of the water pushing the dense

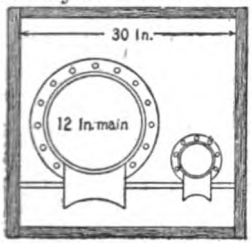


Negative Washer

hypo solution against the plates and then out over the top, as in many forms of washers, this simple device gives the plates a constant soaking in fresh water in such a position that the hypo falls to the bottom, where it is carried off through the outlet pipe.

## Placing a Pipe in an Old Trench

A corporation owning several hundred flats in Hoboken, New Jersey, proposed to heat and light them with exhaust steam from a power plant recently constructed. An old trench was




in the street 3 ft. below the pavement and 220 ft. in length from one manhole to the other. As the city would not give a permit to dig up the old trench, the construction company decided to use it temporarily for a vacuum return pipe during the winter. The trench was 30 in. square and already contained a 12-in. main with projecting flanges at the joints, and a 4-in. pipe as shown in the illustration. The heat had not been turned off from the pipes for ten years previous. After the heat was turned off and the trench allowed to cool for two days, an attempt was made to send a sewer dog through, which failed. The next thing to do was to send the smallest man employed through. The man that volunteered started on his trip with a wire attached to one foot and a string to the other. The important feature was that the string could be broken, pulled out and used as a measure above ground to locate the man for the digging gang in case he got stuck. The wire was to draw a cable through if he succeeded in getting through himself. The extremely narrow quarters, the projecting flanges at each joint, and the intense heat made the trip a perilous and extremely difficult one, but it was successfully accomplished in one hour and a half.

As a small portion of zinc greatly aids the reduction of silver in the bath, small steel articles should be brass plated instead of copper plated previous to dip-silvering. The zinc contained in the brass makes the silver appear whiter and a heavier deposit is formed.

## A Sack Holder

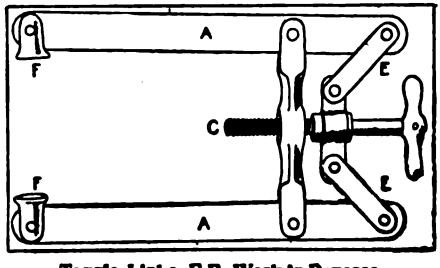
The accompanying illustration shows a very handy device that may be applied to a truck or attached to a stand of its own. It is composed of a circular piece of sheet metal that is made funnel-shaped at the top and the proper size to fit the mouth of the sack at the

Sack Holder

bottom, says American Miller. Around the bottom part is a strap attached with a clamping device as shown to hold the sack in place while in operation. The device is attached by two braces to a truck or may be fitted to a special truck frame.

## Another Pattern-Maker's Clamp

In a recent issue of Popular Mechanics an illustrated article on a pattern-maker's clamp was given. The

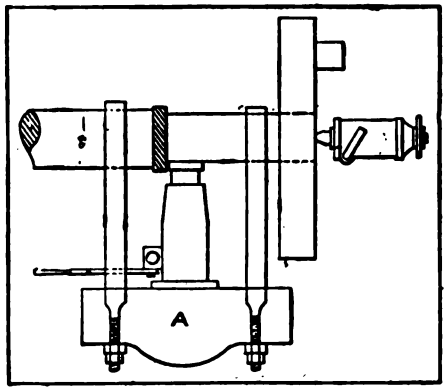



Toggle Links, E E, Work in Reverse

device as shown in the accompanying sketch is an improvement on this clamp. The toggle links, E E, work in reverse and allow the screw to back away from the work as it tightens on the material that may be clamped in the jaws, F F.—Contributed by L. N. Tanner, Lowell, Mass.

### Straightening a Large Armature Shaft

A large 7-in. direct connected armature shaft was sprung $\frac{5}{16}$-in. in one bearing close to the spiral gear. It was a case of straighten or make a new shaft. As there were two steel discs

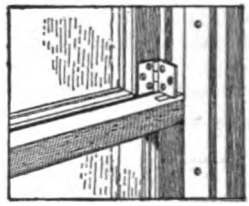



Straightening a Bent Shaft

and two spiral gears that were shrunk on and an armature to remove it was decided to straighten it. The shaft was hung in the lathe centers, and a piece of sheet iron placed on the lathe bed, on which fire brick was built up around the shaft, thus forming an arch to hold the coke. A blowpipe of air and gas was placed through the side of the arch and directly under the shaft, which was turned occasionally to get an even heat, says a correspondent in American Machinist. When red hot a 100-ton hydraulic press, A, was attached by blocking up even with the centers and using two U-bolts around the shaft with a clamp on each across the back end of the press as shown. After 80 tons pressure was placed upon it and released it still was found to be $\frac{1}{16}$ in. out of true. After repeating the operation twice with less pressure the shaft ran true. The shaft was allowed to revolve in the lathe until cold, and after filing and polishing it was replaced in the engine.

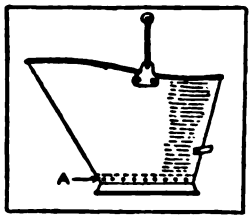
### A Lock for the Window

Secure a small plain hinge about $1\frac{1}{2}$ in. long and 1 in. wide when closed. Place the hinge on the lower right-hand corner of the upper window sash, as shown, and fasten one side to the sash with screws. This will leave the other side of the hinge to turn. To lock the window, turn the free side of the hinge as far back as possible, which brings it over the lower sash. The hinge will not be noticed from the outside, but will prevent the lower sash from being raised or the upper one lowered. When the hinge is closed it will not be in the way of raising the window.



### Increasing the Life of Coal Hods

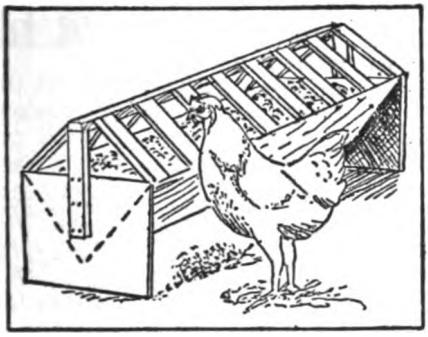
The bottom of coal hods wear through quicker than the sides on account of receiving more force from the coal and rust caused by dampness. If a wood bottom is placed on top of the metal one it will take up the wear. A piece of paper is cut to fit the bottom of the hod and used as a pattern in marking out a piece of wood. A $\frac{3}{8}$-in. thick board will do, which should be free from cracks. After marking the wood from the pattern it is cut and shaped to fit the slope in the front and back of the hod. After placing the wood on top of the metal



bottom, holes are punched through the metal sides at the bottom, as shown at A in the sketch. Drive nails through these holes into the wood bottom to hold it in. This will increase the service of a coal hod several times.

### How to Make a Poultry Feed Trough

A large feed trough to feed poultry may be made from two pieces of lumber, 6 or 8 in. wide and nailed together, forming a V-shaped trough, says the Poultry Keeper. Nail a piece of board 10 by 14 in. at each end, which will stop up the ends and also serve as legs.

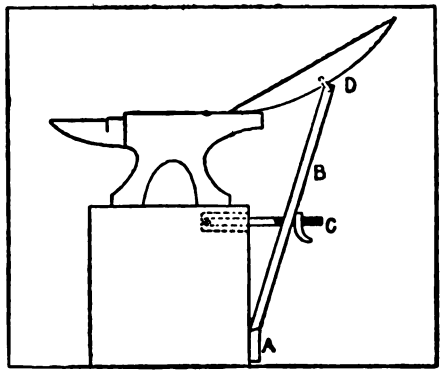


Poultry Feed Trough

On these ends nail two uprights and a strip across the top, which will serve as a handle. From this handle strip to the edge of the trough nail other strips about 3 in. apart to prevent the fowls from getting into the feed with their feet.

### Holder for Plow Discs While Sharpening

A piece of 2 by 4-in. block, A, is beveled on the upper end and fastened to the anvil block as shown. Another piece of 2 by 4-in. material, B, is fitted on top of the small block, which should be long enough to stand about 3½-in. above the anvil. A ½ by 8-in. bolt, C, with a ¼-in. hole in one end and a thread made on the other serves to hold the upright piece, B, in position. A hardwood pin, D, about 4 in. long is fitted in the upper end of the upright piece, B, to receive the disc. When the disc is heated it is removed from

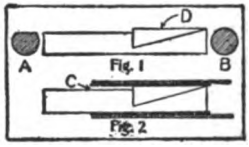



Disc Can Be Turned on Pin

the fire and placed on the pin, D, and adjustment made by the bolt C. The disc can be turned around on the pin and the hammering will be made even all around.—Contributed by Farmer Williamson, Durango, Colo.

### Removing a Broken Tuning Valve

After several trials to remove a stuck tuning valve in a horn the part on the outside was broken off flush. The problem was to remove the broken part remaining. After some thought the workman secured a round piece of brass near the

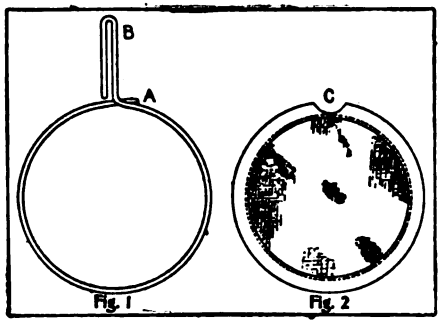



size of the hole in the broken valve. One end of the brass rod was cut out in a wedge-shaped notch as shown at D, Fig. 1, and a wedge was made to fit this notch with its outside roughened. The part of the brass rod back of the wedge was filed flat, as shown in the end view, A, Fig. 1, while the other end, B, including the wedge, remained round. This tool was inserted into the broken valve and a thin piece of metal placed in the space, C, left by the flat part filed on the rod, and used to drive the wedge tight against the broken valve part. A little heat

was applied and the part removed and repaired without trouble.

### How to Make a Water Strainer

Bend a piece of heavy wire in a circle as shown in Fig. 1, forming a handle, B, on one end of the wire and




Water Screen

the other is lapped over a little, as shown at A. This circle should be about 12½ in. in diameter. Cut a circular piece of cheese cloth about 15 in. in diameter and make a broad, loose hem around the edge, Fig. 2, cutting out a small notch, C, in the edge. After the hem is made the diameter of the cloth should be about 13 in. The end of the wire, A, Fig. 1, is inserted in the hem of the cheese cloth circle, C, Fig. 2, and the cloth is pushed around until the wire circle is enclosed in the hem of the cloth. Before pumping a pail of water lay the strainer thus made over the pail. When through pumping remove the strainer and give it a vigorous shake and hang up to dry. Two or three cloth circles should be provided, so that the one in use may be removed and dried.—Contributed by R. B. Reynolds.

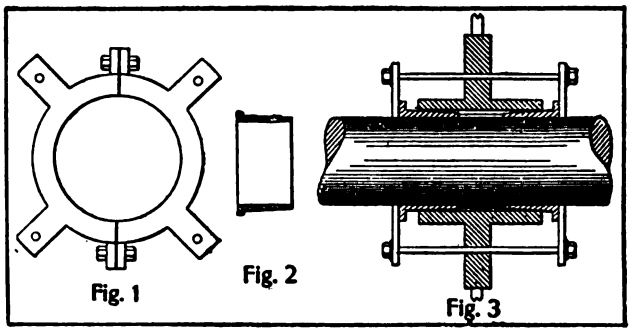
### How to Repair Lathe Bronze Bearings

File or plane the joints of the bronze bearings and after placing together cover the outside with solder. Turn the spindle to remove all wear. Center the bearings in the chuck and bore out to fit the turned spindle. Then place them on a mandrel and turn off the solder to fit the housing. Saw them apart at the old joints and place in position. This will give a new wearing surface on both the spindle and bronze bearings, making them as good as new. —Contributed by E. R. Thompson, Harvard, Ill.

It is easy to determine in what part of the country brass foundry ashes and skimmings originate when found in the hands of the metal dealer, as in New England anthracite coal is used in melting. In the West, South and Middle West coke is used.

### How to Tighten a Worn Blower Fan

A large fan in the heating system of a manufacturing plant had become quite racked. All the rivets were loose and the spiders were so worn that they did not fit the shaft by about ½ in. The shaft was 5 in. in diameter. The fan could not be spared long enough to have a new shaft made and the spiders re-bored, says a correspondent in Power. A plan was adopted as illustrated by the accompanying sketch. Two taper brass sleeves, Fig. 2, were made for wedges, the inside diameter being just a trifle over that

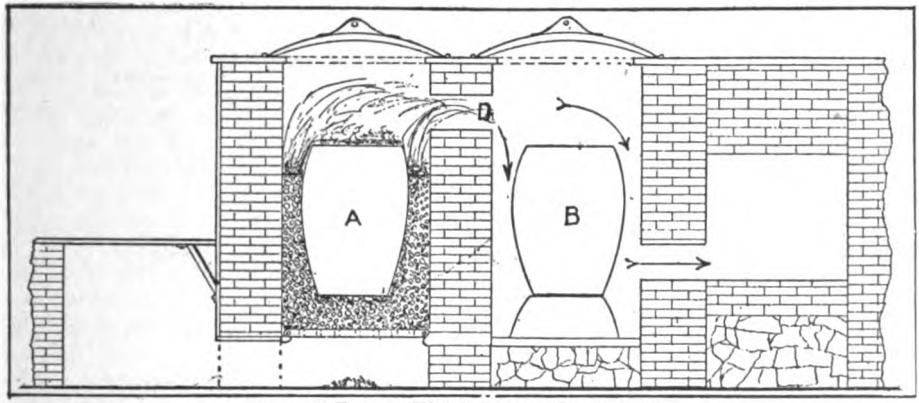



Fastening a Blower Fan to the Shaft

of the shaft, each with a flange on the thick end. Then two cast-iron spiders were constructed in four sections, and the halves bolted together, as in Fig. 1. These were bored to fit loosely on the shaft. After slipping the cone sleeves under the hub of the fan, as in Fig. 3, the cast-iron spiders were put on, one on each side, and four ⅝-in. tie-rods, with threads and nuts on each end, were passed through the holes in the spiders' arms, going between the arms of the fan. Turning up the nuts on the rods drew up the spiders and wedged the sleeves solidly in place under the fan bearing without throwing the fan off center.

## A Tandem Crucible Furnace

For many purposes the tandem crucible furnace will be found quite useful and well worth the cost of installation. Most furnaces in use at the present time are based upon the principle of the tandem furnace. The old tandem furnace was the form in which the waste heat was utilized. The furnace shown in the sketch consists of two similar ones placed in tandem, so that the waste heat from one is utilized for heating the other. If a good natural draught is had, the problem is not difficult. In constructing a tandem furnace all that is needed is to place two similar furnaces together with the flue from the second passing out from the bottom and into the chimney.



Crucible Furnace Which Utilizes Waste Heat

The first furnace is of the usual type, and the crucible, A, sets upon the coke or coal in the regular manner. The covers should close the furnace as tightly as possible, says The Brass World. The flame passes through the flue, D, into the second furnace in which the crucible, B, rests. The bottom of an old crucible is used in the furnace and the crucible sets upon it. From this furnace the flame passes through the bottom flue into the main chimney. The heat that passes into the second furnace is usually insufficient to melt copper, or even brass, but for aluminum, soft metals or warming up a crucible so that it can be introduced into the first furnace it serves a good purpose.

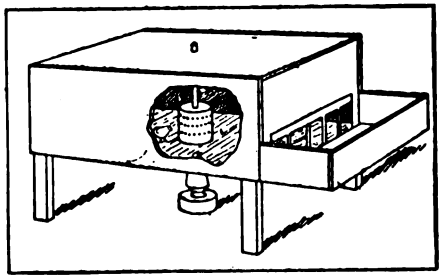
## An Emergency Bake Oven

Quite recently my wife had just gotten a dish of beans ready for cooking, when to her dismay she discovered that the gas had been turned off. She also had a pan of biscuit dough ready for the oven. What to do she did not know. More for a joke than anything else I replied, "I will show you how to cook them."

I went to the hard coal stove, shook down the ashes and dumped them and put the beans and biscuit dough in the ash pan, covering them with a tin cover, and then replaced the pan in the stove and awaited developments. I never tasted better beans and biscuit in my life.—Contributed by Charles Clement Bradley, West Toledo, Ohio.

## A Home-Made Brooder

The accompanying sketch shows how to construct a brooder that will not require much time to make, says a correspondent in the Poultry Keeper. Se-

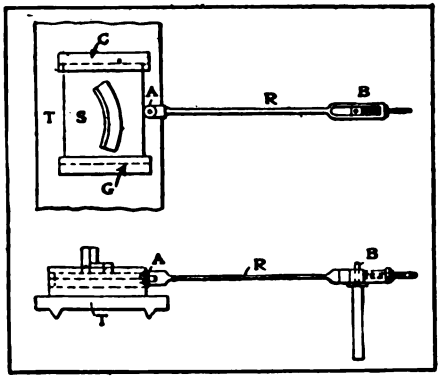


Inexpensive Brooder

cure a box and in the center of the bottom cut a circular hole just large enough to receive a common tomato can. Holes are punched in the side of the can and also a hole cut in its bottom large enough for a 1½-in. pipe. A hole is then cut in the top of the box for this pipe to extend through from the top of the tomato can, which rests on the bottom of the box, as shown. A common lamp furnishes the heat to the radiator formed by the tomato can.

## How to Machine an Arc on a Planer

The following is a description of an attachment used on a planer to machine arcs: Referring to the illustration, T is the table of the planer, S the slide moving in the gibs C and G which

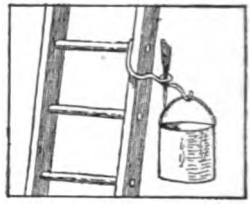



Cutting Arcs on a Planer

are fastened on the planer table. The point A of the slide and a vertical shaft, B, are connected by the rod R. This rod R is made adjustable for different radii, says the American Machinist. The part to be machined is placed on the slide and the tool is clamped on the planer head. The machined line obtained is an exact arc.

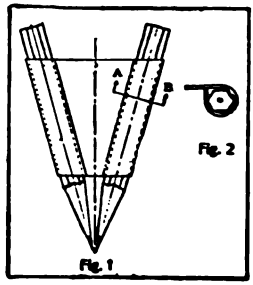
## A Paint Brush and Pail Holder

Various hooks are used by painters on ladders to hold the paint pail. In the sketch is shown how to make a paint brush and pail holder combined by using a heavy wire. A hook formed as shown may be attached to any rung of the ladder and not interfere with the climbing of the workman.



## Home-Made Instrument to Draw Parallel Lines

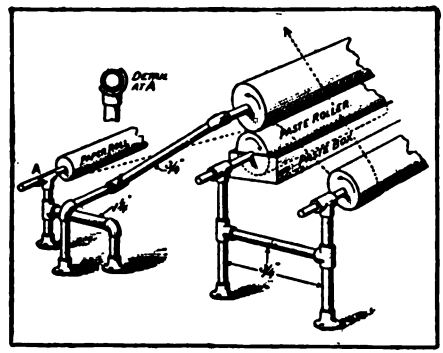
A device that consists of a thin sheet of tin or aluminum, bent as shown, with two common lead pencils held in pockets at each edge of the sheet, makes it possible to draw two parallel lines to be used as guide lines for lettering on a drawing. A cross section of the pockets, A B, is shown in Fig. 2. The pencils may be moved up or down to vary the spacing of the lines, and can easily be removed for sharpening, says American Machinist. This instrument is a time saver, but its chief merit lies in the fact that by its use the lettering on a drawing is more uniform in height than when the guide lines are spaced by guess.



## How to Make Pipe Coverings

Coverings may be made in small shops by means of rolls supported by pipe and fittings as shown in the sketch. Coverings are composed of a layer of asbestos paper, then wool felt building paper and finally a canvas jacket. The size depends on the size of pipe used and wooden rolls must be provided for each size of pipe. These rolls are divided longitudinally into halves so that the end of the paper can be clutched between them when the rolling of the paper is started. The roll of wool felt is mounted on an iron pipe which, extending beyond the roll, is supported by a tee cut longitudinally to serve as a bearing for each end of the pipe roller, as shown at A in the sketch. The paper in unrolling is then passed between two rolls, the lower one of which is partly submerged in paste in a box for holding the paste, so that the wool felt in passing over the roll receives an application of the paste carried up by the roll in its turning. The upper roll serves as a weight to bring the paper in close contact with the paste roller and also to squeeze the wool felt against the roller so that only the proper amount of paste is used, says The Metal Worker. The paper is then passed over an idle roller, and is finally drawn to the work bench, on which is mounted the wooden form needed for each size of pipe. It will thus be seen that it is only necessary to keep rolling the wool felt on the form, after the single thickness of asbestos paper has first been applied, until the desired thickness is obtained, when the covering is ready to be dried before wrapping in the light canvas protection.

The finished roll will dry quickly in an ordinary atmosphere, but if made at times when it should not dry quickly, mold might set in and the paste not set properly. A small drying room may be constructed and heated with a set of horizontal pipes connected at the ends by return bends to be used for the circulation of hot water. The coverings are stacked vertically in this drying room and when the hot water is circulated the heat serves to drive off

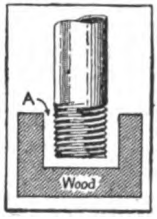



Making Pipe Coverings

the moisture from the paste quickly. The water may be heated by a gas water heater using illuminating gas and placed just outside the drying room. A small circular saw is used for trimming the ends of the coverings when finished, although where a large quantity is not made a common hand saw will answer the purpose.

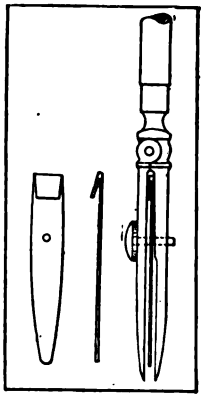
## Home-Made Pipe Cap

Bore a hole in a block of wood about 1 in. deep and $\frac{7}{8}$ to 1 in. larger than the pipe on which the cap is to be used. Plug the threaded end of a short piece of pipe with putty or clay. If clay is used, it must be dried after placing in the pipe. Hold this plugged end of the pipe in the hole made in the wood block, allowing equal distances on the sides as well as the end, as shown in the sketch. Pour into the space, A, around the pipe threads melted lead, and when cool the pipe is unscrewed. By adding some zinc to the lead a cap can be made that will hold the pressure of most city water mains.—Contributed by James E. Noble, Toronto, Canada.



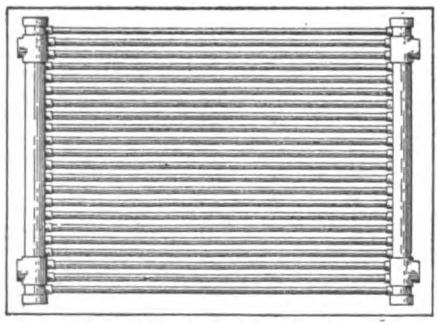
## Increasing the Ink Capacity in a Drawing Pen

The ordinary drawing pen will not hold sufficient ink to enable one to draw a broad line of reasonable length. A simple attachment as shown in the sketch will supply the pen to be used with plenty of ink for broad lines, says the American Machinist. A thin piece of steel is filed and bent to shape. A hole is drilled a little smaller than the diameter of the adjusting screw of the pen. When screwed in, the strip is kept tight on the screw and central between the nibs. The strip can be swiveled around so that the pen may be easily cleaned, and can be taken off when not in use.



## A Home-Made Boiler Grate

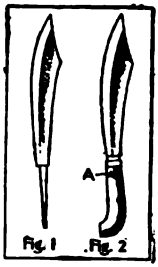
A construction company had to ship their outfit a considerable distance and when putting their power plant in order found that the grates for the boilers were lost in transit. As it was several hundred miles from a manufacturing plant, the engineer had to construct a makeshift grate for immediate use. Some old ¾-in. pipe, including some fittings, was found about the place. Two pieces of 2-in. pipe were cut as long as the width of the firebox. A malleable 2-in. tee was placed on each end of the pipe. One side of each 2-in. pipe was drilled and tapped, one with right hand and the other with left hand threads, to receive the ¾-in. pipe. Threads were cut on each end of the ¾-in. pipe, one end with right hand and the other with left hand threads, leaving a long thread and making them the length of the firebox. Collars were made by cutting small pieces from 1-in. pipe and tapping one set with right hand and the other with left hand threads. When putting the whole device together, as shown in the sketch, the collars were used as locknuts on each end of the ¾-in. pipe. The 2-in. pipes were capped on the ends, leaving the opening in the tee to form a circulation of air through the pipes. Water was kept in the ash pit and this device was used for several months without a sign of burning out.



Home-Made Boiler Grate

## How to Fit Handles to Carving Knives

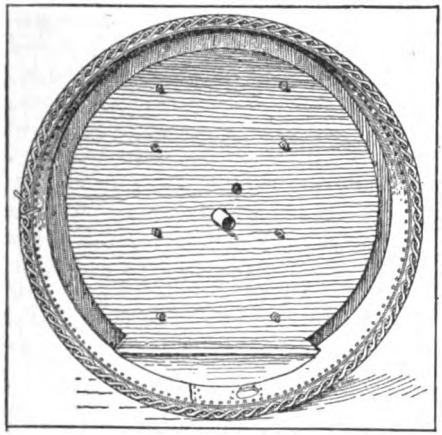
The shank of the blade should be forged the same shape as a flat file shank, tapering and square, as shown in Fig. 1. A piece of wood is secured and a hole bored in the end to receive the shank. The wood should be dressed to the shape desired for a handle while on the shank to keep it straight with the blade. After removing the blade, bore a ⅜-in. hole through the handle, A, Fig. 2, and wrap the handle with paper, covering the hole, A, and extending it over the end of the handle about ½ in. The shank of the blade is again placed in the handle, and while held in an upright position melted solder poured into the space between the paper and the blade. This will fill the space around the square shank and the hole A, and will make a



ferrule at the end of the wood handle. This will always hold the blade solid in the handle. Solder must be used and not babbitt.

### Gasket Made of Wound Asbestos Cord

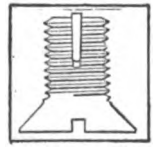
This is a simple method of making a gasket or washer of ⅜-in. wound asbestos packing, or cord. The cords are alternately passed around short bolts, as shown by this tank, which is used to separate crude oil from the sand brought up by the pumps. It is subjected to a slight steam pressure when the lid is on.



Asbestos Packing Gasket

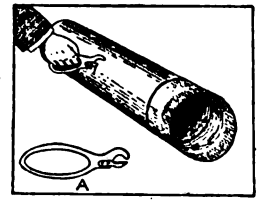
### How to Tighten a Worn Screw

A screw was worn so that it was too small for the hole in a certain place on a printing press, and not being able to obtain one of suitable shape and size, a correspondent in Machinery used the old one by placing it between two pieces of wood in a vise and cutting a slot as shown in the sketch. The slot was opened a little and a flat iron wedge driven in. The screw was then turned into its place, where it held as good as a new one. This method could be used also with bolts where the nut will not stay.



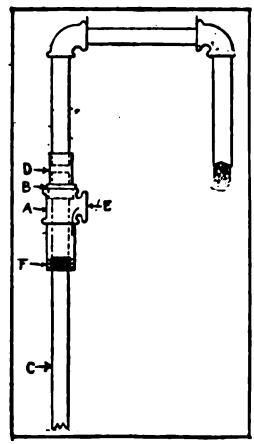
### How to Cut Stovepipe

Where short joints of stovepipe are needed the cutting of them with tinners' shears or a chisel does not make a very good piece of work. Use a common can opener as shown at A in sketch and the work will be easily done and the ends will have a smooth edge.—J. E. M.




### Emptying Oil Barrels with Compressed Air

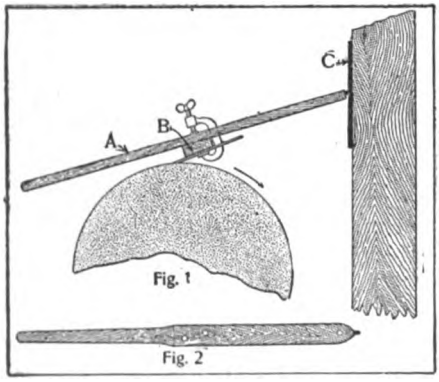
A great many barrels of oil had to be emptied and, as compressed air was close at hand, a correspondent in Power made a device as illustrated to do the work. On one end of a 7-in. length of 1-in. pipe, threaded at both ends, was screwed a 1-in. tee, A, and a 1 by ½-in. bushing, B, was turned to one side of the tee. A long thread was cut on one end of a 35-in. section of ½-in. pipe, and in the other end were filed four notches ⅛ in. deep. This end of the long pipe was inserted in the 1-in. pipe and the threaded end of the ½-in. pipe was turned into the bushing, ½ in. of the thread extending from the top to receive a ½-in. coupling, D. One end of a 16-in. section of ½-in. pipe, which was threaded on both ends, was inserted into the coupling, and an elbow turned on the other end. The side outlet, E, of the tee was used for the air connection.



A 1⅛-in. hole is bored into the bung of the barrel and the free end of the 1-in. pipe, F, turned into it. The compressed air connection may be made by means of a rubber hose, or any suitable means will do. By being careful not to use too much air pressure, the device will empty a barrel in five minutes as thoroughly as if drained.

## A Holder for Tool Grinding

Edge tools, such as chisels and plane irons, are now put on the market




Holding Tools for Grinding

ground and honed, but the ordinary shop appliances for grinding them are often far from satisfactory. Every worker knows that the bevel on the cutting edge of a plane iron or chisel should be uniform and flat, but there are many workmen that will hold these tools in their hands and attempt grinding without the aid of any support. More often the result is a convex instead of a flat or concave bevel. The accompanying sketch shows a device for holding these tools while grinding. A wood bar, A, Fig. 1, is made from 1 or 1¼-in. material, about 2½ in. wide and 3½ ft. long. Fig. 2 shows the top view of this bar. One end is shaped into a handle, into the other has been turned a screw the depth of the threads, the head is clipped off and the end of the shank filed rounding for a pivot. The block B, 4 or 5 in. long, and the width of A, is screwed to it and carries the tool to be ground. In this case the tool is a plane iron clamped to the block with a thumb screw.

On the post just back of the grindstone is fastened a strip of ⅜ by 1-in. iron with holes drilled in a row about ¾ in. apart and numbered. These holes should only be drilled a part of the way in the metal. When the plane iron has been clamped to the block so that the cutting edge is not more than 1 in. ahead of it, the pivot is set in any hole and the iron dropped on the stone. A few seconds of grinding will show the new bevel and if this should not be what is wanted, set the pivot in another hole and try again. Not more than one or two changes will usually be required. When the proper hole has been found note its number.

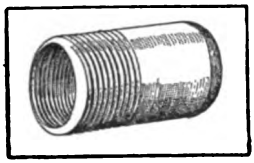
With this device the stone may be turned by one hand and the tool managed with the other. Even on a power-turned stone one hand is better than two, says Wood Craft. The tool may be turned over as many times as desired in the process of grinding to note its progress and it drops back on the same bevel when replaced. Should the pivot slip out of the hole, be sure and replace it in the same hole. It is rapid and accurate, and even in the hands of a boy it is quickly mastered and gives the best of results.

## Wheelbarrow Bucket for Handling Concrete

This wheelbarrow was designed for the handling of concrete. The central stem by which the bucket is hoisted carries a wheel, so that, with handles attached, the bucket becomes a wheelbarrow. The handles are detachable. The proportions of concrete are measured by rows of rivets around the bucket. It is also adaptable for handling coal, earth and other materials, and can be hoisted.

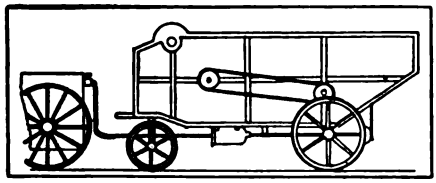
### Quickly Made Pipe Reducer

If in doing some pipe fitting you do not have a reducer at hand you can make one out of a pipe coupling. Place the coupling on the end of a pipe and clamp the whole in a vise. Cut threads about one-half the way over the outside of the coupling and you will have a first-class reducer.—Contributed by Wm. Erickson, Chicago.



### Steam Brake for Threshing Machines

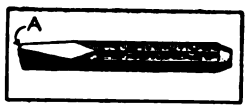
The modern method of threshing is not only one involving power for operation, but the same power is used to draw the outfit from one place to another. These wagon trains often have steep hills to descend which call for considerable skill to prevent the train from running away. A recent invention has provided a wheel brake operated by steam from the boiler of the traction engine. The steam pipe is carried beneath the bodies of the several vehicles the entire length of the train and is controlled by the engineer.



Wheel Brake Operated by Steam

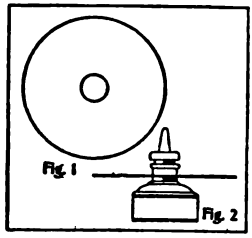
### A Tool for Cutting Hardened Steel Wire

Pliers and chisels are often spoiled by trying to cut hardened steel wire. Grind the chisel with a face about $^1/_{32}$ in., as shown in the sketch at A. This will cut the wire without injury to the tool.—Contributed by G. M. Coleman, Sandusky, O.



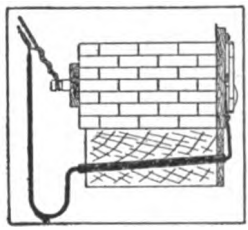

### Keeping an Ink Bottle from Turning Over

Cut a circle about 5 in. in diameter from a heavy piece of cardboard. Make a hole in the center that will fit tightly over the neck of the bottle as shown in Fig. 1. After it is placed on the neck of the bottle, Fig. 2, the bottle cannot turn over far enough to spill the ink.




### How to Attach Drop Wires

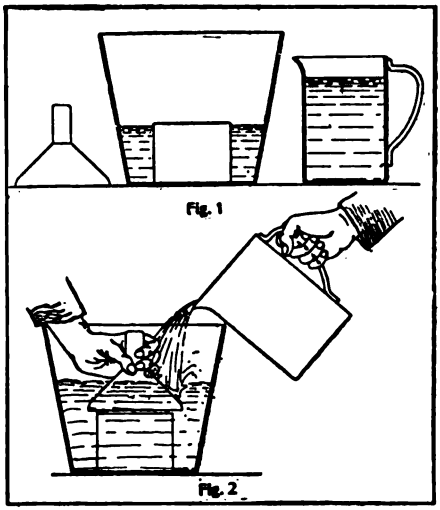
The following rules have been found to cover the installation of drop wires to an extent sufficient to insure good work: Drop wires are to be securely fastened to the outside of the building by means of heavy knobs and screws, and left long enough to project through the window casing and up to the protector. About 6 ft. of wire will be sufficient. The drop wire must be run through the window casing in tubes of approved insulating material. In boring the holes through the window casing for the tubes they must be bored so that they will have a slant downward of about $\frac{1}{2}$ in. in 6 in. toward the outside of the building, says the American Telephone Journal. This will prevent water from dripping through the tubes into the building. The tubes must be cut long enough to allow a projection of about $\frac{1}{2}$ in. on the outside of the window casing, and must be cut of the requisite length for the casing on the outside. Just before the drop wires reach the outside ends of tubes they are to be bent into a drip loop, to prevent water from following the wires into the building. The holes



for the tubing must be bored not less than 2½ in. apart, nor more than 5 in. The drop wires always must run directly to the posts marked line on the protector.

## How to Harden Fine Circular Saws

Secure a bucket, a can or small pail and two pieces of flat-surfaced material larger than the saw to be hardened. Place one of the blocks in the bucket and fill with water barely to cover, as




Hardening Circular Saws

shown in Fig. 1. Have the can or small pail filled with water and within reach. The saw is now given the proper heat and quickly placed on the block in the pail and the other flat piece placed on top immediately, the whole being quickly covered with the water from the can or small pail. The result will be a hardened saw free from warps.

According to L'Electricien, a Vienna firm has recently placed on the market brushes made of glass, which are to replace emery cloth for cleaning and polishing the commutators of dynamos and motors. These brushes are said to clean the commutators without scoring the metal, and their use avoids the inconveniences and dangers of emery cloth.

## How to Remove Old Putty

Remove the window sash and lay it flat on a table with the putty side up. Take a common spring-bottom oiler filled with gasoline and squirt a small quantity of gasoline on the putty all around the sash. Apply a match and the heat of the burning gasoline will soften the old hard putty so that it can be removed with a putty knife without cutting or defacing the sash. If the putty is very hard a second application of the gasoline may be necessary.

## Making a Well House

A well house helps to keep the water in the well cool in summer, and also prevents the pump from freezing in the winter. If it is constructed along the lines as shown in the illustration, a well house may be made to add beauty to the surroundings, says the Country Gentleman. The one here shown is built directly upon the usual square well platform of plank, this being allowed to project some 6 in. all about the house. The roof is made to curve gracefully out to the eaves that overhang the walls. If the doorway is on the north side, no door need be used during the summer; but this should be in place in the winter, and the latticed windows should then have a sash fitted to them, or one opening can be fitted with sash and the other two covered with board shutters. A few vines or a shrub or two may be planted at the base of the walls to add to the attractiveness. So simple a little building can be easily made by the household mechanic.

## THE LAUNCHING OF LAUNCHES

A 16-ft. launch is light and buoyant on the water, but it becomes a dead weight on land and requires several men's strength to haul her on the beach. Boats of larger size increase so rapidly in weight that tackles are found necessary, and boards, rollers, beams, or even regular sliding ways, are required, according to the size of the boat.

One of the handiest contrivances for a skiff is to fasten a sort of caster to the after end of the skeg, as shown in Fig. 1. It makes but little resistance in rowing through the water, but enables one man to take hold of the bow and walk up the board runway as if the skeg were a wheelbarrow.

Small launches are hauled out by laying parallel boards on the beach, inserting rollers made by sawing some round spar into 2-ft. lengths. A spar about 4 in. in diameter will do, though one of 6 in. will work easier; or rollers of iron pipe will suffice.

A launch 30 ft. and upwards becomes too heavy to haul on rollers, and must be handled on grease. This requires heavier stringers than a plank, says the Motor Boat, from which this article is condensed.

Get four pieces of 6 by 6-in. spruce or yellow pine; the former is preferable, as it is far lighter to lug about, though the latter is better if they are to be left down for steady use as stringers. The longer they are the better, as there will be fewer joints to go over and get out of line. Where you join the two lengths of stringers be sure the two ends are on the same blocking, as shown in Fig. 2. Two edges of each stringer should be planed up smooth. Lay them so one edge is up, the other on the outer edge, and measure with a stick so as to get the two parallel.

This forms the foundation or track to haul on, and is all one needs in tidal waters, as one length can be laid at low tide and held from floating away by being nailed to stakes driven down into the sand or mud bottom at intervals along each side of the stringers, as shown in Fig. 3. For fresh water, where there is no perceptible rise or fall in the water level, it is necessary to board across on the lower edge of

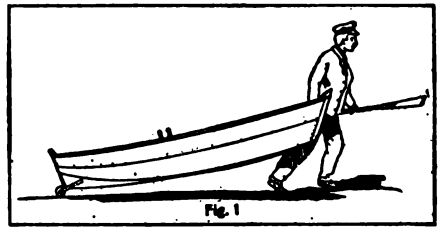
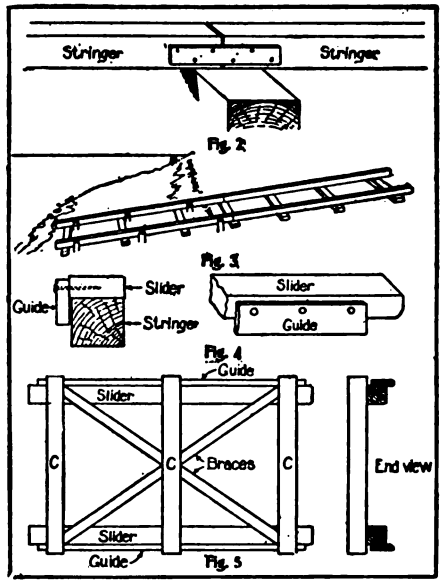


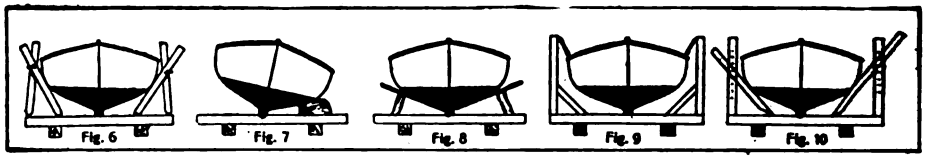
Fig. 1

the stringers at each end, particularly the outer end, as that has to sink the most. By piling rocks on these boards after floating it so the outer end is in deep water, it can be sunk into place.

The sliders or cradle to hold the yacht is now to be made. For this get two pieces of 4 by 6-in. spruce, 8 to 10 ft. long, planed upon one side, with the ends slightly rounded like a runner on a sled. To keep these sliders from slipping off the stringers, get some 2 by 6-in. yellow pine or oak, about as long as the sliders, and bolt them so




they lap down about 2 in. below the sliders, as shown in Fig. 4. Then lay the two sliders the proper distance apart, about 6 ft. for a 30 to 40-ft.




launch, wider, of course, for larger boats, and within a foot or so of each end lay a cross-piece, C, Fig. 5, of 6 by 6-in. oak or yellow pine, and through-bolt them to the fore and aft sliders with two bolts of about ½-in. iron; countersink the heads well into the under side of the sliders, so they will not scratch.

If the launch is very heavy, any number of extra cross-pieces can be laid across to carry her; but be sure and toe-nail them down or they will float away when in the water.

To prevent this cradle from shutting up like a parallel rule, cut two diagonal braces forming an X of, say, 3 by 6-in. spruce, and spike them fast to the sliders as shown in Fig. 5.

To haul this cradle a temporary arrangement can be made by simply making a long loop in the ends of a good piece of 1-in. rope and hooking them over the outer ends of the fore and aft sliders. A wire nail or two will hold them in place there. Several methods are used to increase a man's power to haul this cradle with a launch on it. If the beach is flat and not very much slope, three or four men can move the cradle and launch; but if there be a steep grade, greater power is needed. This can be supplied either by a horse or by making a wooden "crab," as the trade calls it; the novice would probably call it a capstan or winch.

We now come to the various ways of putting and holding the launch on the cradle to prevent her falling over. Most launches have very shallow keels; they are nowhere near as difficult to block up as the deep, narrow-keeled sailboats.

With a great many launches all that is necessary is to float them on to the cradle and slip a block of wood under one side, letting them list or tip over on to that block, and straightening them up after they are high and dry as shown in Fig. 7. Another way is to slip a plank under each bilge and then jam in a brace under it, as in Fig. 8.

Cradles that are to be used repeatedly are sometimes fitted with regular sliding bilge blocks, or upright posts securely braced with tackles at the top to hold the boat as in Fig. 9; others have two slant arms pivoted to the middle cross-piece on the cradle like a pair of scissors, as in Fig. 6. In some the outer uprights are stationary and doubled, so the inner arms work up and down between them, as in Fig. 10. As soon as the launch is securely grounded on the cradle a bolt is slipped through holes in these arms so it holds the slanting arm up against the bilge. In others both arms pivot and accommodate any angle, being held by a boat-clamp when up against the hull.

## REMEDY FOR A LEAKING FOUNTAIN PEN

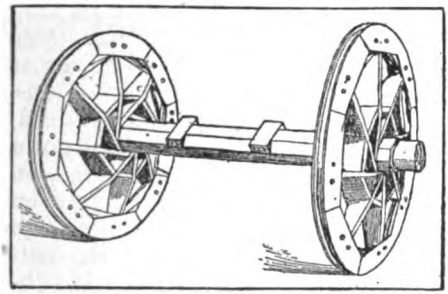
If the threads in the rubber connection of a fountain pen are worn a little the joint will leak enough to soil the fingers. Dry the threads with a blotter and cover them with melted paraffin. Turn the nozzle into the barrel while the paraffin is still warm and you have an ink-tight joint.—Contributed by Bruce W. David, Meadville, Pa.

Overheating of gas engine cylinders may be due to improper flow of water through the cylinder water jacket, to the water jacket having become coated with scale or to have an accumulation of dirt in it, says the Practical Engineer. The temperature of the outflowing water should not be greater than 140 deg.; some makers of gas engines advise that it should be as low as 100 to 120 deg. Fahrenheit.

# SHOP NOTES

## Home-Made Spool for Oil-Drilling Rig

A solid wooden shaft is made from a piece of timber about 14 in. square. This is trimmed in the shape of an octagon. This shaft is supported on axles

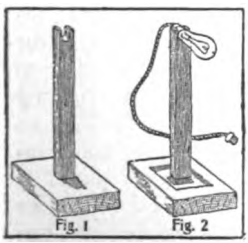


Oil Drillers' Spool

at the ends. The wheels are about 8 ft. in diameter and built up with spokes made from 2 by 12-in. planks nailed to the flat sides of the axle and braced by connecting pieces of the same material. The right-hand wheel is used to propel the spool, either by hand or with a rope drive from an engine. Pegs are inserted in the rim of the wheel to be used when operated by hand. A strap brake is placed on the other wheel.

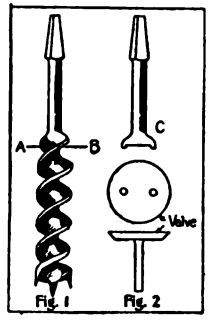
## Home-Made Electric Light Stand

The accompanying sketch shows the construction of an electric light stand for the drawing table. A 6-in. square block is nailed to a 1 by 1½ by 12-in. strip of wood, which is notched at its upper end, as shown in Fig. 1. The square block may be hollowed out, as shown in Fig. 2, to receive tacks or instruments. The notch in the upper end of the strip is fitted to receive the electric socket.



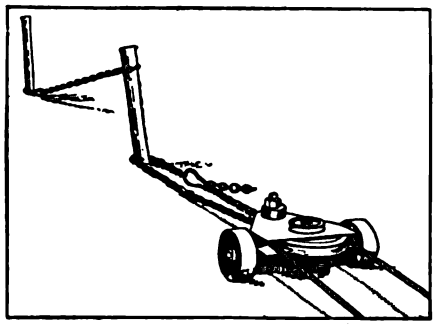

## A Home-Made Tool for Grinding Valves

The valves in gasoline engines and automobile motors sometimes need to be ground so they will fit closely to their seats. A very handy tool for this purpose may be made by using a carpenter's old bit and bitstock. The bit is cut off on the line A-B, as shown in Fig. 1. The end of the remaining part is shaped as shown at C in Fig. 2. If there are no holes in the top of the valve, drill them as shown to fit the tool. A few turns with this tool, using a little fine emery on the valve seat, will make the valve fit closely.




## How to Fasten a Dead Sheave Pulley

The accompanying sketch shows how to fasten, as well as the construction of,

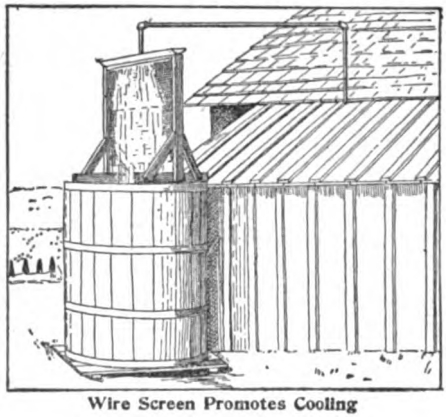


Dead Sheave Pulley Fastened

a dead sheave pulley for moving structures. The sheave pulley is mounted on two wheels for easy transportation, also to keep the cable from touching the ground when in operation. Two stakes fastened with chains as shown will hold it in position.

### Cooling Water for a Large Gasoline Engine

A method of increasing the cooling capacity of a water tank in connection with a large gasoline engine is shown

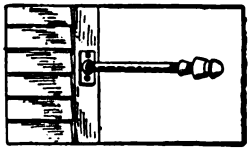


Wire Screen Promotes Cooling

in the accompanying sketch. Galvanized wire netting of about ¼-in. mesh is fastened to a frame above the tank. On top of this frame is a metal trough that receives the hot water coming from the engine through a pipe. The water spills from the trough on the wire netting, which causes it to spread and run down into the tank in a thin sheet. This greatly aids the cooling of the water.

### Quickly Made Extension Insulator Arm

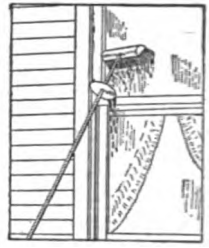
Sometimes it is necessary to use an extension for an insulator on buildings.



This may be made quickly by using a 1-in. waste nut into which is screwed a 1-in. pipe of the proper length. The wooden pin holding the insulator is turned to fit the end of the pipe. It is connected and fastened to the building, as shown in the sketch.—Contributed by George Thorpe, Jr., Millville, N. J.

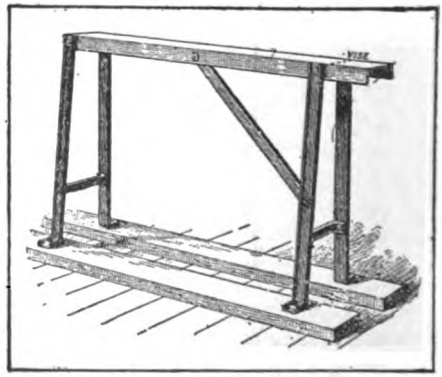
### A Window Washing Kink

When washing windows it is very disagreeable to have the water run down the handle of the washing brush, on to the hands and into your sleeves. Cut a circle of leather from an old boot sole and slip it over the handle of the brush, as shown in the sketch. This will sidetrack the water at the point where the leather is placed.



### A Pipe-Fitter's Knock-Down Bench

A form of knock-down bench suitable for the work of the steamfitter is illustrated in the accompanying sketch. The bench is comprised altogether of metal, in the form of channel irons. It is light and at the same time rigid. When partially taken apart it can be folded into little space, to be carried from or about a building, says the Metal Worker. The top of the bench is made from a channel 5 ft. long and 8 in.

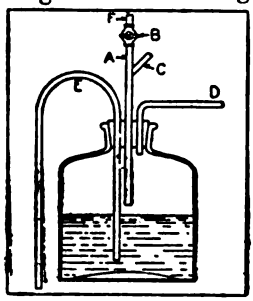


Knock-Down Bench of Channel Irons

wide, which is supported by legs of channel 3 ft. long. The two pairs of legs are bolted to two long planks, these being long enough to assist very materially in the stability of the bench. For general convenience the planks and the bench as a whole can be moved from place to place. When it is desired to carry the bench some distance it is only necessary to loosen the legs from the planks and turn them parallel with the large channel.

## How to Make a Water Pressure Blowpipe

Secure a jar with a large tight-fitting cork. Referring to the sketch the



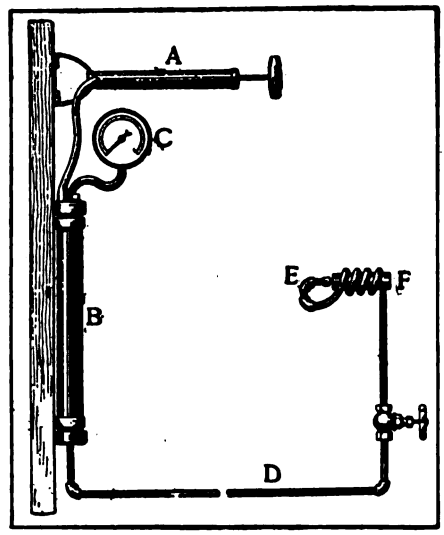

pipe F is connected to a tank or city water pressure. The open projecting pipe, C, allows the air to mingle with the water as it flows into the jar through the pipe A. The air as it is compressed will pass out of the tube D, which is connected to the blowpipe. The water is syphoned off through the pipe E. The valve B is used to regulate the flow of water.—Contributed by D. Jennings, Clear Lake, Iowa.

## A Slipping Belt Starts a Flame

A peculiar incident occurred recently in a mill at Stockton, Utah. An ⅛-in. rubber belt, which had been frequently "doped" with cylinder oil to make it pull, became badly worn. It finally slipped on the pulley and the friction ignited the oil-soaked and frayed belt and it blazed and burned in two. It then wrapped itself around the shaft, and the whirling motion fanned the flame, which burned until it reached the part that was tightly wrapped to the shaft, where it burned out.

## A Home-Made Brazing and Tempering Torch

All jobbing shops have a call at some time or other to do brazing and the forge fire is not the proper one to heat the parts to secure a first-class job. A torch using gasoline or kerosene will furnish a much better fire, and such a device can be constructed by anyone




Home-Made Brazing Torch

of mechanical ability. Make a tank, B, as shown in the illustration, by using a piece of 2-in. pipe 20 in. long and covering the ends with caps. Three holes are drilled in the top cap, to one of which the rubber tube from a bicycle pump is connected, a steam gauge, C, is attached to another, and the remaining one is fitted with a screw plug and used in filling the tank with fuel oil.

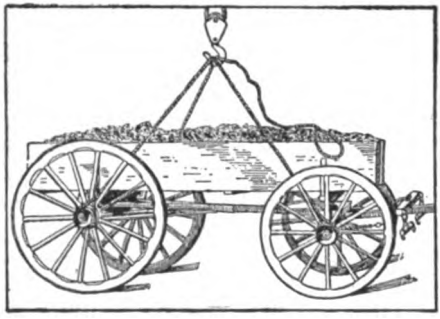
A hole is drilled in the bottom cap of the tank and connections are made with ⅛-in. pipe, D, which may be of any length to suit the surroundings. About 10 in. of the end of this pipe is first filled with lead and coiled around a 1-in. pipe, F, 6 in. long, turning the end out so as to receive the two elbows and a short nipple. When the coil is finished the lead is melted and run out. A small hole is drilled in the center of an ⅛-in. cap and placed on the end

of the pipe, as shown at E. The hole in this cap must correspond with the center of the pipe F. It is necessary to have a globe valve placed somewhere in the ⅛-in. pipe to regulate the flow of oil in the burner, and also shut it off when not in use. To generate it have a little cup or can of some kind that will hold three or four teaspoonfuls of oil and fix it to hang just below the coil while burning.

If one burner is not sufficient to heat the work two may be connected on the same pipe with a tee, so they will throw their blasts together.

## How to Remove Dirt from Excavations

A contractor who is excavating the cellar for a new skyscraper in Chicago has hit upon a method of avoiding the expense and effort of removing excavated material by mule power. It is as simple as it is effective, and, of course, the wonder is that no one thought of it before.

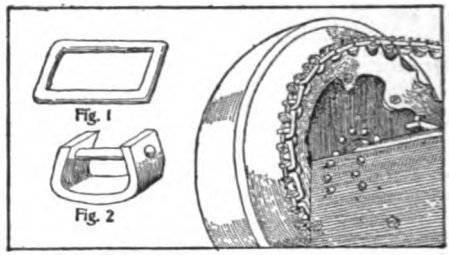


Removing Dirt from Excavations

The usual way is to build an inclined roadway into the hole, up which small loads of dirt are dragged by double teams. The new method avoids all this by lifting the loaded wagon bodily out of the excavation by means of a derrick and four looped cables, as shown in the illustration. Each loop is passed between the wagon body and one of the wheels, between the spokes and over the end of the hub. When each loop is securely in place the signal is given to hoist away, and in a few seconds the whole outfit—2 cu. yd. of earth and a big wagon—is lifted up through the air and swings to the brink 20 ft. above. A team is waiting to be hitched on and draw the load away to the dump.

## How to Make a Heavy Drive Chain

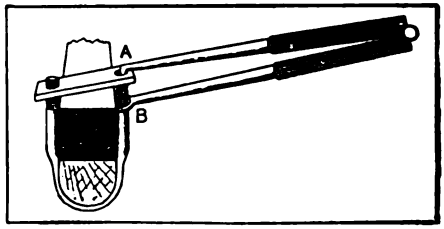
The accompanying illustration shows the construction of the parts to make a heavy chain that will not break. One part of the link is made from ¾-in. round iron and formed as shown in Fig. 1. The other part is made in the shape of a U from ⅝ by 2½-in. wrought iron with a hole drilled through the upper ends. After placing the links together to form the chain a pin is inserted in the holes drilled through the U-shaped piece and riveted.




Making Heavy Chain

## A Tool for Placing Axle Clips

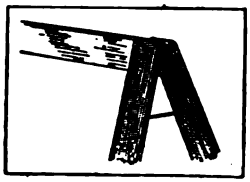
The device is made by using the joints from an old buggy top. A hook, A, is made on one end and a fork, B, on the other. When closed the hook should center in the fork. To place the clip in position the device is applied as shown in the sketch.—Contributed by P. E. Bolstad, Lake Mills, Iowa.




For Placing Axle Clips

### A Folding Carpenter's Horse

Not only when doing little jobs of carpentering, but also in many other operations, such a support as illustrated is found necessary. This horse is an improvement over the ordinary stiff affair in that it shuts together when not in use, and so can be packed out of the way, says a writer in New England Homestead.

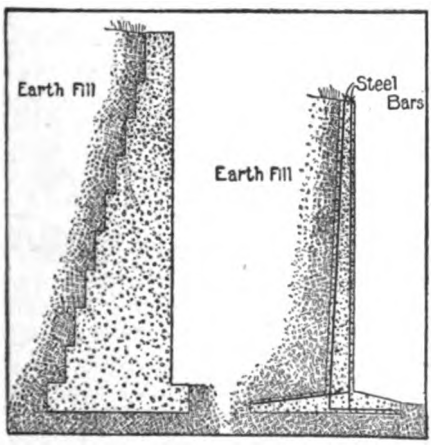


The horse is made of boards cut in strips, the two horizontal boards at the top being hinged together. While in use the legs are kept apart by a long hook, as shown in the sketch.

### Cost Reduced in Building Concrete Walls

In some cities the engineering problem of retaining and area walls to support and hold back earth banks is of more than passing interest. Concrete is the most suitable material for the construction of such walls and the accompanying cut shows two styles of design, the ordinary plan and the reinforced wall. The reinforced construction is coming into general use on account of its strength and economy.

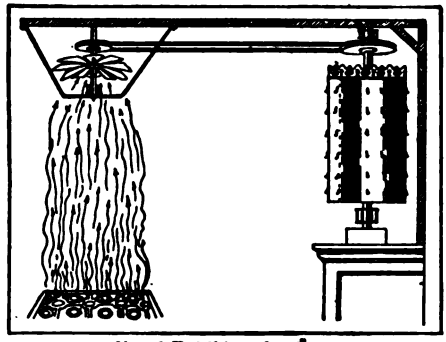
The sketch shows in cross section two walls of equal strength, while in walls less than 10 ft. in height economy would not be effected, but in those extending higher the saving is about 25 per cent, even when the steel bars and the richer mixture of concrete is taken into consideration. The reinforced wall here shown is held in place by the earth fill resting on the base projecting backwards into the filling. This assists very materially in preventing overturning or tipping of the wall. The face and back of the wall as well as the projecting base are tied together into one solid monolith by means of the embedded steel bars.




Area Wall Construction

### How to Make a Goods Exhibitor

A practical tinner of a western city submits the accompanying sketch of a novel goods exhibitor for a hardware or other store which is simple in construction and ought to attract much attention, says the American Artisan. A tin drum 20 in. in diameter and 28 in. high, with some top ornamentation, is provided with a central shaft, a 2-in. wide pulley above and a couple of bicycle pedals attached, one each above and below. A fan wheel 20 in. in. diameter is then made and located above a furnace register, the fan having a 1½-in. band iron support from above, and a simple pulley, such as is used as a sash pulley, attached to shaft as shown. A light sewing machine belt is used to connect the pulleys. An upward flow of hot air from the register operates



Novel Exhibitor for Store

the whole device and causes the drum full of goods to revolve steadily and with good effect. It is an ingenious device and one that will attract much attention.

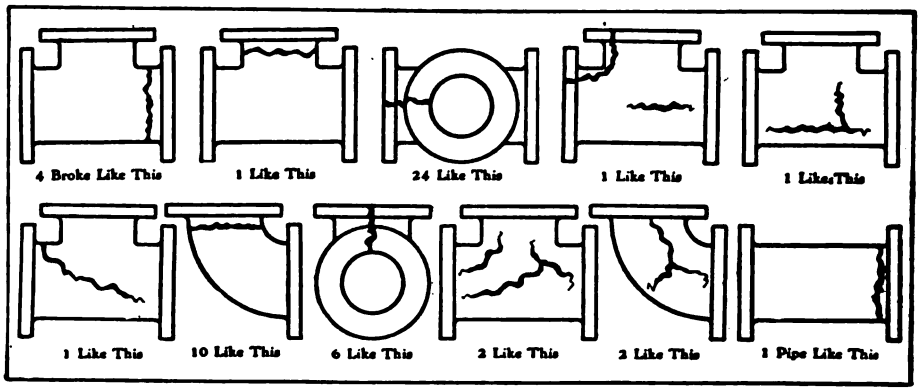
## The Bursting Point of Flanged Fittings

Recently a number of tests were made on flanged fittings of the various sizes to determine the average point at which they would burst under hydraulic pressure. All tests were made by bolting blind flanges to the openings of the fittings and admitting water through a small opening in one flange, says the Valve World. Each fitting was cast with a key number for the purpose of identifying the date and heat for comparison with test bars run out of the same ladle. This gave a check against any fitting which might show strength or weakness beyond the average.

When making the fittings for these tests no particular care was exercised in the foundry, each piece being made in the regular way.

By using these destructive tests as a basis a rule was formulated which, when applied to flange fittings, can be used to determine the thickness of metal for a given pressure, or, the metal being known, to determine the pressure required to rupture. If the thickness of body metal is known, to determine the bursting point multiply the thickness of the metal by the per cent of tensile strength and divide by the inside diameter. The bursting point being given to determine the thickness of the metal, multiply the bursting point by the inside diameter and divide by the per cent of tensile strength. The percentage of tensile strength up to 12 in. in diameter is 65; for larger sizes use 60 per cent.

If the fittings are made of ferrosteel, 33,000 lb. per square inch may be taken as the tensile strength, and for cast-iron the tensile strength will average 22,000 lb. per square inch.



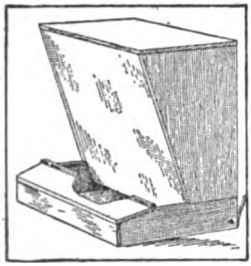

**Of 82 fittings and one piece of pipe tested to the bursting point by hydraulic pressure, the results illustrated were obtained.**

## A Temporary Hose Substitute

A piece of ordinary hose was used to clean out the waste pipe in my sink when obstructed. One day the hose could not be found. For a substitute hose I used one made from newspapers. A quantity of the papers was wrapped around a broom handle, which formed a hollow tube when the handle was removed. One end of this tube was attached to the faucet and the other held over the outlet in the sink. A string was wrapped around the outside on each end and a few turns all along the space between. It served the purpose as well as the regular hose.—Contributed by Henry Bisbing, Trenton, N. J.

## How to Make a Dry Food Hopper

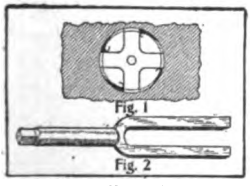
The accompanying sketch shows how to construct a dry food hopper from which fowls may feed but cannot stand in the food. The exact dimensions must be followed in order to get the real worth of it, says the Poultry Keeper. Ground feed or cracked grains work equally well in it.



The bottom or trough is made 7 in. high with the part projecting in front 9½ in. wide, while the length may be optional. A board 4½ in. wide is nailed on the front of the trough so it has a slant and dirt will work away from the opening. A ½-in. piece is fastened to the edge of this, as shown, which will greatly aid in keeping the dirt out. This will leave an opening 4½ in. wide across the front of the hopper, from which the fowls may feed. On the ends of the trough nail other boards and, extending above it so that the fowls must stand in front in order to get the food, which they can get by standing on the 4½-in. strip across the top of the trough.

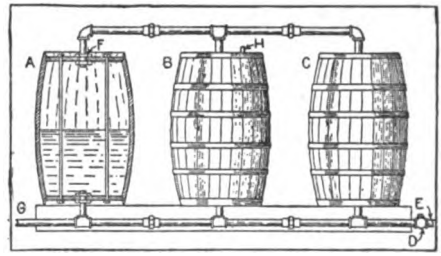
## How to Remove a Broken Tap

A machine tap should never be rushed, and especially when taking a deep cut. Cutting threads in wrought iron, the metal will form as shown in Fig. 1. The tap will cut its entire length if it is turned back frequently to cut off this metal. Never turn a tap by one handle of the holder, as this will cause a side strain that often breaks it. If a tap is broken off flush with the work the broken part may be removed with a tool made as shown in Fig. 2. If it will not start, heat the work with a plumber's torch.—Contributed by Donald S. Stewart, Waynesburg, Pa.




## Home-Made Pneumatic Water System

A party living some distance from a city wished to have a cheap water system for his buildings and grounds and he constructed a successful one, as shown in the accompanying sketch. Three barrels and a 20-gal. keg were secured. The keg was used for a hot water tank in the kitchen connected up in the same manner as connecting a range boiler. The three barrels were connected as shown by first removing one head of each barrel in order to put lock nuts, F, on the pipe. After replacing the heads two ½-in. rods were run through each barrel, as shown at A, and a heavy washer placed on each end with the nuts so as to hold the pressure. The pipe E leads to a force pump at the well and a check valve is placed in this pipe at D to prevent the water being forced back into the pump. The pipe G connects with the house, chicken yards and the barn. A bicycle pump is used to supply the air pressure and is connected to a bicycle tire valve, which may be fastened in any one of the barrels, as shown at H. If all the connections are airtight it will require air filling only once a month. The water is pumped into the barrels by a force pump, which may be operated by hand or power.




Pneumatic Water Supply

## How to Erect a Line Shaft

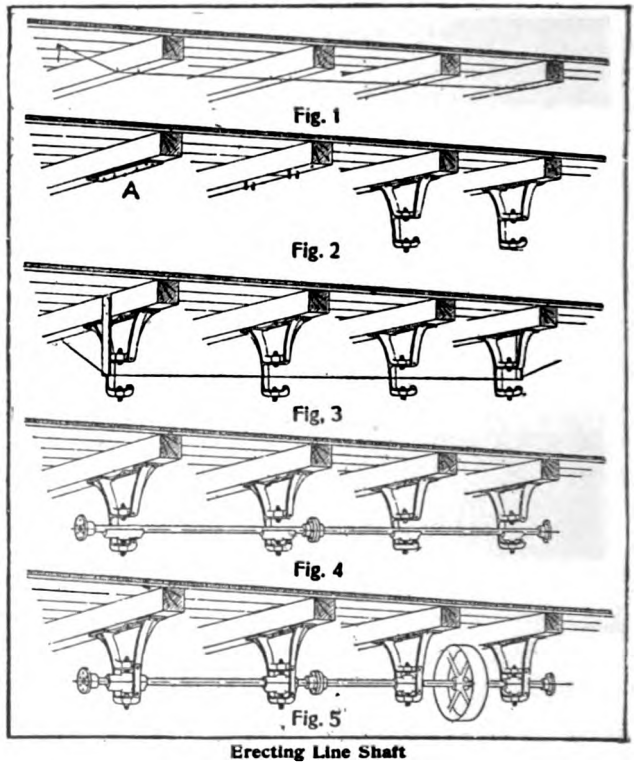
The first operation of erecting a line shaft is to lay off in some manner on the ceiling beams or hanger planks a line, Fig. 1, to represent the center line of the shaft, or, more properly, of the hanger feet directly above the shaft.

This line being marked plainly on the supporting beams or planks, the holes for lag screws or hanger bolts may be bored. The work is made easy and its accuracy insured by use of a templet board having holes to suit the hanger feet and marks to indicate the center line. Placing the templet board with its center line in proper register with the center line marked on the hanger beam and fastening it by partly-driven nails, A, Fig. 2, the bolt holes may be bored quickly and without laying out.

Removing the templet by drawing the nails whose heads were left protruding, the hanger bolts may be inserted, as shown on the second beam in Fig. 2. On the third and fourth beams the hanger frames are up and held by the bolts, which should not yet be set up tight, says Power and Transmission. If lag screws are used, the hanger frame must be lifted and held while one or two screws are entered. The regular hanger bolt, with thread and nut where the lag screw has a head, is a much preferable thing for this work.

The hanger frames up, but without the bolts tight, they are ready for transverse alignment. To do this a line may be stretched in any convenient manner, Fig. 3, through the hanger jaws, to represent transversely the shaft center line, but lower, so as just to clear the bottom plunger screws, in hangers at mid-length of the sagging line. By screwing the lower plunger screw of each hanger frame—one frame at a time—up close to the line the alignment is readily observed. The hanger feet may be tapped with a hammer to move the frame either way, as is necessary to bring the center of the plunger screw directly underneath the line. When so placed the supporting bolts are set up, care being taken to see that such tightening does not alter the alignment. Then the plunger screws should be run down to fill the line perfectly, after which the operation of alignment may be repeated at the other hangers. When this work is done the transverse alignment of the shafting is assured, regardless of varying diameters.

Then the bases of the bearings may be placed on the lower plunger screws, either before or after the shaft is lifted into place, Fig. 4. With the bearing




Erecting Line Shaft

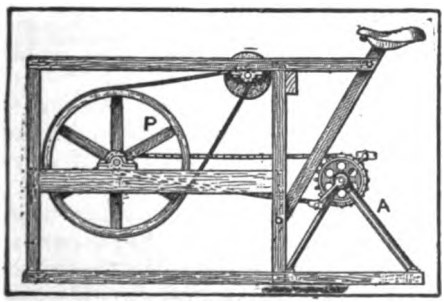
caps placed, Fig. 5, and the upper plungers screwed down, the line is ready for vertical alignment by adjustment of the plunger screws, as dictated by the use of a level along the shaft. With the four-way hanger the preparation of bolts to receive hanger is made in the same manner, but when it comes to bolting them up they must be put up as they are. The transverse alignment must be secured after the shaft is in place, using a line to one side, above or below the shaft. Measurements are made from the line to the shaft in this case.

### A Simple Etching Fluid

Prepare a fluid by using powdered copperas and water, of which the quantity need not be more than a spoonful of each. Clean the part to be etched and, by warming it, apply a thin layer of beeswax. With a sharp-pointed instrument write the name or make the design desired through the beeswax coating and cover with fine table salt. Apply enough solution to the salt just to make it wet. Let it remain until dry and remove the beeswax with kerosene.—Contributed by Frank G. Lilja, Indian Orchard, Mass.

### Home-Made Foot Power Emery Wheel

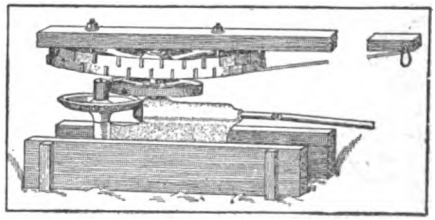
The accompanying sketch shows the design and construction of an emery wheel stand made by a correspondent of the Blacksmith and Wheelwright. The belt wheel, P, is 26 in. in diameter with a 2-in. face and is lined up with a 2-in. pulley on the emery wheel shaft.




A part of an old bicycle frame that contains the hanger is used as the propelling device. It is attached to the stand, as shown at A. Two bicycle chains will connect the bicycle sprocket to the shaft on which is placed the large pulley wheel, P. The upright pieces of the stand are 2 by 2-in., and the top and middle rail are 2 by 4-in. material. The frame is 8-in. wide and is mounted on a 2 by 12-in. plank. The saddle of the bicycle is used for a seat.

### Converting a Mower Into a Horsepower

A horsepower which may be used for light work about the shop or farm may be made from an old mower. Remove the drive wheel from the opposite side



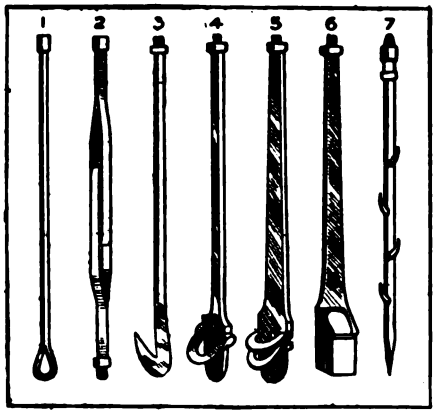
Horsepower Made from Mower

that contains the gearing. Turn the frame of the machine on its side so the main wheel shaft stands vertical and bolt it between two 2-in. planks about 8 ft. long, to which are bolted stakes that have been driven in the ground. Take the tongue of the mower and clamp or bolt it to the drive wheel. A truss rod should be fastened to the outer surface of the wheel and to the end of the tongue.

Gas pipe is used for a tumbling rod which is slipped over the end of the pitman shaft after the wheel has been removed. A hole is drilled through both the gas pipe and the shaft and a pin fitted loosely so the pipe may work at an angle. The gearing is ready for action and will need no remodeling. The ratchet is left in the wheel so, when connected with machinery having a heavy flywheel, the horses may be stopped and the machinery run loosely without interfering with the sweep.

## Fishing Tools Used in Drilling Wells

When drilling tools become fast in a well these tools are used to cut the rope and fish them out so that work can be



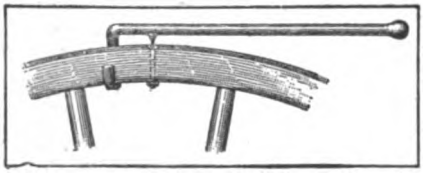

1—Rope Knife Sinker 2—Rope Knife Jars 3—Hook Rope Knife 4—Horseshoe Rope Knife 5—Trip Rope Knife 6—Valve Rope Knife 7—Rope Spear

continued. The rope knives here shown are used in cutting the drill rope when it is necessary to get hold of a drill with a slip socket. They can be used on a string of sucker rods, pipe or sand line. When the latter is used the sinker and jars are necessary. The "trip rope knife" is best, because, when the trip is set, the rope cannot be cut until the knife strikes the rope socket.

The rope spears are used to take hold of a broken cable or rope. They are generally used with the jars and sinker, the sinker being placed above the jars in order to give weight enough to force the spear deep into the rope.

## Another Tire Bolt Holder

The accompanying sketch shows how an ingenious device was constructed by a correspondent of the Blacksmith and

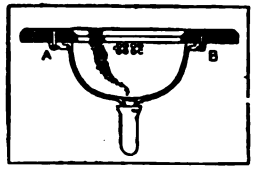


Tire Bolt Holder

Wheelwright to hold a tire bolt while turning the nut. This is made of $\frac{5}{8}$-in. soft steel with a hard steel point inserted $2\frac{1}{2}$ in. from the hook end to hold the bolt. It is about 18 in. long when finished.

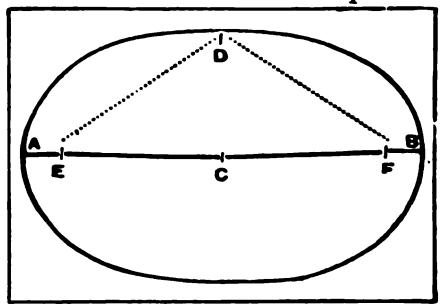
## Fastening Clamp Bolts on a Lavatory

A basin of a lavatory is held up by three or four clamps fastened to the slab by bolts leaded into holes drilled in part way, as shown at B in the sketch. When these bolts loosen and come out it is hard for the repairman to lead them again so they will hold. To make a good holdfast job drill the hole through the slab as shown at A, countersinking the top for the head of the bolt. After the bolt is put in place the hole is filled with plaster.




## How to Draw an Oval

Draw a horizontal line the length of the desired oval and mark the ends A and B. Bisect and mark the point C.




Drawing an Oval

From C draw a vertical line one-half the width of the desired oval and designate the end of this line D. Measure from this point D a distance equal to one-half the length of the oval, or the distance from A to C, back to the horizontal line between A and C and mark this point E. Do likewise from D to

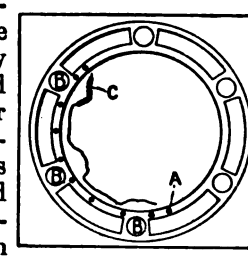
the line between C and B and mark the point F. Drive pins in these points E and F. If working on marble or other material where the pins cannot be driven, put a drop of hot sealing wax on the place where the pin is to be stuck, says the Monumental News. The wax will secure the pin for making the oval and can be removed without damage to the stone or other material. A small loop is made in each end of a thread to be placed over the pins E and F. This thread must be the exact length from A to B. By using a pencil point stretch the string tight on both pins, making it take the position as shown by the dotted lines. Draw a line from A, crossing D, to B. This forms half of the oval. Repeat the operation for the other side.

## A Boiler Blow-Off Recording Device

The accompanying sketch will almost explain itself. By attaching a small water wheel on the blow-off pipe by means of two tees, with branches at angles of 45 deg., and by directly connecting a common bicycle speedometer to the shaft of the water wheel a reading will be obtained from time to time as the boiler is blown down. A little experimenting will enable one to learn readily the approximate amount blown down by subtracting the last reading from the preceding one, says a correspondent in Power. For instance, if while blowing down 5 in. of water the speedometer has run from 100 to 700 it will indicate that the speedometer has to swell its figure by 600 in order to lower the boiler level 5 in.

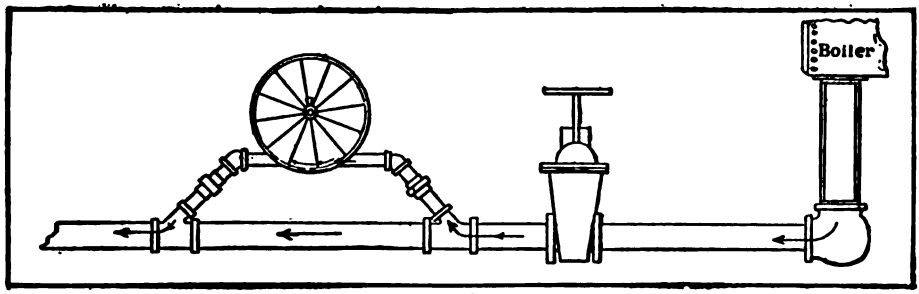
## Repairing a Cracked Cylinder

The sketch shows a gas engine cylinder that was cracked by lighting gas under the water jacket to remove the frost. The repair was made by putting stay bolts in the end of the cylinder with countersunk heads, as shown at A, and long bolts running through the water jacket as shown at B, says a correspondent in Gas Power. The crack in the cylinder was closed by drilling, tapping and putting in soft iron plugs, as shown at C, allowing enough room to head them over, then filing and scraping to make smooth enough for the piston to pass over the crack.



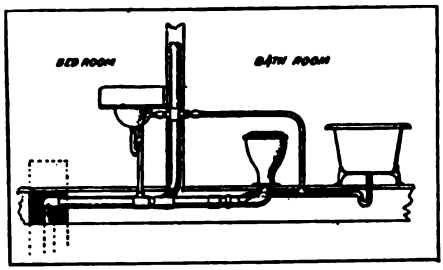

## Size of Soil-Pipe for Dwelling Houses

The reason for the general retention of the 4-in. soil pipe stack as the basis for small residence installations is that the plumbing laws in many cities have named that size as the arbitrary standard for a water-closet connection. Naturally a small city or town contemplating the framing of a sanitary code makes inquiry into the plumbing laws and procedure in larger and healthier cities. The surrounding villages and towns emulate the neighboring cities in




Blowing Off a Boiler

the endeavor to get what is considered the best. The result has been the al-




Satisfactory 3-in. Soil Pipe System

most general acceptance of the 4-in. size as the only proper size for a water-closet connection.

Some time ago a person wanted advice regarding the placing of a bathroom next to a front bedroom and over an alcove in the parlor. There was a 4-in. stud partition available for a soil stack, and the owner positively refused to allow the marring of the finish in the parlor in any way. After some consideration and a talk with the plumbing inspector it was decided to use a 3-in. wrought pipe in the partition and to connect it at the bottom with a 3-in. cast-iron soil pipe, which was in turn connected to the 4-in. house drain. The customer had misgivings and raised objections on account of the novelty of the thing. The job has been doing excellent service for a number of years, says a correspondent of the Metal Worker. Other jobs of that character have since been installed where allowable. In one case the 3-in. pipe runs horizontally 14 ft. before entering the soil stack.

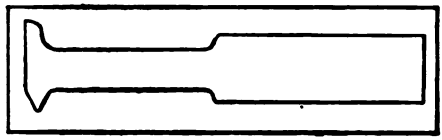
## Stopping a Leak in a Gas Hose

Recently the gase hose connecting a hot plate sprung a leak and by applying a lighted match the seam was found to be about 3 in. in length. The repair was made quite easily by applying two or three coats of shellac varnish.—Contributed by A. W. Graham, Chicago.

## Combined Boring and Threading Tool

The illustration shows a combination boring and threading tool that may be used to good advantage on some kinds of work, says American Machinist.

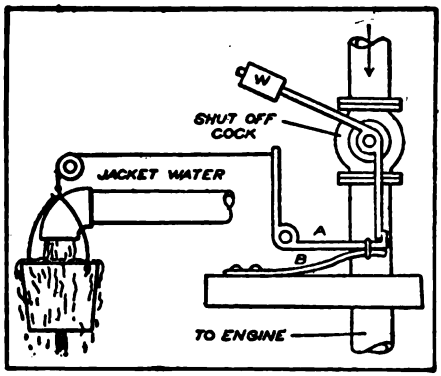
The back part of the tool, of which the sketch is the top view, is ground to be used as a boring tool with the lathe running backward, and the front part for threading. If a number of articles are to be bored and threaded by using a common lathe it is necessary to have two tools and make two settings for each piece, and caliper the thread and hole for each one chased and bored. Two stops are used for the tool slide, one in the back and one in the front.



This makes it only necessary to be sure the first is right and the others will be duplicates. The stop for boring was made so it would swing back; when the hole is bored to size, it is undercut at the back to allow the thread to run out. This tool is especially adapted to brass work.

## Automatic Shut-Off for a Gas Engine

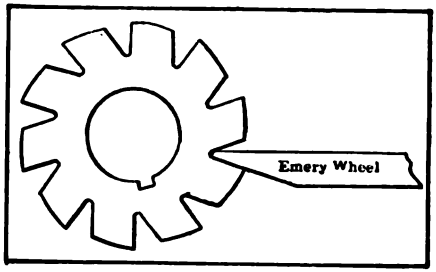
A simple device for shutting down the gas engine when the jacket water supplied to the cylinder fails to flow is described by the Engineer. The jacket water is discharged through a pipe outdoors and the stream from this pipe is caught in a bucket which is suspended by a cord passing over a pulley. The bottom of the bucket is pierced by a hole which is about ¼ in. in diameter. So long as the water discharges from the jacket the bucket will be kept full and running over. If the flow of water ceases the bucket will empty through




the small hole in the bottom and the catch, A, will be thrown downward by the spring, B, allowing the weight, W, to fall and close the shut-off cock.

## How to Grind Formed Cutters

The usual method of grinding formed cutters is to use the flat side of the emery wheel. If the operator will true the beveled side of the wheel so as to make it perfectly straight and then adjust his machine so as to bring this beveled side radial with the center of the cutter he will not be half so liable to draw the temper of the teeth and will get his cutter ground in less than half the time taken if the flat side of the wheel has been used, says the American Machinist. The sketch will explain itself.

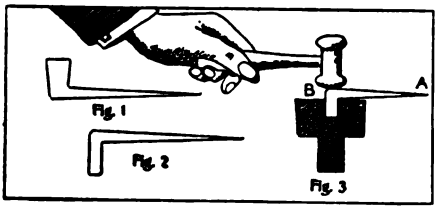



Grinding Formed Cutters

To use the flat side of the emery wheel in grinding the wheel soon becomes glazed and heats the edges of the cutter very quickly, leaving the extreme cutting edge so soft that it will make only a few cuts before it needs grinding again.

## Home-Made Jewelers' Riveting Tool

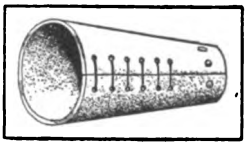
"I have been using a home-made tool for many years and I never saw one like it," says a correspondent of the Keystone. It is a jeweler's riveting tool made from a common heavy wall hook, as shown in Fig. 1, with the hook cut off and bent as shown in Fig. 2, leaving the horizontal bar about 3 in. in length. The vertical drop end is screwed tightly into a vise, as shown in Fig. 3, leaving the horizontal bar about ¼ in. above the edge of the vise. When struck with a hammer at the end, B, it exerts great riveting power upon anything held at the point A, such, for instance, as a watch chain swivel.




Jewelers' Riveting Device

## Speed Indicator Attachment for Shafts Without Centers

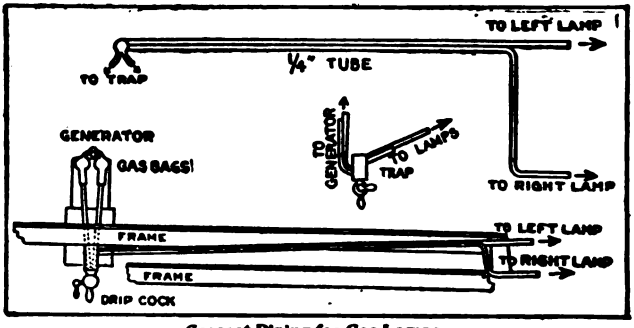
Occasionally shafts are cut off and used without centering holes drilled, which leaves no place to insert the square-pointed end of the indicator to obtain the speed. A little device can be made by using a common cork about 1½ in. in diameter on the large end and 1½ in. long, around which is placed a piece of 3-in. single-ply belting, cone-shaped, to fit over the end of the shaft and to receive the pointed end of the indicator. The belting is fastened to the cork with a few tacks and the edges held together by



wire lacing. The pointed end of the speed indicator is placed in the cork and the cupped end over the end of the shaft.

## Correct Piping for Automobile Lamps

The cause of lights acting badly on automobiles is usually due to defective piping. Many of the complaints are traced to water collecting in the tubes and forming a trap through which the gas cannot pass freely. Where rubber tubing is used and connections made only when lamps are in use it is a nuisance when in a hurry, says Motor Age. The accompanying diagrams show a system that has been used with much success. Any repair man can make and install this at slight expense, being careful to have all pipes pitch down to drip-cocks. The pipe to each lamp should be independent, except at the trap, and gas from the generator should enter the trap below the piping to the lamps. The drip-cock should be opened at least once a week and the pipe should be fastened securely to the frame so as to prevent chafing.




Correct Piping for Gas Lamps

## How to Repair a Cracked Water Jacket

A correspondent in Gas Power relates in the following how he repaired one of the worst cases of a cracked water jacket: "With a file we took off the edge or corner of the head and also the edge of the loose piece, which was entirely removed by the frost. Then we took a clamp and put the loose piece in its place in the head and held it there by clamping. We then used a $\frac{3}{16}$-in. iron drill and drilled three or four holes in the crack at different places and tapped a thread in these holes with a $\frac{1}{4}$-in. tap. In these holes we screwed in tightly $\frac{1}{4}$-in. plugs made from iron that was as soft as possible. They were then cut off close to the casting, leaving only enough metal to allow a little riveting. When the four plugs were in we riveted them with a light hammer and then took off the clamp. Holes were drilled all along the crack and plugs put in as before, and the whole crack was riveted over until all the different plugs looked like one piece. As the crack had been countersunk by filing off the top edge, the head was easily filed smooth, and after it was repainted no one could see where the crack had been except by taking off the head. It is sometimes necessary to hammer a little piece of copper wire into the crack which is left on the face of the head, so as to prevent leaking along the packing."

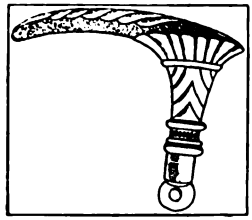
## Double-Lipped Crucibles

The use of double-lipped graphite crucibles is looked upon with dislike by some brass foundries, while others continually use them. Opinions may differ, but there are many instances where the double-lipped crucibles are advantageous. Flasks may be poured more rapidly and with greater certainty, says the Brass World. The bench molder, for instance, has his flasks set upon a spill trough and the crucibles are carried between two rows of flasks. If a crucible with two lips is used, the flasks on one side of the trough are poured and the molder simply changes his own

position to the other side of the spill trough and the crucible, tongs and helpers remain in the same place to pour the other side. The crucible is ready for pouring on either side and the danger of disturbing the flasks is avoided. A double-lipped crucible costs no more and is always ready when wanted.

### Making Umbrella Handles by Electro-Deposition

Umbrella, cane or parasol handles may be made successfully by the deposition of copper upon a soft metal model until a sufficient thickness has been obtained, and then melting out the model or core. A handle of copper sufficiently stiff for all purposes and very light is thus obtained. Patterns may be copied which could not be cast in soft metal or made from stamped shells. By soldering various soft metal parts together so that undercut designs are produced, exceedingly beautiful handles may be made. They could not be made of solid metal in any other manner, says the Brass World.



The method followed for the production of these handles is first to cast the pattern or model of any soft metal. A mixture of lead and antimony in the following proportions answers well and is used for this purpose: lead 87 lb., antimony 13 lb. If difficulty is experienced in running the mixture into the thin or difficult patterns, then a few pounds of tin may be added to each 100 lb. of the mixture.

An "ear" is cast on the model as shown in the sketch in order to allow for holding it in the solution while plating. After the casting has been made and the fins trimmed from it, it is cleaned in the lye kettle and immediately placed in the plating bath. The success of the whole operation depends upon a smooth copper deposit.

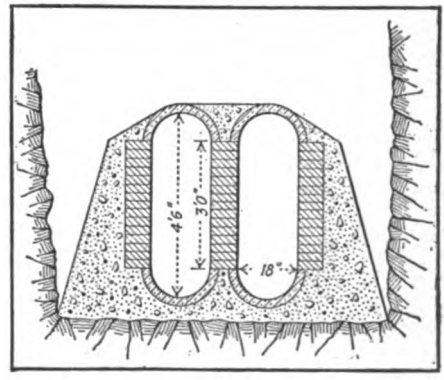
### A Concrete Pipe Culvert

The accompanying sketch and following description of a double culvert appeared in Engineering News, and the culvert was constructed by George M. Cushing at Moca, Santo Domingo. The railway from Santiago to Moca is about 20 miles long and is not a difficult piece of construction. There are seven bridges of from 50-ft. to 75-ft. span and many large culverts. All of the culverts and bridge abutments have been built of concrete.

For pipe culverts cement pipe 18 in. in diameter, 3 ft. long and 3½ in. thick was made, using Portland cement and bank gravel. About 4,000 ft. were made.

The breakage of vitrified pipe is from 50 to 75 per cent on account of the many handlings and the crude manner of transportation after leaving the United States, so that the manufacture of these cement pipes made a great saving.

It was decided to make the 18-in. pipes in two parts, using one-half for invert and the other half for the arch. The side walls were built of brick. The native brick are of very poor quality and to strengthen them they were soaked in Portland cement grout. They



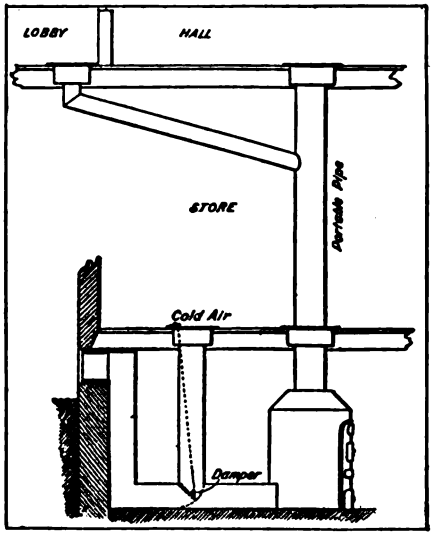

Cross Section of Concrete Culvert

were only used as a side lining and were built up first, taking the place of

lagging, the concrete being placed against it. This culvert is located between very high and steep banks some 35 ft. below the grade and is about 100 ft. long. The retaining walls at each end were laid in concrete against a brick facing, the brick being treated as in the side lining.

## Heating an Amusement Hall with a Portable Pipe

In a certain place where an amusement hall was above a large storeroom, and when laying plans for heating, the question arose how to heat the hall? A suggestion was made by a correspondent of the Metal Worker to place the furnace in the cellar as near the middle of the store as possible and run a 16 or 18-in. pipe up to a 20 by 24-in. register in the floor. Then place in the floor of the hall, immediately above, a register of the same size, arranging on the ceiling below for an opening which will accommodate a round pipe of the same size as comes from the heater. This pipe can be stowed in any convenient place in the store until it is needed, and then by pushing it up to the opening left in the ceiling of the store it will make a direct connection with the hall register when it sets on the register in the first floor without making any tighter connection at the bottom than suggested. If it is also desirable to heat the lobby it is a simple matter to carry a 9 or 10-in. branch from this vertical pipe over to the lobby and connect with a smaller opening under the register in the lobby.

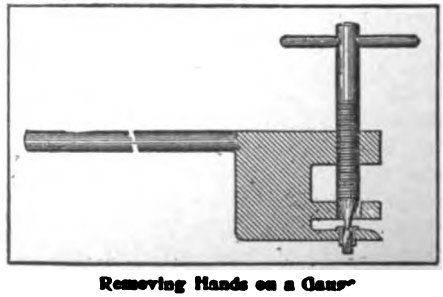



Heating Amusement Hall

If the furnace is to heat the hall occupied by people the air supply should be taken from the outside, though this may not be necessary for heating the store, which will be occupied by few people, and which will have the air changed frequently by the opening and closing of doors, and arrangements can be made to take the air supply to the furnace from the store floor when the hall is not occupied. A combination supply duct with suitable damper, as shown in the sketch, will dispose of the air supply question.

## Tool for Removing Gauge Indicators

Some engineers may have experienced difficulty in removing the indicating needle, or pointer, from a steam gauge. A tool may be made from a piece of bronze, as shown in the sketch, which will be more efficient than a screwdriver, says a correspondent in Power. A $\frac{3}{16}$-in. hole is drilled in the topmost tongue and tapped for a $\frac{1}{4}$-in. screw. The bottom tongue is slipped under the pointer, the end of the screw placed over the point of the pin, and the screw turned. This will remove the pointer without trouble.



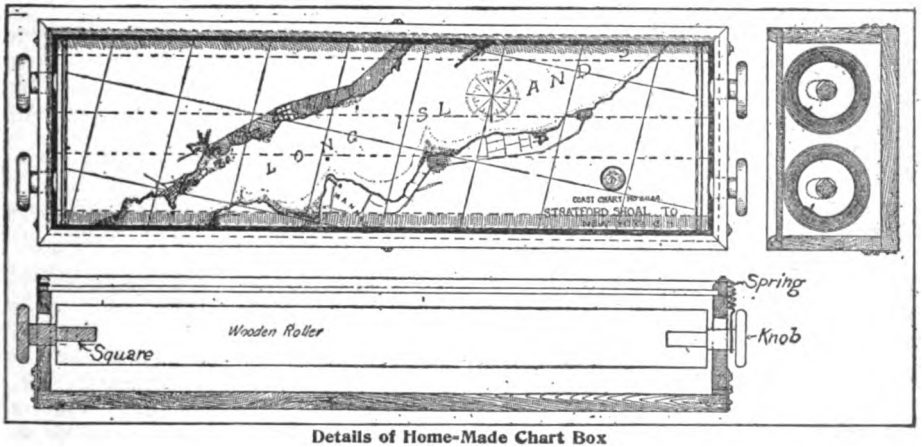
Removing Hands on a Gauge

## How to Make a Chart Box

If you have had the experience of trying to hold a chart on a windy day, or in the rain, you will be able to appreciate the handy little contrivance here described. The device consists of a box about 3 ft. long, 1 ft. wide and 7 in. deep, with a plate-glass top, beneath which is fastened the chart, on two rollers, just as the film is placed on the rollers of a camera. On an extended cruise the charts may be pasted together before the start in one long strip, so that the charts may be rolled along continuously as the cruise progresses, and the particular part of the chart which is needed is always before the navigator's eyes.

The rolls may be made of almost any diameter, but a size of at least 2 in. will be found better than if the diameter be made as small, say, as an ordinary window-shade roller. This is because the paper of the charts is so stiff that it is liable to spring off the roller, if it be too small, where held by the thumbtacks.

The rollers are held in the box by round-ended knobs, with their ends stuck into the ends of the rollers. These knobs are used to turn the rolls in either direction, as may be necessary. In order to keep the chart taut under the glass, so that it can be read clearly, springs are fitted to hold the rolls up against the glass top, and this gives just enough friction, so that the rolls may be




Details of Home-Made Chart Box

New charts can be placed on the rollers at any time by taking out the rollers and attaching to them the new chart by the use of four ordinary thumbtacks, says Motor Boat. Then merely wind the chart on the rollers and place them back in the case.

To explain the method of construction, as illustrated, the sides of the box are ¾ in. thick. For a nice job use mahogany, but pine, cedar or any other wood will answer the purpose. The bottom is made of 1-in. material, and is made removable by being attached to the side with hooks and eyes or with any one of a dozen or more different styles of spring catches, such as those used in cameras.

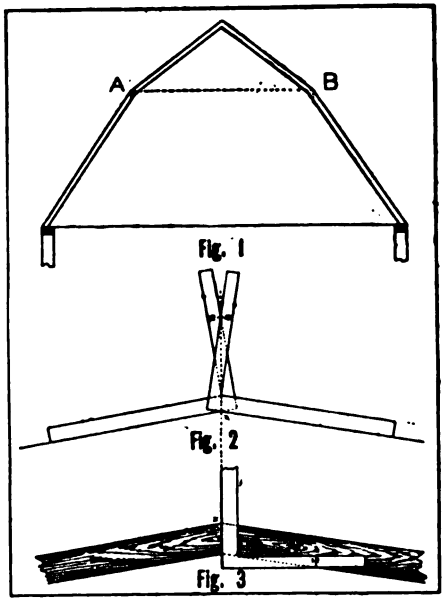
turned easily, and still not be loose enough to let the charts unroll or sag. To provide evenness, as the charts increase in size on one roller and decrease on the other, the axle of the turning knobs must be put through oval-shaped holes or slots, so as to allow the rolls to move up and down.

The glass top is held by a rabbeted frame, set down over it and screwed or bradded fast to the sides. Scuppers should be cut through this frame to allow the water to run off the glass in wet weather.

This chart box can be built by any one possessed of a little ingenuity, and it will be found a very handy affair.

## How to Join Gambrel Roof Rafters

A cut for the proper angle in rafters to make a gambrel roof shown at AB, Fig. 1, is made at the bisecting line




Finding Angle on Rafters for Gambrel Roof

formed by the angle of the rafters, which may be easily found by laying off a diagram and bisecting with a compass, or it may be found with the square direct, as shown in Fig. 2, by taking, say 12, on the tongue of each square as a pivot point and with the blades fitted to the angle formed by the rafters, says the American Carpenter and Builder. The intersecting point on the blade will show the figures to use that number. The blade will give the cut, as shown in Fig. 3.

## Points on Tempering Well Drill Bits

When a bit is plunged into the water, it should be moved up and down, or else the molecular tension above and below the water line will be so different that the bit will be liable to break in the same way as glass when hot water is poured on it. The bit should never be heated in the incandescent cinders of a fire, as that will decarbonize and render the cutting edge worthless. The bit should be heated a few inches back from the edge, and should not remain in the fire longer than necessary to secure the cherry-red color, says the Drill Hole. Immediately after removing the bit from the fire it should be plunged in water for a moment to partially cool it, and then should be rubbed on a stone to remove the outside scale in order that the colors may be easily distinguished. The colors should advance parallel to the cutting edge; and if in any case they are observed to do otherwise, that portion of the bit to which they are advancing most rapidly should be held in water. Frequently it is necessary to plunge the bit in water several times to obtain the proper parallelism before the final cooling; if the bit were cooled when the colors were not parallel to its cutting edge, but crossed it, the cutting edge would likely be too soft in one place and too brittle in another.

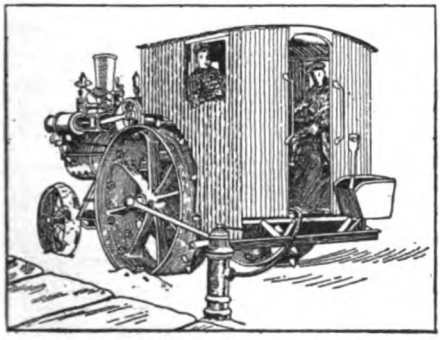
The drill bits are more serviceable when tempered in thick oil or coal tar than when tempered in water. It is presumed that this is due to the water rapidly chilling the thin parts and the skin of thick parts thus producing uneven hardness in the bit while oil or tar cools the bit more gradually and thereby renders it more tough. If it is found that a certain bit should be dipped in water when it has a blue color, it should be dipped in oil when it has a purple color; in other words, to produce the same degree of hardness with oil that has been obtained by water, the bit should be dipped in oil when it has the color that precedes the one that it has when dipped in water. In nearly all cases steel is made tougher and more uniform when tempered in oil than when tempered in water.

A drawing may be cleaned by rubbing it with bread crumbs. This will remove dirt and finger marks, leaving the paper white and clean.

# SHOP NOTES

## Thawing Out Hydrants and Mains

During an increased spell of cold weather a number of water mains and hydrants were frozen in our city and could not be used in case of fire. The accompanying sketch shows how I fitted my road roller with a pair of narrow faced front wheels and with spikes in the rear rollers so I could drive it from one hydrant to another. One end of a hose was connected to a steam pipe inside the cab and the other end run into the stand pipe of the hydrant. The work was accomplished quick and with



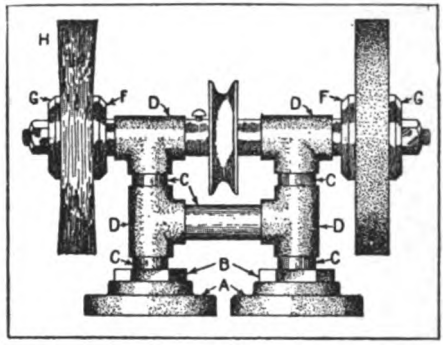
Thawing City Hydrants

success.—Contributed by Wm. B. Barker, Onaway, Mich.

## How to Make a Buffer and Grinder Stand

This stand is an improvement on one described in a recent number of Popular Mechanics. The advantage of having two bases or feet is that it makes a more substantial and rigid frame and can be used for quite heavy work.

The materials necessary for making a buffer and grinder like the one shown in sketch are two pipe flanges, A; two bushings, B; four ½-in. tees, D; five ½-in. nipples, C; two collars, F; two

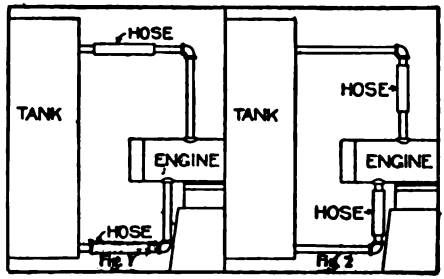



Home-Made Buffer

washers, G; a number of cloth discs for the buffer, H; an emery wheel; a short piece of ½-in. shafting; a pulley and babbitt for bearings. Apply a solution of sal ammoniac to the threads when putting together, which will cause them to rust and make a rigid joint. By using two bases or feet instead of one the whole machine will be more solid and will not "wobble" when running at high speed for heavy work.—Contributed by R. Q. Dalton, Chicago.

## Water Tank Connections for a Gasoline Engine

The ordinary method of connecting a cooling water tank to a gasoline engine is shown in Fig. 1. When pipe is connected in this manner the hose will soon crack and become loose,

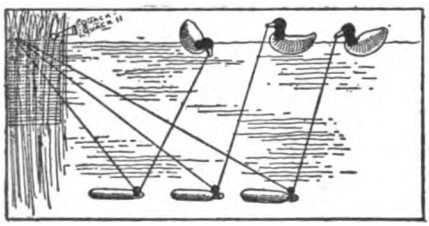



Improved Hose Connection

caused by the vibration of the engine. Make the connections as shown in Fig. 2 and the hose will last indefinitely.—Contributed by Ora S. Harmas, Fennimore, Wis.

## Making Decoy Ducks Appear Like Life

During the spring and fall months of the year many hunters use decoy ducks to assist them in calling the wild

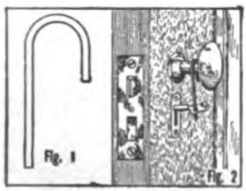


Life-Like Decoys

game to a lake or river. To attract the game the decoy ducks must appear as life-like as possible. This can be done by running a cord from your boat or hiding place through a small pulley, which is attached to a window weight sunk in the water, and fastened to the bill of a decoy. By pulling the cord the decoy will appear to dive and with a duck call the flying game will be attracted to the spot.—Contributed by Walter Short, Council Bluffs, Iowa.

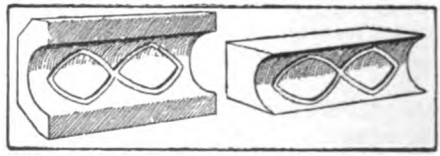
## A Door Key Holder

Bend a piece of heavy wire in the shape as shown in Fig. 1 and place the hook part over the shank of the knob as in Fig. 2. The other end is slipped through the open part in the handle of the key. When a door is locked from the inside and the device applied, it will not only keep other keys from being inserted from the outside, but will also prevent the key from being turned with instruments.




## How to Babbitt a Main Bearing

Occasionally a main bearing of an engine needs rebabbitting, and while it is not a difficult job, it may, nevertheless give considerable trouble if one does not know very well how to proceed. Sometimes, if the box is in four quarters, it may be taken to a machine shop and the work done there, but it must often be poured on the engine by the engineer. A large Corliss engine, located in a place where there was no machine shop, needed repairs and the main bearing rebabbitted. This was accomplished by chipping out all the old babbitt and placing the bottom box back into position. The crank-shaft was leveled and supported by a jack. Another jack was placed against the crank, pressing it tightly against the side of the bearing. The bottom box



Rebabbitting Main Bearings

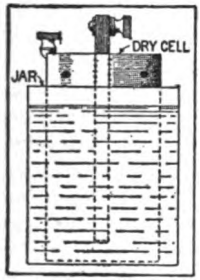
was then poured, taken out, the edge trimmed off the babbitt and then replaced. The quarter-boxes were then placed in position and separated from the bottom box by thin cardboard in order to prevent the babbitt from adhering to the bottom box. They were then poured, taken out, trimmed and replaced. Wooden liners of the required thickness were put in and the top box poured.

All boxes were then taken out, oil-grooves cut in them and scraped, says a correspondent of The Practical Engineer. The oil grooves were cut as shown in the sketch with a half-round gauge or chisel, and the edges were beveled to a half-inch. This method insures a good distribution of the oil

over the bearing. The top box had no oil grooves cut in it, the edges only being beveled, as this box is not supposed to bear heavily on the shaft.

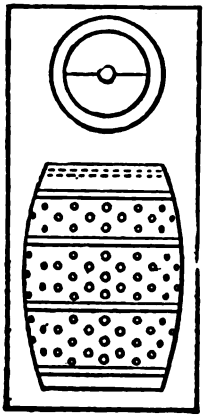
### How to Use Old Dry Batteries

Cut out the bottom of the dry battery and clean thoroughly. Punch three or four holes with a nail or pointed instrument near the top of the cell. These holes will allow the air to escape when the battery is set in the solution. Make a 5-oz. solution of sal ammoniac and place it in a jar which should be a trifle larger than the dry battery. Set the battery prepared as above in this solution and you will have a good battery.—Contributed by M. K. Orton.




### Nail Keg Strainer for a Suction Pipe

A duplex pump was used for pumping pond water for flushing out a deep well and washing away the clay cut out by the casing as it was forced downward. The water seemed to be sufficiently clean and free from any material that would catch in the valves, so no strainer was used on the suction pipe.

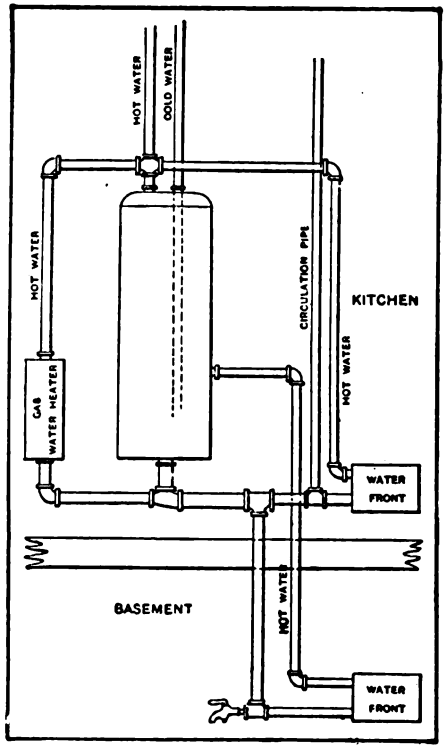


The pump ran smoothly for a few days, then one side refused to deliver water, says a correspondent of Power. On examining the valves it was found that a horse bridle had been drawn up through the suction pipe and had caught under the valve. To avoid a repetition of such an occurrence, a strainer made from a nail keg was placed on the end of the suction pipe.

In making, the hoops on one end of the keg were loosened to remove the head, in which a hole was cut large enough to fit around the suction pipe, on the end of which was screwed a coupling to prevent the strainer coming off. The head was then split in half to permit of its being placed above the coupling. A number of 1-in. holes were bored in the keg as shown in the sketch. The keg was then placed in position over the pipe and the hoops tightened.

### How to Connect Two Water Fronts

The piping from the range boiler should be 1 in. in diameter for the supply to the two water fronts, and instead of the water having to pass through both of the water fronts,




Details of Connections

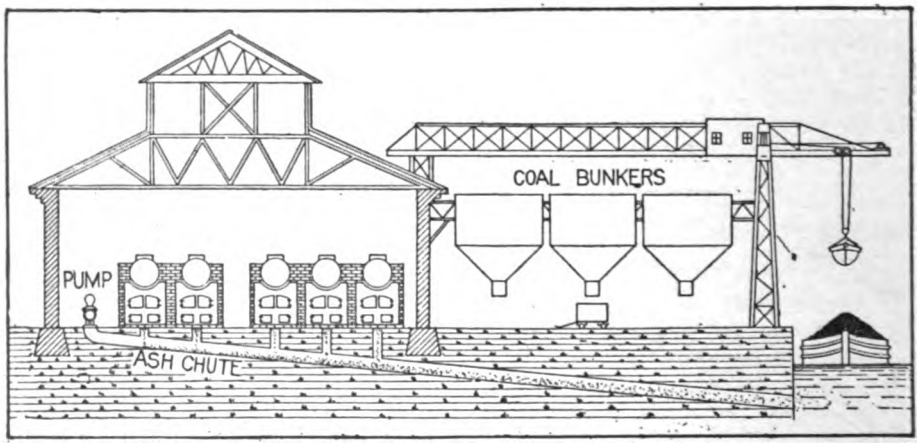
whether they are both in use or not, this 1-in. pipe is connected to a reducing tee, so that either water front can be supplied, says The Metal Worker. The hot water pipe from the basement water front is connected into the boiler in the usual way, while the hot water pipe from the kitchen water front is connected into the hot water service pipe as shown in the illustration. The arrangement of piping thus brings the circulation pipe so that it can deliver water to either of the water fronts.

### Novel Method of Supplying a Plant with Fuel and Removing Ashes

A certain plant is located within 200 ft. of a river bank from which it is supplied with coal brought in barges, unloaded with a steam digger and hoisted to a belt conveyer, which transfers the coal to large bunkers. The bunkers are elevated, fitted with chutes from which the coal is taken in the hand cars holding one ton, to the boiler room, where it is shoveled by hand from the cars onto the grates, says a correspondent of The Practical Engineer.

A cast-iron sluiceway, round and open at the top, runs along the top of the ash-pits, the opening being on the level with the bottom of the pits. One end connects with the river directly beneath the steam digger and the other end to the discharge of a large pump. When the time comes to hustle out the ashes, which is every six hours, the coal wheeler pulls out the ashes with a large hoe and the pump is started. It requires but a short time to remove the ashes.

When the plant was built, the steam digger was erected first, and all the sand used in the construction of the plant was taken from the river bottom. The ash-sluiceway was led to a point over this hole, the supposition being that the ashes would drop into it, when they could be removed to scows by the digger. The hole filled up all right, but not with ashes, and where they go is a mystery. Sometime afterward a boat's crew took several soundings and no trace of ashes could be found.




Removing Ashes from a Boiler Room with Water

### The Proper Care of Show Cases

A great many glass show cases are ruined each year from the lack of proper attention. Small cracks appear, caused by heat or contact with hard, heavy bodies, and if these cracks are not at once attended to they soon spread. Cracks may be kept from spreading by making a short scratch at right angles with a diamond or glass cutter, says the Sporting Goods Dealer. A case should set perfectly level on the floor, especially the new all-glass variety. Use a solution of 1 oz. of white

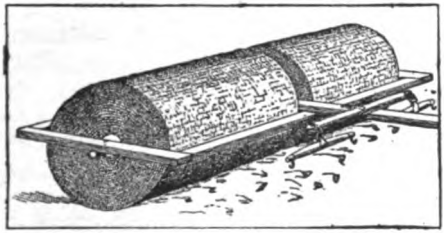
wax dissolved in a pint of pure turpentine to remove scratches. For cleaning the glass, a good method is to use 1 oz. of whiting, 1 oz. alcohol and 1 oz. of water of ammonia in a pint of water. Apply with a soft cloth, allow to dry and then wipe off.

### Roof Shingles

Shingles are usually 16 in. long, and a bundle of them is 20 in. wide and contains 24 courses in the thickness at each end. A bundle of shingles will lay a course 80 ft. long. When shingles are exposed 4 in. to the weather 1,000 will cover 107 sq. ft.; 5 in., 132 sq. ft.; 6 in., 160 sq. ft.

### How to Use Wire Fence Rolls for a Land Roller

Common woven wire fence that is sold in rolls of 40 rd. and 48 in. high can be used to construct a land roller and when the land is rolled the wire, which is good as new, may be used for fencing. Two of these rolls are used in making this roller. Wooden blocks are fitted and inserted in each end of the rolls. Holes are bored in the center of these blocks and a long rod run



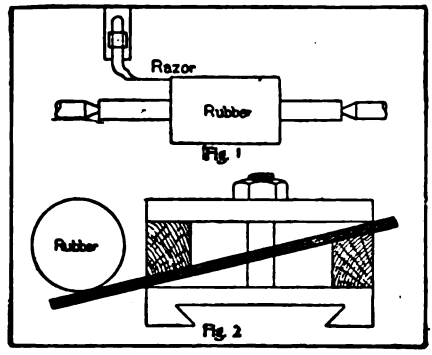
Wire Fence Used as Roller

through the holes which is used as an axle. This rod is attached at each end, and in the middle between the rolls, to a wood frame. A tongue is fastened to the frame which completes the roller. The outside end of the woven wire should be securely tied with wire to the under layers so that it will not unroll when in use.

Ores containing gold, silver and copper have been found in the Culebra cut of the Panama canal.

### How to Turn Rubber

Bend the handle of an old razor at right angles with the blade and mount it in a holder as shown in Fig. 1. This will make one of the best tools to turn rubber the quickest, says American Machinist. When using this tool care should be taken to bring the blade just a little below the center. In setting the tool for cutting, measure from the mandrel or the spindle that the rubber is being turned on.

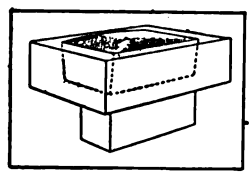



Turning Rubber

Fig. 2 shows a way of turning a rubber roller when there is not sufficient stock for a cut. Use a sharp file fastened in the tool post as shown. Anyone having any difficulties with turning rubber will soon get over them by adopting these methods.

### A Babbitt Riveting Block

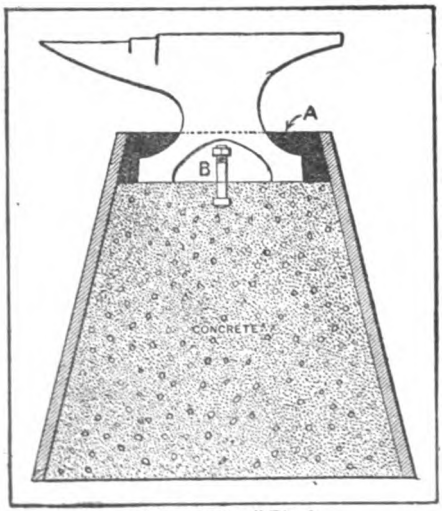
Those who have had experience in hunting up new pieces of babbitt or lead every time they wanted to use a soft block for riveting will appreciate the device here illustrated. A pattern is made from whicl. any number of castings can be molded. The lug on the bottom makes it convenient to hold in the vise. The hollow top is poured full of babbitt (or lead), thus forming a soft anvil that lasts much longer than a plain piece of babbitt, as



it is supported on all sides by hard metal which prevents the mushroom effect, says Machinery. When the babbitt gets so battered up that it cannot be used longer, the block is held in a flame until the babbitt melts, and then it is poured again. This scheme will save time and babbitt.

### How to Make a Concrete Anvil Block

The tapering cast-iron box is filled to within 2 in. of its top with concrete. Wood will do as well as cast iron for the form, only that the cast iron may




Concrete Anvil Block

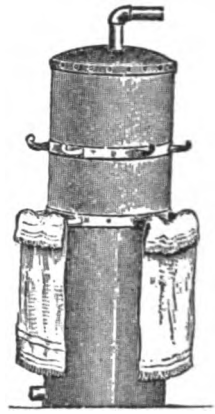
remain in position. On each side of the anvil is imbedded a bolt and nut, B. The space above the concrete is filled with melted lead, A, which holds the anvil rigidly in place, says the American Blacksmith, also deadening its sound to a marked degree.

### To Protect Corncrib from Rats

When building a corncrib set it on posts which are placed part way in the earth. About 22 in. of each post should extend above the ground. On this part of each post place a tile which is 2 ft. long. The tile will settle down enough to allow the crib to rest on the posts. Rats cannot climb up the smooth tile.

### Towel Hanger for Kitchen Boilers

The heat from the kitchen hot water tank can be used to excellent advantage for drying dish towels and other cloths used in the kitchen by the use of the hanger shown in this illustration. It is made of a thin strip of metal from which extend seven or eight arms or hooks on which articles can be hung. The clasps of the rim are so notched as to be easily adjusted to any sized boiler.



### How to Make Drop Black

Drop black, also called Frankfort black, takes its name from the German town in which it was first manufactured, and is called drop black on account of the shape in which it is prepared for sale. It is made from a variety of materials of organic character, such as vine twigs, peach stones, hop vine, bone shavings, ivory cuttings, etc. They are calcined in a closed vessel until they are thoroughly charred, says Railway Master Mechanic. The black thus obtained is ground as fine as possible with water, the mass is next lixivated to free it from soluble matters, and then dried. It is then mixed with a little glue water and made up into small pear-shaped drops for sale. Drop black is of fine texture, varying in hue from bluish black to reddish black, which is due to the different materials of which it is made. Vegetable matters yield a black of a bluish hue and animal matters a grayish hue.

Drop black owes its color to carbon, the amount of which varies in different samples. The following is an analysis sample of drop black:

| | Per cent. |
|---|---|
| Water | 2.333 |
| Carbon | 65.742 |
| Mineral matter | 31.925 |

The mineral matter contained phosphate of lime, an evidence of the use of bones in the composition.

## How to Mend Plaster Casts

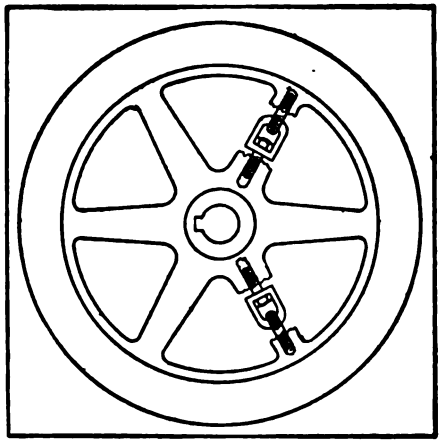
In mending plaster casts I have tried everything, shellac included, with very poor results, until one day I tried oxy phosphate of zinc, a cement used by dentists for filling, and have never had a failure in any case. The cement should be made thin and then the edges of the broken parts brought firmly together and held in place for a few minutes.—Contributed by J. Robbins, D. M. D., Salem, Mass.

## Home-Made Door Holder

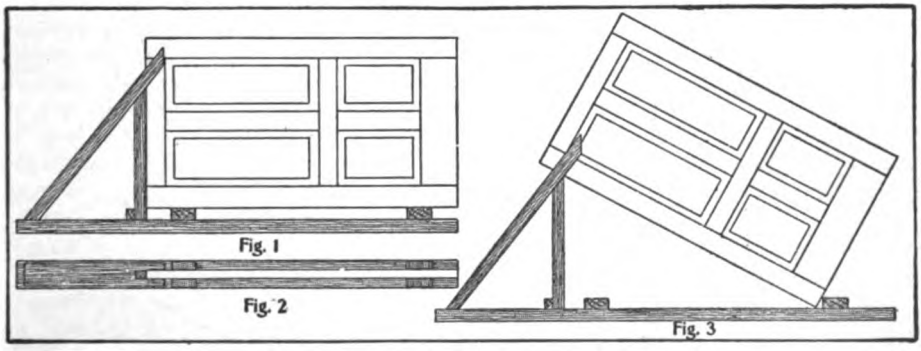
A very simple and easy-to-make door holder that will not scratch the floor and will always keep the edge of the door clean was designed by a correspondent of Woodworkers' Review. Secure a piece of old sheathing, or any old boards around the job, about 8½ ft. long. About 1½ ft. from one end of this board fasten to a small cleat a perpendicular piece 2 ft. 4 in. long and run another piece over the top of this at an angle projecting over about 3 in., as shown in Fig. 1. In this piece that angles, cut a notch the thickness of the door and nail it at the top and bottom. Two cleats are nailed across the board, one about 6 in. from the upright and the other the same distance from the end of the board. Fig. 2 shows the top view and Fig. 3 how it may be used to hold the door in an inclined position.

## Repairing a Broken Fly-Wheel

Two spokes were broken in a fly-wheel on a steel plate shear by the carelessness of an overhead craneman in a steel mill. As there were no spare wheels on hand, the mechanic in charge tapped a 1½-in. hole in the ends of both broken spokes, says a correspondent of the National Engineer. Into the outer end he screwed a stud having a right and left hand thread. Into the



An Odd Repair

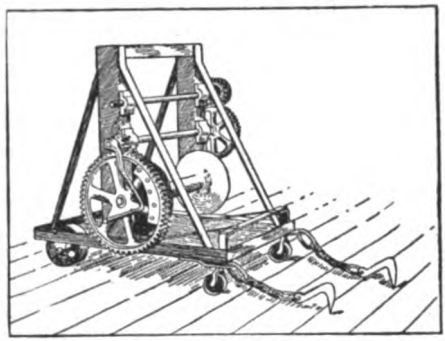



Door Holder That Will Not Scratch the Door

end nearest the axle he screwed an ordinary tap bolt, first slipping it through one side of the turn-buckle which was made as shown in sketch. Any tension could be maintained by this arrangement up to the breaking strength of the rod.

## A Portable Crab

The accompanying sketch shows the construction of a portable crab for plat-



Portable Crab

form and warehouse purposes. It is made entirely of iron and steel, with the exception of three pieces of wood. It has double gearing of which the first is 6 to 1 and the second 20 to 1, giving a pull of 4 tons on a single line with a man turning each crank. The second crank can be thrown out of gear when using only the first. This will make a handy outfit for loading and unloading heavy articles to and from freight cars or about the warehouse.

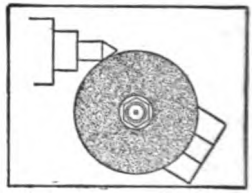
## How to Clean Copper Plates

When copper plates are stained with verdigris, which prevents their amalgamating with and saving the gold, the plates can be cleaned in the following manner: Thoroughly scrub the plates with fine sand and water, using a coarse gunny sack or scrub brush. Wash off the sand and scrub thoroughly with a solution consisting of 1 part of oil of vitriol and 4 parts of water, says Western Machinery. The acid disintegrates the verdigris, dissolving the oxide of copper, and leaves the plate clean, when it will readily amalgamate with the mercury without the use of cyanide solution, except the acid solution should have been made stronger than herein prescribed, in which instance the plate should be washed off with water, and then dressed with a solution of cyanide as usual.

The formation of verdigris on the plates can be stopped by plating them with silver amalgam, after cleaning as before mentioned, exactly the same as mercury, leaving the plates thoroughly coated with silver, whereby they become more effective for catching gold and silver, and will operate better than plates which have been electro-plated with silver.

## Turning Hard Lathe Centers with a Carborundum Tool

The center on my lathe was in bad shape and I had a rush job where a ½-in. mandrel must be used, and as we had no center grinder, apparently the only way possible was to anneal and re-turn the center, says a correspondent of American Machinist. A happy thought struck me to use a carborundum wheel we had—No. 40 grain. Taking out the tool post, I bolted the wheel flatwise in its place on top of the compound rest and swung it around to 60 deg., as shown in the sketch. Running the belt on the highest speed cone, I fed the wheel back and forth along the center, using the cross-feed screw to force the wheel in. In this manner the center was fitted up in good shape quickly; in fact, better than it would be after turning and hardening, as it usually springs some in that process.

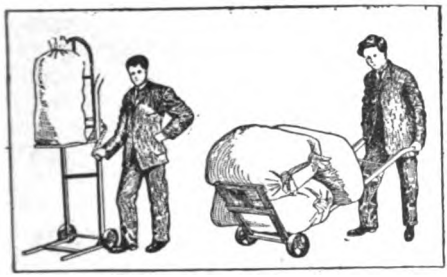


Owners of small shops who have no grinder or cannot afford to own one will find this method a good substitute.

When through with the grinding a polish may be given by using a piece of fine emery cloth placed over a file with a little oil.

## A Novel Sack Truck

The illustration shows an idea in sack trucks for the mill, which is a product of a German miller of Breslau. Three huge sacks full of grain or flour may be pushed around the mill, and by

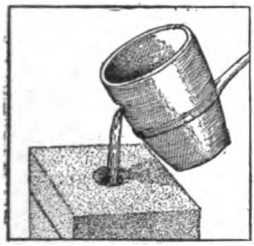


Handy Sack Truck

an ingenious contrivance shown, a sack can be lifted onto one's shoulders without the help of anyone.

## How to Keep Slag Back in Ladle

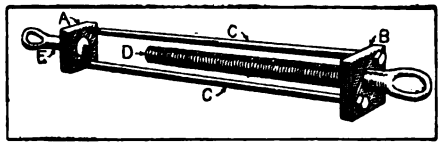
An extra man is always required for each ladle when taking off a heat to keep the slag and dross back from the pouring stream of molten metal. Make a hole or a spout in the side of the ladle as shown in the sketch and the part of the ladle above the hole will not permit the dross to pass out with the flow of metal.



A round file may be used as a reamer by inserting it in the hole to be reamed and turning to the right instead of to the left. By doing so the file will not bind and excellent work will result.

## How to Make a Long Turnbuckle

A hole is drilled in the center of two square plates of metal which may be of any size suitable for the work at hand. These two plates of metal are represented by A and B in the sketch. Two smaller holes are drilled in opposite corners of both plates, A and B,



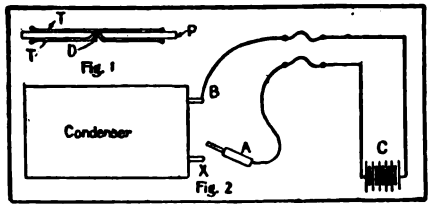

Making a Long Turnbuckle

and the ones in B are tapped to receive the threads of the long bolts, C C. A long screw bolt D is made with an eye in one end and is inserted through the center hole in B and fitted with a nut on the back side of the plate. Another eye piece is inserted through the center hole in plate A and a head riveted on the back side. When in position the nut on the back side of the plate B is turned to take up the slack.

## How to Clear a Short-Circuited Condenser

The accompanying diagram shows how to apply the electric current to a condenser that may have become short-circuited by the tinfoil, through a defect in the paper insulation, making a contact one sheet with the other, as shown in Fig. 1.

Connect the contact point, A, Fig. 2, to one side of the source of current and the wire, B, to the other side, connecting this wire to the condenser as shown. Then by means of attaching the con-




Cleaning out a Condenser

tact point, A, to the condenser terminal, X, you will succeed in burning out the short-circuited portion of the condenser, says Telephony. Be sure to insert a fuse wire between the contact point and the source of current, which will blow out at about five amperes, and it is well to simply make passing contacts between A and X until you have observed that the short-circuited portion has been cleared. C represents the source of electric current, which may be the regular 20 or 40-volt storage battery or it may be a 110-volt lighting circuit. Either system will serve so long as it is a source of direct current.

In Fig. 1 is shown the tinfoil, T, and the paper insulation, P. D shows the defect in the paper where the tinfoil has forced itself through in contact with another sheet. It is this contact point which is burnt out when you "flash" the condenser in the manner described.

## How to Construct a Small Brass Furnace

The blacksmith, particularly the one who has put a metal working lathe in his shop, frequently feels the need of some means to obtain small castings quickly. If the shop is located in the vicinity of a foundry, the problem is simple, but when the nearest melting shop is miles away, then the question of repairs becomes a serious and expensive one. There is a way by which the smith in a remote region may obtain permanent relief. It is by putting in a small brass furnace and the accessories of a foundry sufficient to make small patterns, mold them in sand and cast in brass.

There are a great many places in repair work where a brass casting can be made to replace a broken steel one, and there are many other places where brass construction is far better than iron, although perhaps more costly. Sometimes cost cannot be considered where repairs must be made in a hurry.

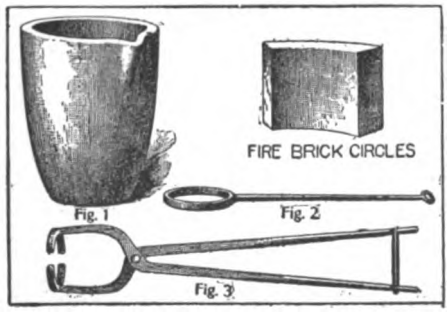



**Fig. 1—Crucible for Melting. Fig. 2—Ladle Handle for Crucible. Fig. 3—Crucible Tongs**

Figure 1 represents a form of crucible usually employed for containing brass during the melting process. These crucibles can be obtained of any size, from 1-oz. capacity to large enough to hold 300 lb. of metal.

Different sizes of tongs will be required to fit crucibles of varying capacity, but as a foundry seldom uses more than one or two sizes of crucible, the assortment of tong sizes need not be an elaborate one. These are clamped over the crucible whenever it is necessary to move the crucible, either for putting in more coal, for replacing the crucible in a vertical position in the fire, or for removing it when the brass is ready to be poured into the molds. To pour the metal out of the crucible, a bar may be put through the tongs just above the crucible and held by two men, while another man tips down the crucible by means of the top end of the tongs, using them as a lever fulcrumed over the bar. In this manner the contents of the crucible may be poured at will. In regular foundries the tongs are removed from the crucible after the latter has been taken from the furnace and set on the ground over one of the ladle handles shown in Fig. 2. Then the tongs are removed, the ladle handle lifted into place to take the weight of the crucible and contents, which then

may be treated as if it were an ordinary ladle, and the molds poured by one man instead of three. The tongs are made as shown in Fig. 3.

To make a brass furnace for occasional use, procure a piece of sheet iron, 3 ft. wide and 8 ft. long. Bend this up in a cylinder and rivet together as shown in Fig. 4. Cut opening for the smoke pipe, A, the grate stems, C and D, for the ash door and for the air pipe, B. Also rivet on slides each side of the ash door in order that the air supply entering under the grate may be controlled by means of a sheet metal slide fitted over the ash opening instead of a door, and for the purpose of closing that opening entirely in case of necessity. The forge blower is connected direct to the air pipe, B, and used in case the chimney fails to give the necessary degree of heat.

The grate may be taken from any coal stove which will yield the proper size. The grate is held in position both by the stems, C and D, which bear in the iron shell, and by the bearings of the stems in the brick lining of the furnace. The fire pot is lined with fire

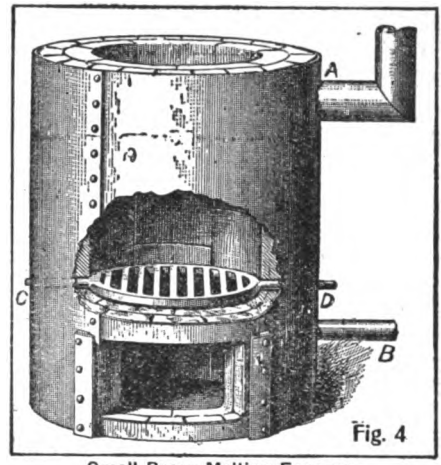


Fig. 4

Small Brass Melting Furnace

be 18 in. inside and 24 in. outside diameter. This will leave 3 in. all around inside the shell for a course of common bricks set on end and laid flat against the shell, the whole to be set with fire clay.

By having the working floor level with the top of the furnace it is easier to lower the crucibles into place, also to remove them from the furnace when under heat, says a correspondent of the Blacksmith and Wheelwright. The furnace should be placed in a pit excavated in the floor of the shop, as shown in Fig. 5, the furnace being supported on two pieces of railroad iron placed across the pit. The smoke pipe, C, is led away to a flue, E, which should be at least 30 ft. high to give the necessary draft. Were it not for the possibility that a blast might be required on account of poor coal, or some other reason, then the ash door and slide might be dispensed with, together with the bottom plate between the furnace and the rails. In this case the ash and clinkers would fall directly to the floor of the pit through the space between the rails.

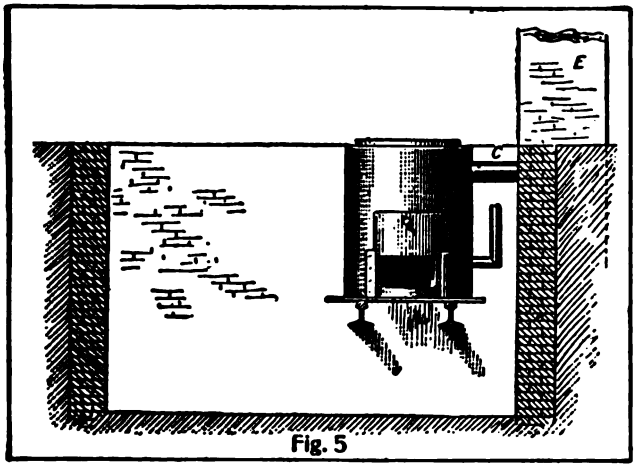


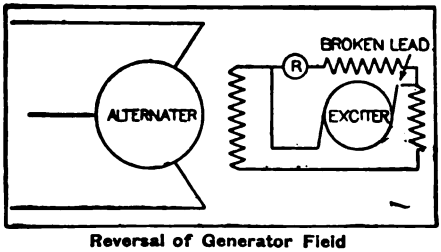
Fig. 5

Furnace Arranged in a Pit

brick circles. These circles are carried in stock by manufacturers of fire brick, and are known simply as "brass furnace circles." If a brick of this kind 7 in. high and 3 in. thick is used it will take seven to make a circle, which will

## The Reversal of a Generator Field

An interesting field reversal occurred in a power plant consisting of a 440-volt, 150-kw., belted three-phase generator, with a 6-kw., four-pole, 125-volt belted exciter. A few minutes before "shutting down time" the alternator lost its field. A hurried examination showed that the negative exciter lead was broken at the brush-holder, also that three of the pole pieces were north pole, and one south. The lead, when found, lay across the frame, ap-



Reversal of Generator Field

parently having dropped there when it broke, but without grounding. After the broken lead had been repaired, a short-circuit test with a telephone receiver showed the circuit between the two armatures clear.

The machines were then started up, but the exciter "picked up" the wrong way, says a correspondent of the Electric Journal. The only direct-current apparatus available was a couple of dry batteries which the engineer explained, as he brought them out, were about exhausted. These were applied to the series field of the exciter. They would reverse the field in the air-gap, but as soon as they were disconnected the residual field still showed the wrong polarity. The batteries were then applied to the shunt field. The field in the air-gap was apparently neutral while the batteries were attached. This suggested a possible solution of the trouble. The batteries were connected in the shunt field circuit and then the machine was started with all the resistance in the rheostat cut out. After a few seconds the machine began to pick up in the right direction and was then ready to run.

The accompanying diagram shows the cause of the field reversal. When the field circuit of the alternator was broken it discharged through the shunt field of the exciter, the direction of the current being opposite to the normal.

## A Concrete Pipe Joint

A novel method of connecting concrete pipe by means of an impervious and strong joint is described in the Engineering News. In the many instances in which cast concrete pipe has been used it has generally been found extremely difficult to form a joint which is at once watertight and strong enough to bear the weight of the earth filling, but the present process seems to solve both problems.

The pipes are cast in lengths of about 3 ft. The end faces of each pipe are provided with a groove having a triangular or semi-circular section, this groove being larger at the lower part of the pipe where the thickness is greater. These faces are provided with shoulders, to prevent a vertical movement of the pipes, when being set. At the crown of the pipes, semi-circular openings are provided, which form round holes in the top of the pipe when the two sections are joined. The joint is effected by first putting the adjacent sections together, the shoulders interlocked, and pouring hot asphalt through the circular opening on top until the entire groove is filled with asphalt. This filling of asphalt rapidly hardens so that in a very short time the earth fill can be replaced in the ditch. The small amount of asphalt which may leak through the inside of the joint may be chipped off as soon as it hardens.

A copper coating may be applied to brass for laying-out purposes in the same manner as used on iron or steel. The entire surface is covered with cast-iron dust, while the brass is still wet with the solution. Brush off the cast-iron dust, and the surface will have a nice copper coating.

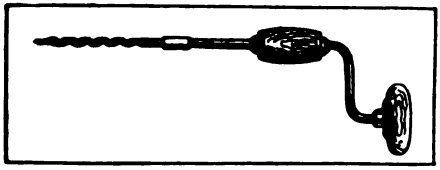
## How to Set Up and Operate Pumps

The suction and discharge pipes should, under no circumstances, be of smaller diameter than indicated by pump connections. When long pipes are used it is necessary to increase the size to allow for friction. Use as few elbows, tees and valves as possible, says the Practical Engineer. Lay suction line with a uniform grade from the pump to the source of supply, and be sure to avoid air pockets. The greatest care must be taken to make the suction line absolutely airtight, as a very small leak will supply the pump with enough air so that little or no water can be obtained.

A foot valve is also desirable if its location is such that the suction pipe can be drained in cold weather. The valve will insure quick starting of the pump by keeping the suction pipe filled with water. Hot water cannot well be lifted by suction, as its vapors tend to destroy the necessary vacuum. Therefore, hot water should be arranged to flow to the pump, and this applies also to thick liquids. Keep the stuffing boxes evenly packed, but do not screw them down tight, and give the pump reasonable attention.

## Linemen's Pole Brace for Boring Holes

This brace and bit is intended for boring holes in the tops of poles after

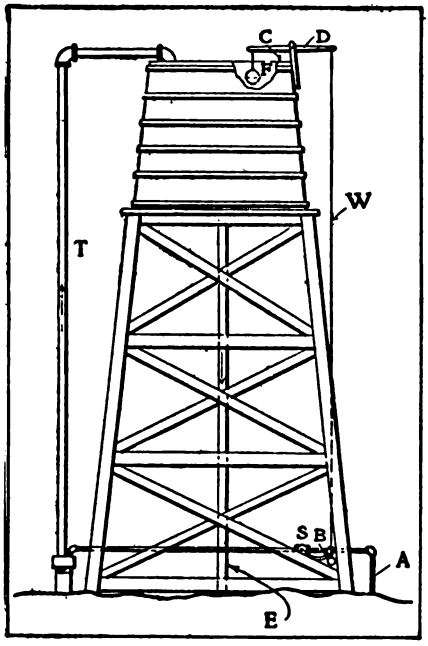


Brace for Boring Pole Tops

they have been set. In operating the brace the left hand grasps the center knob and steadies it, while the end or crank knob is turned with the right hand. In this way the lineman is not obliged to lean out from the pole and danger of falling is lessened.

## Air-Lift Regulator for Water Tanks

In our plant we have an air-lift supplying water to a tank which is situated some distance from the engine room, and consequently could not be




Automatic Tank Regulator

easily regulated therefrom, says a correspondent of Power. The demand on the tank was intermittent, and it was essential that the tank should neither go empty or overflow. The regulator shown in the accompanying sketch was devised and installed.

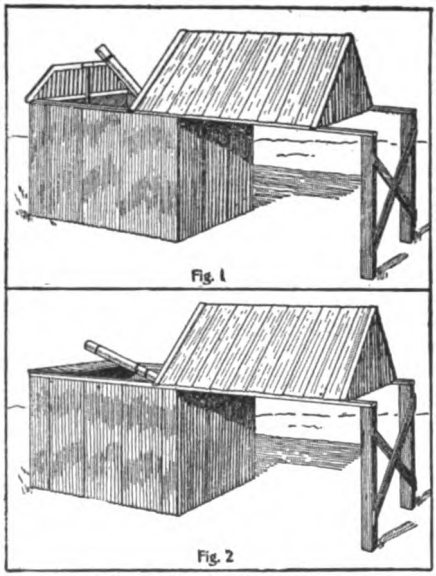
A stop-cock, S, with a bell crank lever attached to the plug, is placed in the air pipe, A. From this lever a wire, W, is connected to a walking-beam, D, from the opposite end of which a float, F, is suspended. The stop-cock and float were adjusted so that when the water was 3 in. from the top of the tank the stop-cock was just closed. As soon as the water fell in the tank the stop-cock was opened, admitting the air to the lift.

This device kept the water within 2 in. of a fixed point excepting, of course, when the air supply was shut off. The

walking-beam, D, has a stop, C, on which to rest when the tank is emptied. The weight, B, is used as a counterbalance for the float and to keep a tension on the wires.

## A Wood and Iron Telescope House

The accompanying illustrations show the construction of a house used for a telescope in England that is made by using a frame of wood over which is placed corrugated iron as a covering. The roof is placed on small rollers and can be moved clear of the house, giving an entire opening for the telescope,




Observatory Without Dome

says the English Mechanic. Fig. 2 shows the gable turned down to clear the way to view the horizon.

## How to Wash Automobile Tires

The best method of washing automobile tires consists of passing a damp sponge, or a well-wrung cloth, around the covers. In this way all grit and dirt can be effectively removed, and the condition of the rubber readily seen. The washing should be done with the smallest possible quantity of water to prevent permeation of moisture to the inside of the covers. Many motorists are in the habit of washing the bodies of the cars with kerosene and water, and for removing mud and dust from the varnish the mixture is very satisfactory. But such a method should never be employed for the cleansing of tires, says Automobile Topics. If rubber comes in contact with kerosene for any length of time it will become swollen, disintegrated and will crumble in the hand. If moisture is allowed to enter the cover it will very soon begin the destruction of the canvas linings, besides rusting the rims, and rusty rims will ruin the covers.

## Nickel Plating Without Electric Current

A light coat of nickel may be deposited upon brass and copper articles without the use of the electric current. The deposit is hardly sufficient to stand heavy buffing, but it may be lightly treated without cutting through.

A solution is made up as follows:

| | |
|---|---|
| Water | gal. 1 |
| Double Nickel Salts | oz. 8 |
| Sal-ammoniac | oz. 8 |

The salts are dissolved in the water, and the whole is then heated nearly to boiling, says the Brass World. The brass or copper articles are immersed in the solution and some pieces of aluminum are placed in it so that they come in contact with the brass or copper. The aluminum may be in the form of sheet scrap or granulated. A few pieces only are necessary.

Gas is given off from the aluminum and within a minute the article will become covered with a white coat of nickel. In a few minutes a fairly heavy deposit will have been produced.

The nickel deposit is not quite as white as that obtained by electrodeposition from a good nickel solution, but it is the equal of an ordinary grade. It has a dark shade resembling the nickel obtained in an alkaline plating solution.

Leather washers smeared with soap will not leak gasoline.

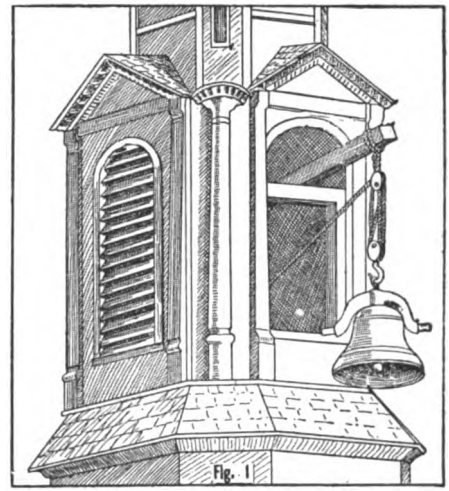
# How to Mount Large Bells in Towers

(By Courtesy of Meneely Bell Co.)

The bell-chamber should not be placed any higher in the tower than is necessary in order to bring the position of the bell, when mounted, just above the level of the tops of the surrounding houses. This room should be especially arranged to permit the free egress of the sound. It must be tightly sealed directly above the tops of the windows, which should be as wide and open as possible, and extend almost to the floor, in order that the bell, when at rest, may have its mouth above the level of their base. The floor beneath the bell must be tightly closed.

It is usual to construct the tower in such a manner that the bell can be readily hoisted to its position through openings on the inside. Since, however, it is frequently necessary to raise the bell on the outside, the accompanying cut, together with the following instructions, shows an easy way of getting a bell into its place.

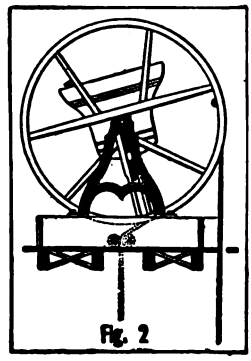
First a strong beam is projected at an elevated angle, from the top of a window in the bell-chamber, and securely fastened. The tackle is attached to the end of this beam and the power is applied either from within the tower, or by running the rope to the ground and through a stationary pulley, where it may be drawn upon by any number of men, a team of horses, or a mechanical apparatus. When the bell has been raised to a sufficient height, it can be drawn into the tower by the guide rope or a small tackle. Prior to the hoisting of the bell, the frame should be raised and placed so that it has a firm and level bearing. The wheel should also be raised before the bell and placed upon the proper side of the tower, ready for attachment. It will be noticed that the wheel must necessarily be placed upon the side of the frame opposite to that upon which the tolling hammer is to be attached. When the bell is mounted the standards should have small, wooden braces set up against




Mounting Large Bells

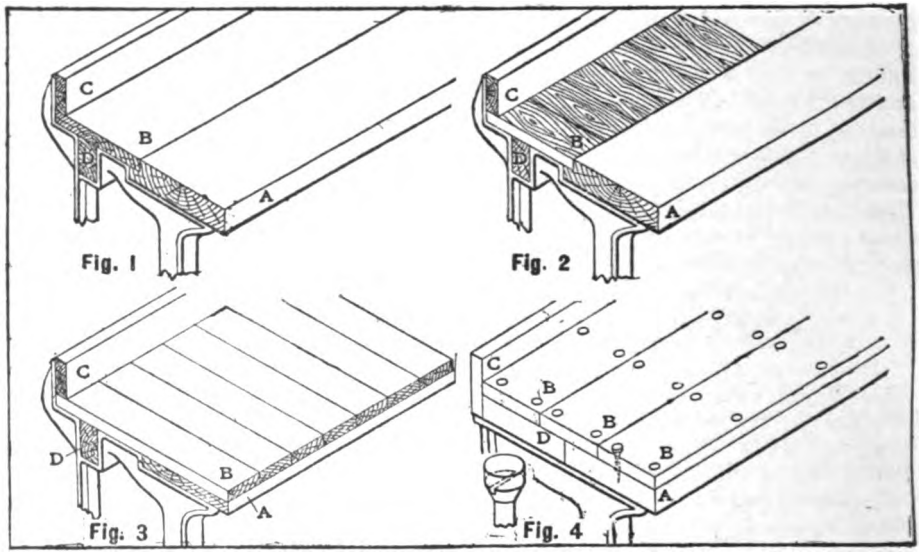
them, sidewise and bearing against the wall of the tower at the intersection of the floor, so as to prevent any fracture or straining in that direction. The clapper bolt should be well oiled when inserted and the key opened at the end, to prevent its falling out.

The rope is attached in the manner shown in Fig. 2. Whenever the weight of the bell permits, it is usual to let the rope pass down through sheaves, directly under the center of the wheel, by which arrangement the bell can be swung completely over, without disarranging the rope. In case of bells of heavy weight, since any additional friction would materially increase the labor of ringing, it is usual to let the rope fall in a direct line from the outer portion of the wheel and pass through the floor, without the use of sheaves.



## Some Designs of Work Benches

The average shop needs a bench that is rigid; that will stand chipping and filing; that can be used in testing work on a surface plate or in handling jigs and fixtures; that will not splinter badly nor yet injure a tool should it happen to drop onto it. For the toolmaker the cast-iron bench top has many advantages, but both the bench and the tool are very liable to be marred by dropping the tool on it, so that for general use we must rely on wood as a material for this purpose.




Various Styles of Work Benches

Steam pipes have taken the place of stoves and the best place for them is on the wall back of the bench, says the American Machinist. This will not allow us to brace up the bench against the wall. A cast-iron bench leg is now used, as shown in Fig. 1, which will permit the bench to stand far enough away from the wall to allow a passage way for the heat from the pipes. Figure 1 also shows the back board, B, rabbeted to the plank A, which supports it all along the front edge, and it is also supported by the stringer D, which runs the whole length of the bench. These supports, in addition to the cross bearing of the legs every 6 or 8 ft., give the back board a stiffness that is unknown where they are simply laid flush and not rabbeted and the stringer is absent.

All cracks are more or less a nuisance in bench work, but in this case any shrinkage can be taken up by wedging against the iron support of the board C and the edge of the back board, B.

Another style bench with the same leg is shown in Fig. 2. Here the front plank, A, and the board, C, are the same as before, but instead of having one back board, this part of the bench is made up of narrow strips as B, fitting into the rabbet in plank A and supported by the stringer D as before. These narrow boards can be either tongue and grooved hardwood flooring, or can be square edges, as preferred; in either case any shrinkage can be taken up by forcing the boards together.

A cheaper form of bench is shown in Fig. 3, where the heavy planking is entirely dispensed with and the boards B run the full width of the bench as shown. Running along the front, underneath the main boards, is a soft plank, A, which supports the edge of the bench where the most work comes, and under the back is the 2 by

6-in. stringer as before. Here, too, the boards can be either notched or square edge, each having its advocates; the objection against the tongue and groove being that the edges are apt to split off from heavy articles dropping on them. An advantage claimed for the boards running this way is that the work going on or off the bench is always in the direction of the grain of the wood and that fewer splints are formed on that account. In Fig. 2 or 3 any local wear can be remedied by replacing the worn board with a new one.

Still another style of bench is shown in Fig. 4 and one which is designed to be serviceable and have a long life without so much regard to first cost as some shops must exercise. The bench leg is flat on top, the first layer of maple planks, A and D, and on top, narrower boards of the same material. These are fastened with long wood screws, holes being countersunk and plugged as shown.

## Calking Pipe Joints

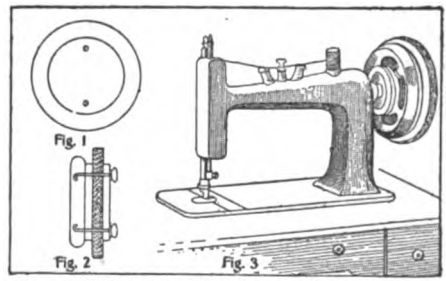
A method recently introduced of making lead joints for gas and water pipes is claimed to possess a number of advantages over the old ways. Formerly joints for gas and water pipes were made by first putting in strands of hemp yarn and filling the remaining space with molten lead. After cooling this would require calking and when finished only a part of the lead would be holding the joint. In making the joints in this manner it is necessary to have the pipes dry or else a poor joint will be made; there is also danger of accidents from the blowing of the hot metal. If the yarn is not properly calked the lead will enter the pipe and form an obstruction for the water or gas.

The new method of making the joint, it is claimed, avoids all the disadvantages above mentioned and has other advantages of its own. In this newer method a patent "lead wool" is used, and this consists of fine threads of the purest virgin lead cut by patent machinery, and in such a way that it will weld together when hammered, says Light. The patent lead wool is set out in strands formed of a sufficient number of threads, each strand weighing about a pound and being about 3 ft. long.

After the introduction of the usual hemp or yarn (not tarred), this strand of "lead wool" is twisted until it fits the space in the socket. It is then well calked, and this calking is repeated with each turn of the lead wool until the socket is filled and the whole of the lead wool is tightly pressed into a dense mass of lead, whereby not only a safe and efficient packing is obtained over the entire depth of the socket, but the joint is capable of withstanding a much greater pressure than the joint made in the ordinary manner.

## Home-Made Buffing Wheel

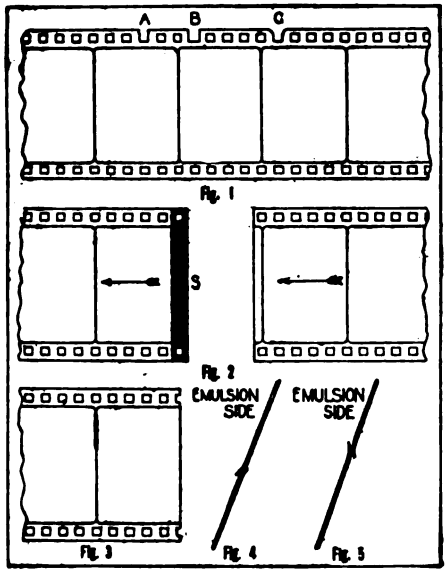
The family sewing machine may be put into useful service when not needed for sewing purposes by making a buffing wheel and attaching it to the small hand or fly-wheel. Two pieces of wood are made circular about the same size in diameter as the wheel. Several layers of cloth are placed between these wood discs and trimmed in a circle larger than the discs as shown in Fig. 2. These wood discs, together with the cloth, are clamped to the wheel with two bolts which are made hooked on one end and a thumb nut on the other. The buffing wheel can be attached and removed quickly. Figure 3 shows the wheel in position.



Polishing with Sewing Machine

## How to Repair a Moving Picture Film

When a socket hole is broken out in a film as shown at A, Fig. 1, it is best to trim it rounding, as at C, to be used only until time may be had to make a splice. The hole should never




Repairing Moving Picture Film

be trimmed square as at B, says the Moving Picture World. It is better to make a splice as soon as possible, and to lose one picture in doing so, rather than have the notch catch, which is liable to cause the loss of several pictures.

The splice should be made as shown in Fig. 2, scraping the end S where the film is cut, and on the end of that part toward the beginning of the film, as shown in the direction of the arrows. The cut is made between the sprocket holes, not through them, as in Fig. 3. In passing through the machine the emulsion side of the film is never touched except by the rollers, while the celluloid side comes in contact with all the rigid parts of the machine, and if there is anything that is not smooth, there is trouble; so it can be seen by Fig. 4 that, no matter what it hits, the film will pass safely; but in Fig. 5, with the wrong splice, it is always inviting trouble.

## How to Paint over Cement

It is not safe to paint over the surface of cement until it has stood exposed to the weather for about one year unless the surface has first been sized with acid water to kill the alkali, and even then there is some danger of bad results. Here is a somewhat tedious method for preparing and painting such a surface, but it has the sanction of some of the best painters, says the Master Painter. Slack one-half bushel of fresh stone lime in a barrel and add in all 25 gal. of water; when slacked and cold add 6 gal. of the best cider vinegar and 5 lb. of best dry venetian red. Mix well and then strain through a fine wire strainer. Use it when about the consistency of thin cream. Give the cement surface a coat of this, and after standing a day or so apply a coat of red lead and linseed oil paint. After this has dried you may paint the surface any color you wish. Some jobs require two coats of paint over the red lead paint. In this case make the second coat of paint serve as filler and paint both. This second coat may be made with plaster of paris and oil of the consistency of buttermilk. Then break up some white lead and oil to make a paint the same consistency as the plaster paint. Now take equal parts of each of the two mixtures and "box" them together, and thin to a working consistency with turpentine. This second coat should be applied as heavy as possible, or as heavy as you can spread it well. After this coat is dry apply your next and finishing coat of paint, which should be quite glossy, or about as you would for the last coat on woodwork outside. The object in giving it this plaster paint is to prevent the running and wrinkling of the paint where considerable paint is to be applied to the surface. And it must be made to dry quickly, so that you will not likely give the finishing coat

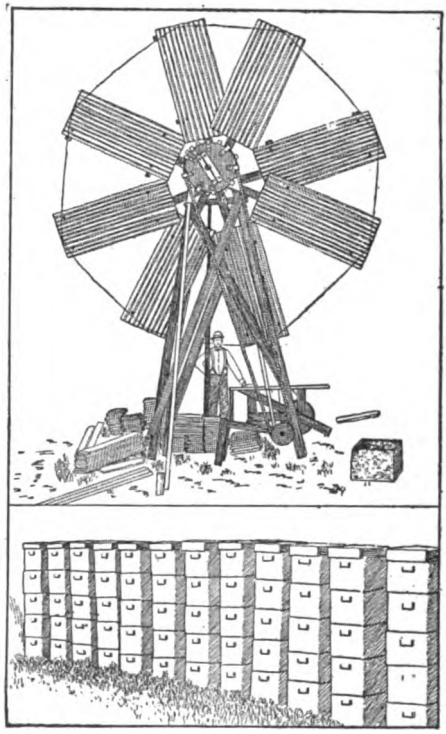
before the second coat is dry enough, for if you do that there will be blistering or cracking. Observe particularly that no plaster is to go in the last or finishing coat.

### Home-Made Power Windmill

As I am owner of several hundred colonies of bees, I am constantly in need of new beehives, frames and hive parts. These apiarian accessories of the present day are very expensive. Being a mechanic of a small amount of ability, I concluded to manufacture the accessories at home. A circular saw could be installed very cheap, but the power to drive it was quite another thing. The cheapest gasoline engines were too expensive for me, and I had no water power to use, so I decided to harness the wind and turn it into service. The illustration shows how this was accomplished. The windmill was constructed from house building material, which was not damaged for building purposes, and to which use I will put it when through making beehives.

The axle for this mill was made out of a heavy 2-in. gas pipe. It revolves in iron bearings which fit into the bolsters of the frame. The axle is drilled on each side of the bearings, and iron pins inserted through the holes. The framework and crossarms are made from 2 by 4-in. material, 12 ft. long. The arms for the wheel are secured to the axle by means of a clamp, which is effected by the arm being half sunk around the axle, and a corresponding piece for the opposite side, with ½-in. bolts inserted to draw them together. One of the arms is secured to the axle by means of a pin to prevent the wheel from slipping on the axle. In order to secure the rest of the arms in addition to the clamps, a wire was placed encircling the outer circumference of the wheel and fastened to each arm. The pieces of sheet steel roofing are fastened to the crosspieces on the arms by means of large screws. A friction brake is used to control the mill, and is also used in starting and stopping it. The power of the mill is transmitted to a line shaft at the lower part of the frame by means of a rope drive belt.

The mill is set with the surface of



Develops 3 or 4 Hp.

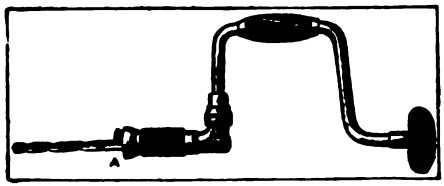
the wheel facing north and south, and is securely braced fore and aft. In addition to this, it is guyed to the ground with steel telephone wire. The mill has been operated in a gale of 50 miles an hour, and there was no apparent danger of tipping over. It makes no difference if the wind comes from the north or the south, as all that is necessary to get the forward movement on the machinery is to cross the rope belt. To accommodate this belt crossing, the bearing of the driving wheel side is placed on a lever which can be raised or lowered as the case may demand.

The mill is geared 40 to 1, and drives a 6-in. circular saw with a rim speed of from ½ to ¾ of a mile per minute. I have no way to rate the power, but

I am of the opinion there is 3 or 4 hp. when running in a stiff breeze.—Contributed by T. P. Robinson, Bartlett, Texas.

### How to Drill Tapered Holes In Marble Slabs

Sometimes the plumber needs to drill holes in slate and marble slabs in which to insert wood plugs for holding retaining screws. When a straight hole is

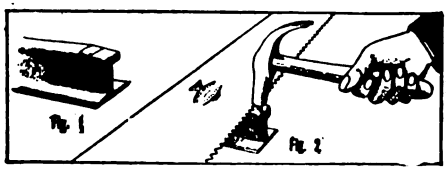



For Drilling Tapered Holes in Marble

drilled the wood plug is liable to shrink and slip out, even though it may be well fitted and driven in tight. Tapered holes are necessary. These holes may be drilled in one operation by removing one jaw from the chuck on the brace as shown at A in the sketch. This will set the point of the drill a trifle to one side of the center line. When a hole is drilled with this device it will have sufficient taper to hold the wood plug tightly.

### Home-Made Saw Set

Secure a piece of T-rail about 1 ft. long (if railroad iron is not available, any piece of iron about 2 in. square will do) and bevel one end on top with a file, $\frac{1}{8}$ in. down by $\frac{5}{8}$ in. back. On this bevel make a gauge mark $\frac{3}{16}$ in. down from the top of the bevel as shown in



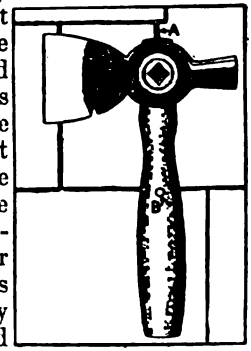

Home-Made Saw Set

Fig. 1. Lay the saw on the flat surface of the iron with the points of the teeth to the gauge mark. Strike each tooth, as shown in Fig. 2, one smart blow, or two light blows with a light hammer having a small face (a horseshoeing hammer works well).

The gauge mark given is for soft wood, such as white pine, hemlock, etc. To set the saw for hard wood, draw it back a trifle from the gauge mark. The above is a quick, effective and accurate method of setting a saw.—Contributed by N. J. McLean.

### A Measure on a Shingling Hatchet

In shingling roofs, considerable time is lost by going back and forth across the roof striking chalk lines and chalking the lines, but by using the measure attached to the hatchet as shown in the sketch this lost time may be saved and the work accomplished with greater speed. A nail is driven part way into the wood handle as shown at A, leaving about $\frac{1}{2}$ in. extending. Bore a small hole in the handle at B, in which to place a hardwood pin. This hole and pin should be placed at the right distance from the extreme end of the nail, A, to equal distance that the shingles show to the weather.



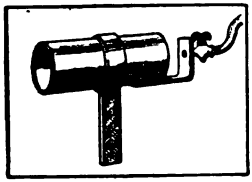

In using the hatchet, the first double course of shingles are laid in the usual way with the line; then, by placing it as shown, eight or ten courses of shingles may be laid while going across the roof once. Always place the hatchet at the lower right-hand corner of the shingle when placing it, and see that the left-hand corner is even with the last shingle placed.—J. E. B.

In putting up leather belting be sure to place the hair side next to the pulley. It not only clings to the pulley better but will wear much longer.

# SHOP NOTES

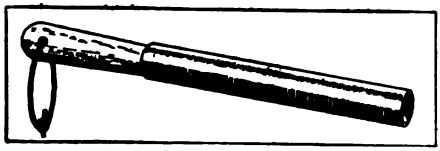
## How to Make a Shop Gas Heater

A small shop needs some kind of a heater for melting babbitt, heating soldering irons or drawing the temper in steel. Such a heater can be made to burn gas for fuel by using a piece of 2-in. pipe 6 or 7 in. long with a strap of iron bent around and made fast to it leaving a shank that will fit a mortise in the bench, or to be placed in the jaws of a vise. An L-shaped piece of metal is riveted to one end of the pipe, as shown in the sketch, with the bend about 1 in. from the end. In this bend, and exactly centering the hole on the pipe, drill a hole and fit in it a pet cock. The opening in the pet cock is bushed down to $\frac{1}{16}$-in. Attach a hose to the pet cock from a gas jet and the heater is ready for use.—Contributed by E. L. Scoville, Ashtabula, O.



## A Handy Spout Rapper

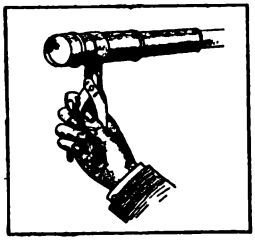
The accompanying sketch shows a spout rapper for the miller, made from $1\frac{1}{2}$-in. rubber hose by putting a wood handle in one end, with a string attached for hanging it up. This is a simple device, says the American Miller, but will be found exceedingly useful. One can be made and put in a convenient place on each floor.



Spout Rapper

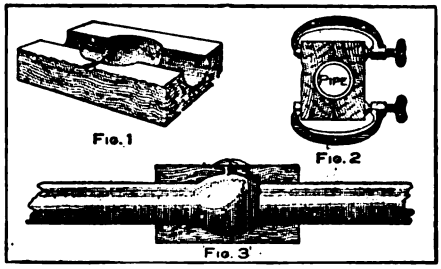
## How to Turn Thin Tubes Fitted with Threads

It is often difficult to turn the thin metal tubes in the parts of a telescope, field or opera glass without denting the sides if a vise or pliers are used for gripping them. The part may be easily held and turned by placing a piece of leather around it and holding the ends with the pliers close to the tube, as shown in the sketch, so the leather will grip the tube tightly.



## Another Way to Make a Soldered Joint

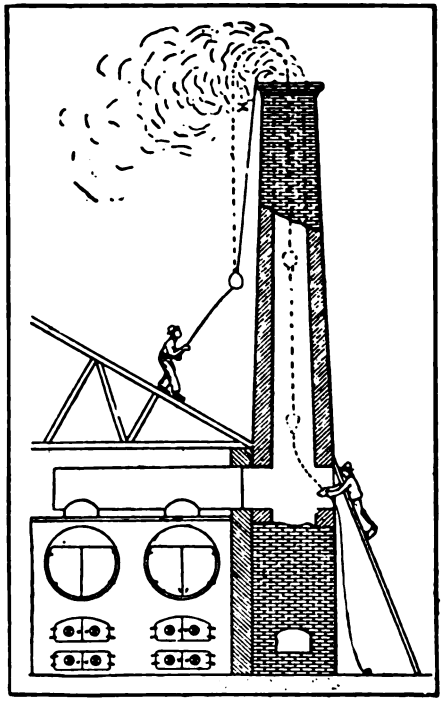
The method herein described and the accompanying cut show how to make a soldered joint on brass, copper and lead pipe. The pipe is cleaned and tinned, then placed in a mold made of two pieces of wood. One piece or one-half of the mold is shown in Fig. 1. The two parts of the mold are placed around the pipe joint to be soldered and held in position with clamps, as shown in Fig. 2, while the melted solder is poured. Figure 3 shows the completed joint with one-half of the mold removed.




Another Soldered Joint

### How to Put a Line over a Stack

In repairing or painting a stack, it is sometimes necessary to place a line



Putting a Line over a Stack

over the top, and the method illustrated herewith, from The Engineer, will be found successful.

A paper bag is blown out full, attached to a cord and sent up the stack with the draft. After securing the bag end of the string it is only necessary to pull up a stronger line, then a rope, by which a tackle can be hoisted.

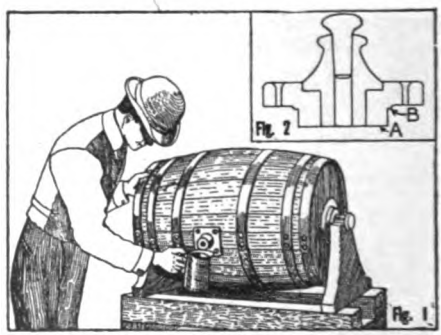
### Blown-Out Shots in Mines

Blown-out shots in mines are caused in several ways, viz.: Carelessness of workmen in drilling and tamping; overcharging of hole; insufficient tamping; unskillful placing of the explosive, having the length of the upper drill hole greater than that of the under, and thus placing the shot in the solid, says Mining Science. In order to prevent blow-out shots, it is wise to observe: That the hole is properly drilled and cleaned, and of just sufficient size to hold the cartridge, that the depth does not exceed the undercut and, if possible, the hole pointing upward, and that the hole is stemmed with clay, preferably dampened.

### A Handy Shellac Barrel

Owing to the drop in price which brought denatured alcohol down to the present cost, users are enabled to cut their own shellac in quantities. A barrel may be rigged up as shown in the sketch that will hold 35 to 40 gal. of shellac which will not only facilitate the drawing of the liquid but assist in its liquefaction. A few rotations in the barrel will mix it up very thoroughly, says Wood Craft. The spigot may always return to its vertical position if a counterweight be attached diametrically opposite. A piece of heavy iron bar, bent to the shape of the barrel, can be attached with screws to make this weight.

Figure 2 illustrates a cross section of the assembled spigot with stopper in place. If made of hard wood and thoroughly soaked in linseed oil it will be found to act freely. In fitting it to



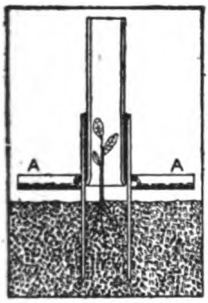

Shellac Barrel

the barrel, a hole is cut out of the latter to receive the 3-in. projection, A. Around this hole is flattened off a surface of about 4 in., so that the surface, B, of the spigot may make a good tight joint with the barrel. Four screws are used to attach the spigot,

being inserted through the rectangular portion and near the four corners. In placing the dry shellac in the barrel a large open-mouth funnel will be found very effective in the way of a time saver. Three pounds of shellac to one gallon of alcohol will be found a fair proportion for cutting.

### How to Transplant Plants

The accompanying sketch shows how to make a device to transplant cabbage and tomato plants that will not allow the dirt to fall away from the roots. In making the device, two pieces of brass pipe 2 ft. long, one 2 in. and the other 1¾ in. in diameter, must be secured. Two handles, A A, are attached to the outside of the 2-in. pipe. The 1¾-in. pipe is bent out at one end in a bell shape to fit the interior of the larger pipe. The larger pipe is set over a plant and pushed down into the ground, and when raised out the plant and earth about its roots are removed intact. The smaller pipe, when pushed down on the earth about the plant, removes them in one solid piece. Plants set in this manner will not wilt, and almost all of them will grow.

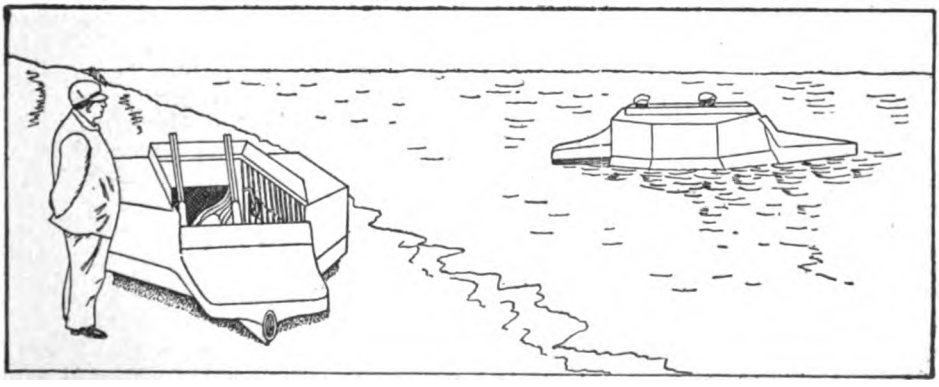



### A Goose Hunting Boat

A goose is decidedly game and because he is a goose that is no reason he should be a fool bird and take all kinds of chances. Least of all does he take any risks that might endanger his neck—at any rate chances in the shape of a man. Neither does the goose take any chances in the color of a man.

The sportsman knows his goose and treats him accordingly. When the ice breaks up and goes floating about the harbors in large cakes to find its way to the sea, the sportsman sets his plans to fool the wily goose at his own game. About the time when the ice breaks up, great flocks of geese on their way from the south spend weeks feeding in the shallow harbors along the Nova Scotian coast, lingering around the shores of the peninsular province until the real spring has come and the milder weather begins to loosen up the ice in the regions farther north, says Field and Stream. This is the time when the sportsman dons his "ice clothes," gets out his "goose-float" and begins his campaign against the wisest specimen of the feathered tribe.

The "goose-boats" are long, low, squarely built affairs, made of wood, partially covered with canvas, and painted white. They will easily accommodate two men, and can be propelled from the inside without oars or other aid from the outside. The paddles which propel the floats are arranged

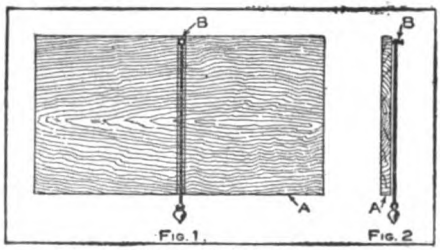


The Goose Boat is Rowed from Inside

underneath the boat and are propelled by a series of chains inside the craft, as shown in the accompanying sketch. The float so nearly resembles an ice cake that its occupants can approach within a few yards of a flock of geese feeding or sitting on the water.

### A Substitute for a Level

Secure a board with one straight edge and use this edge for the bottom of the level as shown in the sketch at A, Fig. 1. On one side of the board draw two parallel lines at right angles and perfectly square with the edge A. Exactly in the center between the parallel lines swing a cord attached to a nail driven in the board at B. To the lower end of the cord tie a plumb bob or weight just a little below the edge of the board A. Figure 2 shows the end view. When the board is held up vertical with its edge, A, resting on the work, the cord must swing parallel with the lines to have a perfect level.



Home-Made Level

### How to Make a Socket Wrench

Secure a small piece of steel pipe, from 2½ to 3 in. long, of suitable diameter to make a wrench of the desired size. Fit a short piece of round iron inside the pipe. Take a welding heat on both pieces and weld the pipe down smooth to the shank, drawing the shank down to the desired size to fit the brace, says the Blacksmith and Wheelwright. Heat the hollow end of the pipe and square it up, drawing the square end down a little below the size of the pipe so that the nuts will not stick inside above the square end.


Socket Wrench

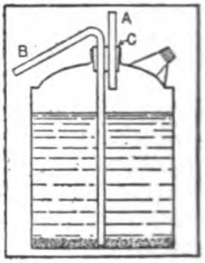
### Where the Heat Goes in a Gasoline Engine

It is pretty generally agreed that the heat expenditures in a modern water-cooled gasoline motor are, according to Country Life, about as follows:

| | Per cent. |
|---|---|
| To useful work | 17 |
| To loss in radiation (not through water jacket) | 15 |
| To loss into water jacket | 52 |
| To loss in exhaust | 16 |
| | 100 |

### How to Clean Sediment from an Oil Can

The sediment in oil cans may be removed without pouring out the contents by using the device here illustrated. A rubber stopper, C, is fitted with two tubes made from either glass or metal. One of these tubes, B, is adjusted in the rubber stopper so the lower end will almost touch the bottom of the can. The other tube, A, only extends through the stopper. When the pressure is applied to the pipe, A, the sediment passes out through the pipe B.—Contributed by Henry B. Burke, South Acton, Mass.



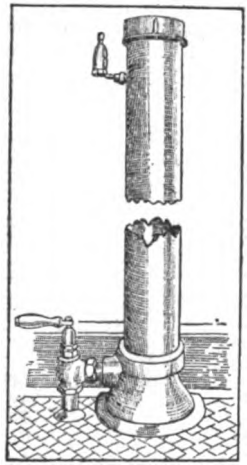

### Etching on Steel

Although etching on steel is supposed to be a trade secret, it is more or less generally known in the trades where such work is desirable. The surface of the steel, after being thoroughly cleaned, is first varnished with a solution of gum guiac or resin in alcohol. The imprint is then applied to the varnish with a rubber stamp con-

taining the letters or design desired, which is inked with a solution of caustic potash. This potash cuts through the varnish, leaving the steel exposed, says the Metal Worker. The etching is then accomplished by a weak solution of nitric acid applied to the steel, which bites out lines in the steel where the varnish has been cut by the potash. The varnish, it will then be seen, acts as a mat to keep the solution of nitric acid confined. The remaining varnish is removed by a strong potash solution, and the piece of steel then rubbed dry, leaving the imprint intact.

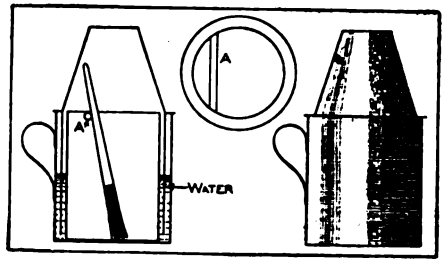
## One-Pipe Radiator for a Bathroom

The limited amount of space in the majority of bathrooms makes it very inconvenient for placing a regular radiator with sufficient radiating surface. The solution of this problem is clearly shown in the accompanying illustration. This radiator is made of 3½-in. wrought iron or steel pipe of any suitable length. The pipe is screwed into a specially constructed cast-iron base, or stand; an ordinary cast-iron cap covers the top, says the Valve World. The steam enters the base and passes up into the pipe. An automatic air valve is placed at the top.



## A Pattern-Makers' Varnish Can

A receptacle to hold shellac varnish for the pattern shop should be made in such a way as to be readily accessible and to have a tight-fitting cover to exclude the air. The accompanying sketch shows a double-walled can, or rather a smaller can set in a larger one, the two being soldered together so

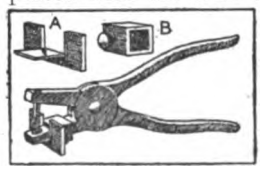



Varnish Can for Patternmakers

as to keep the smaller can in the center. The cover or stopper is of a diameter between the size of the outer and inner cans, and has a high conical top. This cover is inserted between the outer and inner cans, which should have a space of about ¼ in. A little water is kept between the cans so as to make an airtight seal, says Drafting. The high conical top of the cover accommodates the brush handle, which may either be set in the can resting on the bottom, or can be suspended by driving a wire brad in the brush handle and hanging it over the wire, as shown at A in the sketch. This wire is not only good to suspend or lean the brush against, but to wipe the surplus fluid off when removed from the varnish. If the brush is wiped only on the wire, and never allowed to touch the side of the can, the receptacle can be kept clean and tidy.

## How to Make a Belt Punch Gauge

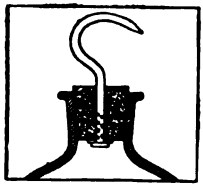
Where belts run over small pulleys it is necessary to have the lace holes placed near the ends of the belt. Some sort of a gauge must be used on the punch to make the holes in line. A gauge that can be quickly attached to a punch may be made by using a piece of sheet metal ⅛-in. thick cut and bent in the shape shown at A in the sketch. A



square block of metal, B, is fitted to the lower jaw of the punch and provided with a thumbscrew as shown. The projecting part of A is placed into the block B and both are slipped on the lower jaw of the punch. The adjustment can be made by placing the block at the point desired and fastening with the thumbscrew.—Contributed by A. W. Griggs, Homer, New York.

### A Handle for Corks

To avoid the bother of having corks break in the bottle when removing



them numerous times, secure a nail and drive it through the cork from the bottom end, using a small washer between the nail head and the cork to keep the nail from pulling through, and bend the projecting end in the shape of a handle as shown in the sketch. This is very convenient when the contents of the bottle must be used quite often.

### How to Cast Wax in Plaster Molds

Brass founders, modellers and others frequently desire to make a wax cast in a plaster of Paris mold, and unless the method of doing it is known, trouble frequently will be experienced. When rightly carried out, however, the operation is simple and certain.

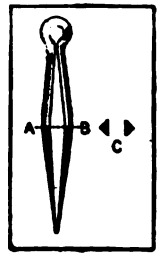
Wax adheres to dry plaster so that it is impossible to remove the cast without tearing. In order to prevent this difficulty, it is necessary to wet the plaster, says The Brass World. As an excess of water is detrimental to good results, the following method of procedure should be followed:

Place the plaster face upon a pail of water and allow it to remain until the water just begins to show in the face of the mold. The whole mold should not be immersed as too much water will then be taken up, but the back of the mold is held in the water with the hands and the face watched. As soon as the water begins to appear the mold is removed. The water will then spread over the entire surface but not in too great a quantity.

When the wax is cast in the mold, it can be easily removed without tearing. The moisture in the plaster prevents the adhesion. The moisture that remains in new plaster, immediately after casting, seems to be present in too great a quantity to allow a good wax casting to be made in it, and the best results are obtained by drying the plaster and then treating with water in the manner previously described.

### Split Cotter Pins Used as Sliver Tweezers

File a split cotter pin to a needle point making it triangular on line AB, as shown by the sketch in the cross section C. Midway between the eye and the end a piece of $\frac{1}{8}$-in. round rod is inserted and with strong pliers the free ends are bent together; but not quite closed, leaving a space of about $\frac{1}{16}$ in. The tweezers are used by running the point under the sliver, then closing by pinching the ends together. If it is hard to get at the sliver the wound is slightly enlarged by using the tweezers with the points together as a lancet point.




As a hygienic precaution always suck the wound from which a sliver has been extracted and put some disinfectant on it. After the tweezers have been used pass them quickly through the flame of a spirit lamp or put them in boiling water. This will prevent the danger of blood poisoning. If the tweezers are used promiscuously disease may be inoculated from one person to another. These tweezers are so easily and cheaply made that every one may have his own and keep them in his pocketbook.—Contributed by C. E. Warren, M. D.

### Gas Engine's Speed Retarded by Improper Ignition

The following is a description, which no doubt has a familiar ring to those who have "been there," but shows how simple a trouble may be when found, but undiscovered appears extremely complicated. This trouble was in a private lighting plant where it was impossible to carry proper voltage at even half-load. A brief examination of the generator showed nothing out of order more than that it was operating under considerably reduced speed, due to the driving power, a horizontal gas engine, which ran unsteadily and seemed to be laboring under divers difficulties, says the Electric Journal.

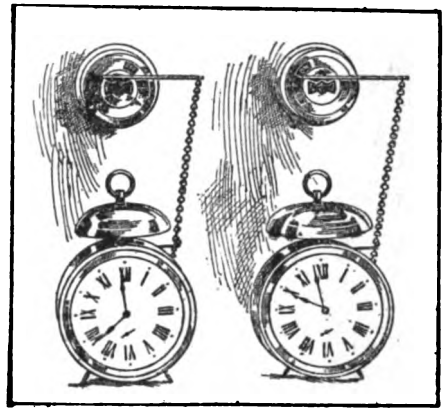
When shut down examination was made for leaky valves by carefully listening while turning the engine slowly. The valves and also the compression were found to be all right. Next the hot tube was examined. As most of the flame which heated it burned above the tube, adjustments were made to lower the flame, which, in the main, was accomplished by turning the less gas, upon which the tube immediately became bright red—much hotter than formerly. The engine was then started. It came sharply up to speed. The entire load was thrown on. The lamp went to full brilliancy with the engine running easily and with plenty of power to spare. The owner, seeing the lights up to candle-power, came running in in great glee and declared he "never had such good light before."

The insufficiently heated tube had simply retarded the explosions and greatly diminished their effectiveness. This was the sole trouble. It was afterward learned that the engine builders had been appealed to. They suggested that, owing to the evident seriousness of the trouble, the engine be shipped to them for overhauling, which they would do for a considerable sum.

Acid will clean old files and make them better, but will not make good files of worn-out ones.

### Alarm Clock Switch for Window Lights

The automatic electric time switch device here shown is one of the simplest of the many devices for shutting

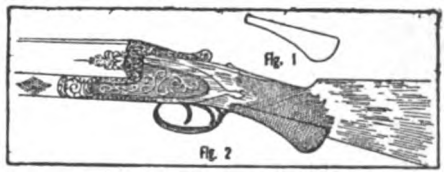


Time Switch for Window Lights

off electric lights used for illuminating windows or signs. It is nothing more than a common alarm clock, attached by a chain and lever to a regulation electric switch. The alarm hand of the clock is set for the time desired, the lever on the switch is turned to indicate on or off, and the chain hanging from the end of the lever is fastened in the slot of the alarm key by a hook. The proprietor then leaves his place of business for the night, knowing the device will switch off the lights at the time set.

### Changing a Plain Gunstock Into a Pistol Grip

Many hunters have plain grip stock on their rifle or shotgun and would like to change it to a pistol grip. The illustration shows how to do this and avoid the necessity of purchasing a new stock. Cut a piece of selected wood of the

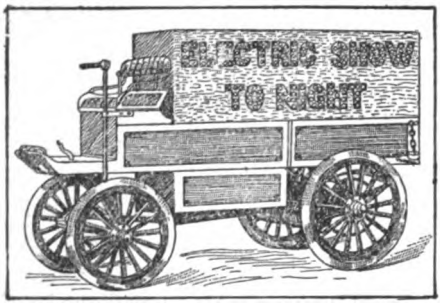



Changing Gunstock

same material as the stock, in the shape shown in Fig. 1. The stock is cut out on the line shown in Fig. 2, making a notch into which the piece of wood is fitted and securely glued. When finished and varnished, the joint will be solid and look as neat as if made from a whole piece of wood.

### Electric Signs on Automobiles

The accompanying illustration shows an electric illuminated sign used on

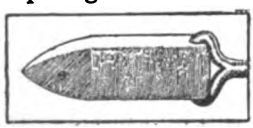



Electric Sign Wagon

electric trucks for advertising a recent electric show. The current used for illuminating may either be taken from the storage battery furnishing the driving power or a set of batteries specially provided and carried on the truck inside the sign box. An automatic flasher could be attached which would make a very unique advertising scheme for night parades.

### A Soldering Iron Kink

Drill a $\frac{3}{16}$-in. hole in one of the tapering surfaces of the soldering iron,



as shown, and some hard tasks may be made easy. This will be of special service in soldering washers on to small rivets. Tin the surface to be soldered and place the washer on the rivet and press the heated soldering iron on the washer with the rivet point inserted into the drilled hole.—Contributed by Chas. E. Frary, Norwalk, Ohio.

### Unjointing and Removing Cast-Iron Pipe

When our city bought out the original water company some 15 years ago it established a new supply and abandoned quite a large quantity of 6-in. pipe in the ground, laying a new 12-in. main on the opposite side of the street during the past season, says a correspondent of Water and Gas Review.

I accidentally discovered this 6-in. main, and on breaking into it found it as perfect inside as when laid some 20 years ago. I proceeded to take it out, pipe at that time being worth here $40 per ton. After trying one day to melt it out with wood, charcoal, etc., I took the first train to Boston in search of a melting apparatus of some kind, I did not really know what. After a good deal of inquiry I found the right thing in the shape of a powerful gasoline torch.

On my return home, and as my men had a lot of bolts uncovered, I set to work melting them out. And this is the simple method I pursued: I dug a good space out around and under the bolt, placed a hood of sheet iron bent around over the top of the bolt to help concentrate the heat, and then turned on the flame, keeping it centered in one spot on the side. In five minutes the metal started, and in half an hour I could take out the pipe.

It is necessary to melt only the upper half or, perhaps, a little more than half, melting from center of sides up to top, first completely one side and then the other, when by calling a couple of men to lift and work the spigot end of the pipe with a bar against the bell it is easily forced out.

The torch used would hold 2 1-5 qt. of gasoline at one charge. A full flame would melt a copper rod 4-5 in. in diameter in 2½ minutes.

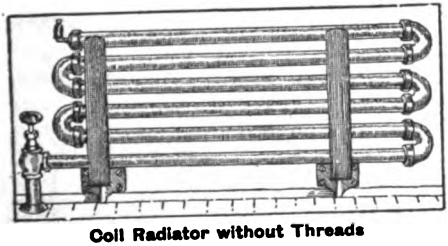
The proper covering of a boiler and the steam piping saves a large per cent of fuel.

## How to Heat Turpentine

There are two methods of heating turpentine without danger. When an open pan is used it is made with a jacket—that is, there are two pans, an outer and an inner one, with a space between; superheated steam from a boiler is passed into the space and is allowed to escape through a waste steam valve at the bottom; a safety valve at the side of the pan allows the steam to blow off if the temperature rises too high. Turpentine boils vigorously at a temperature of about 338 deg. F.—much higher than the boiling point of water—hence the steam at ordinary pressure would not cause turpentine to boil, says The Modern Painter. Turpentine can be heated to boiling point over a burner or fire, provided it is contained in a still which is closed with the exception of one tube leading to a condensing coil kept cool by being placed in a tub, through which a current of cold water is caused to flow; any turpentine which may be vaporized is condensed in the worm and recovered, and no vapor can pass into the outer air.

## Pipe Coil Radiator without Threads

This radiator, as shown in the accompanying illustration, is intended to be used for temporary heating; such as in summer homes where little heat is

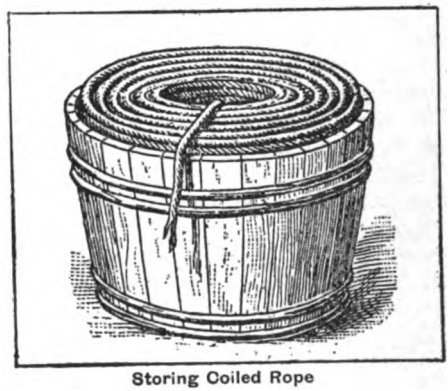


Coil Radiator without Threads

required, in buildings in the course of construction, in rooms drenched with water after a fire or in basements for drying out purposes. The coil radiator is made up of pipe fittings without threads, says the Valve World. In place of the threads the ends of the pipe are turned tapering and the fittings are reamed to a corresponding taper, so that the pipe may be driven into the fitting readily and quickly by unskilled labor, and a good, steam-tight joint will be the result.

## How to Handle Coils of Rope

Coils of rope that are left standing on the floor or in the basement become dirty and do not present a good appear-

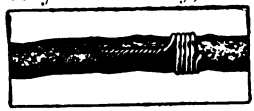


Storing Coiled Rope

ance to a customer. By keeping them in a tub or even one-half of a barrel that has been sawed in two, as shown in the illustration, the coils will be in better shape than when unsupported, says Hardware and Metal. This will permit the moving of a coil about, even after most of it has been sold, without falling down or becoming tangled.

## How to Make an Electric Wire Splice

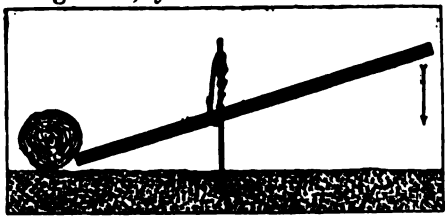
The splice shown in the accompanying sketch I find very satisfactory, and especially so on a duplex and triplex wire. It is quickly made and



soldered or covered with tape before or after the final wrap. This splice will not snap in two and will stand any ordinary strain.—Contributed by Frank S. Snyder, Dayton, Ohio.

### How to Drive a Small Wire Into the Ground

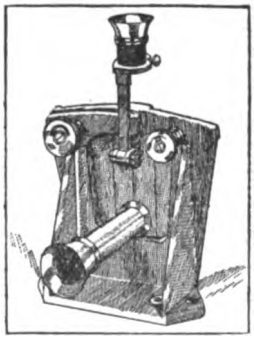
If you have ever tried to drive a small wire of considerable length into the ground, you will know how difficult a job it is to get the wire driven without bending. The accompanying sketch shows how a wire may be driven into the ground by using a stout cord or rope, giving several half-hitches about the wire and forming a loop through which to pass a lever. A weight is placed on one end of the lever, and by pushing down on the other end the wire can be forced into the earth without bending.—Contributed by C. G. Whitcomb, Chicago.



Driving Small Wire Into Ground

### Measuring the Horsepower of Marine Steam Turbines

The rapidly growing adoption of steam turbines for ship propulsion has created a demand for some ready means of ascertaining their horsepower, and as the steam indicator is not suitable for this purpose, we are thrown back on a torsion-meter as the only known method by which such information is obtainable. Torsion-meters are instruments to determine the twisting strain on shafts. They consist of two disks that are mounted on the shaft at a convenient distance apart. In each disk is cut a radial slot near its outer circumference, and the two slots are in the same radial plane when no power is being transmitted and there is no twist on the shaft. Behind one disk is fixed an electric lamp, masked, but having a slot cut in the mask directly opposite the slot in the disk. This will throw a flash of light along the shaft toward the other disk at every revolution, says Page's Weekly, London.



This is where the function of the torque-finder as illustrated comes into service. Behind the disk opposite the one with the electric light is fitted the torque-finder. It is capable of slight circumferential adjustment. When this finder is adjusted with its slot to come in line with the slot in the disks and the electric light, a flash of light is seen at every revolution of the shaft. If the shaft revolves fast enough, the light will appear to be continuous. At each end of the shaft we have what is virtually an instantaneous shutter fixed in the two disks, and nothing between except the beam of light, which once in each revolution flashes clear through the two disks. Let us suppose the shaft is transmitting power. One disk will lag behind the other by a definite amount, and, although three of the slots are still in line, the fourth slot, or the one in the lagging disk, effectually blanks the flash and no light is seen at the eye-piece. This torque-finder is graduated with a scale by degrees, and by this arrangement, with the distance between the disks and the diameter of the shaft, a rule is formulated to obtain the nominal horsepower.

### How to Clean Engine Paint

Engine paint may be cleaned by applying a solution of 1 gal. water, 4 oz. of borax and ½ pt. of lard oil. Stir this into a perfect emulsion and apply a coat of it to the surface of the paint and let it remain for a little while, then rub off clean with a rag or waste, says the English Mechanic. Be sure to remove the composition before it becomes dry. Add more borax if the solution is not strong enough.

### A Combined Window Shade and Awning

A convenient awning made by using a window shade can be constructed at a trifling cost. Two extending arms as shown in Fig. 1 are made from ¼-in. round iron 28 in. long with 4 in. of each end bent in in the shape of an L and at right angles to each other, making one right and the other left. These arms are used to support the end of the shade and are attached to the window casing with two screw eyes as shown at C, Fig. 2. Place the spring roller of the shade in the window as shown at A, Fig. 2. The hem in the lower end of the shade should be supplied with a round stick as long as the width of the shade. A ¼-in. hole, 4 in. deep, is bored into each end of the round stick to receive the outer ends of the arms B, Fig. 2. The lower sash of the window is raised, the shade pulled down and pushed out through the opening and the arms attached, which hold the shade in the position of an awning as shown in Fig. 3. This will keep out the bright sunlight and admit the fresh air.—Contributed by P. McCarthy, Denver, Colo.

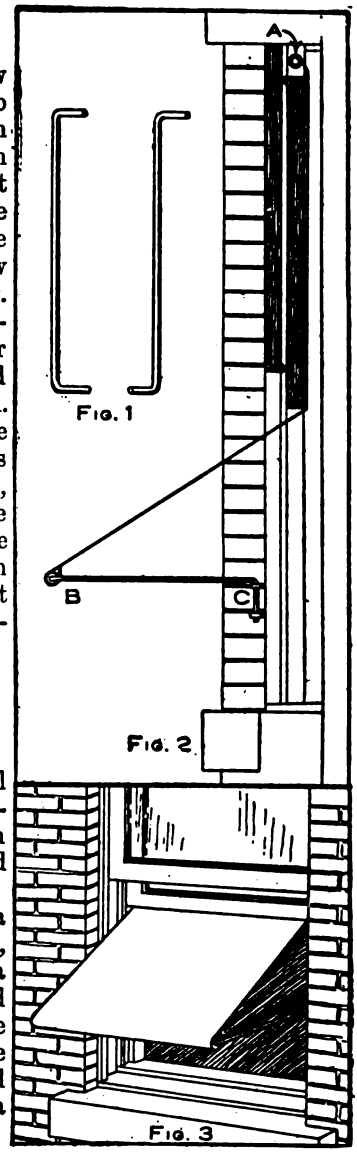


Fig. 1

Fig. 2

Fig. 3

### How to Make a Temporary Stencil

It is often the case that a man wants a stencil for a very limited amount of work, or when a stencil cutter is not immediately available. For such cases, one may be readily made from paper and will stand considerable careful usage.

Take a piece of strong, not too thick, manila paper, or, better still, good bond letter paper; and, after marking the desired design on it, give it a good coat of varnish or linseed oil, says Wood Craft. When it is thoroughly dry, lay it on a piece of glass and with a sharp-pointed knife cut out the characters. Such a stencil will do just as good work as any. Care should be taken to lay it on a flat surface when not in use.

## New Way to Store Gasoline

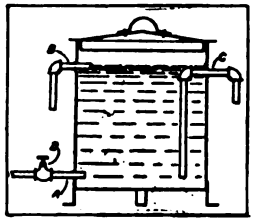
A new plan for storing gasoline or petrol depends upon the fire-stopping property of wire gauze that gives safety to the Davy mining camp. The gauze tube is inserted in the opening of the can or tank, extending to the bottom, and the orifice is then sealed by a plug held in place by fusible solder. If fire occurs near or around the tank, the solder melts and the plug is blown out, when the vapor escaping through the gauze tube burns quietly without exploding, says the Master Painter. In a test of the method, 12 out of 17 ordinary cans filled with volatile oil exploded on contact with fire, throwing

the burning liquid in every direction, but 12 cans fitted with the safety device failed to explode and the liquid burned quietly and harmlessly. Even open receptacles are made much safer by a covering of wire gauze, which prevents explosion in case the oil is ignited.

### Quickly Made Oil Separator

An efficient and easily made oil separator for separating oil from the water before filtering is shown in the sketch which is taken from the Practical Engineer.

A gallon oil can or an ordinary waste can may be used for the tank, and pipe, A, is connected to the drip from the engine and fitted with a small valve, D. The oil and water from the engine enter through this pipe until it is on the level with the pipe B. The oil floating on the surface of the water passes off through the pipe B, while the water runs out through the pipe C, which is ¼ in. lower than B, so that the water cannot reach the pipe B. To prevent any oil from getting into the pipe C when starting the separator, enough water should be poured into the can to cover the bottom of pipe C.



### Things to Know About Wall Paper

One single roll of common wall paper is 8 yd. long by 18 in. wide, and one single roll of ingrain, felt or cartridge paper is 8 yd. long by 30 in. wide. One single roll of one strip border is 8 yd. long by 18 in. wide and contains 8 yd. of border. One single roll of two strip border is 8 yd. long by 18 in. wide and contains 16 yd. of border. Common wall paper is put up in double rolls; and ingrain, felt or cartridge paper is put up in triple rolls. Prices are quoted on single rolls.

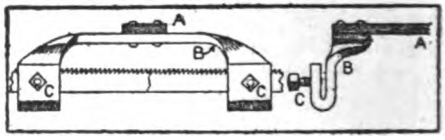
To find the quantity of common paper necessary to cover a room, multiply the height of the room by the length of the four sides and divide by 36, which will give the number of single rolls required. For each single roll of common paper 1½ yd. of border will be necessary.

For ingrain, felt or cartridge paper, multiply the height of the room by the length of the four sides and divide by 49, which will give the number of single rolls required. Deduct one single roll of common paper for every 50 sq. ft. of opening.

Multiply the length of the ceiling by the width and divide by 36 for common paper and divide by 9 for ingrain, felt or cartridge paper to obtain the quantity of single rolls required for the ceiling.

### A Home-Made Brazing Clamp for Band Saws

A bar of iron, ¼ in. thick by about 1¼ in. wide and 10 or 12 in. long, is bent at both edges in the shape shown in the illustration. The short bar, A, is riveted on in the middle of the bar B to be used in holding the clamp in a vise. The bent ends of the bar B are drilled and tapped for two small set screws, C C, which are to be used to hold the ends of the saw while brazing. —Contributed by A. R. Kibbe, New Richmond, Wis.




For Brazing Band Saws

One part Venetian turpentine added to four parts of glue will make a flexible glue to attach leather to metals. The mass is heated in a glue pot until it becomes sticky and no more bubbles appear. A fresh mixture will work best.

## Panel Designs

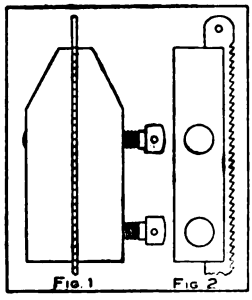
"Summer"

Courtesy Decorator's & Painter's Magazine, London

"Winter"

### Substitute for a Hack-Saw

On some kinds of work it is impossible to use a common hack-saw frame with the saw. If the saw blade is placed in a machinist's parallel clamp allowing 1 or 1½ in. to extend beyond the ends of the clamp jaws, as shown in the sketch, it can be used to advantage in holes or irregular work.—Contributed by Chas. H. Beetle, Philadelphia, Pa.

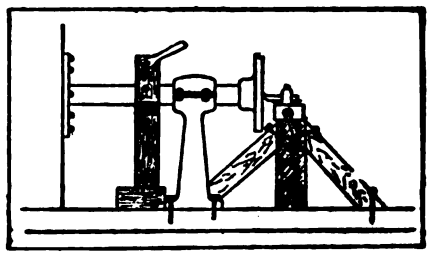



### Lining up a Generator and Water Wheel

"Recently in a power house where an old generator, which was direct-connected to a water wheel, was to be replaced by a new machine, we had the following all-night experience," writes C. L. Abbott in the Electric Journal: "When the old generator was uncoupled from the water wheel it was found that the water wheel shaft could not be stopped in the usual way owing to a leak in the gate, and it was necessary to rig up a heavy clamp made of 10-in. timbers. This was placed on the shaft and tightened up until the wheel came to a standstill. Then the new half coupling was fitted to the shaft and the key driven home. Before coupling to the new generator it was thought best to make sure that the coupling ran true. The wooden clamp was loosened enough to let the shaft turn slowly. A steel point held on a rest showed that the face of the coupling was running out of true a full thirty-second of an inch, probably due to the key being high and driven in too tightly. As it was past midnight and it was necessary that the generator be running in the morning something had to be done without delay. The power house was on a lonely stream several miles from the nearest town; hence there was no means of getting good tools quickly. An old slide rest and lathe tool were found and mounted on wooden supports so that a cut could be taken across the face of the coupling. A man was stationed at the wooden clamp with a wrench to govern the speed by tightening or loosening the bolts, while another poured cold water on the clamp to keep it cool.

"After the first cut was taken off it was found that the tool was too dull to make a second cut, and as there were no other tools available, matters looked serious. After groping around some time with a lantern some pieces of emery cloth were found in a tool box. These pieces were wired around the water wheel shaft in such a manner as to leave a clear space in the middle. The wooden clamp was again loosened, and as the shaft whirled the emery cloth around, the tool was quickly ground sharp on the improvised grindstone.

"Without further mishap the coupling was turned true, coupled to its mate on the generator shaft and the machine put in operation.

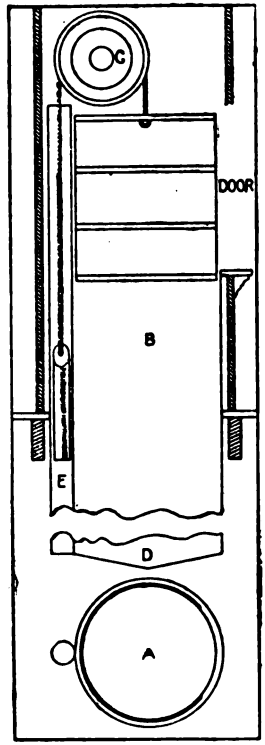

Lining up the Shaft

"As that group of grimy, tired-eyed men stood there in the gray of the morning and watched that machine running as smooth as a watch they felt well repaid for their night of toil."

Large gate valves may be cleaned from mud that goes in with the steam from a foaming boiler by opening and closing the valve a few times while water is running through it. This can be done safely when there is no pressure on the boilers.

## How to Make a Cold Dumb Waiter

Perhaps one of the greatest hardships to be encountered by comparatively prosperous people is that of having to get through the hot summer months without ice, as in the case of most farm homes and in many suburban localities where there is little or no ice delivery.




The accompanying illustration will show how to construct a device to keep eatables cool, and especially in the north, where the ground stays cold the year round at a reasonable depth.

The casing of this dumb waiter hole is round, as shown at A, and should be made of galvanized iron. The depth of the hole depends on the locality, but scarcely needs to exceed 8 or 10 ft., says Domestic Engineering. If the casing extends through the cellar it would be well to set it deep enough so that the waiter, when down, will stand below the cellar floor, as this would secure a lower temperature than that of the cellar. The bottom of the casing, D, is made slightly funnel-shaped, to facilitate cleaning, and the whole casing is soldered up watertight so that there will be no danger of water rising in from the inside.

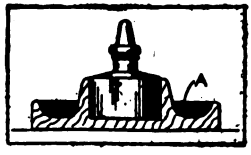
Another and smaller galvanized tube, E, is made to contain a counterweight for the dumb waiter, and this tube should be long enough to balance the run of the waiter and extend up high enough so that the weight will not be pulled out at the top. The door should be long enough and sufficiently wide to admit of taking the waiter out in order to clean the casing. A brake may be attached to the wheel, G, if the load varies too much for the counterweight.

Should the casing extend through a cellar, there may be a door put in the casing so as to give access to the waiter from the cellar, making the carriage do the service of a regular dumb waiter.

The fact that a house is already built is no bar to putting in one of these cold storage plants, as a circle may be cut out of the floor as large as the casing, and the hole bored with a large auger, and the dirt carried out of the door. The casing may be put down in sections and soldered before being put down into the ground. If the work is carried down from the bottom of a cellar it will be all the easier. The main feature of this device is the fact that it will keep things from freezing in the winter as well as from melting in the summer.

## How to Make an Ink Bottle Stand

This stand as shown in the accompanying cut is made with a rather large bottom to prevent upsetting of the ink bottle. The special feature is the groove, A, which forms a receptacle to hold tacks, pens, etc. The stand is made of wood, and, being round, it requires but a few minutes' time to turn it on a lathe. When sandpapered and varnished, it makes quite a useful and ornamental article for the drawing table.—W. E. W.

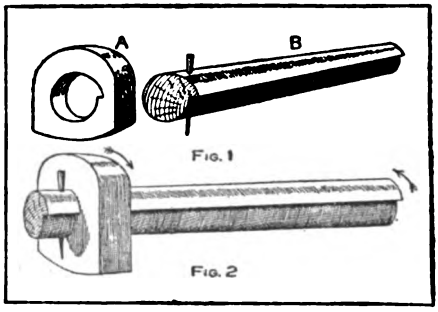



Small leaks in steam boilers may be stopped by putting in a small quantity of wheat bran through the manhole into the boiler.

# SHOP NOTES

## How to Make a Carpenter's Wood Gauge

This gauge is made from hard wood with the head cut in the shape shown at A, Fig. 1, with a ¾-in. hole bored in the center. One-quarter of the circumference of this hole is cut out on a

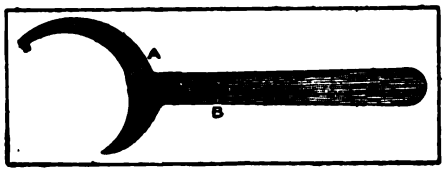



Clamping Wood Gauge

larger arc of a circle forming a notch as shown. The stick B, Fig. 1, is formed to fit this hole made in the head. The object of this construction is: when the gauge is found the head may be set on the stick by giving it a slight twist in the direction of the arrows shown in Fig. 2. The gauge will remain set in the place until changed by a reverse twist of the stick and head.—Contributed by E. H. Haver.

## An Improved Spanner Wrench

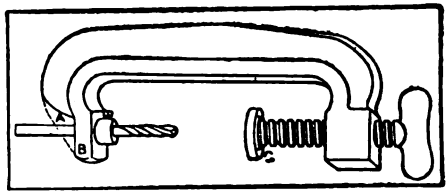
The accompanying sketch shows a design of a spanner wrench with an adjustable jaw. This wrench can be quickly made and will prove a handy tool for turning nuts and hose couplings of various sizes. The large end of the jaw, A, is slotted to fit over the handle, B, and riveted so as to make the joint loose enough to work with ease.




Adjustable Spanner Wrench

## Home-Made Portable Drill

A quick and simple method of making a portable drill is by taking a large clamp, cutting out a part of the web, as shown at A in the sketch, and then drilling a ½-in. hole through the upper jaw, B, through which hole the drill may be placed. A collar with a set screw is made and placed on the drill shank, the collar bearing against the inside of the upper jaw. The drill may be turned with a chuck on a bit




Portable Drill

stock, or a crank may be provided with a set-screw for clamping the drill, which will serve the purpose equally well, says Machinery. The feeding is done by the clamp screw, C. This style of drill may be used in numerous places where no other device could be applied. The clamp can be used for the drill or as a clamp.

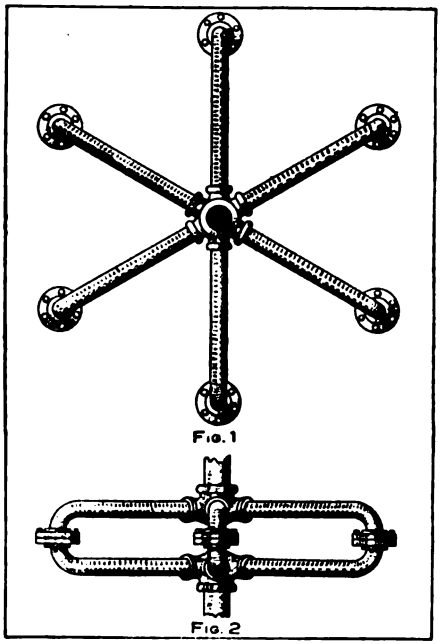
## How to Prevent Bronze Bearings from Running Hot

Flow a mixture of washing powder and water through the oil cups while they are opened as wide as possible, and the machine running light without any load. The fluid as it comes through the bearing will be very black. Run about 1 pt. of this mixture through

and then follow with clear water to wash the bearing out clean. This will make the axle and bronze boxes smooth and eliminate the possibility of new bearings running hot.

## Exhaust Steam Tank Water Heater

A water heater designed to utilize the exhaust steam and for use in heating water in tanks is constructed as shown in the sketch. This form of heater



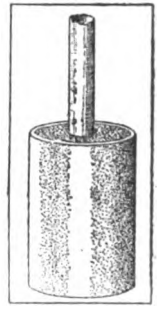

Tank Water Heater

has an 8-in. supply of exhaust steam and may be made 10 ft. or more in diameter and 28 in. high, says the Metal Worker. The pipe heating surface is of 4-in. pipe flanged where the two bends meet at the outer ends and has screw joints at the cast-iron hubs. Figure 1 shows the top and Fig. 2 the side view.

When cutting valve seats, if the cutters chatter, fill the teeth with common window putty and bake it hard on a steam pipe. The cutter will then cut true and smooth.

## How to Set Iron Posts in Cement

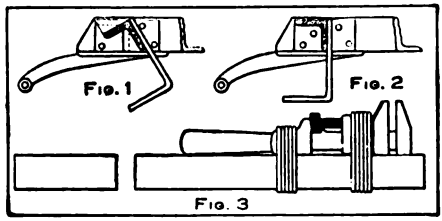
The posts can be made by using old iron pipe from 1 to 2 in. in diameter and 6 ft. long. One end of a common 3-in. drain tile is placed on a board and the pipe is held with one end in the tile and as near the center as possible. A mixture of cement and sand is placed in the tile around the pipe and tamped in tightly. When the cement sets the tile end of the post is placed in the ground. This will make a cheap and durable post.



## Emergency Repair with a Monkey Wrench

An automobile met with a collision and was left standing along the roadside out in the country, with the cooler and its supporting angle all twisted out of shape. This angle presented an appearance about as shown in Fig. 1, while it should have been straight, as in Fig. 2. To get the automobile running it was necessary to get the cross member straightened. The only available tool was a monkey wrench, says a correspondent of American Machinist.

A wooden bar, 6 ft. long by 3 in. square, was found along the roadside,




How the Wrench Was Used

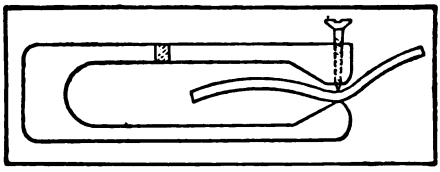
and the wrench was fastened securely to one end of this by means of a wire, as shown in Fig. 3. With this long lever arm on the monkey wrench, the steel angle was straightened easily and the cooler placed in position.

### A Wash for Fire-Brick

Some prefer a mixture of fire-clay and cement for plastering the walls of furnaces and combustion chambers, but it is best to use fire-clay alone, as the heat takes all the water out of the cement, leaving the fire-clay to crumble and fall from the walls. A mixture of fire-clay and salt is good to preserve the walls, says Power, making a glazed surface to which soot will not adhere. Five shovelfuls of fire-clay to one of salt gives good results, but it must be mixed thoroughly.

### Calipers for Irregular Wood Work

The accompanying sketch shows the construction of a pair of calipers to be used on stock with an irregular section, to uniform thickness, says Wood Craft. After working out one side of the stock to templet and roughing out the other side, the calipers, properly adjusted to required size, are applied as shown. Owing to their construction, the arms are permitted to spring considerably, at the same time the screw making a deep scratch on the rough side. By constantly cutting to the bottom of the successive scratches a uniform thickness is readily obtained.

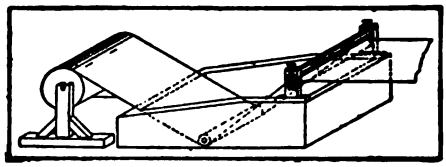


Calipering Irregular Work

### Painting Car Roof Canvas

Where there is a large quantity of canvas used for roofing purposes it requires considerable time and expense to apply paint to both sides of the material with a brush. The accompanying sketch shows the construction of tub with an old pair of tinsmith's rollers or pipe formers placed on top, the tub being used for the paint, says the Electric Traction Weekly. There is also a wooden roller in the bottom of the tub.

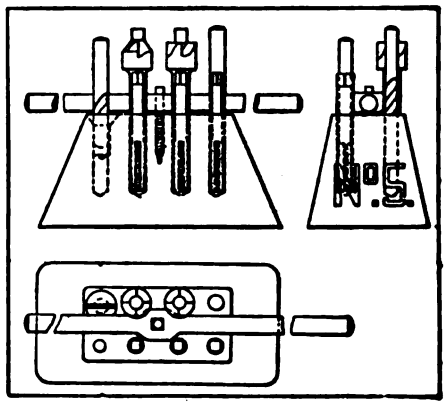
The canvas is run under the bottom roller and then through the rollers at the top. As these rollers are adjustable with thumb screws the amount of paint left in the canvas can be regulated as desired. A man takes hold of the end of the canvas and walks away as fast as he may and the painting is done much quicker and better than with a brush.



Method of Painting Canvas

### Block for Holding Taps and Tap Drills

The accompanying cut shows a block which has proved very handy for shop use, says a correspondent of Machinery. It is intended for holding the three taps in the set, one tap drill, one full size diameter drill, one counter-bore, one counter-sink, and a tap wrench. By having the tool-room provided with blocks such as these, when a man wants taps and drills or counterbores for a certain job, he simply asks for block number so and so, and he receives the block with all the accompanying tools. There is a

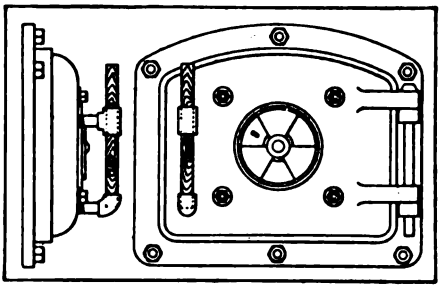



Tool Set Holder

great deal of time saved as compared with such systems where the man first has to ask for taps, and then for tap drills, and finally for the counterbore and counter-sink.

## A Handle for Boiler Front Fire Doors

The handle on fire doors of boiler fronts consists of a small hook which becomes very hot and the door cannot be opened unless it is lifted with a shovel. If the hook breaks off, a bolt



A Fire Door Wood Handle

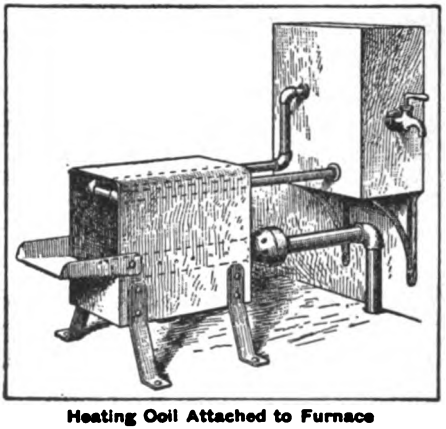
is usually inserted in its place. The sketch shows the details of a handle that will remain cool so that it may be handled with the bare hand, says the Practical Engineer. Two holes are drilled in the door, as shown, and tapped for ¾-in. pipe. Each hole is fitted with a ¾-in. nipple, 3½ in. long. A ¾-in. ell is turned on the lower nipple, and a ¾-in. tee on the upper one. Place a broom handle through the tee, allowing the end to set in the ell and cut it off as high as the top of the door. This will be high enough so you do not have to stoop to open the door.

## Waterproofing for Bottle Labels

Clean up an old celluloid film and cut it up into small shreds. Place these shreds in a bottle and cover them with amyl acetate, or acetone. After a few shakings and a little time the celluloid will dissolve, says the Photographic News, and give a clear fluid, which may be brushed over the labels with the aid of a soft brush or a feather. Another useful mixture for this purpose may be formed by dissolving Canada balsam in chloroform.

## A Soldering Furnace and Water Heater

A great many times hot water is a convenience in the workshop and where a soldering furnace is used an auxiliary water heater may be supplied, says the Metal Worker. As can be seen from the sketch the soldering furnace is constructed of sheet metal and the burner is made from ¾-in. pipe drilled on the sides, so that the gas will flame at both sides of the coppers that may be inserted for heating. The furnace is 5 in. wide and 7 in. high from top to bottom and 8 in. long from front to back. Just over the burners are supports for the soldering copper made from band iron and riveted to the sides. At the front there is a chute on which the coppers may rest, and this is so constructed that it will also hold a shield to close the front of the furnace when there are no soldering coppers in it.



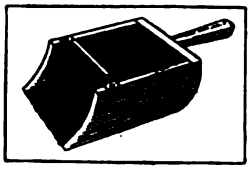
Heating Coil Attached to Furnace

A coil pipe made of ⅜-in. pipe is used for heating the water, and is connected with a 5-gal. tank, which can be located near at hand and in a convenient place for both filling and draw-

ing off the water. The furnace as shown is made to use natural or manufactured gas, but the water heating coil can be supplied to any gasoline furnace in the same way.

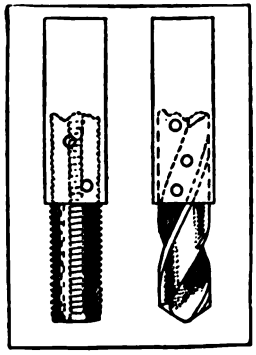
### A Home-Made Mill Scoop

The accompanying sketch shows the construction of a scoop that is handy in almost any mill. Secure two boards 8 or 10 in. wide and cut them as shown for the sides. The bottom is covered with a piece of sheet iron or galvanized iron. The latter will give much better service, says the American Miller. A round piece is fitted into the top edges of the boards and fastened with screws for the top handle. The back handle is attached with a bolt inserted through the handle and through a 2-in. piece of wood that is fitted into and nailed to the back end of the boards.



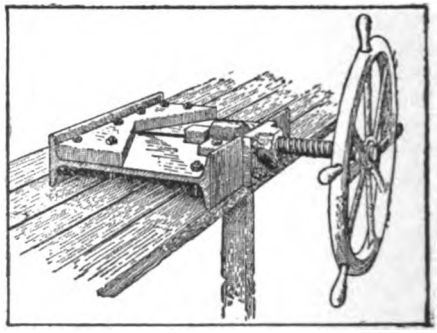
### How to Use Broken Taps and Drills

The short end of a tap or drill that has been broken can be used again with a device as shown in the sketch. It consists of a piece of brass or iron tubing which has several holes drilled in the sides at one end where the broken tap or drill is to be inserted. A sheet of paper should be wrapped around the tubing covering the holes, and the end of the tube beyond the broken tool filled with a wood plug. Melted babbitt is then poured into the tube around the broken tool. The holes that are drilled into the tube will anchor the babbitt and keep it from turning. The broken tool should fit the hole of the tube very close.—Contributed by the Rockford Drilling Machine Co.



### Concrete Reinforcement Steel Bending Vise

The main body of the vise is made from a piece of I-beam, 18 in. wide by 3 ft. long. A slot 1 in. wide is cut in the center and fitted with a block as shown in the sketch. A V-shaped casting is bolted in the I-beam on the opposite side from the block. A cast-iron wheel with handles is fastened to a large screw which turns in a nut that is attached to the I-beam. The reinforcement steel is placed in the vise between the block and the V-shape casting and by turning the wheel with the handles the steel is bent to the proper shape.



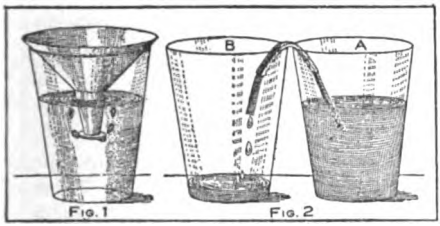
The Steel Bending Vise

### White Lead to Dry Dead Flat

To make white lead paint dry to a perfectly dead flat on walls add a very little clear water to the paint and mix well with it. Beat up the lead as it comes from the keg, stir in the water until it combines with the lead, add color and driers, then thin with turpentine, says Master Painter. The water does no harm to the paint.

## How to Save Oil

One of several experiments as shown in Fig. 1 demonstrates the fact that dirty oil cannot be cleaned by passing it through hot water. When oil is passed through water or exposed to a moist atmosphere it will absorb from 2 to 3 per cent. of moisture and the muddy and turbid appearance of the oil

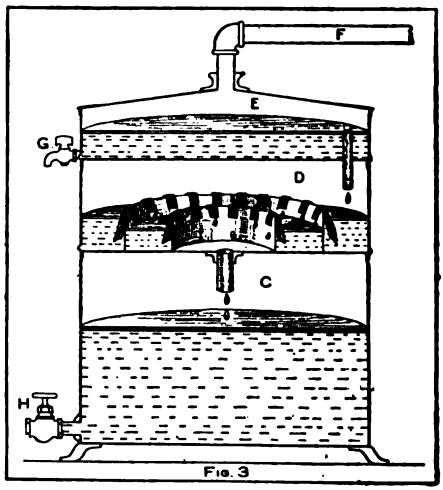



The Experiments

coming through the ordinary filter is caused by the moisture it contains. To try this experiment out, solder a small tin cap over the lower end of a funnel and make a small hole in the center of the cap. This will cause the oil to be spread out in drops as shown. A tumbler is filled half full of hot water and placed on a steam pipe or where it will remain hot. Place the funnel in the tumbler with the cap-covered end about 2 in. under water (Fig. 1) and then turn the dirty oil in very slowly. As each drop of oil forms on the edge of the cap, to flow through the water, watch them and see if they will leave any dirt behind. After enough dirty oil is put through to fill the glass, the water will be as clear as before. Put some iron filings in the oil and make another trial. The globules of oil will carry the filings up with them.

The second experiment may be tried out by placing two tumblers close together (Fig. 2) and placing a quantity of dirty oil in the glass A. Make a small tin trough to reach from the inside of one glass to the inside of the other and lay a lamp-wick in the trough, allowing one end to extend into the oil in glass A and the other end to hang in glass B. In a few hours' time the glass B will contain all the clean oil, leaving the dirt and sediment in glass A.

These experiments will teach how to make a filter on a larger scale which can be made as illustrated in Fig. 3. For a clean oil receptacle make a tank from galvanized metal, C, 20 in. high and 30 in. in diameter. Make another tank of the same diameter and 12 in. high, with a lower rim flanged to set on top of the clean-oil tank, for a filtering chamber, D. On top of this is placed another tank, E, the same diameter and 6 in. high, with a flanged rim to set on the filtering chamber. This tank has a cover through which a pipe, F, conveys the dirty oil. This latter tank is the settling chamber where the oil separates from most of the water and heavy sediment. A pipe is fitted in the bottom of the settling chamber and extends nearly to the top of the tank. The oil overflows through this pipe into the filtering chamber, where it is then filtered through 9 ft. of 1-in. wick. By this means the oil is separated from the rest of its impurities and is carried up over the partitions of the troughs, draining into the clean oil tank, C. A spigot, G, is

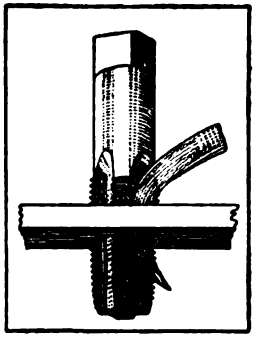



The Completed Oil Separator

placed in the settling chamber to drain off the sediment and a valve, H, is fitted in the bottom edge of the tank C to draw off the clean oil. This filter

will take care of about 1 gal. of oil an hour. After being filtered continuously for from six to eight months, the oil comes out perfectly clear, only slightly darker in color. Cheap paraffin oil, or an oil of high viscosity, cannot be used, as the wicks soon separate the filler or heavy compounding from the mineral stock, leaving a thin oil of poor lubricating qualities.—Condensed article from Power.

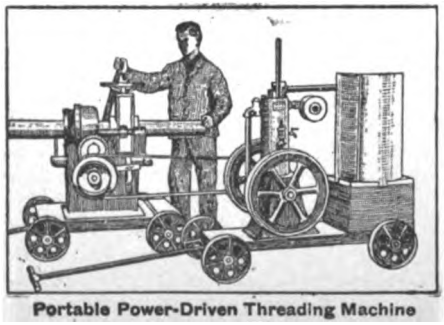
## Making a Tap Cut Larger Than Its Size



If a tapped hole is too tight for a stud, or bolt, cut a small strip of sheet copper and insert it in the flute of the tap, as shown in the illustration. This will crowd the tap over to one side, which makes a larger threaded hole. This will work in the same manner on reamers.

## A Portable Pipe-Threading Machine Outfit

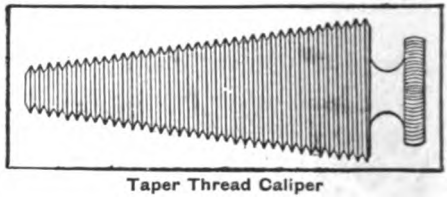
The illustration shows a pipe cutting and threading machine outfit for the use of a plumber or steamfitter. This outfit was arranged by a correspondent of Domestic Engineering and he finds it an economical way of cutting and fitting large pipe on construction work. The cut is self-explanatory. This may be a suggestion of how power can be applied in many similar instances.



Portable Power-Driven Threading Machine

## Calipering Taper Tapped Holes

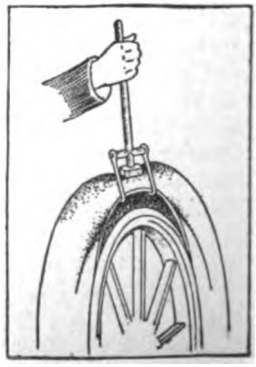
The tool shown in the sketch is used for calipering taper tapped holes in boilers when fitting studs. It is a simple, though very useful and economical tool, and it will doubtless be appreciated by those having much work of this kind to do, says Machinery. The thread part of the tool is about 3 in. long, with the small end ¼ in. and the large end 1 in. in diameter. The hole in which the stud is to be fitted is calipered by filling the threads of the plug with chalk. When the plug is removed the chalk will show exactly the largest diameter of the hole.

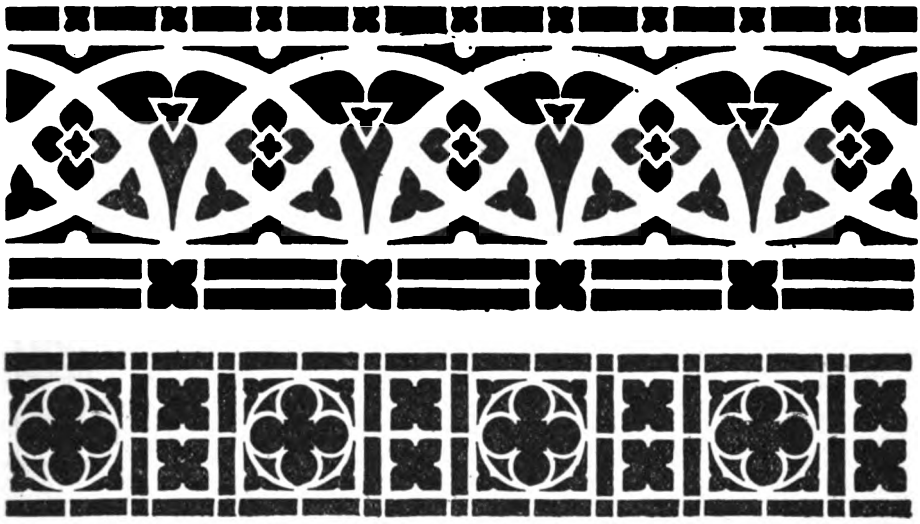


Taper Thread Caliper

## Tool for Putting on Automobile Tires

A simple tool that will aid one man in putting on the largest clincher automobile tire alone is shown in the illustration. The handle of the tool is made from a ¾-in. pipe 30 in. long with a cap fitted on both ends. A ½-in. hole is drilled through the pipe 4½ in. from one end. A rod ½ in. in diameter and 6 in. long is threaded on both ends and placed in the ½-in. hole drilled in the pipe. Hooks made from ⅜-in.





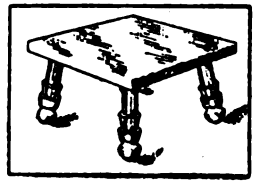
FRIEZE AND DADO BAND—These designs are eminently suitable for a small church or chapel. The color scheme may be: Upper walls, deep vellum; dado, light bronze green; dado band stencilled in soft green and golden red on the vellum ground, with lines over and under of cool brown. The frieze could also be stencilled in similar colors on a like ground. With a ceiling in creamy white, and the woodwork stained or brush-stained light brown, a pleasing effect would be obtained.—From The Decorators' and Painters' Magazine.

rod iron and 6 in. long are flattened at their upper ends through which ½-in. holes are drilled. Two collars are cut from ¾-in. pipe 1½ in. long and placed on the ½-in. rod, one on each side of the pipe that forms the handle. The hooks are placed on the rod against the collars and held in place with nuts. A wood block, 1½ by 2 in. is fastened on the cap of the handle between the hooks with a ¼-in. bolt. The cap is drilled to receive the bolt. The wood block is rounded and a piece of rubber attached to keep it from slipping on the tire. When in operation the hooks are caught in the bead of the tire and the wooden block placed against it, and by pulling on the handle of the tool the tire will open up and give ample room to remove or place in lugs or give attention to the inner tube.—Contributed by S. J. Hixon, Chicopee Falls, Mass.

An excellent soft solder, good for purposes where not much pressure is carried, says Machinery, is made by adding to each pound of lead, while melting, a teaspoonful of common salt.

## An Insulated Stool for Electricians

The accompanying illustration shows how to make an insulated stool on which to stand while making line repairs or supplying carbons to arc lamps. A square piece of board is provided with legs made from wooden insulator brackets or pins. Each leg is then fitted with a heavy glass insulator. This will guard against any short circuit that the workman may make and will stop any connection with damp floors.



## How to Dig Pole Holes in Quicksand

Pole holes may be dug in quicksand by using a barrel with both heads removed. The barrel is set where the hole is to be made and the excavation done from inside the barrel, allowing it to sink as the hole is dug, says the

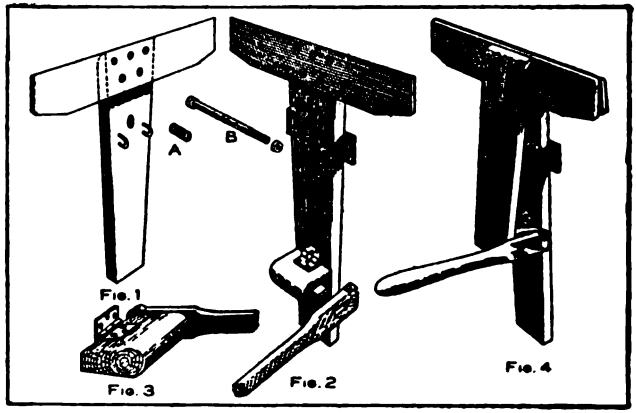
Electric Traction Weekly. The sides of the hole are thus sheathed, and by means of a hand pump the water can be kept out.

If the quicksand occurs for a depth greater than the height of one barrel, a second barrel can be placed on top of the first. This second barrel should be a little larger than the first, so it will go down over the lower one part way. The pole must be raised in such a hole as soon as the hole is dug.

## Home-Made Saw Clamp

By N. J. McLean

The following is a description of how to make a clamp for holding a saw while filing: The uprights are made from 1¼-in. hard wood. The front piece, Fig. 1, is 19 in. long and dressed tapering so that one end will be 6 in. and the other 5 in. wide. The back piece, Fig. 2, is dressed in the same way but is 5 in. longer, making it 24 in. over all. For the parts that hold the saw use two pieces of iron plate, ⅜ by 2½ or 3 in. and 15 in. long. Bevel the lower corners as shown. Drill from three to five holes in the middle of these plates and countersink them to take common screw heads. These plates are screwed to the top ends of the uprights, allowing about ⅜ in. to project above. If iron plates are not available, use hardwood pieces ¾ in. thick by 3½ in. wide. Bore holes and fit two U-bolts about 8 in. from the upper ends of each of the uprights, as shown in Figs. 1 and 2. The loop should be large enough to take a ½-in. bolt, B. The inner circle of the loop should be about ¾ in. from the piece through which it passes for metal jaws and 1¼ in. for wood. About 2 in. above the U-bolts bore a hole ⅜ in. deep in each upright to hold a light coil spring, A. This spring will keep the jaws apart when the pressure is released.

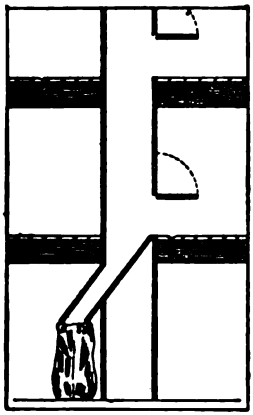



The adjusting piece is made of hardwood, preferably maple or beech, about 9 in. long over all. One edge is trimmed circular on a 1¼-in. radius and the sides are tapered down, making the other edge ⅞ in. thick, as shown in Fig. 3. The extreme width from the rounding edge to the flat part is 3 in. Form a tenon on one end, as shown, ⅝ in. thick, 2½ in. wide and 2 in. long. Attach this adjusting piece to the longest upright with a 4-in. hinge, as shown in Fig. 2, and place it so the bottom surface will be even with the lower end of the shorter upright when the lever is in a horizontal position. The lever should be about 12 in. long, 1¼ in. thick and 2 in. wide at the large end and tapered to form a handle on the other end. A mortise is cut to fit the tenon of the adjusting piece and a small bolt or rivet placed through the end of the lever to prevent its splitting. Fasten a thin plate of metal to the back of the longest upright, as shown in Fig. 2. Drill two holes in each end large enough to insert a nail or screw; also, bore a small hole through the lower end of the upright, as shown in Fig. 4, for the purpose of fastening the clamp to a bench or elsewhere.

It is well to remember that a slight blow will break out the arms or rim of an iron pulley if trying to move one when stuck on a shaft.

### How to Handle Sweepings in a Mill

An old unused elevator in a mill can be put into service for disposing of sweepings. The accompanying sketch explains itself and shows how sweepings can be dropped to a bin or into a sack on the bottom floor. Openings are cut in the elevator on a level with each floor and doors provided to cover them. The miller will find this device a saving of time and labor.



### How to Hair a Violin Bow

Remove the slide, wedges, etc., from the frog. Take the hair and wind a piece of silk thread around it and singe the ends to prevent pulling out. Put a little mucilage on the end and push it well down in and then place the block and wedge. Shred the hair well out and over the block, making sure that the block is a little tight, then replace and put the ferrule on the end. Make a wedge the width of the ferrule and put it on tight, spreading the hair at the same time. Cut the wedge off close to the ferrule. This will finish the bottom end of the bow.

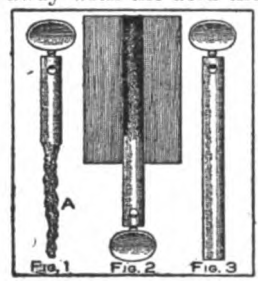
After removing the bone top of the upper end of the bow, put the frog in place and cut the hair at about ¼ in. beyond the edge of the mortise while keeping the hair straight, says a correspondent in the Keystone. Wind a little piece of silk thread around it and singe the ends as before, put the bone slide on the hair and take the frog out of its place, tip it right over and apply a little mucilage. Put it into place and push the block home, bring the hair down over it and replace the top or bone slide. This will complete the job, which will take about 15 minutes.

### Applying Leather Fillets to Patterns

Do not use glue for attaching leather fillets to patterns as the moisture from the wet sand will penetrate the thin edges of the leather and make them curl away from the pattern. The best adhesive to use for leather fillets is the regular orange shellac used in varnishing patterns, excepting that the shellac used should be quite thick, says Machinery. A sufficient amount of fillet for the work in hand is given a coat of shellac on the inside, and the same is done with the corners of the patterns which are to receive the fillets. Repeat this operation about three times, allowing two or three minutes between the coats, so that the varnish may soak in. After applying the last coat, place the leather fillet in position and rub it in place with a round stick of suitable size to correspond with the radius of the fillet. Proceeding in this way, the result will be far more satisfactory than when using glue, and the fillet will be practically waterproof.

### How to Repair Old Battery Zincs

When battery zincs become eaten away with the acid they can be made as good as new by first scraping clean the part A, Fig. 1, then inserting in a hole bored in a block of wood (Fig. 2). Melted zinc is then poured into the hole around the corroded part. When the metal becomes cold the wood is removed by splitting and you have a new zinc, as shown in Fig. 3.—Contributed by Luther Leggitt, Chicago.

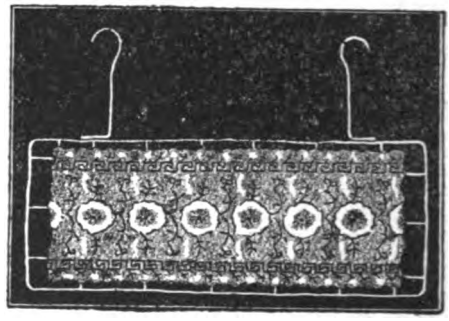


## A Method of Electroplating Lace

As copper-bronze powder can be electroplated the same as other metallic objects, it renders a conductor which may be applied to lace for this purpose. The task of plating lace is not so difficult as it would naturally seem. The first operation in the electroplating of lace is to render it waterproof. Shellac varnish is used for this purpose, as it dries rapidly and is easily made. The shellac should be of good quality and dissolved in alcohol, so as to make a thin varnish. The varnish thus made should be free from sticks and dirt. It should be made thin enough with the alcohol so that it will not clog up the meshes of the lace. Lay the lace upon a flat board, and with a stiff brush coat it with the shellac varnish and rub well into the fibres. The lace is then turned over and the other side coated before it becomes dry. As the varnish is thin the lace will not adhere to the board. Hang up the lace from one end so it will dry, which takes an hour or so. A second coat of shellac is now applied over the first and the whole allowed to dry. A third coat is usually necessary, and when this has dried the lace will be quite stiff and waterproof.

A frame is now made in which to hold the lace while plating. A rod of stiff brass or copper is bent in the form shown in the illustration, and hooks soldered on it for holding the edge of the lace. These hooks are made by soldering brass pins along the inside of the frame. The pins should be annealed before soldering by heating them to a red heat. Unless this is done, they are apt to break in service. When the pins are soldered on the points are bent in the form of a hook. The lace is then fastened inside of the frame on these hooks.

It is necessary to apply a coating of varnish to the lace on which to stick the copper-bronze powder. Any common varnish will answer, but it must be thinned with turpentine before application, in order to avoid filling up the meshes of the lace. Equal parts of varnish and turpentine will make about the right mixture. The varnish, thus thinned, is applied to the lace with a rather stiff paint brush. Care must be taken to see that all parts are covered, and any meshes that may have become filled with the varnish cleaned out by means of a splinter of wood. The frame is now hung up and left for the varnish on the lace to become "tacky" but not dry. This will take from half an hour to an hour. When the varnish becomes "tacky" or quite sticky, the copper-bronze powder (pure copper powder) is applied to the lace by means of a badger-hair brush. The powder should be well rubbed into the lace



Holder for Lace While Plating

with the brush. Do not be too saving of the powder, but apply plenty of it. By placing a sheet of paper underneath, the surplus powder may be saved. Allow the whole to dry for some time, or until the varnish hardens. This will take from 4 to 10 hours, which depends upon the kind of varnish used. It is necessary that the varnish should be thoroughly dry in order to prevent the powder from washing off in the solution.

When the varnish has dried, the lace is given a "strike" in a silver solution. The lace and frame is simply immersed in the silver solution for a second. The copper immediately changes to silver. The film of grease on the powder is also removed and the surface made a better conductor. The lace should not

be allowed to remain in the solution any longer than is necessary, or the copper may become attacked and dissolved. As soon as whitened, remove and rinse in cold water. When thoroughly rinsed, the lace and frame are hung in a copper solution in the same manner as any article to be plated. The first deposit is carried out in an acid copper solution which stands about 18 deg. Beaumé. This enables a heavy deposit to be put on with rapidity. Annodes should hang on each side of the lace in order to insure an even deposit. The lace will be gradually covered over its entire surface with an even, bright deposit of copper. From one to two hours are usually needed for a complete covering, and if a heavier deposit is necessary a longer time must be given. If a smooth, tough deposit is to be obtained, the current must not be high; about 1 to 1½ volts. After the lace has been copper plated, it may be silvered, gilded or treated with any other finish. The various colors produced on solid metal may be obtained on the lace as long as the solutions do not have to be used hot. Hot solutions are liable to disturb the metal on the surface of the lace unless it is very thick.

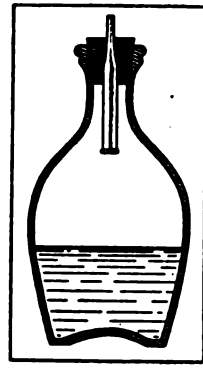
The lace so plated may be made into a variety of articles, as it has a tenacity of solid metal.—Condensed article from The Brass World.

## An Improved Block for Holding Lathe Tools

The accompanying illustration shows the construction of a V-block for use in holding round and flat lathe tools. After the tool is put in the V of the block, both are placed in the tool post of the lathe and clamped with the screw. The screw of the V-block is tightened on the tool, which makes it rigid and eliminates the chattering.

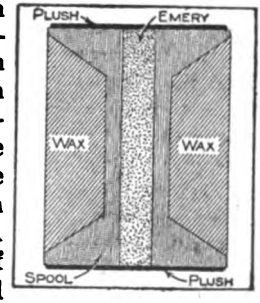
## Home-Made Dropper Cork for a Bottle

Almost every shop has some bottles containing different liquids and as only a few drops of some liquids are required at a time, a dropper bottle becomes necessary. A dropper cork can be supplied to any bottle by boring a hole through a good new cork and inserting the glass of a fountain pen filler, allowing the small end to protrude about ½ in. from the top of the cork. The lower end will then extend down into the neck of the bottle about 2 in. below the bottom of the cork. The bottle is used in the same way as a pepper sauce bottle, says the Keystone. The glass tube has sufficient length so that when the drop reaches the bottom of the tube the air pressure has become great enough, combined with the capillary attraction of the tube, to sustain the drop in the tube, thereby preventing any escaping of the fumes.



## A Tailor's Wax Spool

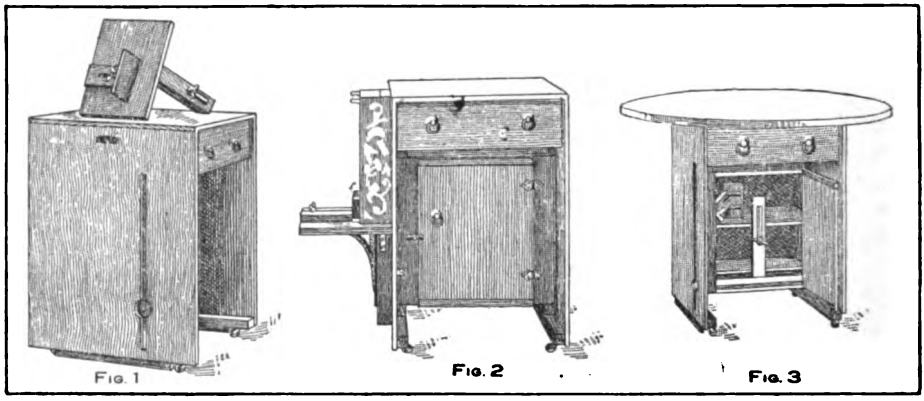
This handy device is made from an ordinary wood spool from which the thread has been removed. Melted wax is run on the spool between the flanges, filling the space level with the rims, as shown in the cut. A small circle of plush is glued fast to one end and the whole of the



spool is filled with fine emery and then another plush circle is glued on the other end. This will combine two useful implements—a thread waxer and a needle polisher—in a compact form.

### How to Make a Pyrographer's Table

Any pyrographer will appreciate the construction of the table and cabinet as illustrated. Anyone doing burnt wood work will know the annoyance of building up a steady support for the arm to the level of the article on which the work is to be done. The size of this table may be made to suit the surroundings and the space of the builder. Fig. 1 shows the table with a slot cut in the side support in which to place the thumb screw of the bracket as shown on top of the table. It will be noticed, Fig. 2, that while both drawer and cabinet are available for storing the apparatus, they are not in the way of the operator while sitting at his work; the drawer overhangs the knees and the cabinet is far enough back not to interfere with sitting up close to the work. The bracket shelf slides in the slot at the side of the table, and is fastened to any height by the thumb screw. There is also a smaller slide bracket on the shelf to clamp irregular objects to the side of the table. The thumb screws, hinges and drawer pulls can be purchased from any hardware store. When the table is not in use for pyrography it can be used for a writing table or a round top provided and attached on which to play games. When used for this purpose the bracket, as well as the pyrographic outfit, is stowed away in the cabinet as shown in Fig. 3.—Contributed by I. Almstaedt, Thompsonville, Staten Island.



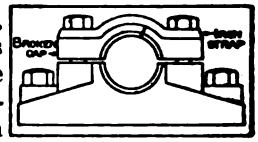

Pyrographer's Work Table

### How to Remove Stains from Concrete Floor

Oil stains on concrete floors may be removed by using a mixture of 1 lb. oxalic acid in 3 gal. water, with enough wheat flour added to make a paste that can be applied with a brush. Allow the application to remain for two days and then remove with clear water and a scrubbing brush. A second application will remove the most stubborn case.

### Temporary Repair on a Broken Bearing Cap

A temporary, as well as an ingenious, repair was made on a cap covering a bearing on a large machine. As it was impossible to get a new cap, and as there was not time to make a permanent repair, an iron

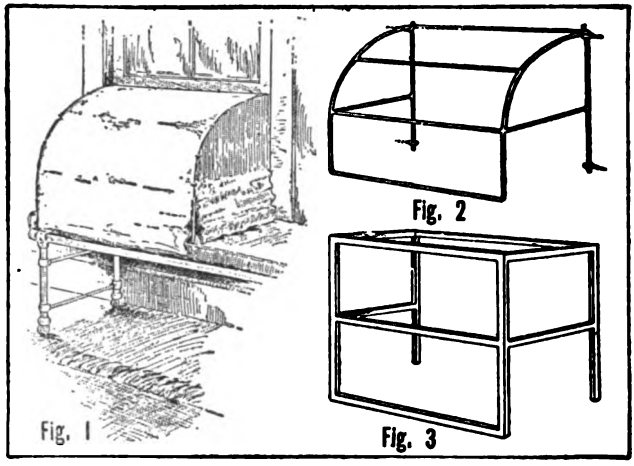


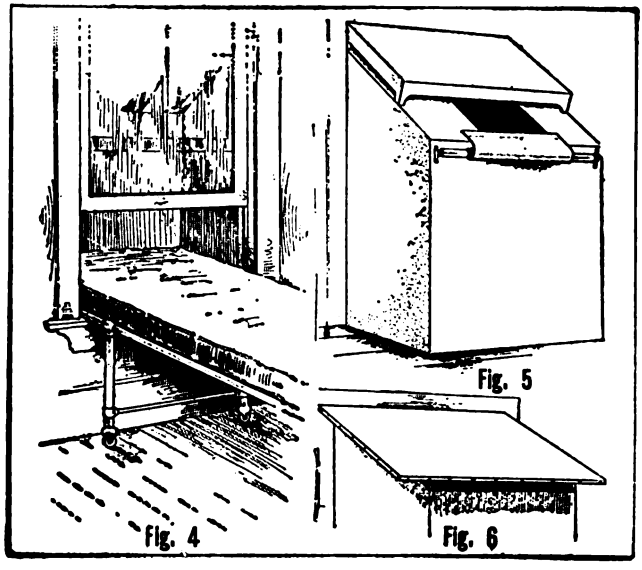
strap was made to fit the shape of the cap, and holes drilled in each end, says the National Engineer. This strap was put over the cap and held in place by the same bolts as held the cap in place before. This repair answered well until a new cap could be made.

### How to Obtain Fresh Air While Sleeping

The accompanying illustrations show the construction of two different devices exhibited by the state of Massachusetts for the purpose of securing fresh air in sleeping rooms. Figure 1 shows a single bed placed before a window. A light iron frame, Fig. 2, fits over the head of the bed and within the window frame. This frame is covered with cotton cloth. After one is snugly tucked in bed under this shield, with the loose cloth at the end and side tucked in about him, he can raise the sash and be practically out of doors, though his body will be in a warm room, says the Country Gentleman. In cold weather the head should, of course, be protected by a warm cap, and if the window is on the "weather" side of the house it will be well to place an awning on the outside of the window as one does to keep out the sun's rays in the summer. This frame, as shown in Fig. 2, can be fastened to the inside of the window frame by screw-eyes and hooks. A square frame, Fig. 3, can be made from laths, which would answer much the same purpose, and be easier to cover, as the cloth could be tacked on.

Another device is shown in Fig. 4. Here the single bed has the head extended through the window into a little tent-like awning, the outside of which is shown in Fig. 5. The iron leg of the bed will have to be slipped back to the position shown in Fig. 4, or a wooden frame for the bed can be made by any one handy with tools. The bottom of the awning is entirely open, while the roof has the center opening that is shown in Fig. 5. The upper end of this opening is protected by a raised frame covered with cloth, while the lower part can be left open, to be covered in stormy or windy weather by a

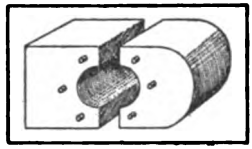


curtain on a regular spring roller, as shown. A cord runs from the curtain up over a little pulley at the top of the window frame and hangs down within reach of the occupant of the bed. A simpler cover, and one that would always protect from storm, is shown in Fig. 6. In this case a roof of cloth projecting some 6 in. at the sides and at the back is raised above the entirely open top, as shown. With such a plan it might be well to provide a cloth screen, or curtain, to close the open side, from which a strong wind may be blowing. The bottom of the sash, Fig. 4, can have a cloth tacked to it, to come down to the bed, if it is desired to keep the room within warm during the night.

### Side-Slap Stopped by Using Pegs in the Bearing

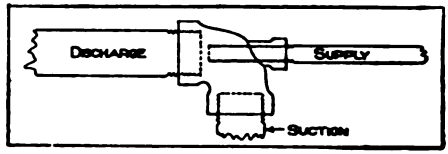
Sometimes an annoying pound will be heard by the engineer while his engine is running. This was so in the case of a large Corliss engine and it seemed impossible for the engineer to locate the noise.



After placing a crowbar between the shaft and the crosshead the trouble was found to be a side-slap caused by wear, says the Practical Engineer. The boxes were taken out, each drilled and three pegs made fast in the holes, as shown in the sketch. After they were dressed down to the proper length all lost motion was taken up and the trouble remedied.

### Ejecting Water with Low Pressure

For the purpose of removing water in cellars, pits and tanks the following described device will be of great assistance where water pressure can be supplied. It can also be used where poles are being placed in soft ground, as sand will go through as well as water. The device consists of a 2-in. suction and a 2-in. discharge pipe placed in a reducing tee at right angles. The supply or pressure pipe is ¾ in. and is screwed into the reducing tee, as shown, with the end extending a little beyond the suction pipe. The discharge

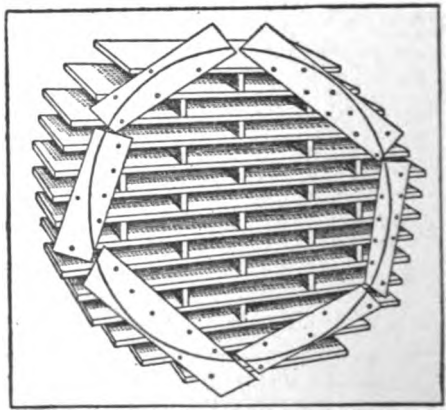



The Pipe Connections

pipe should not be over 10 times its diameter in length. With 50 lb. pressure from a hydrant, which is attached to the supply pipe, it will discharge about 80 gal. of water per minute.

### How to Make a Circular Louvre

A quick and good way to make a circular louvre is to first build the circle jam and then bevel the slats. Two or more pieces are provided for each slat from ¾ by 2-in. material with the ends beveled to 45 deg., says a correspondent of the Wood-Worker. Tack these pieces edgewise on the face of one slat, then tack another slat on these, and so on until enough slats are added



Frame Ready to Saw

to fill the circle. Some thin boards are nailed to the surface of all the slats, as shown in the sketch, on which to draw a circle with a diameter the same as that of the jam. The whole mass of

slats thus bound together is placed on a band saw table and cut out on the line. It is then ready to drop into the jam and nail fast.

## How to Make a Split-Log Drag for Earth Roads

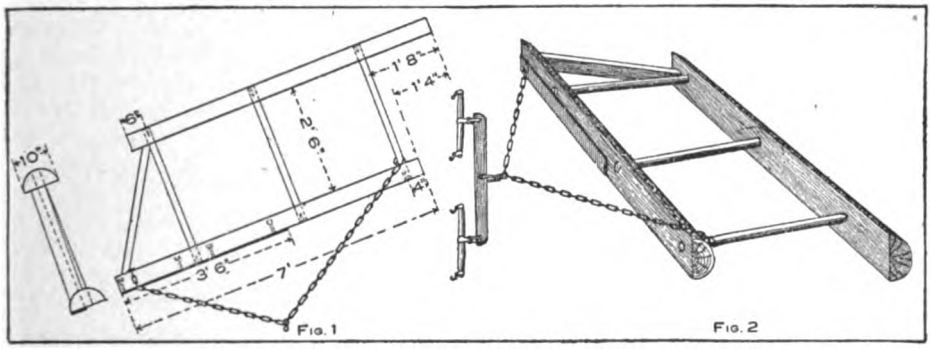
By D. Ward King

In many sections of the country there is no rock, gravel or other hard materials for road building and the most common type of highway is the dirt road. A detailed description is here given for the construction of a split-log drag for making dirt roads. Various devices have been tried and the one to gain the most favor is the two-slab log or plank drag with a liberal "set back." A dry red cedar log is the best material for a drag. Red elm and walnut when thoroughly dried are excellent, and box elder, soft maple, or even willow are preferable to oak, hickory or ash.

The log should be 7 or 8 ft. long and from 10 to 12 in. in diameter, and carefully split in the middle. The heaviest and best slab should be selected for the front. At a point on the front slab 4 in. from the end that is to be at the middle of the road locate the center of the hole for a cross stake, and 22 in. from the other end of the front slab locate the center for another cross stake. The hole for the middle stake will be on a line connecting and halfway between the other two, as shown in Fig. 1. The back slab should now be placed in position behind the other and from the end which is to be at the middle of the road measure 20 in. for the center of one cross stake, and 6 in. from the other end locate the center of the other stake. The center for the middle stake is found in the same manner as on the front slab. The holes that are bored for the stakes should be 2 in. in diameter and considerable care must be taken to hold the augur plumb while boring the holes so the stakes will fit properly. The hole to take the forward end of the chain should be bored in the same manner. When these holes are brought opposite each other, one end of the back slab will be 16 in. nearer the center of the roadway than the front one, giving what is known as the "set back."

The two slabs are held together with stakes made of straight-grained timber and tapered gradually toward the ends. No shoulder is cut on them at the point where they enter the slabs. They should be 2 in. in diameter at the ends and long enough to hold the slabs 30 in. apart, and fastened in place with wedges only.

When the stakes have been placed in position and tightly wedged, a brace 2 in. thick and 4 in. wide is placed diagonally to them at the ditch end, as shown in Fig. 1. The brace is fitted on the front slab so that its lower edge will be 1 in. from the bottom edge of the front slab, while the other end rests in the middle of the back slab and in the angle between slab and the end stake.




King's Split-Log Drag

The blade is made of a strip of iron 3½ ft. long, 3 or 4 in. wide and ¼ in. thick. This iron is attached to the front slab, so that it will be ½ in. below the lower edge of the slab at the ditch end, while the end of the iron toward the middle of the road should be flush with the edge of the slab. The iron is fastened to the slab with ⅝-in. flat-headed bolts and the holes to receive them should be countersunk. If the face of the slab is plumb it is well to wedge out the lower edge of the iron blade with a three-cornered strip of wood to give it a slant like the bit of a plane. The drag is shown complete in Fig. 2.

Drags can be constructed of planks instead of logs, and while the dimensions and the construction are the same, the planks must be strengthened by placing a second plank, 2 by 6 in., along the middle and on the back side of each 2 by 12-in. plank, as shown in Fig. 3. The planks are held together with stakes, and an iron strip for a cutting edge is supplied in the same manner as for the split-log drag. This completed drag is shown in Fig. 4.

A platform made of 1-in. boards and held together with three cleats is placed on the stakes between the slabs. These boards should be spaced at least 1 in. apart to allow any earth that may heap up and fall over the front slab to sift through upon the road again. The end cleats should be placed so that they will just drop inside of the end stakes, while the middle cleat can be shifted to either side of the middle stake. These cleats should extend about 1 in. beyond the width of the platform.

An ordinary trace chain is strong enough to draw the drag if the clevis is not fastened through a link. The chain is wrapped around the rear stake and passed over the front slab. The other end of the chain is passed through the hole bored for it in the end of the front slab and fastened with a pin slipped through a link.

For ordinary purposes the clevis should be fastened far enough toward the blade end of the front slab on the chain to force the unloaded drag to follow the team at an angle of 45 deg. This will cause the earth to move along the face of the drag smoothly and will give comparatively light draft to the team, provided the driver rides in the line of draft. Sometimes conditions are met that require special treatment. Often a flat place several rods in length or a seepy spot needs special attention.

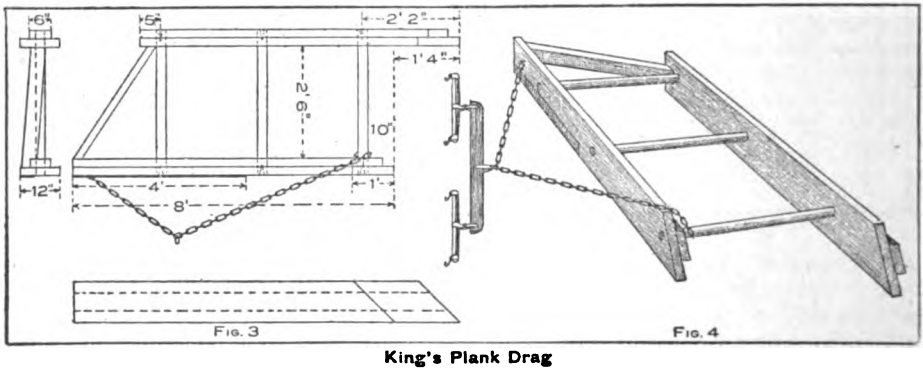



Fig. 3 Fig. 4

King's Plank Drag

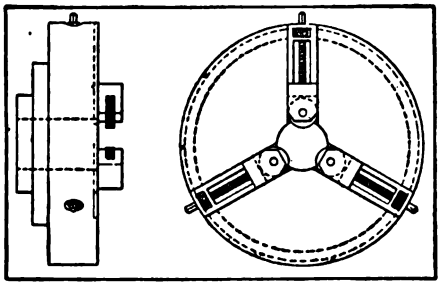
The distance from the drag at which the team is hitched affects the depth of cutting. Shortening the chain tends to lift the front slab from the ground; a longer hitch causes the blade to cut more deeply. If small weeds are to be cut or a furrow of earth is to be moved, the double-tree should be attached rather close to the ditch end of the drag. The drag will then move nearly ditch end foremost, and the driver should stand with one foot on the extreme forward end of the front slab. This will swing the drag back to the proper angle and will cause the blade to plow.

Usually two horses are enough to

pull a drag over an ordinary earth road. When four horses are used, they should be hitched to the drag by means of a four-horse evener. The team should be driven with one horse on each side of the right-hand wheel track or rut the full length of the portion to be dragged, and the return made over the other half of the roadway.

## How to Knurl Work in Long Lengths

Recently we had a lot of wire of various sizes to knurl, says a correspondent of American Machinist. An



Knurls in the Chuck's Jaws

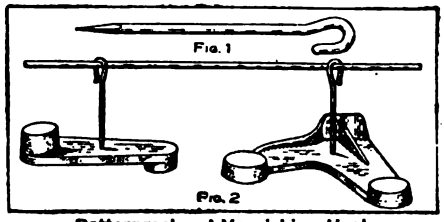
old three-jaw self-centering chuck was taken apart and the jaws annealed, after which they were slotted as shown, to receive the knurls. The wire was in coils and was mounted on a turntable at the rear of the spindle. After passing between the straightening rolls it was led through the spindle between the knurls and grasped by a clamp held in the tool holder. The jaws of the clamp were shod with copper so as not to mar the work. A set-screw held the circular rack after the knurls were adjusted to depth. The carriage as it receded from the chuck drew the wire through the straightening rolls and the knurls.

The knurls were about 1 in. diameter. They would knurl any size material that would pass through the spindle. The knurling was done with a liberal supply of oil flowing on the knurls.

A chain 2½ miles long and weighing 25 tons was recently made in England for use in a colliery.

## A Varnishing Hook to Hold Wood Patterns

When varnishing small wood patterns it is difficult to hold them when

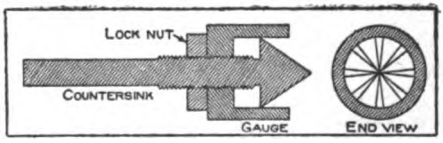



Patternmakers' Varnishing Hook

applying the finishing coat, and to hold them when drying without some of the parts touching, which destroys the finish. A wire hook made as shown in Fig. 1 about 2½ in. long and hung over a wire as in Fig. 2, will not only hold patterns wh. coating and drying, but also will protect the fingers from coming in contact with the varnish. The small hole made by inserting the point of the hook will not mar the pattern much, and if placed in the right position it can be used by the molder for lifting.

## An Adjustable Gauge for a Countersink

Countersinking holes to different depths for flat-headed screws in pieces varying in thickness makes it impossible to gauge the depth by the drill press spindle, or to do the work neatly with a hand drill. The sketch shows how to make a gauge on a countersink that

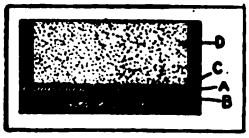



The Countersink Gauge

will gauge the work perfectly, whether used with a hand drill or in a drill press. The gauge is in the form of a cup that can be adjusted by turning it on threads of the countersink. A lock nut is fitted to hold the gauge when set at the proper depth.

## How to Marbleize Concrete

To produce a concrete face that will have the appearance of sanded finish marble, such as used for exterior building stone, is very successfully done on any face-down block machine by first covering the face to the depth of ⅛ in. with a dry mixture of 1 part cement to 3 parts marble dust, and the regular dampened concrete is then placed upon it and tamped in the usual way, sufficient moisture penetrating the dry facing to produce a hard face. When this method is applied to rock-face molds it is necessary to first paint the face of the mold with a coat of Japan dryer, which must be hard before using the mold, says American Carpenter and Builder.




Marble dust from the Vermont quarries produces the smoothest surface, but is more troublesome in adhering to the mold than Georgia marble dust, which is of a flint or crystalline nature. Facing made as above may be polished or glossed after the blocks are five or six weeks' old by polishing much the same as natural marble.

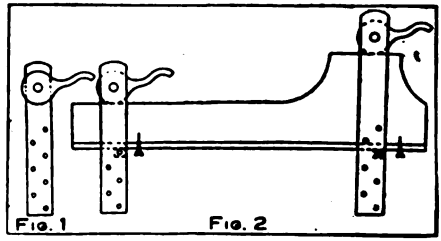
A cheaper method of producing polished or glossed marble surface is to construct a mold as shown in the sketch, which is the same as any ordinary artificial stone mold, except that on the bottom or face side is placed a polished plate glass, A, which rests on a rubber blanket or mat, B, to save breaking the glass when tamping. On the glass is poured to the depth of ⅛ in. a composition made of 1 part Portland cement and 3 parts marble dust, C, mixed with sufficient water to admit pouring. This composition must be well agitated until poured, which is immediately covered with rather a dry concrete block composition, D, which must be well and carefully tamped, and the mold left undisturbed for at least one day, when the block or slab is removed and seasoned.

When a highly polished glass and fine marble dust is used the surface is perfect, and it sometimes is necessary to slightly warm the glass to free the block from it. Such surface can be highly glossed by vigorous rubbing with felt frequently dampened with a solution of 1 part oxalic acid to 6 parts clean water. All acids must be washed off the block with clean water as soon as the desired gloss is obtained.

## A Wagon Maker's Clamp for Holding Frame Panels

The accompanying sketch shows a very simple device which can be used to hold the panels on a wagon frame until they are fastened together by means of wood screws, says a correspondent of the American Blacksmith. It is constructed entirely of wood, with the exception of the bolts.

Secure two pieces of wood about 4 ft. long, 4 in. wide and 2 in. thick, and in one end bore several holes about 3 or 4 in. apart, as shown in Fig. 1.




Clamp for Wagon Frame Panels

Near the other end of each piece bore a hole and fasten a clamp with a bolt. When this is done, the next step to be taken is to construct two pieces of wood about 3 in. square and 6 in. long, with pegs projecting out on one end about 2 in. These pegs should not be directly in the center, but a little to one side, or, in other words, a little off center, so that it can be turned in four different ways when regulating the length of the clamp, the holes in some cases not being close enough together to properly adjust every length. As can be readily seen in Fig. 2, this is a very simple and convenient device for

holding panels on the frames, and should prove very useful to the wagon builder.

### How to Save Monograms When Repainting

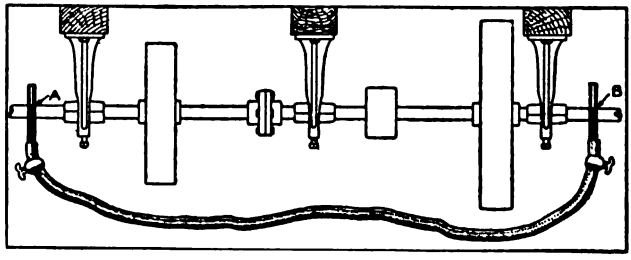
On carriage body panels there is frequently a small monogram or ornament which contains much fine work. If the panel can be repainted without having to replace the ornament again much time may be saved, says the Master Painter. The following is a method by which such an ornament may be saved:

When lead coloring the work, avoid the monogram and leave it untouched until the job is ready for quick color. At this stage mix some ordinary soap to a paste with water, and with a writing pencil carefully cut in and coat over twice with the soap the portion required to be saved. When this is done put the quick and varnish colors on over the soaped portions and all, as though you had no intention of saving them. Next day, when flatting the varnish down, it will be found that the color on the soaped portions easily breaks away, leaving the monogram standing out in its original state.

### How to Level a Line Shaft

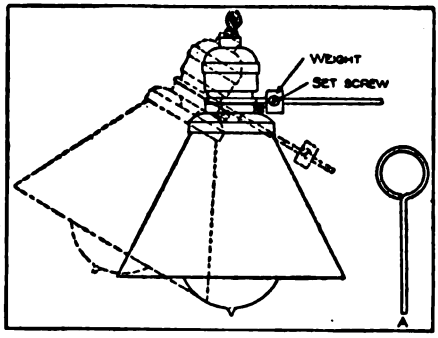
Millwrights have a hard time to level up shafting after it has been in use for some time, due to the sagging of the overhead joist. In a great many places the pulleys are so close together that a spirit level cannot be placed on the shaft and the only way that seems possible is to take the shaft down and run a line through the hanger bearings, which requires considerable time.

The sketch herewith illustrates a good way, as it is based on the principle of "water will find its own level." By taking a small rubber tube or hose and attaching two small cocks and a water glass on each end, and filling the entire length with water, the shaft can then be made level where it is found to sag by noting the water level in the glass tubes as shown at A and B. Shafts not in line require 25 to 50 per cent more power than if they were in line.—Contributed by Geo. W. Richardson, Chicago.




### Angle Adjuster for Electric Drop Lights

Electric lights that are suspended by a flexible drop cord from the ceiling are not usually in the best position for close office work. A simple method of giving the globe the proper angle is




Adjustable to Any Angle

to procure a piece of heavy wire and bend it around the socket just above the shade holder so that it will fit tightly. Allow about 5 or 6 in. to extend out at right angles to the socket. Take a small block of round or square bar, or rod, and drill a hole through it large enough to fit the wire. At right angles to this drill another hole and tap it for a machine or set screw. By sliding the weight block along the wire and tightening the set screw at the proper position the shade and lamp will

be tilted so as to direct the light at the desired angle. The wire is formed in the shape shown at A in the sketch.

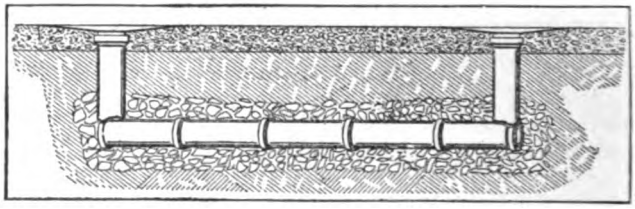
### How to Drain a Boiler Room Floor

The old floor of our boiler room was made of plank laid on stringers resting on the ground. The floor naturally wore, rotted and was eaten out by the rats, says a correspondent of Power. It was decided to place a floor in that would last as long as the plant and consequently a floor was constructed of cement concrete. As this made a perfectly tight floor the question came up of how to take care of the several drips usually found around a boiler room.

After tearing out the old wooden floor a trench was excavated a trifle less than 2 ft. deep and about 1 ft. wide for the proper length in front of the boilers. In the bottom of this trench was laid a layer of about 3 in. of loose broken stone from 2 to 4 in. long. On top of this stone was laid a series of unglazed 4-in. drain tile such as used for draining swamps and low places. Around these tile and on top of them was placed more broken stone, about filling the trench half full, and at each end a length of tile was stood on end reaching to within 1 in. of the completed floor level. It will be noticed in the sketch that the two end sections of the horizontal series of drain tile were roughly beveled off by breaking with a chisel and hammer in order to form a rough sort of an elbow, the loose stone surrounding this point being chosen to fill in without falling into the space between the vertical and horizontal sections. After having placed all these parts of the drainage system, a layer of clay-like earth was placed in the trench to bring the level up to the bottom line of the floor layer. The floor was then laid over this trench the same as the rest of the boiler room, with the exception that surrounding these vertical drainage holes it was sloped down for about 12 in. each way to carry water toward the holes. This made a perfect drainage that has given entire satisfaction.

### How to Clean Raised Gold Leafed Letters

Dust the letters off with a soft brush and wash them with castile soap suds, also using a soft brush, after which wash with plenty of clean water, to remove all soap. A wad of cotton will be the safest to use. Allow the work to dry, then if needed, restore luster by washing with dilute sulphuric acid, making the water quite acid, but not too strong, says the Master Painter. Oxalic acid will also answer the purpose.



### Removing Cinders from the Eye

The best way to remove particles of dirt or cinders from the eye is to secure a raw potato and cut a very thin slice, about $^1/_{32}$ in. thick and $\frac{1}{4}$ in. wide. Slip this under the eyelid and the cinder will adhere to the potato. The potato being cool and moist will not hurt the eye.

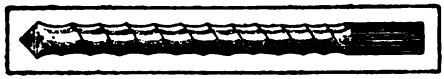
Rifle barrels that are leaded can be cleaned by stopping up one end of the barrel and filling with mercury. Allow this to remain in the barrel 24 hr. and then return the mercury to a bottle for future use. Wipe out the barrel with a piece of linen cloth oiled. The mercury will clean out the lead.

Screws may be kept from getting rusty and sticking tight by applying graphite mixed with ordinary oil.

# SHOP NOTES

## Home-Made Extension Drill

While drilling some castings one day I found that the twist drill was not long enough to reach through each piece. The holes were to be $\frac{3}{8}$-in. in diameter. I took a piece of $\frac{5}{16}$-in. round tool steel and after heating I hammered it out square and then after taking another heat the square steel was twisted until it had the appearance shown in the accompanying cut.

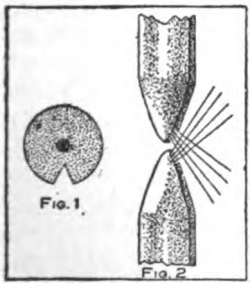


Used Like an Ordinary Twist Drill

After the twisted rod was tempered and ground to the proper cutting edge it was placed in the drill chuck and used the same as an ordinary twist drill. It is surprising how well this tool will work.—Contributed by L. N. Fasnacht, Inland, Ohio.

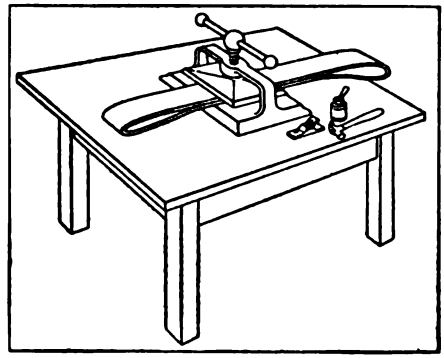
## Preparing Carbons for a Moving Picture Machine

For those that cannot secure the side core carbons the following method will help them get a better light: File the carbons so as to make a V-shaped groove in them half-way to the center core, as shown in the cross-section, Fig. 1. When placing the carbons in the machine, set them with the grooves towards the condenser, says the Moving-Picture World. The carbons will burn away faster on the grooved side and will not hide the arc at the crater, as shown in Fig. 2.




## Pressure Applied While Gluing Belts

Some means is necessary to apply pressure on freshly glued belting while drying, says the American Miller. The sketch shows the application of an old

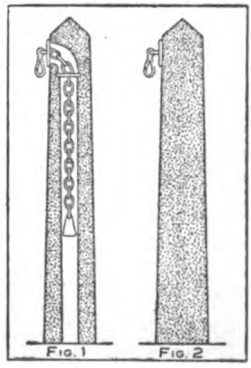


Belting in Letter Press

letter copying press, such as may be found in almost any office, which is very handy for this purpose.

## How to Make a Cement Hitching Post

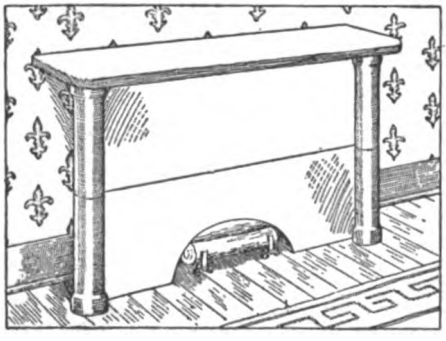
The cement post as illustrated by the accompanying sketch is made in a mold constructed of boards. The shape of the mold can be made to suit the builder. The post should be about 10 in. at the bottom and 6 or 7 in. at the top. When the mold is ready for the cement a $1\frac{1}{2}$-in. gas pipe with an elbow turned on one end is placed in the center of the mold. A cement composed of 2 parts sharp, clean sand and 1 part cement is poured into the mold



around the pipe. When the cement sets the pipe should be in the center of the post, as shown in Fig. 1. A chain with a weight attached to one end and a snap on the other is placed in the pipe as shown. The ring holding the snap is made sufficiently large so it will not pass into the elbow. Figure 2 shows the completed post.

## Home-Made Mantel

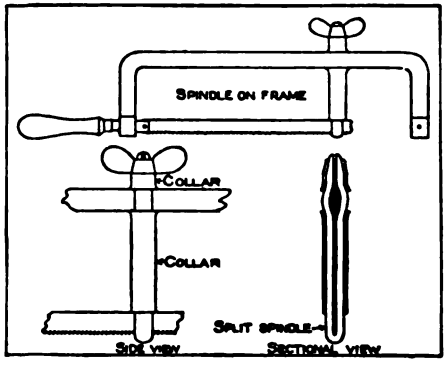
The accompanying sketch shows the construction of a home-made mantel and gas grate. The top is made from a selected piece of 2- by 12-in. plank of suitable length, dressed and finished as smooth as possible, and two of the corners rounded. The columns or supports are made from four lengths of vitrified tile. The smooth ends are placed together with their bell ends apart and then filled with a neat mixture of cement. If care is taken in making the connection the joint will not be seen. These tile columns when placed under and supporting the top board can be finished in any color to suit. The front is covered with sheet metal, and if the metal cannot be obtained in a sheet large enough to cover the whole front, it can be made from two pieces connected with a turned seam in the middle as shown. The bottom part of the metal is cut on a curved line to make an opening behind which the gas logs are placed. This metal front can be finished in colors or bronzes to suit the builder. If it is possible to place the mantel against a wall in which there is a chimney, the burnt gases and fumes can be removed by making a vent into the chimney.



Gas Grate and Mantel

## How to Use Broken Hack-Saw Blades

By means of a holder as shown in the sketch it is possible to utilize broken hack-saw blades. The holder consists of a spindle with a slot at its lower end



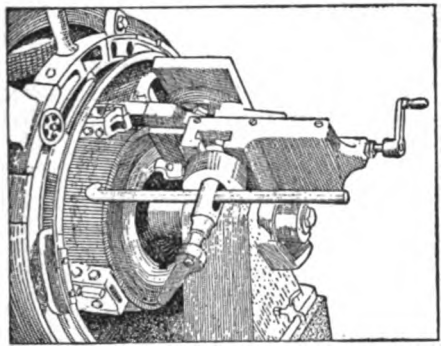

Utilizing Broken Hack-Saws

in which to hold the broken end of the saw blade, says the English Mechanic. This slot extends full length of the spindle and embraces the saw frame at its upper end. Between the blade and the frame is a collar made from a tube cut to the proper length, and above the frame is a shorter collar made from the same material. A nut is screwed on the upper end of the split spindle, and when tightened it binds the broken saw in the slot below the end of the tube and at the same time binds the frame between the top of the tube and the collar. A rigid grip is thus provided, which allows the broken blade to be subjected to tension and held as firmly as when it is complete.

A good quick way for one man to do chalking with a chalk line is to fasten a medium-sized fish hook to one end of the line, after filing off the barb. This can readily be inserted and removed.

## Novel Way of Turning a Commutator

The commutator of a small direct-connected generator had to be turned down and a rather novel method was used in accomplishing the work. As the armature could not be put into the lathe without removing the crank disc and the flywheel, it was considered best to bring a part of the lathe to the machine. The compound rest was taken from the lathe and secured to a small



Turning a Commutator

cast plate, about 12 in. long, 6 in. wide and 1 in. thick. The plate was then clamped to the two top studs of the outside main bearing of the generator as shown in the sketch. After removing the brush holder ring and starting the engine, a smooth, even cut was easily taken off the commutator with a stiff boring bar held in the tool post.—Contributed by Elvin F. Brough, Sulphide, Ont.

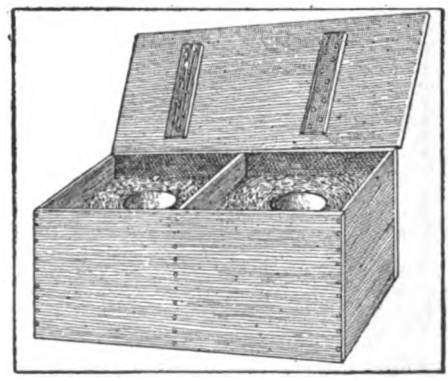
## Pullman Body Color

The Pullman body color, which varies in shade from light olive to a dark olive, is commonly composed of drop black, Indian red and medium chrome yellow. Although ivory black and stone ochre is sometimes used in lieu of drop black and chrome yellow, says Railway Master Mechanic, that which contains chrome yellow is preferable, on account of its extra strength, as it will admit of being used much thinner, which is a decided advantage in all colors.

## How to Make a Fireless Cooker

During the hot summer months a fireless cooker comes into demand more than any other season of the year, yet the saving of fuel makes this cooking device one of universal favor. To make a two-compartment cooker, as shown in the sketch, purchase two 1-gal. earthenware fruit jars with large mouths which are about 10 in. high and 7 in. in diameter. Make a box 24 in. long, 12 in. wide and 18 in. deep inside measurements, with a tight fitting, hinged cover. A sash lock should be used on the cover to draw it down tight when the cover is closed. The box is lined throughout with heavy strawboard, making lap joints at the corners and tacking it on with 8-oz. tacks. Place a piece of felt weather strip around the top of the inside of the box for the cover to fit against. This will hold the heat within. Fit a board partition in the center of the box, dividing it in the middle and making two nearly square compartments. Place a layer of straw or hay about 4 in. deep and pack down tightly in the bottom of each compartment.

Make two cylinders of strawboard 10 in. high and just large enough in diameter for the jars to fit in snugly. Place one cylinder with a jar in each compartment as near in the center as possible and pack straw or hay tightly around them until the space is filled level with the tops of the cylinders. Two pillows are made from muslin and

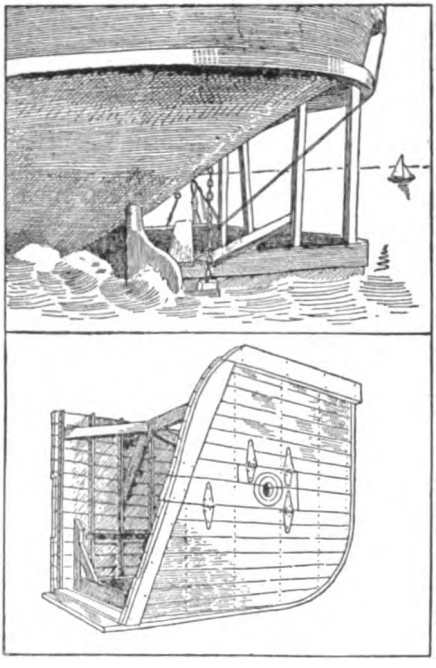


Hay Stove Complete

stuffed with straw so they will be slightly larger than the remaining space above the cylinders. This will allow for a slight compression when the cover is closed. When completed as above the cooker is ready for use. Vegetables, boiled meats, rice and cereals are placed on a fire and heated to the cooking temperature and then placed in the cooker, which continues the cooking until ready to serve.—Contributed by H. M. Roth, Troy, Ohio.

## Repairing a Boat's Propeller While in Water

A palace twin-screw steamer broke her propeller blades twice during the season and had to go some distance to a drydock where she could be repaired.



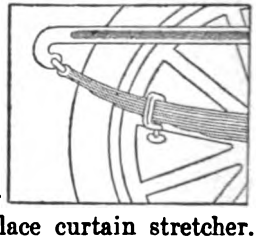
A Repair Cradle for Each Propeller

This, of course, resulted in considerable loss of time, and to avoid any such mishaps in the future, two immense boxes or cradles were constructed, one for each propeller, for repairing purposes. These were sunk into place around the propeller, as shown in the illustration, the shaft of the propeller being inserted in a circular opening in hinged doors on each side of the bearing. The cradle is held in place by braces and the water removed by the steam pumps. When the water is all out the pressure from the exterior holds the cradle tightly against the side of the ship and makes the joint almost watertight. Any water that leaks in is quickly removed with the pumps. In this way the workmen have access to the propellers and can do the necessary repairs in a short time, doing away with the expense and loss of time taking the steamer to drydocks.

The boxes or cradles were constructed as shown in the second illustration. They were made from matched lumber held together with battens made from rail iron. The bearing around the place where the propeller shaft enters the box was made to separate near the center and each half was attached to hinged doors. In this manner the cradles could be quickly placed in position about the propeller blades and the joints made almost watertight.

## Temporary Repair for a Broken Automobile Spring

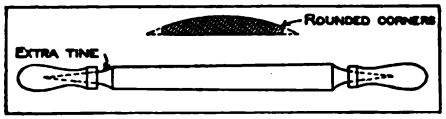
While taking an automobile spin through the country, one of the front springs broke, caused by striking a bump. The spring was of the semi-elliptical type and at first no plan suggested itself as a solution of the problem. In the tool box, however, I found a small hand clamp like those used in clamping the frame of a lace curtain stretcher. The car was jacked up, so that the jack supported the frame but let the spring be relieved of the weight of the car. The clamp was then tightened up on the broken spring as shown in the sketch. This held the broken parts together until a new piece could be supplied. A large monkey wrench could



be used in the same manner and tightened up with a pair of pliers which would serve the same purpose, but the clamp was applied quicker.—Contributed by Paul B. Wright, Cleveland, O.

### How to Make a Burnisher

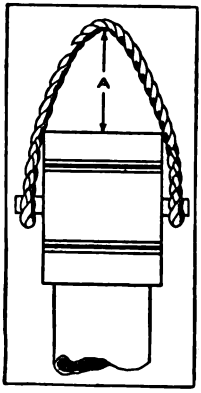
An old half-round file will provide the material to construct a burnisher. Grind away all the teeth and round the corners, as shown in the sketch, making the whole surface smooth and then finishing with very fine emery, says the Model Engineer. An extra tine should be ground on the smaller end of the file for the purpose of having a handle on each end. With the aid of this tool a brilliant finish can be given to screw heads, small pins and other similar small work.



Burnisher Made of Old File

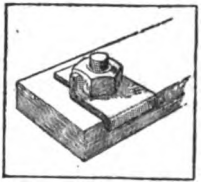
### A Quick Repair Bail for Rod Tools

When the bail in the swivel of rod tools breaks, a quick repair can be made by using a rope bail. Take a piece of ⅜-in. soft rope about 2 ft. long and splice a close eye in each end; an eye that when finished will require quite a little power to force it over the lugs on the swivel, says a correspondent of The Drill Hole. Enough tucks should be made in the splices so that the distance marked A in the sketch does not exceed 5 or 6 in. Keep the tools hitting on the spring of the cable and you will find that you will have a bail which, in some respects, is superior to the metal one, as it does away with nearly all the noise of the swivel, and owing to the slight spring which it has, is much easier on the ball bearings.




### How to Make a Nut Lock

The accompanying sketch shows the construction of a simple lock for a nut. It consists of a piece of ¼-in. sheet metal with a hole punched for the bolt to pass through, and a slit extending part way on one side. After the metal is slipped over the bolt one side is bent down as shown and the nut then screwed up tight, leaving the nut with one flat side parallel with the slit. A hammer and a chisel are all the tools necessary to bring the free end of the slit upright along the side of the nut. Nothing short of a break will allow the nut to turn back. This combination of a nut lock and a washer can be applied in many cases.—Contributed by Donald A. Hampson, Middletown, N. Y.



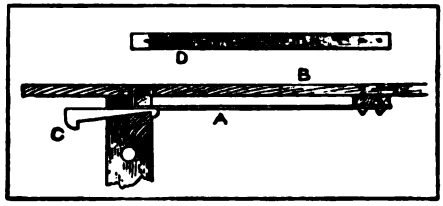
### Surface Cleaning Before Varnishing

In cleaning a vehicle body before varnishing it is necessary that every vestige of the pumice should be removed by numerous applications of water, and the use of the water tool, sponge and chamois. Any pumice allowed to remain will become hard there, but the varnish and brush will work it free, to appear all over the work, making it seedy. Not only this, but the brush will get a lot of grit in it, to be parted with some other job, says the Blacksmith and Wheelwright. After the proper washing and rubbing of the job it is well to use a silk cloth to remove any possible lint that may remain from the chamois; for the chamois will have lint. Should any specks appear, after the care taken, remove them with a small bit of wood that is pointed.

PANEL DESIGN—Intended for the middle of a panel on the brickwork of a shop front. The ground to be a light creamy drab, the stencil in gray and brown, and the speckled border a light gray; and outside this a band with deep buff stencil on drab ground, lines of dark gray and brown, and stiles of a deeper drab than the ground of panel.—From the Decorators' and Painters' Magazine.

## How to Make a Bench Stop for Woodworkers

The accompanying sketch shows how to make a bench stop that can be instantly adjusted to the work in hand and quickly lowered, leaving a clear bench surface, not in the way of the work on top of the bench when the stop is not needed. A piece of steel is bent in the shape of a hook, A, and made square at the turns and fastened to the under side of the bench top, B, with two bolts. The two bolts pass through the bench top, through a small block of wood and through the end of the piece of steel which now forms the bench stop. The holes through the bench top should be countersunk to admit the heads of the bolts below the surface, says the Blacksmith and Wheelwright. A key, C, is shaped as shown and used for making the adjustments.

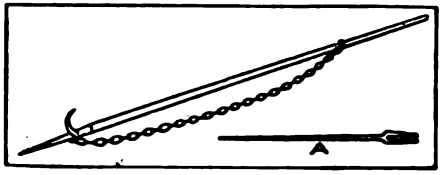



Details of Bench Stop

By simply pushing the key to the right the stop is raised to any desired height. In this case a recess is cut in the cross-piece to support the key. If the stop is located away from the cross-piece, simply make a bolt to support the key. The top of the stop is shown at D, which is filed with a V-shaped notch in the center and teeth cut on each side. A spring leaf can be used to make the stop. The hole for the vise screw is for a carpenter's bench where the vise does not come above the bench.

## Tool for Work on Mill Dams

Illustrated herewith is a tool that is handy for making the work easier when piling planks from sluices on mill dams when the water is high or in the spring time during freshets, says the American Miller. It consists of a common boat-hook with a chain attached. The chain should be as light as possi-



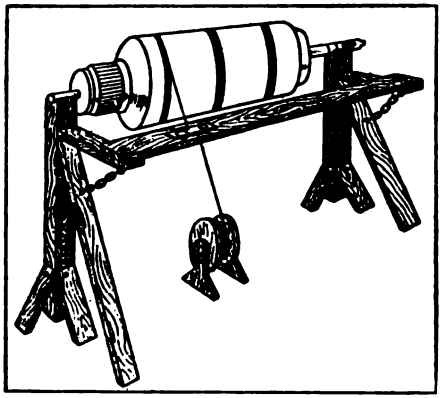

For Work on Mill Dams

ble, but strong enough to stand the strain it will receive. About a 5-16 in. chain will do.

The slack in the chain is taken up by sliding a large link on the end of the chain up on the pole. The pole may be of any length desired. The bar A has a crab-claw to catch into the links of the chain and bear on the fulcrum under bar when using.

## How to Band Armatures

Small roads having few cars cannot afford expensive equipment in their repair shops. A master mechanic and correspondent of Electric Railway Review has supplied a device for banding armatures without using a lathe. The



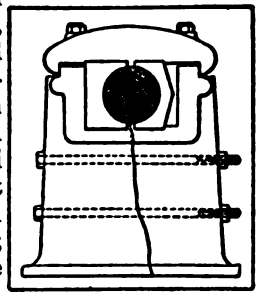
Banding Armatures Without a Lathe

armature rests, as shown in the sketch, on two special stands. Connecting with these stands and running alongside the armature is a 2 by 4-in. hardwood tension bar on which, by means of lag screws, fiber tension blocks can be placed to guide and put a tension on the banding wire taken from a reel standing on the floor below. A special crank is arranged to fit the pinion end of the shaft so that the armature may be turned while placing the band wire.

Stove pipes, boiler tubes, etc., may be kept clean from soot by throwing a small piece of zinc into the fire occasionally.

## Repairing a Cracked Main Bearing

A large cross-compound engine that had to run 20 out of 24 hours was running as usual when the low-pressure crank broke and came around, striking the end of the connecting-rod, which broke the main bearing and pushed the shaft about 6 in. ahead of the engine; also breaking the piston rings.



The engine was shut down and repairs began immediately, says a correspondent of Power. Two holes were drilled through the bearing and two bolts 2 in. in diameter were put through, as shown in the sketch, and drawn tight. The low pressure side was put out of commission and the engine started on the high pressure side, which ran satisfactorily until a new crank could be forged.

## Depositing Copper on Glass

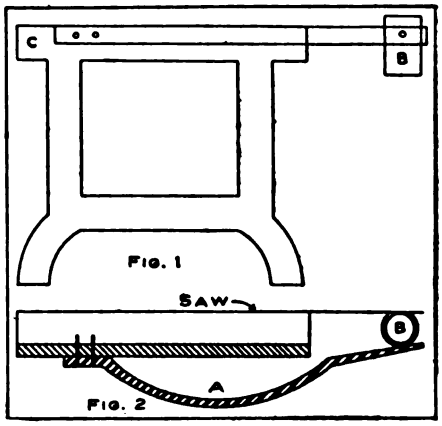
A new method of depositing copper on glass has recently been discovered by an English investigator, says the Brass World. A mixture of 1 part of freshly distilled phenyl hydrazine and 2 parts of water is heated until the solution is clear. A warm solution of cupric hydroxide in ammonia is then added (made by precipitating sulphate of copper by potash, washing and dissolving in ammonia). The cupric hydroxide is reduced to cuprous hydroxide with evolution of nitrogen gas.

A hot 10 per cent solution of caustic potash is then added until a slight precipitate of cuprous hydroxide takes place. If the solution, in this condition, is brought in contact with a clean glass surface, a bright deposit of copper forms on it. This is thin and perfectly reflecting.

The copper thus deposited is washed after an hour or so with water, then with alcohol, and finally with ether, in order to dry it without rupture. It is then coated with lacquer or varnish.

### An Oiler for Automatic Saw Grinders

Perfect grinding of saws can be done on any automatic grinder, providing the saw is kept in the right shape and




Details of Oiling Device

is properly prepared for grinding. The saw should be cleaned and oiled after it is placed on the grinder. This can be accomplished by taking cotton waste saturated with kerosene oil and applying it to the saw inside and out, where the clamp comes onto the saw. If the saw is not oiled, it will get gummy and when in this condition imperfect grinding will be the result, says the Wood-Worker. This cleaning can be done with the machine itself, by attaching an oiling device, as shown in Figs. 1 and 2.

The device can be made in a short time. Get a piece of old band saw steel, any thickness from 16 to 18-gauge, and cut a strip about ¾ in. wide and 12 or 14 in. long. File the edges nice and smooth and bend it as shown at A, Fig. 2. Punch two holes in the end where the spring is fastened to the clamp, and one hole at the other end, to fasten the stuffing box with a stove bolt.

The stuffing box, B, can be made by taking a piece of brass pipe 1½ in. in diameter and ¾ in. longer than the saw clamp is wide. Put a wooden plug in the bottom of the box and file a slot in the side where it comes in contact with the saw. This will leave it in such shape that if the waste is stuffed in tightly it cannot fall out, and at the same time it can be forced outside the box, so the waste will have a bearing on the saw only. Fasten the box to the spring with a stove bolt and fasten the spring with wood screws to the grinder clamp, C.

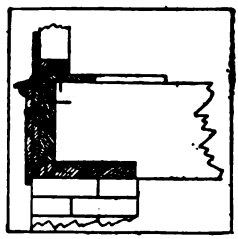
By the use of this device all that is necessary to do is to saturate the waste about once a day, and the rest of the work is done by the grinder. The same device can be put on the inside of the grinder also, by the use of a different spring to suit the angle.

### Home-Made Linoleum

A good strong linoleum may be made from old Brussels carpet that has not been worn through. Tack the carpet, right side down, on the floor, and then apply paint, giving it a large number of coats; the last few coats to be of the desired color, allowing each coat to dry well. If the paint begins to wear, apply a fresh coat of paint. The effect of mosaic tile may be produced by dotting the last coat with different colors of paint.

### A Rat-Proof Sill Construction

The accompanying sketch shows in detail how to construct a sill that will not only keep out the rats and mice,

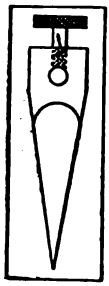


but has the advantage of making a solid backing for the baseboard. A 2 by 12-in. plank is placed flatwise on the foundation to which is first spiked a 2 by 10-in. plank at right angles on its outer edge. By making a 2-in. mortise in

the joist to fit over the 2 by 12-in. base, the top edge of the joist will be level with the 2 by 10-in. plank, says the American Carpenter and Builder. A rough flooring is now laid, on top of which is placed a 2 by 4-in. stud, flatwise and flush with the outside of the construction. This makes a solid backing for the baseboard. On this 2 by 4-in. stud is toe-nailed the upright studding forming the sides of the building.

## Home-Made Trammel Points

Having had occasion to use trammel points when there was none at hand, I



set about to make them, says a correspondent of Power. I took two old worn-out files and broke them off within ½ in. of the tine. I next had them annealed and ground off the teeth, drilled a ¼-in. hole, as shown in the sketch, and $\frac{3}{16}$-in. tap holes for the thumb screws. Then by using a ¼-in. polished rod flattened on one side to hold the points, I had trammel points that were useful in many ways.

## How to Recut Threads on Small Machine Screws

It is often necessary to cut or rechase threads on small screws and in doing so, if the screwhead is placed in a vise it is almost sure to spoil the screw. Change the operation by placing the diestock in the vise and running the screw through the die with a screwdriver. This will always save the finished screwhead.

Show windows may be cleaned by using the following paste, applying with a soft rag and rubbing off with another soft dry rag: Mix thoroughly together 9 oz. prepared chalk, ½ oz. white bole, ½ oz. jeweler's rouge, 5 oz. water and 3 oz. alcohol.

## Striking the Water Line on a Boat

(Condensed from an Article by C. G. Davis, in Motor Boat.)

Painting the water line of a boat is not so simple a matter as some people suppose it to be. Many are somewhat surprised to find that the bottom paint is considerably higher on one side than

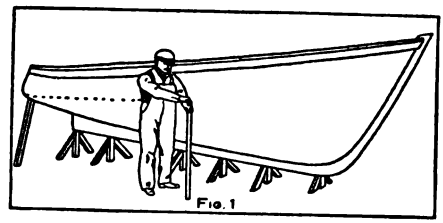
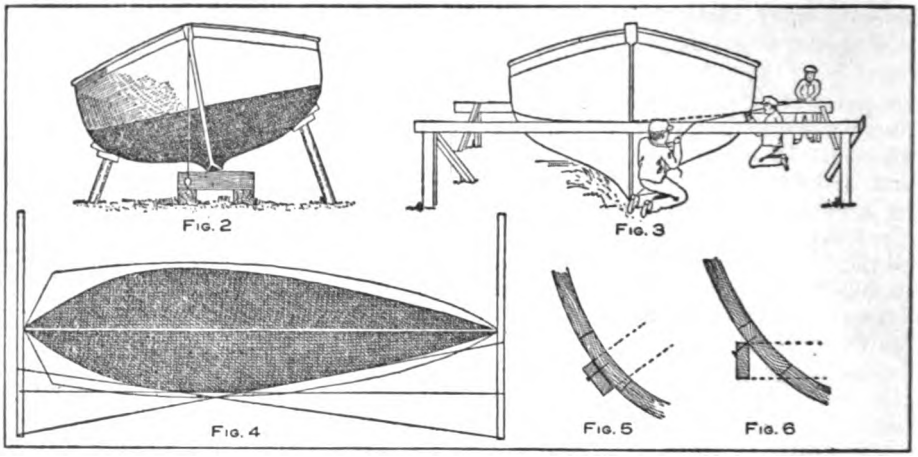


FIG. 1

on the other after they get the boat afloat, making the boat appear to be resting crooked on the water. A new boat built in a shop with a smooth level board floor under it, can easily have a water line scribed around it by cutting a stick the exact distance from her proposed water line to the floor and then, holding this stick vertical, going around the hull making a series of spots every few inches apart as shown in Fig. 1.

To strike a new line on an old boat the first thing to be done is to drop a plumb-bob from the point of the stem and off the center of the stern and see if the boat is standing perfectly plumb, as shown in Fig. 2. If it is, you are ready to begin, but if not, wedge up and down on the shores or blocking until you get her perfectly true, as the plumb-bob will show.

Secure two long boards, at least twice the width of the boat, that have been planed up so that they are straight on one edge. Nail the middle of one of these boards so that its straight edge comes just level with where you want the water line to be. Hold the ends up by nailing two posts to the floor and put two braces aft so that as you pull from one to the other to tighten the line they will not move. Tack the other board fast aft, the same way, being careful to have the two perfectly leveled up with a spirit level. With a

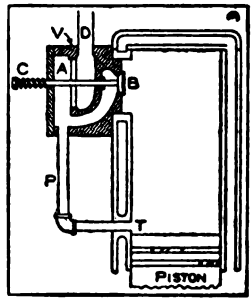



fish line made fast at one end—or quicker yet, let another man hold it—you can swing this line out on one board and in on the other so that a third man with a pencil can make a series of spots around the hull that will guide you in getting a perfect water line, as shown in Fig. 3. In Fig. 4 is shown the method of swinging the line to get the different angles of the boat. By bending a thin batten the line can be scratched in through the spots made on the boat. To do the work properly procure a batten about 1 in. wide and less than ¼ in. thick and a handful of 1-in. or 1¼-in. steel wire brads. If the side of the boat is vertical the batten will lay flat against it, but you can readily see that if the side of the boat is rounding under—as it is at the turn of the boat's bilge—the batten, if nailed flat, as shown in Fig. 5, will incline to curl up at the ends; this is what you must guard against. Let only the upper edge of the batten touch the planks and send the brad diagonally through it into the planking so it holds the batten as shown in Fig. 6. By keeping the batten vertical it will help to make the line a true, straight one as you bend it around.

Scratch the water line in with an awl or compass point deep enough so that it will show through one or two prime coats of paint to guide you when you paint the last finishing coat. When you paint, remember to do the top coat before you do the last coat of bottom paint, for two reasons: One is that the thick copper paint generally used on bottoms of boats will cover the edges of the white more completely, but the principal reason is that the paint will run up hill, and you can cut out the line sharp and distinct with no fear of the paint running into the other coat, as it is sure to do with a brush full of paint held up and trying to cut out the line clearly from above. Drops of paint are sure to run down and spoil the line.

## Valve Operating Device for Gas Engines

The accompanying sketch shows how to make a valve operating device that can be supplied to almost any make of gas engine on the market after the old valve operating cams, gears, etc., have been worn out. The valve box, V, with valve and piston, can be made by anyone owning a lathe. The operation is shown by the cut: when the explosion takes place and drives the piston outward until it reaches the end of the stroke, the piston uncovers a small



opening at T into which the pressure enters and is led by the pipe P to the valve box. The pressure now operates on the disc of the valve rod, A, pushing it inward until the exhaust valve, B, is opened. The burnt gases then rush out and operate on the piston or disc, A, until it is lifted far enough to allow the exhaust or burnt gases to pass out at D. So long as the exhaust passes the valve B, the piston A will be held in and the valve B kept open. As soon as the cylinder is clear, the spring C closes the valve ready for another explosion. With this device it is impossible for the engine to throw out an unburnt charge of gas, as it must explode in order to open the valve.—Contributed by Geo. McVicker, North Bend, Neb.

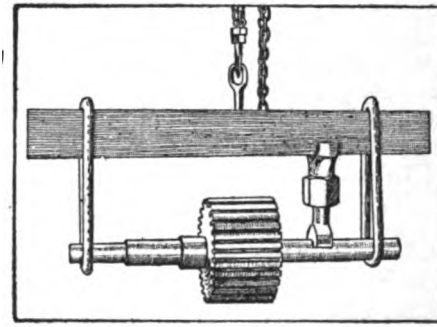
### Flux for Use in Melting Brass

Most fluxes used in melting brass attack the crucible and cause all sorts of trouble. Glass has been used to some extent for this purpose by rolled brass manufacturers, who are able by this means to reduce the spelter loss to below 1 per cent, says the American Machinist. One reason for the success of glass as a flux is that it does not become actually liquid, and hence does not attack the crucible. It becomes pasty and is readily skimmed off, this being a difficult operation with a liquid flux.

Sulphur in powdered form mixed with oil makes one of the best things for hot bearings.

### Straightening Armature Shafts

The straightening of armature shafts is a kink that sometimes troubles shop men. The accompanying illustration shows an armature shaft bender which is made from a large bar of metal, two large links and an expanding block.

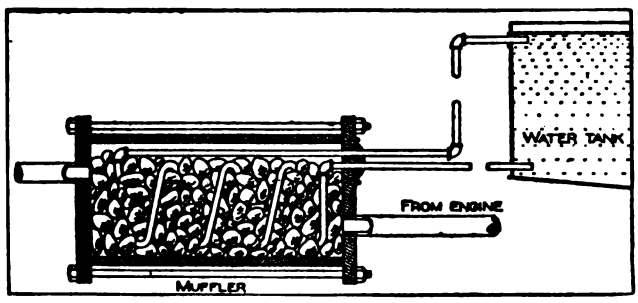


Armature Shaft Bender

The screw on the expanding block has a fine thread so that the pressure can be applied slowly and evenly, says Electric Traction Weekly. The block can be moved to any point on the shaft so that the pressure may be effective between any two points on the shaft. The operation of the device is readily appreciable from the illustration shown.

### A Muffler Water Heater for Explosive Engines

Where gas, gasoline or other explosive engines are used, a water heater coil can be connected within the muffler to heat water as a convenience for washing or other purposes. In each case the method of construction may be different according to conditions, says a correspondent of Power. The cut represents one that was made from a piece of cast-iron column 10 in. in diameter and cut 16 in. long, with two square pieces of cast-iron foot-plates clamped across each end with six ⅝-in. bolts. Holes were

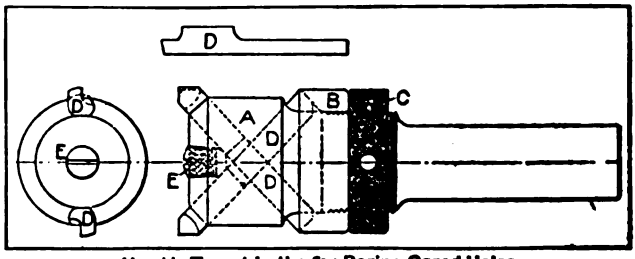


drilled and tapped for the exhaust inlet and outlet; the two for the water pipes connecting the coil were drilled and two holes to correspond with them were drilled through an old cast-iron tea-kettle lid. The space in the hollow of the lid was filled with asbestos fiber and the cap screws screwed down, making a serviceable stuffing box. The interior of the cylinder was filled with cobblestones from the size of an egg to the size of one's fist. These were packed tightly about the coil and answer for absorbing and delivering the heat to the pipes; also as a muffler.

The piping should be connected to the water tank with considerable distance to insure circulation. The pipe used for this was ¼-in. common black gas pipe. The tank holds 7 gal. water, which can be heated to the boiling point. The cover for the tank was weighted so as to give a little pressure to hasten the heating. This size of heating apparatus was used on an 8-hp. engine.

## An Expanding Boring Tool

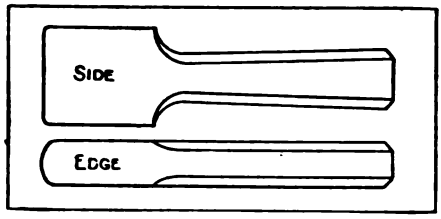
The illustration shows an expanding boring tool which is used in a turret lathe. The tool can also be used in a common lathe or drill press, but it is especially adapted for boring cored holes and used in a turret lathe. The shank, A, is made from mild steel, turned to fit the turret and threaded 14 threads per inch on the shoulder for the nut, C, and collar, B, which is bored to a sliding fit over the threads, and is casehardened. The holes for the cutters are ⅜ in. in diameter and cross each other, says a correspondent of American Machinist. The cutters are made from ⅜-in. round steel and are cut down to the center line, so as to cross each other as shown at D. After the cutters are made and hardened, they are put in place and adjusted to a trifle over the desired size and locked with the screw E. They are ground to the size in a grinding machine and then backed off.



Used in Turret Lathe for Boring Cored Holes

## Tool for Expanding Babbitt Box Linings

There are several causes for babbitt linings in boxes coming loose and when they get loose, from whatever cause, there is trouble with the machine until it is fixed, says the Wood-Worker. The



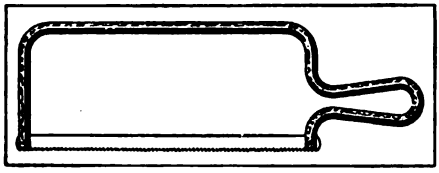
For Tightening Loose Babbitt Linings

usual method is to rebabbitt, but a temporary repair can be made by expanding the inner surface of the box, thus causing the babbitt lining to spring outward and become solidly fixed in the casting again. A tool that is used for this purpose can be made from a piece of steel ½ in. thick, 1⅛ in. wide and 4 in. long. In general appearance it resembles a saw filer's upset swage, but differs from the swage in the working end or face of the tool, which is rounded to a small radius across the face, and the corners rounded off all the way around the face, so there will be no sharp edges to cut the face of the box. Two views of the tool are shown in the sketch, one showing the side, the other the edge. The corners are ground off after the end is rounded to the desired radius.

There should be two of these tools, one to be of larger radius than the other, the smaller one for journal bearings up to about 1¼ in., the other for larger sizes. A light hammer should be used to strike the tool, one not weighing more than 6 or 8 oz., and it should be used very lightly all over, then repeat if necessary.

### A Home-Made Hacksaw Frame

A quickly made hacksaw frame can be constructed by using a piece of ½-in. round iron bent in the shape shown in the sketch. If mild steel is used, the bending may be done cold in a vise. Each end of the rod is slotted to receive the ends of the saw blade. A small hole is drilled through each slotted end in which to insert a pin. The



Quickly Made Hacksaw Frame

frame should be made a trifle long so it will be necessary to spring it when putting in the blade.

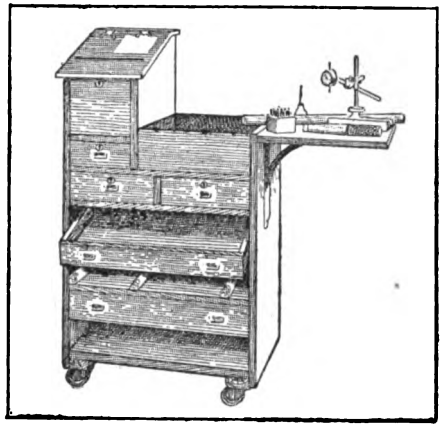
### How to Tighten Loose Wagon Wheel Spokes

When a wagon wheel tire is to be reset, a good method of tightening the spokes is to split the tenon of the spoke with a wood chisel, drive a wedge tightly into the split tenon and saw the remaining end of the wedge off close to the felly. This will make the spoke fit tight when the tire is reset.—Contributed by Wm. Van Der Clock, Paterson, N. J.

Apply soapsuds with a small brush to joints or fittings in an air pressure system to find leaks. It makes no difference how small the leak may be it will at once show up by the foaming soap bubbles.

### Truck Desk for a Shop Foreman

The shop foreman usually has his desk fastened to the wall where it will

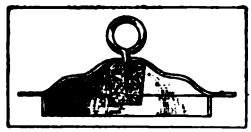


Can be Moved About the Shop

be centrally located for his division of the shop. In many cases he will have to make several trips to the desk for things forgotten. The accompanying sketch explains itself. The desk complete with several drawers is mounted on large casters which makes it possible to move the whole outfit to any place on the floor, says Drafting. Special tools are kept in the lower drawers, while time sheets, memoranda, etc., can be kept under lock and key at the top of the cabinet.

### How to Repair Kettle Covers

Tin kettles are so cheap that it does not pay to take one to a tinner for repairs. In many instances the knob breaks loose from the cover. When such is the case, the best thing to do, if one has not a soldering outfit, is to run an eye screw through the cover and into a good strong cork placed inside of the cover as shown in the sketch.



It is estimated that the total cost of coal and its transportation for the trip of the "Battle Fleet" around the world will be $5,000,000.

## Cement and Concrete Lining of Ditches

A certain water company in southern California has lined its main canal and laterals with a thickness of concrete varying from 4 in. for the larger canal to 2 in. for the smaller laterals. The work of lining was done very thoroughly and with great care. If the

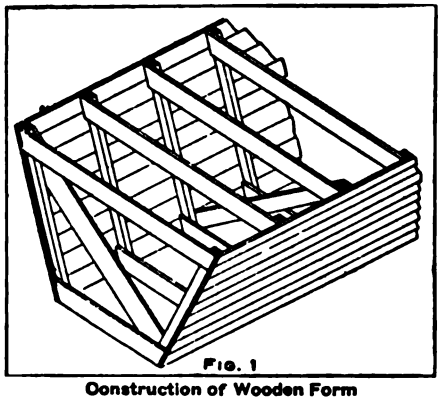


FIG. 1

Construction of Wooden Form

canal was of an old earth ditch it was prepared for the lining and carefully finished as described. If the canal had to be constructed and then lined the excavation was made with shovels, and the excavation given an irrigation to settle and soften the ground. The excavated cross-section was made larger than the finished cross-section by the thickness of the lining, says the Irrigation Age. The bottom of the ditch was carefully graded and tamped so as to give a solid, smooth surface. A wooden form in the shape of a trough with no bottom is placed in the bottom of the ditch. This wooden form is 16 to 20 ft. long, depending on the size of the ditch, and to make it rigid the frames on which the side mold boards are nailed are placed every 2 ft. apart, as shown in Fig. 1. The trough is placed in such a position that the axis of the ditch coincides with the axis of the form. Moist earth from the excavation is shoveled behind this form and is well tamped in successive layers; at least 6 in. of earth is packed solidly in this manner, as shown in Fig. 2. The earth form is now removed and before the earth has had time to dry the lining is put in.

Another form, smaller than the earth form, is used for the lining. For use in some of the laterals this form was given a peculiar shape with the idea of strengthening the lining and giving the ditch a slightly curved form at the bottom, the corners being rounded as shown in Figs. 3 and 4. The form is built with the usual side slopes of ½ to 1; the slope is made flatter for the lower 8 in., where a slope of 1 to 1 is used. The depth of the form is equal to the depth of the lined section plus the thickness of the concrete. The form for larger canals is similar to the earth form. It is placed on the bottom of the finished earth ditch and properly aligned; the concrete, which is mixed rather wet, is now thrown in the space between the form and the earth and well tamped. The side lining having been completed, the form is removed and the bottom lining put in. Wherever possible the concrete is kept wet while setting by allowing water to run in the ditch and retaining it with earth dams.

The concrete is made of 1 part cement to 7 parts of coarse gravel of varying sizes. The main canal which was lined has a bottom width of 5 ft., a depth of 4½ ft., and the thickness of the lining is 4 in. Some of the smaller laterals are 8 in. at the bottom and 18 in. deep, with a lining 2 in. thick.

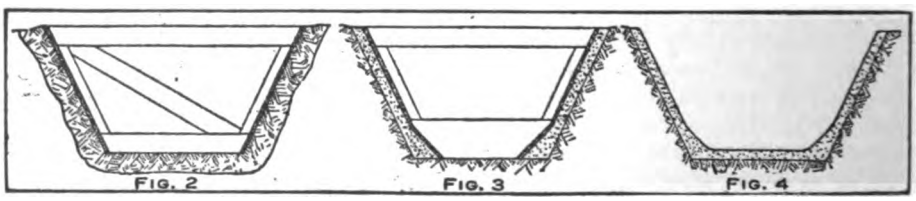
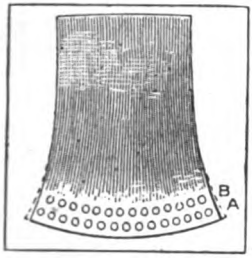


FIG. 2 FIG. 3 FIG. 4

Successive Operations in Lining the Ditch

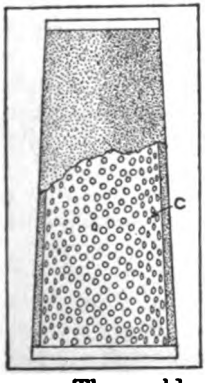
### How to Upset an Axe

Heat the axe to a bright yellow and hammer as shown at A in the sketch. Turn over and proceed in the same manner on the other side, then heat again and hammer at B. Hammer at a low heat when finishing so as to leave a smooth surface, says the Blacksmith and Wheelwright. Do not strike edgewise, but trim off all the superfluous metal. File smooth and heat to a cherry red. Lay ¾ in. from the edge. Plunge into a slack tub, edge first, until cold. This will harden the axe and the next is to temper. Blow up your fire and, after brightening the axe, hold over the fire and draw to a blue color and cool off and the job is done. Be careful not to draw the heat too fast at the edge, or it may be too soft in the edge or too hard ½ to ¾ in. from the edge.



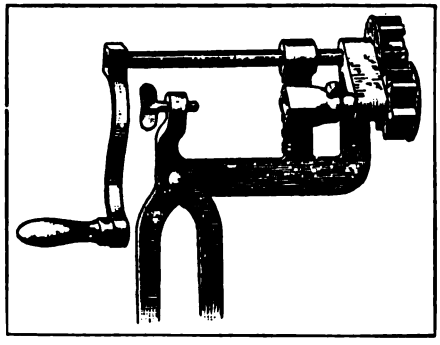

### Green Sand Cores Used in Molding

Sometimes in foundries practically a very small thing will vex the molder and cause him to leave his job, as a good man does not want to make work for the scrap pile. This happened to be the case where the foreman was baffled as well as the molder. It was in the making of some tapering columns which were to be made in a green sand mold, with a green sand core made on a perforated barrel, as shown, and the whole cast on end, says a correspondent of Southern Machinery. The molder started out to make the castings and was very successful. But in a few days he commenced to have bad luck, as he called it, but the foreman insisted that he go ahead, and the molder laid off. Next morning the molder was at his post and all the castings were good again. He happened to think that the clay cores, on which the green sand was placed, had vent holes C and the possibility that these had become stopped up. They were cleaned out and the castings came out all right.




### Home-Made Tire Bolting Machine

The accompanying sketch shows the construction of a home-made tire bolting machine. The cog wheels from an old clothes wringer were used for the gears, and the shaft for the handle turns in a bearing made from a buggy shaft eye, says a correspondent of Blacksmith and Wheelwright. The wrench is made in different sizes for $\frac{3}{16}$, ¼ and $\frac{5}{16}$-in. nuts and put on with a set screw.



Showing Construction of Machine

### How to Find the Length of a Belt

The length of a belt may be found by adding the diameter of the two pulleys together and dividing the result by 2 and multiplying the quotient by 3¼. Add the product to twice the distance between the centers of the shaft and you will have the length of the belt required.

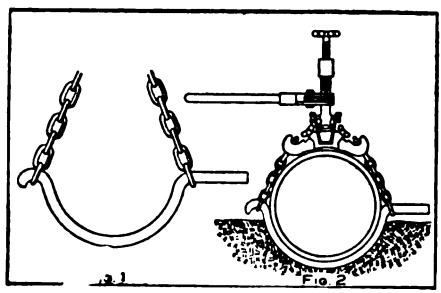
# SHOP NOTES

## Boat Lamp for Fishing

When spearing fish along the shore ordinary bicycle lamps will give sufficient light, but if a boat is used it is necessary to provide a much larger light, says the Metal Worker. A metal frame can be made to fit on the bow of the boat, something similar to the one shown in the accompanying sketch. This lamp is made just the same as an ordinary street lamp, with the glass on three sides and a door in the back and a ventilator on top. The lamp frame is made large enough to put in two or three oil lamps.

## Chain Hook for Tapping Large Mains

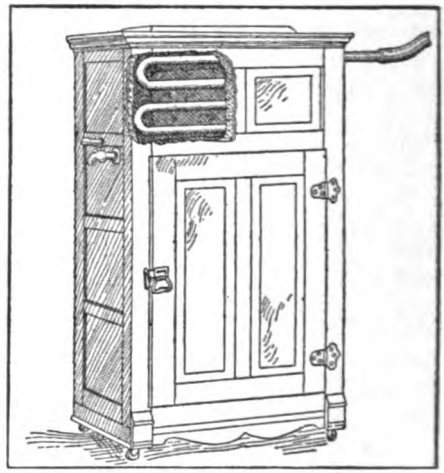
At a meeting of an association devoted to illuminating gas, a sketch was submitted to show a kind of hook used for tapping large mains. This hook is adapted for use on mains 16 in. in diameter and larger. The object of the hook is to save the necessity of digging under a large main for the purpose of applying a tapping device. The hook is shown in Fig. 1. Fig. 2 shows how it may be forced under the main and adjusted for attaching the tapping machine.




Hook for Tapping Large Mains

## How to Make Water Coils for a Refrigerator

Finding it very hard to always have ice water in a small tank I sought a remedy for this so as to have ice water at all times. The measurement was taken of the interior of my refrigerator in the ice compartment. The tinner made a coil for me by using heavy block tin pipe of a size to fit inside a $\frac{5}{8}$-in. hose. This coil was made with several turns of the pipe and fitted against the front part of the ice box. One end extended out on one side of the refrigerator to which was attached a hose connecting to the water faucet. The other end of the coil was soldered to a spigot that projected through the other side of the refrigerator. The coil is shown in the sketch through a broken portion of the ice box. By making the connection to the water supply with a

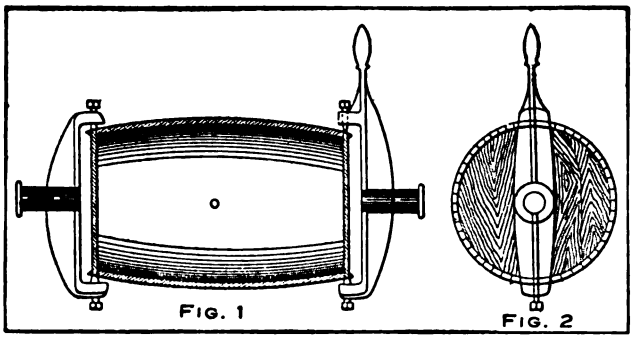


Coils Are Block Tin Pipe

hose the refrigerator can be moved without causing a leak.—Contributed by H. G. Head, Louisville, Ky.

### Another Handy Shellac Barrel

The accompanying sketch, Fig. 1, shows another method of attaching axles to a barrel to be used for shellac. The clamps are made from cast iron and carry two ¾-in. set screws to be used on the outside of the chines of the barrel. There is nearly always an iron hoop at this place, says a correspondent of Wood Craft. The cast clamps have journals, and one of them also extends upward, forming a handle by which to turn the barrel when in use, as shown in Fig. 2.

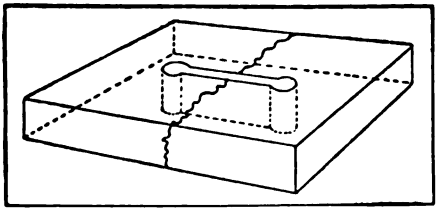



A Handy Barrel to Contain Shellac

The clamp is so formed that the center projection or journal will not be exactly in the middle of the barrel head when in position, but will be 1 in. above the center, so that the bung-hole or spigot will always be turned upward or toward the top as soon as the handle is free.

### A Dumb-Bell Patch Kink

A simple application of a repair called a dumb-bell patch, that is not widely known, is shown in the sketch. The patch, or more properly, the link, gets its name from the resemblance it bears to the dumb-bell, and finds a field of usefulness in joining the parts of a broken casting that must be held as near as possible to their original position and have no screw heads or indentations in the finished surface, says a correspondent of Machinery. The broken pieces are put close together, and the place for the dumb-bell is laid out, after which the casting is drilled and slotted to these lines. A piece of steel is then carefully worked up to fit this opening, but with the distance from center to center of the round ends slightly less than the drilled holes for the dumb-bell. The dumb-bell piece is heated until it is long enough to be driven home, and while cooling it is riveted slightly to fill perfectly all around, after which the patch can be filed off flush. By this method the parts will be held together with considerable force.



The Dumb-Bell Patch

### When Water Gets Into a Watch

A watch maker who has worked at the bench for over a quarter of a century gives this advice to watch owners who may accidentally get water into their watches.

Do not open your watch until you secure some sort of a dish into which to place it, and also enough kerosene to cover it all over; any old tin can will do. Open your watch case, both front and back covers, and carefully move it around in the kerosene until you have thoroughly filled it with oil. Allow it to remain in the kerosene until you can have it cleaned. It will come

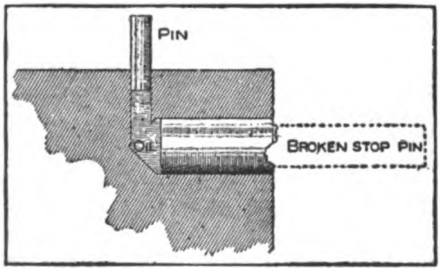
out of the oil without any of the parts rusting, thus saving much expense, and the watch.—Contributed by John W. Blinn, Spokane, Wash.

### Steel Slugs Used in a Tumbling Machine

Steel slugs that are obtained by punching ⅛-in. holes in steel sheets of the same thickness make excellent material for use in connection with tumbling articles. While steel balls are very effective and will be largely used in the future the expense of the balls is the main objection which retards their use. The slugs have a sharp edge at first, but this soon wears off and they become round, says The Brass World. When they are in this condition they serve to smooth up the surface of rough work in an excellent manner. They are used principally in tumbling small articles made of sheet steel, but can be used to an advantage upon other classes of goods. They are used with a soap solution in order to prevent the rusting of the steel during the tumbling.

### Removing Broken Stop Pin Shanks by Hydraulics

Some machines have a series of hardened stop pins and the breaking of these pins is a source of considerable annoyance to both operator and tool

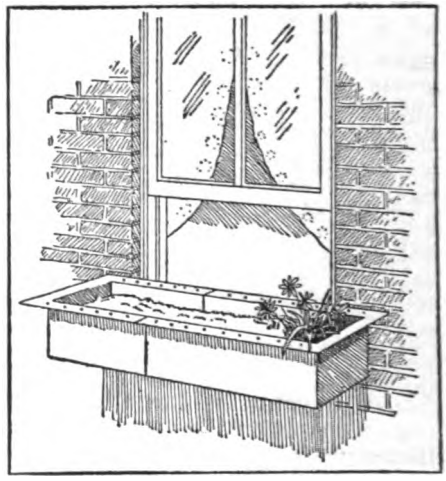



Removing Stop Pin

maker; perhaps not so much the mere breakage as the difficulty of removing the broken shank which is left in the machine. The usual method is to go after them with a chisel, damaging the machine to a great extent, says the American Machinist. Usually a small cavity is left between the end of the pin and the bottom of the hole. If this cavity is tapped, by drilling a hole into it at right angles and filling with machine oil, the broken stop pin may be removed by inserting a pin to fit the drilled hole and striking it a smart tap with a hammer.

### An Adjustable Window Box for Flowers

A window box always has a neat appearance by exactly filling the space be-



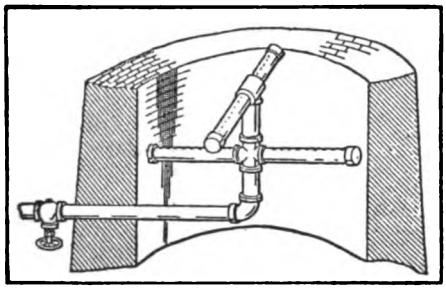
Made of Sheet Metal

tween the upright portions of the window frame. For the family that may move from place to place, or have occasion to use a box on different sized windows, the adjustable box as shown in the sketch will do duty without the least sacrifice of appearances. This box is made in two parts from sheet metal, one flanged to fit inside the other and small holes provided for locking at any point. The two parts can be made so the box will fill any space between 3 ft. and 6 ft., when they are connected.

It is not advisable to paint on exterior cement work until it has been exposed to the weather for about one year.

### Home-Made Steam Blower

When it is necessary to have more draft, says Power, a steam blower may be rigged up in the stack as shown in the accompanying sketch. A 1-in.



For Increasing Draft

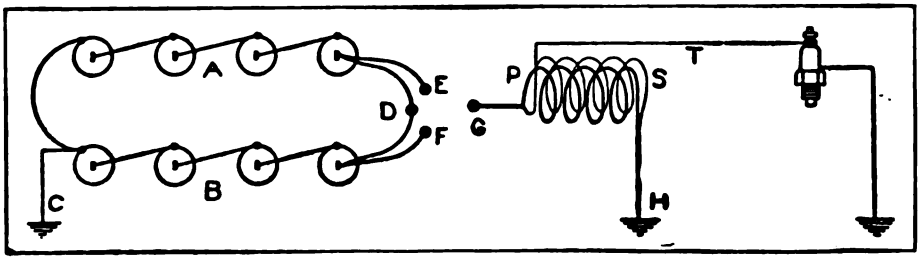
steam pipe is connected up to the center of the inside of the stack and an elbow put on turning upward. A short nipple is turned into this elbow and a cross screwed on its upper end. Run two short pipes out from the cross with ⅛-in. holes drilled along the top and with each outer end covered with a cap. Another short nipple is turned into the cross and a tee placed on its upper end with two more horizontal pipes extending out at right angles to the first two, as shown in the sketch.

### Battery Connections for a Single Cylinder Gas Engine

The accompanying diagram shows how to wire eight cells for use with a single cylinder gasoline engine. Connect the two groups of cells, A and B, in series, using a common ground connection, C, for both, as shown at the left hand end of the sketch. Provide a three-point switch at D and connect the terminal of one group of batteries to point E, as indicated; then connect the second group to point F, as shown. By moving the switch lever from E to F the different sets of cells may be used alternately. After using each set of cells until they are no longer fresh, connect the carbon terminals of both sets to point D on the switch. This will give a series-multiple connection enabling both sets of cells to be used together. Connect the other end of the switch lever, indicated by the single point, G, to the primary, P, or low-tension side of the induction coil. Both the primary, P, and secondary, S, windings of the coil must be grounded at H, as shown, this usually being made in the form of a single connection by coil makers, says Motor Age. A high-tension cable, T, is led from the secondary of the coil to the plug. The ground connection indicated on the latter is taken care of by its insertion in the cylinder.

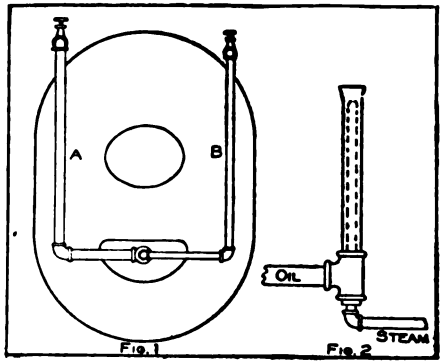
### A Home-Made Oil Burner

The accompanying sketch shows the construction of a home-made oil burner for traction engines. It is automatic when regulated, as the high pressure of steam will cut down the feed of oil, says a correspondent of Thresherman's Review. The oil pipe, A, is 1 in., while the steam pipe, B, is ⅜ in. in diameter and the arrangement of the piping, which is attached on the rear end of the boiler, is shown in Fig. 1. The oil is fed by gravity and no pressure is put on it. The burner, as shown in Fig. 2, leads straight into the ash pit




Details of Battery Connections

through the center of the lower door, Fig. 1, and is pointed slightly downward. The grate bars are taken out and the firebox lined with fire brick and arched over just under the flues. The object of removing the grate bars is to get all the heating space possible. A slot should be cut in the lower door to close the draft, and should be made from the bottom up so that the door can be opened. The oil feeds into the burner from the outside of the steam

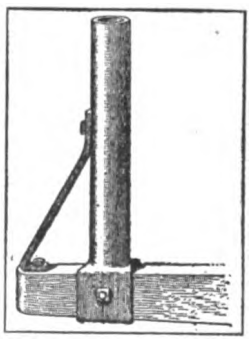


Simple Oil Burner

pipe. The steam pipe does not extend to the end of the large pipe by about 2 in.

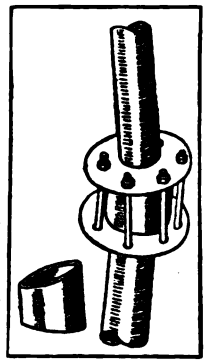
## How to Iron Bolsters

It is always well to have things ready for busy times, says a correspondent of Blacksmith and Wheelwright. How handy it is on a hot summer day, when you are overcrowded with work, if you can take from the shelf a finished article and hand it to your customer. It is almost like finding the money, and you can go on with your work undisturbed. During the slack times, make up different kinds of articles that there will be a demand for when the rush comes. I will give my way of ironing bolsters. Take a gas or water pipe 1½ or 1¾ in. and split it in the shape shown in the sketch. You can bend the ends under the bolster ¼ in., which makes it stronger. Enough pipe can be taken from the scrap that is bought from the farmers. One man can make four bolsters in a day in this way.



## Temporary Connection Between Pipes Not in Line

When two lines of pipe are not in proper alignment with each other and are to be connected, pull the pipes as near in line as possible and place between the flanges a piece of pipe of a size larger than the lines to be connected and shaped as shown in the sketch. This piece should be beveled to fit between the flanges which do not face each other perfectly, says a correspondent of the Metal Worker. By cutting the pipe straight on both ends it can be used in an emergency where one pipe is a few inches short and cannot be easily replaced. Where a number of machines of different sizes are to be connected and tested it is well to have several short pipes of different lengths, so as to make it unnecessary to change the piping for every machine.



## A Backing for Letters on Glass

A backing-up for letters on glass that needs no varnish may be made as follows: Equal parts of tube lead and fat oil should be mixed, to which should be added a tablespoonful of litharge, says Signs of the Times. Color with green or yellow tube color to suit, and strain through fine bolting cloth. If the mixture is too thick after straining it should be thinned with boiled oil.

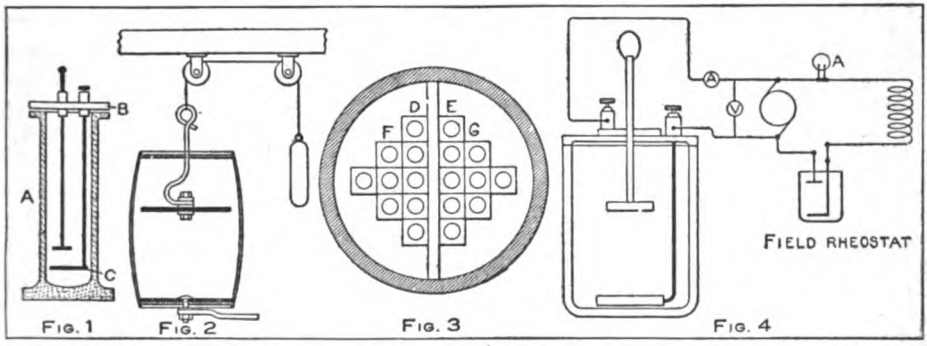
## Dynamo Testing Rheostats

The apparatus which is used to make full-load tests of dynamos in electric plants is known as the water rheostat. These tests are made from time to time, and generally at the time when it is not possible to use the regular working circuits. In testing small apparatus the form of rheostat shown in Fig. 1 is used. This consists of a large glass jar, A, with a rubber-cover piece, B, on the top containing two binding-posts for the connections. One binding-post is connected to a wire which goes down to the bottom of the jar and fastens to a copper disk, C. The other terminal is connected to a movable rod. The liquid used is water mixed with a few drops of sulphuric acid. This form of rheostat will stand about 20 amperes, the jar being about 14 in. long by 3 in. in diameter.

In the ordinary electric plant it is necessary to have a larger rheostat. This can be made from an oil barrel, but constructed on the same principle. This form of rheostat is shown in Fig. 2. Water is used in this apparatus and mixed with a solution of salt or sal-ammoniac. This rheostat has a capacity of about 100 amperes, the barrel holding about 40 gal. of water.

One of the defects in water rheostats is the heating of the water after the rheostat is in use for a short time. This heating effect can be removed by introducing a series of pipes in the rheostat which have cold water running through them. When this form is used a tank is employed with the rheostat attachment on one side of the tank and the pipes on the other. The pipes should be of copper, as this metal is a good conductor of heat.

Another form of rheostat, known as the submerged rheostat, gives more constant resistance than any of the other types. The rheostat is made up of a certain number of coils of iron wire placed in wooden compartments, one coil generally taking up two compartments, one-half coil in each. The compartments are placed in a barrel of water. The top of the submerged rheostat is shown in Fig. 3. Compartment D is connected with E, F with G and so on. This form of rheostat will stand from 500 to 1,000 amperes. The diameter of the coils should be abqut 1½ in. Two-thirds of the coils should be about 75 ft. long—using No. 14 gauge wire; the remaining coils on an average of about 70 ft. of No. 16 and 18 gauge wire. When in use the coils may be connected in series, parallel or series-parallel. The capacity of the barrel is about 40 gal. When using this form of rheostat it is best to have the water changing at all times so as to maintain a constant temperature. Any one of the rheostats is placed in connection with the dynamo for a test, as shown in Fig. 4.—Condensed article from the Practical Engineer.




**Testing Rheostats for Small Electric Plant**

One barrel of good cement will lay 100 sq. ft. of ceramic floor.

## Driving Underground Pipes

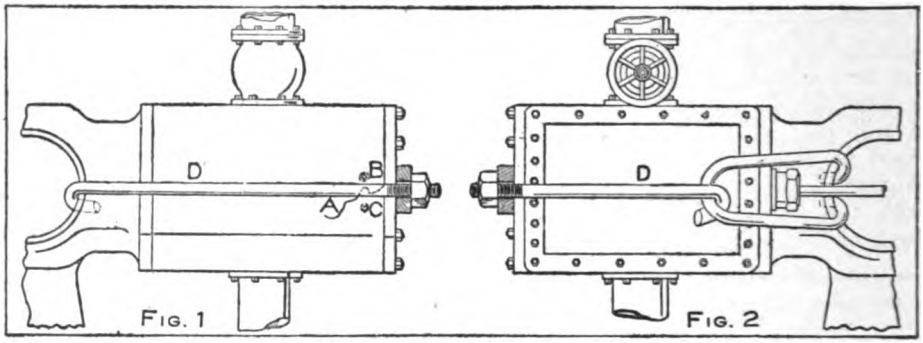
A building about 600 ft. long was to be equipped with six drinking fountains in a line in the center of the building. The floor was of pine and hard maple laid on about 8 in. of cinders, packed down tight, under which was sandy soil. The problem was to run a main without taking up the floor. Large holes were cut in the floor where the fountains were to be connected to the main and the sand tunneled out ahead far enough to admit an 18-ft. length of 2½-in. pipe. A rope 20 or 30 ft. long was securely fastened to the rear end of the pipe. A hose was attached to the same end. Then with one man at the hole to steer the pipe and three or four laborers to pull on the rope the water pressure was turned on and the pipe was easily pushed through the soft sand as the stream of water bored a hole in advance.

The pipe was started in with the coupling end first to avoid injury to the thread. When the length was all in, another length could be coupled on and the operation repeated. Smaller holes were cut in the floor at intervals of 30 or 50 ft. to see that the pipe was keeping the proper course. This operation was repeated from each fountain location until the main was run.

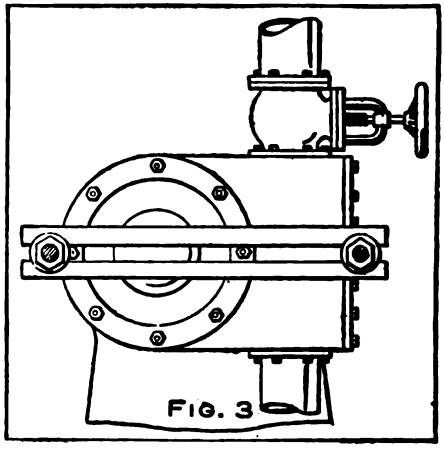
Statistics collected by the government indicate that the nation has consumed about 7,000,000,000 tons of coal up to the present time. Nearly half of this has been used in the last 10 years.

## An Emergency Repair on a Cylinder Head

The accompanying cuts show how a high-speed engine was repaired to keep it running after the damages caused by a broken piston. When the piston broke it drove the cylinder head loose from the cylinder, which also made a large crack along the side, as shown at A, Fig. 1. Studs were put in at points B and C and the crack filled with litharge and glycerine, says Power. A link was then shrunk over the studs and 2-in. rods, D, were put on, with two 2-in. bars placed across the head, as shown in Fig. 3, and the nuts tightened up. Fig. 2 shows the steam chest side and the method of placing the rods and links so as not to interfere with the valve rod. It took some time to complete the job, but as the new cylin-




Emergency Repair of Cylinder Head




Repairing Cylinder Head

der did not arrive for two months, time and money were saved.

## Cement for Glass and Metal Tanks

An aquarium cement that has been thoroughly tested is made of 1 gill each of litharge, fine white sand and plaster of paris; finely pulverized rosin 1-3 gill. Mix thoroughly and make into a paste with boiled linseed oil to which dryer has been added. Beat it well and let it stand for 4 or 5 hr. before using, as it will lose its strength after it has stood for some 15 hr., says the Metal Worker. Glass cemented into its frame with this cement is good for either fresh or salt water.

For mining purposes tamping material is much cheaper than dynamite Dry clay is the best material, although crushed stone or screening mixed with clay makes good tamping. Damp sand is also very satisfactory. A well tamped charge requires less explosive.

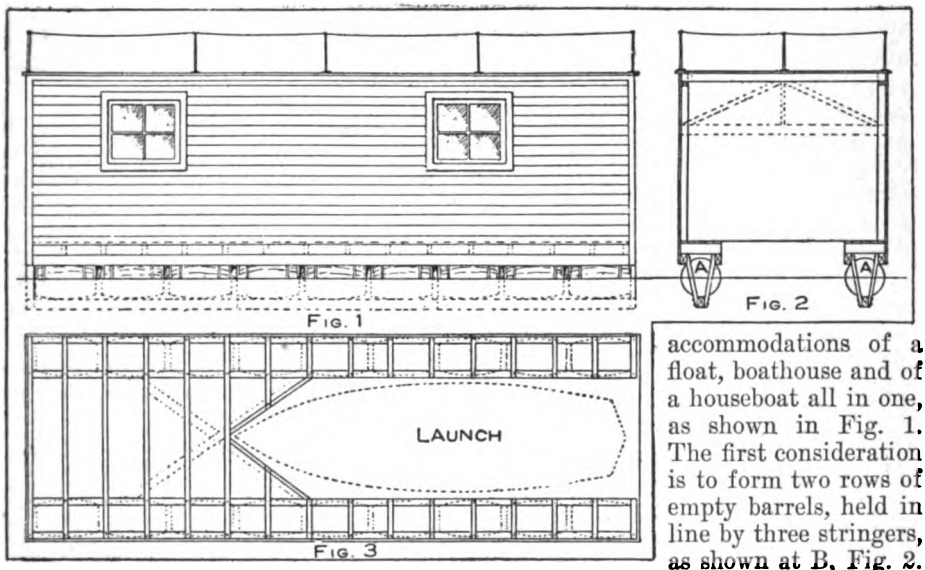
Waxed floors that are not worn may be cleaned with a cloth that is damp with either benzine or turpentine.

## A Boathouse Houseboat

By Custer Ingham, in Motor Boat

A question of a suitable boathouse is sometimes a perplexing one, and perhaps the idea which is brought out in this article will help to solve the problem. On the rivers and lakes where the disturbing influences of tidal waters are not felt, boathouses are common, and it is an easy proposition to build one which will answer every requirement. Even on tidal waters boathouses are in use, but they are not very convenient, owing to the rise and fall of water every twelve hours.

One way of building a satisfactory boathouse is by the use of barrels that support a platform which embodies the accommodations of a float, boathouse and of a houseboat all in one, as shown in Fig. 1. The first consideration is to form two rows of empty barrels, held in line by three stringers, as shown at B, Fig. 2. If you wish to build only a float, your work is virtually at an end when you have the barrels arranged in line. Any lumber is good enough to construct a platform and anyone can do the work. But the idea can be carried much farther. For instance, to make a boathouse have the two rows of barrels sufficiently long, so that they will extend beyond the space occupied by the boat and leave plenty of floor space at the inboard end of the house to tie and brace together the




The Boathouse Houseboat

two lines of barrels accurately and firmly. By building a platform at one end and around the sides leaving a cutway space between the barrel rows for a motor boat, as shown in Fig. 3, and by building a roof over the entire contrivance, a very effective floating boathouse is obtained. If one wishes, the place unoccupied by the boat can be used as a store room for keeping tools and odds and ends, or it may be fitted up as neatly as the owner may desire, with berths and the like. Thus you will have not only a boathouse but likewise a houseboat, and when the motor boat is firmly made fast in its place, you have a motor houseboat which is capable of traveling anywhere in good waters.

It is an important thing to remember, to place each barrel so that it rests with its bung-hole up and with a removable board in the floor above, so that the barrel can be pumped out in case it should leak. If a careful selection of barrels is made and only empty linseed oil barrels are secured, or something just as good, there will be little danger of leakage.

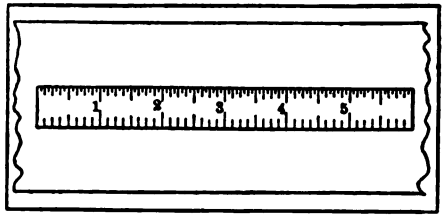
In building this boathouse, or houseboat, care should be taken to bolt the cross beams to the stringers securely to the shore end, as they are the only beams that extend entirely across and must, of course, stand the strain of twisting. If a roof is built, this strain can be carried partly by the roof of the house, if the roof beams are diagonally braced to the upright posts, and the upright posts likewise should be trussed.

## A Bronzing Liquid for Stencil Work

Stencil the design on the wall with good wearing body varnish, and apply the gold bronze; this will give a very bright luster. Rub the bronze with a wad of cotton. If it is desired to use the bronze in liquid form, mix the bronze with gum Arabic water, making the gum water quite thin or weak with gum, says the Master Painter. Or the bronze may be mixed with rubbing varnish thinned with turpentine.

## A Steel Rule Fitted to a Draftsman's T-Square

The blade of the T-square is recessed to receive a 6-in. flexible steel scale, as

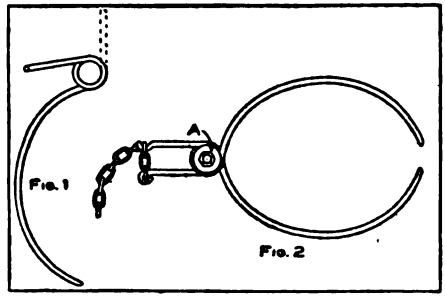



Improve Your T-Square

shown in the sketch. Shellac is used to hold the scale in place in its recess. The dividers and compasses may be set directly from this scale, says Machinery, and the annoyance of looking for an ordinary loose draftsman's scale is avoided. Scales are graduated to 32nds and 64ths of an inch. This will make it convenient for fine work.

## A Rake Tooth Cornstalk Holder

Secure two rake teeth, as shown in Fig. 1, from an old hay rake and after



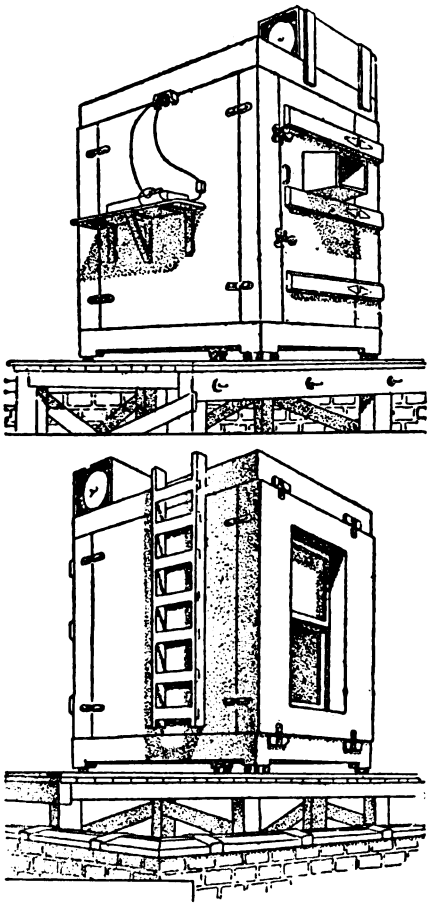

To Hold Cornstalks

heating bend the ends of them straight as shown by the dotted lines. Place the teeth together opposite each other and fasten them with a bolt and large washers, using a round wood plug that will just fill the hole in the circle of the spring, A, Fig. 2. When heating the

ends and bending them make a hook on one end and an eye on the other in which to attach a chain to hold the holder together around the stalks while tying.

### Testing Windows for Air Leakage

Air leakage around windows was discussed to some length at a meeting of the American Society of Heating and



Two Views of Testing Box

Ventilating Engineers, and one of its members agreed to pursue the investigations farther and to submit results of his work at a subsequent meeting. The location selected for making these tests was on top of a lofty building. This was done in order to subject the windows to wind conditions that more nearly averaged the conditions ordinarily to be found. The device used for the test looks very much like a good-sized refrigerator, but it is made with the intent of having a small room into which is placed one window, with the walls designed to resist the flow of heat so that the loss will be only through the window glass and around the window casings and frame.

The air within the room was warmed by using a small electric radiator and the test was made by registering the amount of current used in a certain length of time, and by knowing the contents of the room, a thermometer registers the amount of heat taken up by the confined air, provided there is no leakage.

The construction of the house is in sections, the four sides, top and bottom being in separate pieces which can be joined together after it is taken to the roof. This allows it to be taken through a small trap door, or taken to different localities.

### Cutting a Hole Through a Concrete Dam

A circular hole was cut through a concrete dam for a flood waterway by using an air plug drill and 1½-in. flat chisels. The dam had been in use 10 years and was built of concrete composed of crushed shale and Portland cement. The concrete was soft and tough rather than hard and brittle, says a correspondent of Engineering News. Chipping with 1-in. flat chisels did not work satisfactorily, but the wider 1½-in. chisels seemed to be suited to the material.

When the hole was cut the dam was 16 ft. thick, the invert being 2½ ft. above the rock creek bottom. The hole when completed is 5 ft. 4 in. in diameter for the downstream, 13 ft. of its length, and 6 ft. in diameter for the last 3 ft. near the upstream end of the dam. The hole was cut at an average rate of 1 ft. per 9-hour day, using a single drill with air pressure at 70 lb.

Two laborers alternated in holding the drill and with plenty of sharp chisels at hand no delay was experienced.

The chisels were sunk into the concrete until the repeated blows of the plug drill hammer caused a piece to break out. From a few seconds to 5 or 10 minutes were necessary to break out a piece of the concrete. As the men became accustomed to the drill they used at times a wedging method by sinking two or three chisels into the concrete along a line calculated to loosen a large piece containing perhaps ½ cu. ft. of material. This method worked well, especially when the lower portion of the hole was advanced ahead of the upper portion.

## Tile Bench Construction for a Greenhouse

The accompanying sketch shows how to make a tile bench to hold soil for flower beds in a greenhouse. The bottom of the bench, as shown in Fig. 1, is made from tiles split in the middle. These tiles are of special make for floors and are shown in Fig. 3. When cut in the middle each half will be 2 in. thick, 24 in. long and 12 in. wide. As tile posts and cross pieces are now made the bench can be held up by this construction as shown, but ordinary 2- by 6-in. wood may be used for this purpose, says a correspondent of Florists' Review. When wood is used for the supports all joints of the tile that is resting on the supports must be coated with mortar to keep the drip from the wood. The tiles make a nice level surface, and also give perfect drainage. Tile has been known for years to be the best material on which to grow plants on account of the way in which it allows the air to get at the soil and the roots of the growing plants.

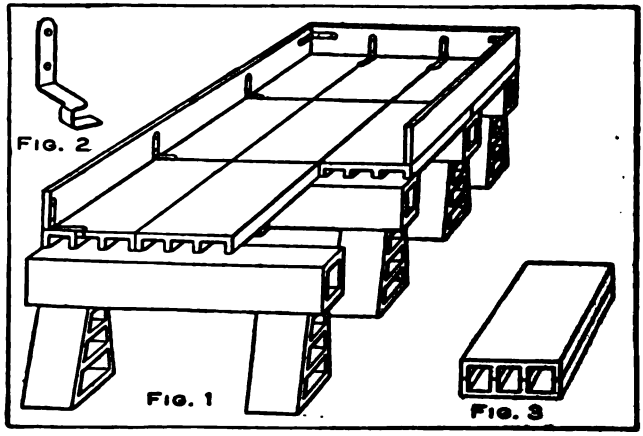
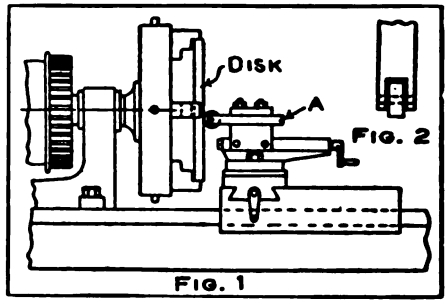



Fig. 2 shows the construction of a little clip made from metal which attaches on the tiles and forms a bracket to fasten the side boards of the bench.

## A Lathe Tool for Truing Discs in a Chuck

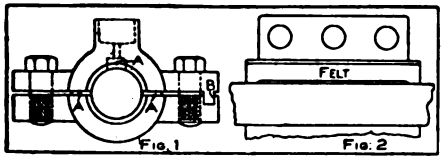
A device for truing up any disc or plate in a lathe chuck is shown in the sketch. The tool, A, Fig. 1, consists of a piece of steel about ¾ by 1⅜ in., having a slot at one end to take a hardened steel roller $\frac{5}{16}$ in. long and 1¼ in. in diameter. Figure 2 shows an enlarged view of the tool. The disk is trued up by placing it in the chuck and tightening the jaws slightly, set the work revolving and bring the roller to bear with light pressure, and in a few revolutions the plate will be found to run true, says the Model Engineer. This method is easier than chalking and then tapping with a hammer.



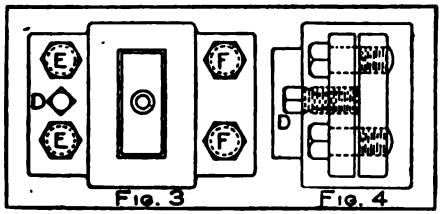

Handy Lathe Tool

## A Dust-Proof Bearing

It is very important to have such bearings on wood-working machinery that the wear can be taken up without taking off the bearing cap to remove the liners. A bearing that is designed to be dust-proof and have this adjustment is shown in the accompanying sketches. The end elevation is shown



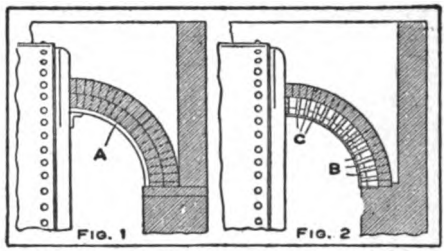

in Fig. 1 and the cross section showing the felt cut out and fitted against the shaft at each end is shown in Fig. 2. The cap has a projection, B, Fig. 1, that is a good fit into the groove in the lower half of the bearing. Brass or iron liners of about 26 gauge are placed under this projection to make up the thickness equal to the space left between the cap and bearing. This space next to the shaft is fitted with felt, same as shown in Fig. 2. The cap rests on the projection, B, Fig. 1, and setscrew, D, Figs. 3 and 4, and just tight enough on the felt to keep it in place. All that is necessary to take up the wear is to slacken the setscrew D and tighten the capscrews EE and FF.




When the bearing becomes worn so that it is necessary to remove liners then loosen all capscrews and remove as many liners as desired, with a piece of tin, endwise, and the bearing may be adjusted in the same manner as stated above, says the Wood-Worker. In Figs. 1 and 3 it will be noticed the cap is drilled out opposite the oil hole about ⅝-in. in diameter and deep enough so that the piece of felt will rest tightly on the shaft. The oil will filter through the felt, preventing dirt from working through the oil onto the shaft.

## Burned-Out Grate Bars Used for Arch Supports

The rear arch of a 36-in. by 12-ft. return flue boiler was in a decidedly shaky condition. The arch was constructed, as shown in Fig. 1, with 1-in. square iron supports, A, bent to shape with one end resting against the head of the boiler, and the other end supported on the back wall, says Power. These irons did not last long and the brickwork soon gave out. The grate bars were placed as shown at B, Fig. 2,




Utilizing Grate Bars in a Brick Arch

with fire-clay, C, between them and a covering of bricks on top. This construction of an arch has stood the heat longer than the brick and square iron bars.

## Flexible Wire Connections to a Spark Plug

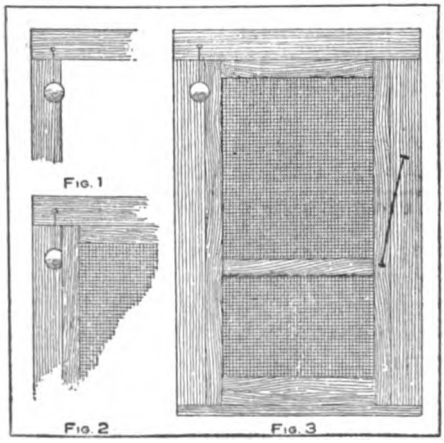
The vibrations of the wire causes many a break in the connections to spark plugs. A very simple way of making a good contact, yet securing one that is flexible, is to make a coil of wire around a lead pencil that will be about 3 or 4 in. long. The end of the coil thus made may be soldered to the secondary wire and the other end of it either soldered to a terminal or shaped to meet the requirements of the spark plug. A flexible end made in this manner will permit any amount of vibration without breaking.

## Preventing Cement from Sticking to Molds

One of the rock-faced plates on our cement block machine had a spot where the cement would stick to the face of it and leave an imperfect impression. As this plate had the best pattern we tried numerous methods to get the cement to leave the pattern in a perfect condition. At last we applied a thin wet cloth to the plate and then the block came away with a perfect impression. — Contributed by Lester Bellamy, Belmont, N. Y.

## A Simple Screen Door Check

All that is required for a screen door check to keep it from slamming is a small rubber ball that can be purchased



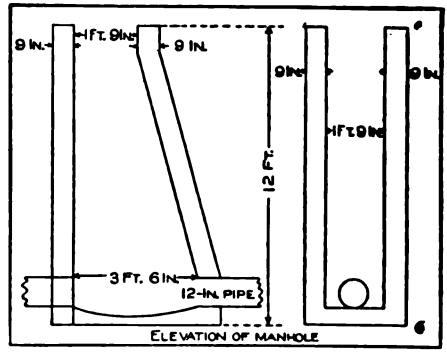

Door Check

for a few cents. A stout cord is attached to the rubber ball and hung on a nail driven into the door casing. It is hung at such a point that only a portion of the ball extends in the doorway, as shown in Fig. 1. Fig. 2 shows the door striking the ball, and Fig. 3 the ball swinging clear of the door when the door is closed.

Hot water will remove the grease and dirt from an engine better than can be done by wiping with waste. The hot water can be secured by attaching a hose to the overflow of the injector.

## Cost of Concrete Manholes

The cost of concrete work is variable. Each unusual condition entering into the work has its own influence. Sometimes it is the cost of the material, again it is the cost of erecting the forms, says Canadian Cement. Herewith is given an example of actual costs and a detailed statement of how the costs are distributed. From the




Forms for Manhole

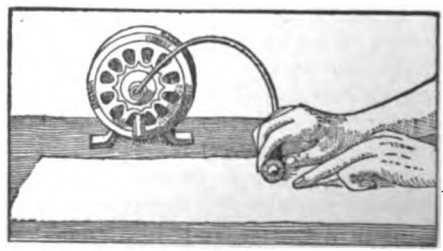
sketch it will be seen that nothing very unusual in the shape of forms was encountered, the great waste being that the lumber used was so cut up that it could not be used again.

| | |
|---|---|
| Lumber for forms | $ 9.00 |
| Labor on forms | 22.75 |
| Sand and gravel | 4.00 |
| Cement at $2.25 a barrel | 11.00 |
| Labor on placing concrete | 2.92 |
| Total | $49.67 |

Total cubic yards concrete in manhole, 4.08 cu. yd., which made the cost of concrete $12.17 per yard.

## Power-Driven Eraser

An electric motor-driven eraser is a new device adapted for use in a



A Motor Eraser

draughting room. It is far superior to the hand eraser, as it will make absolutely clean erasures, owing to the high rate of speed at which the eraser wheel revolves, says Popular Electricity. The eraser wheel is driven with a flexible shaft by a small motor, which is easily moved from table to table in the draughting room. A flexible cord with a plug is provided for attaching to any incandescent lamp socket.

## A Substitute Reamer

Some time ago I had to bolt some plates on a machine with ⅜-in. bolts and all the holes were drilled too small by about $^{3}/_{32}$ in. As a drill or reamer was not at hand I took a three-cornered file and inserted the tip in the chuck of a brace and put the heel into the holes in the plates and turned the brace. It was surprising how rapidly the holes were made larger.—Contributed by Dudley F. Clapp, E. Windsor Hill, Conn.

Broken taps may be removed by pouring hydrochloric acid into the hole around the tap, says the American Machinist, and leaving it stand about 4 minutes. Enough of the tap and the edge of the hole will be eaten away to loosen the tap.

## How to Make a Camper's Kitchen

By Geo. B. Wrenn

Portable wooden buildings made in sections that can be readily taken apart and put together again have been in great demand in the last few years by campers who are beginning to realize the necessity of more substantial camps than are secured by the use of tents. Especially is a wooden building desirable for kitchen use as it will not be easily upset by strong winds and can be locked whenever necessary.

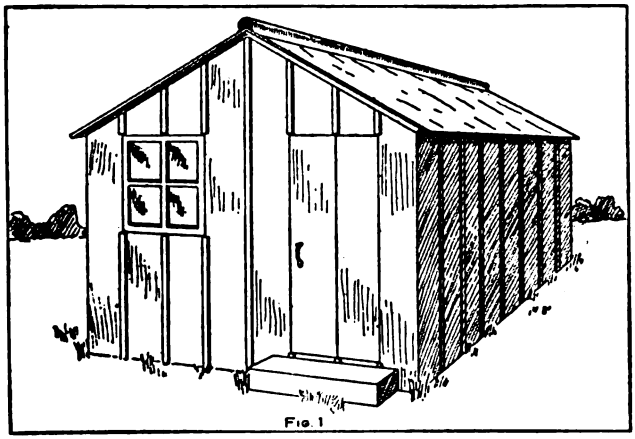


Fig. 1

The Camper's Kitchen

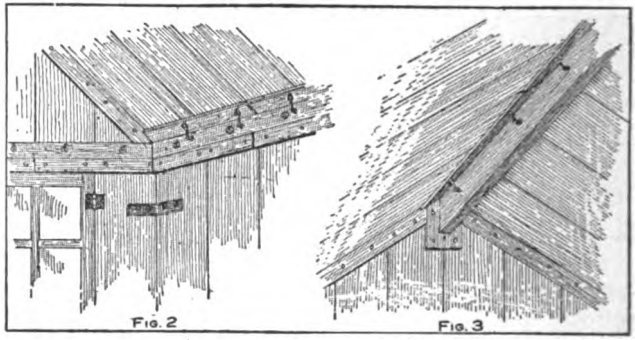
It is the purpose of this article to describe in detail the construction of a portable building, suitable for a kitchen for the average size camping party, which when set up will have the appearance of an ordinary building, the arrangement of sections not being apparent from the outside. The building as shown in Fig. 1 will be about 8 ft. square, 9 ft. high at the ridge and 6 ft. high at the eaves.

The two low walls under the eaves are made up of boards 1 by 12 in., and are 6 ft. long. Each section consists of two boards fastened together at each end with strips of oak 1 by 2 by 24 in. Thus each section of the low walls are 2 ft. wide and 6 ft. long, and there are four sections in each wall. The four sections are connected together at top and bottom with long, narrow strips of boards 1 by 2 in. and about 8 ft. long, which are fastened to the sections with ⅜-in. carriage bolts. These narrow boards should be placed directly on top of the oak strips that connect the boards in each section.

The walls are connected with thin iron bars, about 8 in. long, bent to fit into the corners, as shown in Fig. 2, and fastened to the walls with carriage bolts. A cheap method is to use screen

door hooks, but these sometimes tear out of the wood when the building is being connected up.

The front and rear walls contain the door, windows and gable ends and are not quite so simple in construction as the other walls. They are made up with two boards in a section and four sections in a wall. Bearing in mind that the building is to be 9 ft. high at the ridge and 6 ft. high at the eaves you will find that you can make up the boards for these walls from 16-ft. lengths, as a board this length will make the longest and shortest board, and another board this length can be sawed to make the next to the longest and the next to the shortest board, etc.



Roof and Gable Construction

The long, narrow boards connecting the sections of the front and rear walls are fastened in such manner that when the building is erected the top of the upper strip is 6 ft. from the ground and the top of the lower strip is 6 in. from the ground. The reason for elevating the lower strip is that if it is ever desired to put a floor in the building, 2 by 4-in. oak beams, about 8 ft. long, can be used and made to rest on the oak strips at bottom of side walls, and on these the floor boards can be placed with the ends resting on the oak strips at the bottom of the front and rear walls.

The slamming of the door shut often will gradually cause the front wall to bulge out slightly, enough in time to cause the oak strips at bottom of front wall to be drawn out from under the floor boards. To avoid this a strong wire should be run under the floor connecting the front and rear walls at about the middle, and this wire stretched tight.

Space for the door and windows should be cut into the sections in such a manner as to be about half in one section and half in an adjoining section, and thus no section will be cut in two.

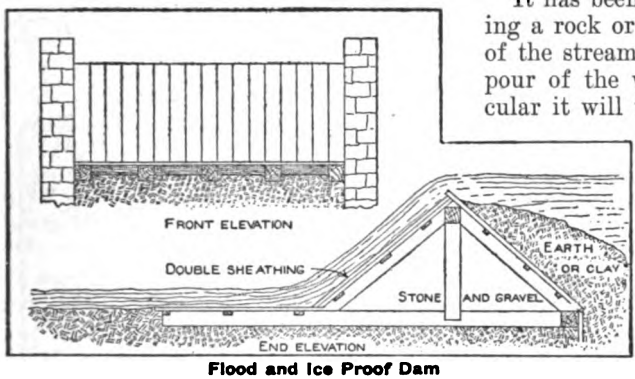
The hinges for door and windows should have loose pins that can be removed and the door or window taken out when it is desired to move the building.

The front wall should contain a window, but this could be put in the door if desired and the door placed in the middle of the building. A small window should also be arranged in the rear wall that can swing open, thus allowing for ventilation. By opening this window and the front door and window a draft will be immediately started that will keep the building cool in the very hottest weather.

At the peak of both front and rear wall a mortised block is bolted in which rests a 2 by 4-in. oak beam, extending from front to rear wall and supporting the upper end of roof sections, as shown in Fig. 3. The lower end of the roof sections rests on the low side walls, and the oak strips connecting the boards of the sections are so placed that when the building is put together the strips at the lower end of roof will be just inside and touching the side walls, thus preventing the roof from sliding off. Screen door hooks are used to fasten the roof to the beam at ridge and to the side walls.

The peak of the roof is covered with a ridge roll to keep out the rain. This should be fastened down with short nails so that it can easily be torn off when desired to move the building. The space between the boards in the

sections should be covered over with lath and also the space between the sections, but in the latter the lath of course can only be nailed to one of the sections, but in such a manner as to lap over the next section. In like manner lath should be nailed over the cracks in the walls. If the roof boards are free from knots and cracks and are given several coats of good roof paint each season the roof will not leak.



Flood and Ice Proof Dam

### Expanding a Disk with Electric Flat Irons

A new crankpin 6 in. in diameter had to be replaced on the high pressure side of a 500-hp. cross compound engine. The pin had a taper of 1-64 in., and had to be fitted tight into the disk, which was 5 in. thick, with a 12-in. shaft. The problem was to expand the disk to receive the pin. Several heating units from 6-lb. electric flat irons were grouped around an iron core, 3¾ in. in diameter, and placed in the 6-in. hole in the crank disk. It required 4 hr. after the current was turned on to expand the disk sufficiently to allow the crankpin to slip in.

Men's hats may be stiffened by using a mixture of 1 part borax and 5 parts shellac gum.

One gallon of paint will cover about 600 sq. ft.

### A Flood and Ice Proof Mill Dam

It has been discovered that in building a rock or stone dam where the bed of the stream is not solid rock and the pour of the water is almost perpendicular it will undermine and the breast will go away in pieces. Also, logs and ice going over will come back against the breast and batter it to pieces finally.

A dam built like the one shown in the sketch will remove a number of obstacles that are very destructive to mill dams, says a correspondent of American Miller. Anything passing over the breast of this dam will pass off smoothly and never come back against it. There is no possible chance for undermining from the pour of the water. The abutments at each end of the dam are built of stone and cement, and are high enough above the crest to take the entire stream at the time of a flood. Filling with stone and gravel under the sheathing and filling with dirt on the up-stream side puts the weight well up stream and makes it perfectly secure.

The dam is built by sections, each section completed and spiked together and lapping the mud sills as done in framing a barn. This dam is so tied together that the entire structure would have to all go at once to be washed out.

In building a dam the breast should be set square with the stream, if possible, and the filling above should be good ground or clay, but no stone, as stone gives a rough surface. The top of the filling should be as compact and smooth as possible.

Regulate your fire by the damper and not by the ash-pit doors. Never open your fire doors when it can be avoided, says Power. To keep them open longer than is absolutely necessary is injurious to the boiler and wasteful of fuel.

## One Way to Make a Concrete Fly-Wheel

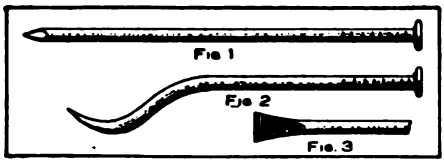
In South Africa iron is very expensive on account of the railway and ocean carriage. An interesting experiment has just been made in connection with the Rand water works. Some of the water is pumped from artesian boreholes, the pumps being of the bucket and plunger type, driven by gearing.

On the crankshaft is a fly-wheel, 14 ft. in diameter. The boss of the wheel is cast iron, bored and tapped for 4-in. piping. These arms of piping were screwed into the boss and rusted fast, says a correspondent of Power. At the outer end of the arms a sheet iron rim or ring, ¼ in. thick, was secured by nuts, and a second ring to form the outer periphery of the wheels was held by bolts and pipe distance pieces. The space between was filled with concrete reinforced by four rods of ¼-in. iron laced in between the distance pieces.

The rim is only 13 in. deep and as it only rotates at 20 turns a minute, it is perfectly safe. The concrete was made of rock crushed to pass through a ¼-in. mesh, 1½ parts; rock crushed to pass through a 1-in. mesh, but not to pass ½-in. mesh, 3 parts, and cement, 1 part. Such a use of concrete is decidedly novel and, it appears, sound practice under the circumstances, for the fly-wheels run at slower speed than the motors and there is no serious risk of overspeed.

## How to Make a Thumb Tack Lifter

This thumb tack lifter is made from an ordinary 60-penny wire nail, Fig. 1,

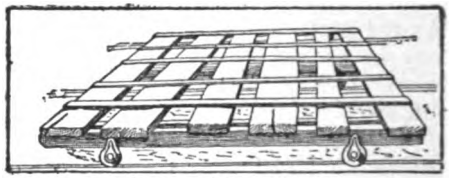



Handy Tack Lifter

which is about 5 in. long. Bend the nail as shown in Fig. 2 and flatten the point so as to make it about ½ in. wide, Fig. 3, and grind the edge quite sharp. The head of the nail may be used for driving the tacks. The bend will prevent the lifter from rolling off the drawing table.

## Piling Lumber for the Dry Kiln

Proper care must be taken when piling lumber on the tracks for the dry kiln, else the pieces will come from the kiln crooked and warped in various shapes so as to make them unfit for some



The Foundation Planks

kinds of work. If there is mixed lengths, it is well to sort the lengths into piles as carefully as you would on the yard, says the Wood-Worker. A common fault with most kiln piling is that of using two or three trucks for lumber lengths without sufficient piling foundations. It is difficult to keep lumber from sagging and warping between the rests when this is done. The accompanying sketch shows a dry-kiln piling foundation from which can be seen at a glance the means adopted to get more piling strips under the lumber. There are three trucks, and without the foundation planks on it there would be only end rests and a center piece for the lumber. The arrangement shown is to put 2-in. planks on the trucks and then arrange piling strips on this, so as to make only a short distance between each rest for the lumber to prevent its sagging during the process of drying. This plan of a piling foundation was used for kiln-drying oak lumber that had to be thoroughly dried just like oak for furniture factory and cabinet work, and with its use the lumber came out in good shape. The heat in the kiln should be so regulated that the drying power is concentrated on the body

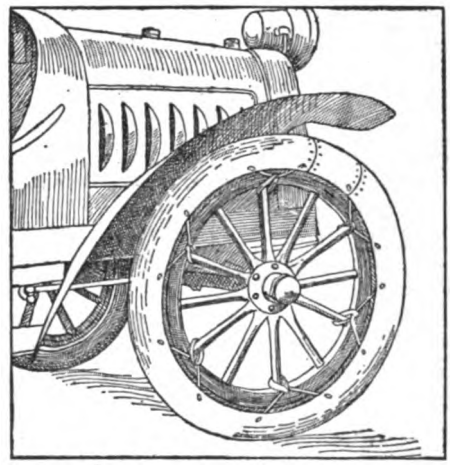
of the lumber and not on the ends. By so doing there will be little or no checking at the ends.

### Automobile Tire Protector

The rough and rutty road conditions of the country call for more than ordinary protection of automobile tires. The sides that form the rough walls of the ruts tear the rubber from the fabric and causes frequent blowouts. One of the best protectors for tires can be made from discarded casings not completely worn out. The old casing is cut in two, cross section, choosing an injured part if there be one, so that it may be cut off from one end. The beads which fit into the flanges of the rim are then cut off with a stout knife, and the protector is placed around the tire that it is intended to protect. If the old casing has not been shortened to get rid of some bad portion the protector will lack about 4 in. of surrounding the wheel, which may be filled in with a small section of another old casing. This short piece may be fastened securely by using several wire belt links, with the points on the outside, to unite it to the old casing.

Opposite every other spoke a mark should be made on the sides of the old casing, beginning with the spoke which should be in the middle of the small section; 3 in. on either side of these marks and about ¾ in. in from the margin holes should be made through the walls of the old casing with a ¼-in. punch, such as used by harnessmakers for heavy leather. Pieces of No. 9 galvanized wire 12 in. long are bent like a wide open V, and hooks 1½ in. long bent on the ends, the hooks at right angles to the plane of the V. These wires are hooked through the holes in the sides of the casings with the points outward and the ends bent down and around the base wire. This will give six retaining wire loops on a side, spaced to come opposite each other and in line with the six alternate spokes of the wheel.

Rawhide straps ½ in. wide and 15 in. long are used to hold the protector on, each strap passing through the V-shaped wire loops on either side of the wheel and on both sides of the spokes. These six straps are drawn moderately tight before the tire is pumped up, and when inflated the protector should fit quite snugly all around. The wires on both sides serve not only to hold the protector in place, but they protect the shoe from side wear in ruts, says a correspondent of Automobile. The tread will not wear off as fast as the tread of an ordinary tire, because it is not under similar tension, the surface yielding somewhat to any tearing action of the road impediments, instead of being gouged out. If the protectors are only placed on the front wheels they will save the wear on the rear tires almost as much as though they were covered. This is due to the increased size of the front tires, which make a pathway for the rear wheels.



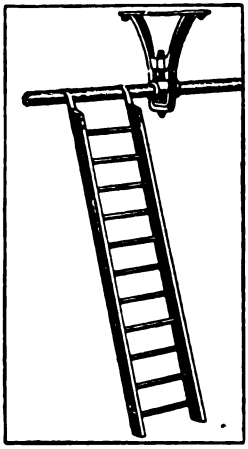
Auto Tire Protector

A cement that will resist white heat may be made of pulverized fire-clay, 4 parts; plumbago, 1 part; iron filings or borings free from oxide, 2 parts; peroxide manganese, 1 part; borax, ½ part, and sea salt, ½ part, says Power. Mix these to a thick paste, and use immediately, heating gradually when first using.

# SHOP NOTES

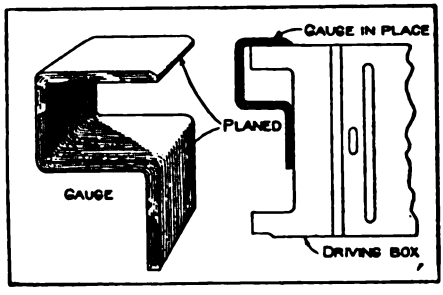
## A Handy Shop Ladder

A ladder constructed as shown in the accompanying sketch makes a very useful device around a machine shop for oiling or adjusting line shaft bearings while the machinery is in operation. Two hooks of metal are bolted to the ends of the ladder as shown, so that they will hang over the shafting for the upper support while the lower end rests on the floor. Overhead work may be accomplished with this ladder while the shafting is running.—Contributed by Frank J. Roby, Mandan, N. Dak.



## How to Make a Driving Box Gauge

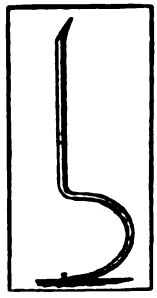
The accompanying sketch shows a gauge for transferring the line where the driving box shoe bears on the outside of the box for the purpose of centering the brass which is necessary when boring worn or new bearings. It is important that the gauge should be planed or otherwise made perfectly level on the bearing side, as this is nothing more than an offset straightedge.—Urban A. Towle, Rumford, Me.




Details of Driving Box Gauge

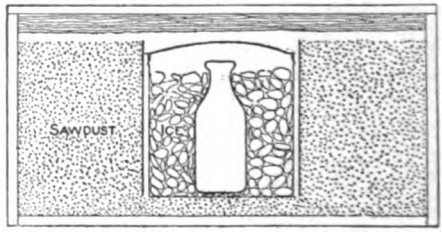
## Improved Spike Pulling Bar

The accompanying sketch shows an improvement in a bar for pulling spikes. Instead of being made like a crowbar, or an inverted bar, which makes it necessary to stoop, to push down with the former or pull up with the latter, it is made vertical with a half-turn hook, in the end of which is cut the V-slot for the head of a spike.—Contributed by J. E. Histed, Shawnee, Okla.



## Home-Made Milk Bottle Ice Box

At a cost of from 25 to 50 cents anyone can make one of these milk bottle ice boxes. Any ordinary wooden box about 13 by 18 in., with a depth of 12 in., can be obtained from your grocer. In the bottom of this box place plenty of sawdust and on this set a tin pail or can that is 8 in. in diameter and high enough to take in a quart bottle of milk. The pail must rest on sawdust and not on the bottom of the box.

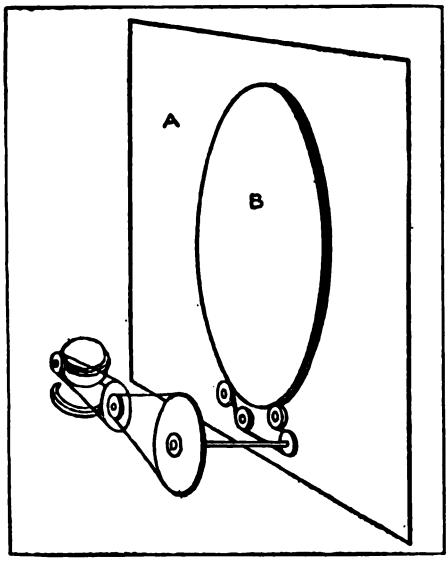



Keeps Milk Cold and Sweet

Place a cylinder of tin around the pail, which is a little larger than the pail, and pack sawdust about the cylinder, filling the space full up to the level of the top of the pail. Fasten with nails or tacks about 50 layers of newspapers to the under side of the box cover. The milk bottle is set in the pail and broken ice packed about it. An ice box of this description will hold two quart bottles of milk. It will take about 2 cents a day to operate this cooling device.

### A Mechanical Moving Window Display

The display board, A, is 6 ft. 6 in. square, out of which is cut a 5-ft. wheel, B, as shown in the sketch. This




Run by Electric Motor

wheel is mounted on a ball-bearing grindstone shaft, with the ends resting on tripods both front and rear, the long end of the shaft on the front side of the wheel, which permits the display of any kind and size of goods. The legs of the front tripod supporting the shaft should be concealed by two large articles, such as guns, etc., says the Sporting Goods Dealer. The tripods and axle are not shown in the sketch. The wheel is made to revolve by an electric sewing machine motor cleverly harnessed to it. The method of operation will doubtless be clear from the sketch, but it may be explained that the motor is belted to a 4-in. awning pulley on the shaft with a 1½-in. awning pulley, the latter being belted to a sewing machine drive wheel on a shaft of ½-in. round rod, with a 2-in side pulley at the other end. The main drive belt is a No. 7 sash cord, which runs in a groove cut in the circumference of the wheel B. The arrangement of the pulleys reduces the speed of the large wheel to about four revolutions a minute.

### Use and Abuse of a Watch

The winding of a watch should be regular, even and without jerks and not fast, so that the oil flows smooth and not in spasms around the coils of the mainspring. It should not be wound too tight, as this will make the oil leave the inside of the coils, thus allowing the spring to unwind by jerks, causing it to break in time. The winding should be done in the morning, as it will stand the jolts and jars better when the balance takes its full motion.

A spring never breaks from the thickening of the oil, unless inferior oil, or too much, is used. Just enough oil should be placed in the oil cup for each job, or at least every day, so that the lubricating qualities may be retained. Good oil may be ruined by exposing to the sun or leaving it uncovered.

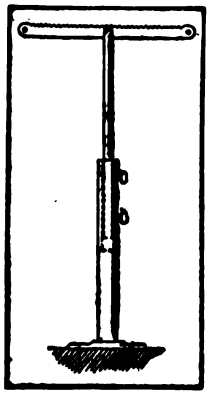
Mainsprings are often put in watches and not examined as to trueness. The coils may be uneven, when they will rub both sides of the barrel, wearing off the metal and hindering the recoil, as well as rendering the oil useless.

The pocket where a watch is to be carried should be made to fit it, and nothing put in this pocket but the watch. Chamois skin is the best material, as it is elastic and a non-conductor of heat, cold or electricity. When not in use a watch should be either laid

flat, face up or down, giving the oil a chance to enter the bearings. When the oil becomes gummy, cleaning will be necessary. This will depend upon its use, but in no case should a watch run over two years without cleaning.—Contributed by Hugo F. Franson, Chicago.

### Removing Static Electricity from Belts

In a machine shop where the machinery is run by a large induction motor much trouble was experienced with the static discharge from the main belt, says Power. A simple yet effective means used to remedy the trouble is shown in the sketch.

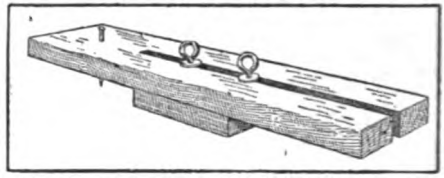


A piece of 1-in. stock was cut to a length of 10 in. and drilled with a $\frac{9}{16}$-in. drill for 5 in.; then tapped for two $\frac{1}{4}$-in. thumb-screws. A piece of $\frac{1}{2}$-in. stock was cut to a length of 12 in. and a 10-in. hack saw blade was riveted on one end as shown. A base plate was then fastened to the 1-in. piece and this was set in place and grounded to the lightning arresters. The $\frac{1}{2}$-in. piece was dropped into place and set at the required height by the thumb-screws. Pipe 1 in. and $\frac{1}{2}$ in. could be used in the place of the solid stock.

### Home-Made Joiner's Gauge

At one time being placed in a position where I had everything needed but a wood gauge, I made a makeshift, as shown in the sketch, says a correspondent of Woodworker's Review. This gauge gave as good results as one costing many times more.

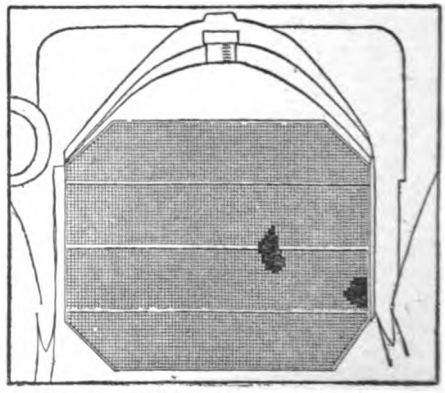
The gauge is 8 in. long, $1\frac{1}{4}$ in. wide and $\frac{3}{8}$ in. thick. The main piece is slotted part way to admit two No. 8 screw eyes that hold the sliding block. The sliding block is $2\frac{1}{2}$ in. long. Washers $\frac{1}{4}$ in. in diameter are used on the screw eyes to prevent the rapid wearing away of the wood. A small brad is placed in the end for the marking point.



Handy Home-Made Gauge

### Repairing Automobile Radiators with Cement

A honeycomb radiator of the usual type, built up from an enormous number of small tubes, expanded at the ends or separated by wires and soldered together, is difficult to repair with facilities less complete than those employed for the original assembling. Any attempt to solder has an unpleasant tendency to extend the area of leakage, the heat of the iron melting the solder in the neighborhood of the break as well as that it is sought to apply. On this account it is practically impossible to effect a satisfactory emergency repair of such a radiator with solder, and recourse must be had to some other method, says the Motor Age. Such a method is found in the



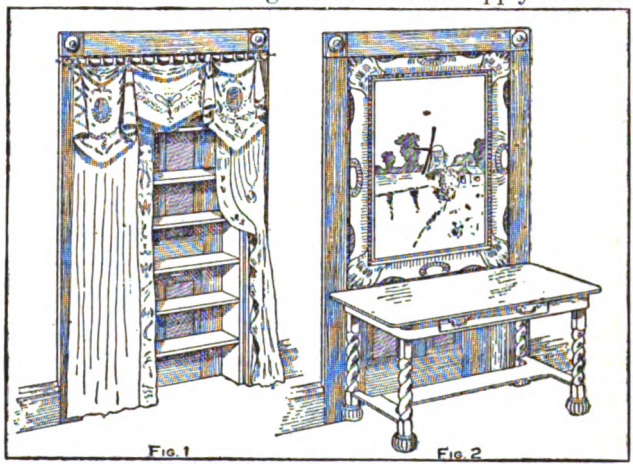
Repairing Leak with Hydraulic Cement

use of a good quality of hydraulic cement, with which the interstices of the radiator surrounding the leak are completely filled. This will most effectively stop the loss of water, and, if the leak is only a small one, will not cut down the radiating surface to any great extent.

### Utilizing an Unused Door

A doorway unused for some reason or other, and the door kept locked, can be utilized by converting its recess into a bookcase. This can be done by setting up two vertical boards on each side of the door jam, and on these boards nail the cross-pieces on which the shelves are to rest, or, better still, fasten them with screws. The entire woodwork should match that of the door and casing. If this cannot be done, then the wood should be stained to match it as near as possible. A curtain may be hung from a rod fastened just inside of the door jams, or, if the recess be shallow, from a rod fastened across the outside of the door recess, as shown in Fig. 1.

A closed door also makes a fine recess in which to place a painting. If the painting is not long enough to fill the space, a stand can be placed in front, as shown in Fig. 2. Draperies may be applied in this case should the particular painting not be of sufficient width to fill the space.




**Two Ways of Using a Closed Door Space**

### Decorating a Metal Ceiling

Metal ceilings are usually prepared by the manufacturers, who give them a coat of dipping paint that dries hard enough to enable them to stack the sheets on top of one another and box them for transportation. This is done to keep them from rusting, says the Painters' Magazine, and unless they are abrased in fastening them on the ceilings they need no other treatment before painting, but a good washing with naphtha to remove grease and dirt. When sheet steel or galvanized metal has been put up without any previous preparation or shop coating, it is necessary to use a special priming in order to avoid the risk of peeling of the paint from the metal.

For galvanized metal apply the following solution before painting: One ounce each of copper nitrate, copper chloride and sal ammoniac are dissolved in ½ gal. of water, and when this is effected add 1 oz. of commercial or crude hydrochloric acid. The solution must be made in an earthen or glass jar, or bottle, not in tin cans or other metal. Any druggist can furnish the ingredients or make the solution for it. Apply to the metal with a soft brush and let stand for at least 12 hr., when a grayish film will have formed. Go over this with the duster; then go ahead with any good oil paint that you wish to use, and you need not apprehend any risk of peeling. If the metal be sheet steel, the best preparation is to remove grease or dirt with naphtha. The first coat of paint should be semi-flat, in order to have it adhere well. A priming made from keg lead with any desired coloring matter, ground in oil, thinned with equal parts of coach japan, rubbing varnish and turpentine,

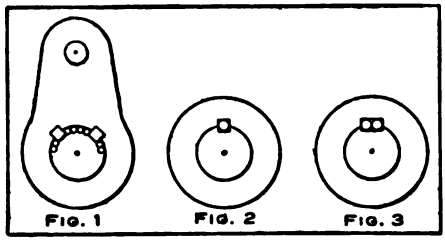
will give the desired result. Any other paint, glossy or flat, will adhere well to this coating.

### Moving a Cement Sidewalk

A contractor was called upon to move a cement walk that is 5 ft. wide and 62 ft. long. The first thing he did was to remove the dirt on one side to a point where the walk was to be placed and a sand bed put in. Stakes were driven in the earth with their tops level with the lower edge of the walk. Some pieces of wood were laid on top of the stakes with their ends extending under the edge of the walk. Planks were placed on the other edge of the walk, against which a number of jackscrews were set. Each screw was set up a little at a time and the walk was easily moved all in one piece.

### How to Remove Hubs and Keys

After spending several days in trying to force a disc off from a large shaft by pressing and driving, the scheme shown in Fig. 1 was tried with success, says a correspondent of Southern Machinery. A row of 1¼-in. holes were drilled in the end of the shaft, the holes being close together and also as close to the disc as possible without injuring it. The length of the row was made equal to half of the circumfer-



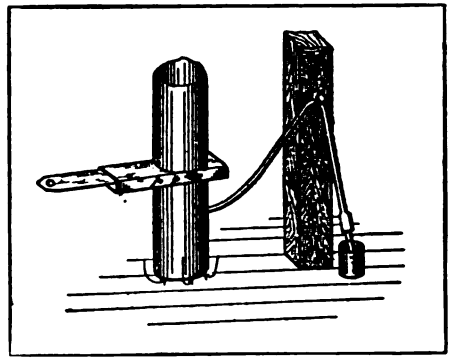

Removing Hubs and Keys

ence of the shaft. After drilling the holes the crank disc was easily pressed off.

When repairing machinery it often becomes necessary to remove a key having its head broken off and, in some cases, the end badly battered. If it is a square key, it can be loosened as shown in Fig. 2. Drill a hole lengthwise of the key of the largest diameter possible without injuring either the shaft or the hub. Then drive a cold chisel between the key and the hub, the chisel being flat on the side next to the hub and having the slope or bevel and a high center next to the key. The effect of the chisel will be to collapse the key, after which the shaft can be driven or pressed from the hub. If the key is flat like that shown in Fig. 3, drill two or more holes.

### How to Test Exhaust-Fan Suction

It is well to make some tests at several of the suction pipes and ascertain



Using the Draft Gauge

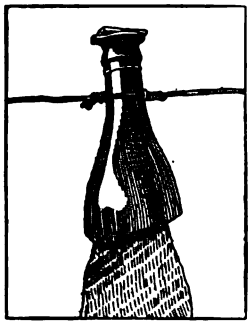
just what speed of fan is required to take the shavings away in good shape, says Wood Craft. Having found by this experiment what speed of fan will take the shavings away properly, ascertain the amount of air pressure or exhaust pressure necessary for the work. This can easily be done by means of a little instrument called a draft gauge, which should be made and used as here illustrated. It has a piece of rubber tube, a piece of glass tube which will fit inside the rubber tubing, and a tumbler of water.

Punch a hole in the exhaust pipe and insert the rubber tube as shown by the sketch. Place the glass tube in the tumbler of water and note how far above the surface of the water in the

tumbler is the surface of the water in the glass tube. It will probably be between 1 and 2 in. Test the other exhaust pipes. If all of them show about the same amount of water suction, then the pulleys may be arranged in the fan drive so that the given pressure of water will be maintained at all times in the exhaust pipes.

### Broken Bottles Used for Insulators

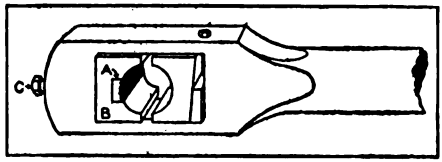
The farmers in a hop-growing section of Oregon constructed a farmers' telephone line by using such material as they happened to have at hand. The line was built of wire which had been used as a trellis for the vines. This wire was tied to the necks of bottles which took the place of the ordinary glass or porcelain insulator. A large spike driven through leather washers and into the pole or cross arm fastened the neck of the bottle to the support as shown.



### Truing Up a Wrist Pin

When getting some repairs done on a crank special attention was given to lining it up on the boring table or face plate preceding the boring, to be sure that the hole was bored parallel to the wrist pin. From some cause or other the hole was not bored true and the crank would run hot, although apparently it was loose on the pin. It was found that the crank-pin was not parallel to the shaft, and the problem was to make it so without taking it to the shop again. It was decided to make a cutting tool out of the front half of the brass box, as shown at A in the sketch. This tool consisted of flutes on a rectangular piece of tool steel, the tool being recessed into the front half of the brass crank-pin box, B.

A ⅜-in. tapped hole was put in the end of the connecting rod, and a cap screw, C, inserted to adjust the cutting tool against the crank-pin, the plan being to turn the flywheel of the engine by hand and allow the cutting tool to trim off the crank-pin on the high places.

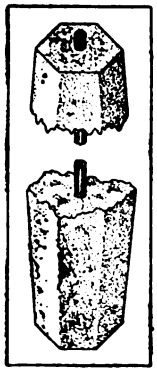



Cutting Tool in Crank-Pin Box

After this was accomplished the cutting tool, A, was taken out and the box babbitted. No heating occurred when the engine was started, and the crank-pin gave no farther trouble.

### Placing Concrete Piles

In a good many instances piling are placed in low places where there is soft soil or all sand. A patent was granted to a California man for making a concrete pile that can be placed in soft earth with its own weight. When making the pile a gas pipe of suitable size is placed in the center of the concrete as shown in the accompanying sketch. When the pile is placed, water pressure is applied to the top of the pipe. The water pressure as it flows out at the lower end of the pile washes away the loose soil and the pile sinks with its own weight.

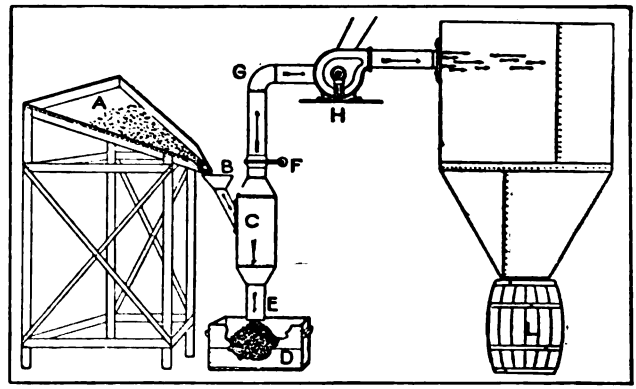


Dissolve 1 lb. of pale glue in 1 pt. of water in a covered vessel heated over a water bath. Allow this to cool and add gradually 3½ oz. of nitric acid. A glue made in this manner is very strong and will not gelatinize. This glue could not be used on some kinds of material on account of so much acid.

# REMOVING SAWDUST OR LEATHER FROM TUMBLED ARTICLES

Tumbling is necessary to remove sharp edges and scratches on small metal goods. If it were not for this process they could not be turned out so cheaply. The first tumbling is with gravel to remove the sharp edges and cut down the surface. Steel slugs may also be used for this purpose, says the Brass World. When this operation is completed, the articles are tumbled with leather or sawdust to produce the final finish preparatory to plating.

When the last tumbling is finished the usual method of removing the leather or sawdust is to riddle the articles. A novel apparatus has been provided by one concern to do this separating which is quite a success.




Details of Apparatus for Removing the Leather

The apparatus consists of a trough of wood, A, lined with sheet zinc and inclined toward the funnel B. This trough is to receive the articles as they come from the tumbler and is inclined so that they may be readily pushed into the funnel by hand. The funnel B is rigidly attached to a pipe, C, which tapers down at E. Both the funnel, B, and the pipes, C and E, are made of tin or galvanized iron. The pipe C is about 8 in. in diameter, and E is about 6 in. It is not necessary to have an exact size. On the top of C the pipe is again tapered to 6 in. and a slide blast gate, F, is placed to control the blast. At G the pipe turns and is connected with an exhaust fan, H. This fan may be driven by a belt to a line shaft or direct-connected to an electric motor. The other end of the fan or the exhaust side is connected with a large sheet iron collector of the usual type. This is the well-known appliance used for collecting buffings, sawdust, etc., when an exhaust fan is used.

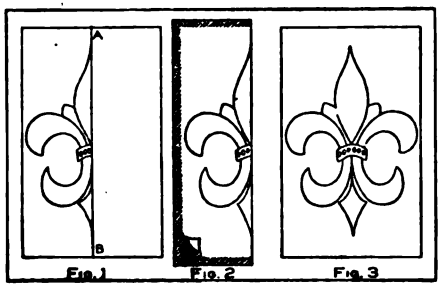
A box or other receptacle, D, is used to catch the cleaned articles. A barrel, L, receives the sawdust or leather. To clean a mixture of small articles and sawdust, it is first dumped into the trough A. This is not inclined so that the articles will slide into the funnel alone, but they must be pushed with the hands. If they all entered at once it would not be possible to clean them thoroughly. As they pass through the funnel B and fall down through the pipe C, the air that is sucked up by the fan removes the sawdust, which is carried over into the collector, and the articles cleaned fall into the box D under the lower end of the pipes.

## A Manhole Gasket

About the only manhole gasket that can be used repeatedly with safety is the flat-wire inserted asbestos gasket, says Power. As marking the manhole plate for the purpose is impracticable, it can be done successfully as follows: Leave the gasket adhering to the plate, and do not turn the plate end for end; put the plate in place and tighten the nut with thumb and finger while working the plate until it settles into its proper place, which can be felt. Then a wrench may be applied.

## Making Designs with Two Sides Alike

Designs having two sides alike may be accurately made by first drawing one-half the design as shown in Fig. 1 and then fold on line AB. Also fold a

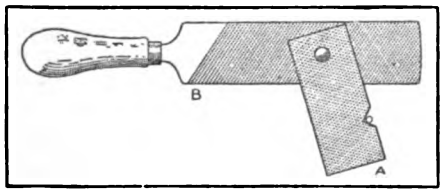



Handy for Leather Workers

sheet of carbon paper, keeping the carbon side out, and place in the fold of the paper as in Fig. 2. Trace the half design drawn with a hard lead pencil or stylus. The back side of the paper will have the complete design, as shown in Fig. 3. This method is especially adapted for workers in leather.

## Home-Made Wire Cutter

Any flat file that is worn out can be used to make a wire cutter as shown in the sketch. A short piece, A, is broken off from the end of the file and annealed, so a hole can be drilled in one end and a V-shaped notch cut in the side of it. The larger part, B, is also annealed and a hole drilled in the center and at such a distance from the end to match the one drilled into the short piece. The parts are now tem-




Wire Cutter Made of Old File

pered and riveted together as shown. The wire is placed in the notch and is cut off by striking the piece, A, or this piece may be clamped in a vise and the wire cut by a forward movement of the handle.

## Supporting Strength of Barrels

The weight that sound, strong barrels set on end will safely support is beyond ordinary belief. Care should be taken that the barrels have good hoops and rivets employed, that they are set evenly, and the load applied vertically and centrally upon them. Be sure that they do not lean or rock over sidewise, which greatly weakens them. The barrels should stand on a level floor, planks or other reliable floor, with planks or timbers laid across the upper ends, so as to divide the pressure evenly upon the staves.

A mechanical and erecting engineer has so supported 13 tons on two whisky barrels, says a correspondent of Power. A 60-in. by 14-ft., 100-hp. boiler was supported during bricking-in by two whisky barrels, which furnished a cheap, firm support, much more convenient to work around than cribbing, or other means usually employed.

## How to Exterminate Moles

When an open hole is found drop into it a piece of cotton saturated with carbon disulphide (carbon bisulphuret), covering it over immediately with earth to keep the fumes down. Carbon disulphide, when exposed to the air, forms a heavy gas, which settles down into the hole and smothers all animal life that may be therein. This is also effective in killing moles and gophers in the garden and field.

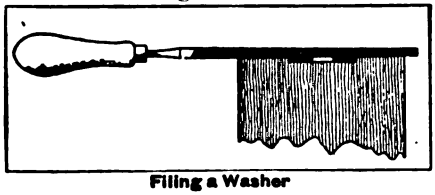
The operator must be careful not to breathe too much of this gas, cautions Florists' Review. In using in the greenhouse put it in at night, so that you will not need to be in the house for a few hours afterward. Also keep the fluid in a well-corked receptacle and away from children. This is sure death for moles and gophers, as it kills every animal in the hole where it is put.

### How to Dissolve Glass

A hole may be cut or etched through glass readily by using hydrofluoric acid, says Machinery. The acid should be applied in the same way as etching acid, using wax to surround the portion of glass which is to be penetrated. Hydrofluoric acid is sold in wax bottles, as it cannot be kept in glass. It may be handled with a hard rubber dropper similar in construction to the ordinary glass medicine droppers.

### Filing Washers to a Special Thickness

One of the items most often required in the garage is a washer of a particular size and thickness, and as often as not it proves that what one exactly requires is not to be found, says Motor. A washer of a certain thickness is often wanted, for instance, to take up a small amount of backlash or end-play in a shaft. In a case of this kind secure a washer thicker than required and carefully file it down. To file a washer sounds easy, but, handled in the ordinary way, is a difficult thing to do. If one tries to grip it in the vise by the edge it either springs out or rocks in an annoying manner. The operation is made easy if the washer is first pressed between the jaws of a vise into the surface of a piece of soft wood endwise of the grain, as shown in the



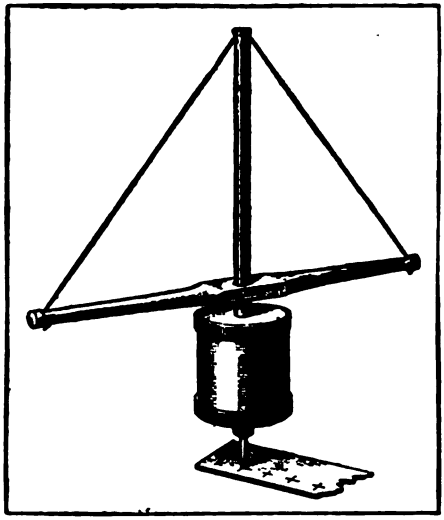
Filing a Washer

sketch. When filing, the wood and metal are cut away together, and if one can handle the file at all well the washer can be removed from its bed as true and as thin as may be desired.

When wet batteries are not in use remove the zincs from the battery solution if possible, thus giving them longer life.

### Home-Made Drilling Machine

It will be seen from the sketch that the drilling machine is a very simple affair, consisting essentially of a round block of wood, about 8 in. long and 8 in. in diameter, with an iron band ring



Simple Drilling Machine

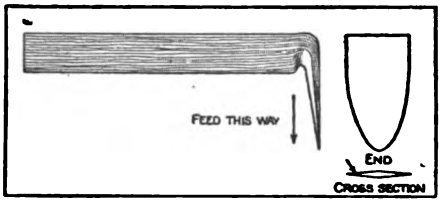
placed on the top and bottom to prevent splitting. Through its center and protruding about 2 in. below is a smooth round wooden shaft about 1¼ in. in diameter and 3 ft. in length. Both ends of this shaft are protected from splitting by a ring or ferrule. The crossbar is a piece of wood about 3 in. wide, 1 in. thick and 3½ ft. long, having a hole in the center large enough to allow the bar to move easily up and down on the shaft and shaped as shown. The ends of the bar may also be protected by ferrules. A hole is bored in each end of the bar and also in the upper end of the shaft. Through these holes a piece of strong cord or rawhide is passed and drawn tight, with a bar standing, squared, about 1 in. above the block. The cord is then secured from slipping in the holes by means of knots and pegs driven in the holes, says the Metal Worker. A drill is inserted in the end of this shaft below the block, and may be made from an

old hand saw file ground to a triangular point.

To set the machine in motion, place the point of the drill on the spot where a hole is to be made, with the machine in an upright position, and while grasping the bar in one hand, with the other turn the shaft around until the bar is raised as high as it will go. Then lay hold of the bar with both hands and press quickly downward. The weight of the block gives sufficient motion to wind up the cord and raise the bar again, when a second downward motion of the bar causes a revolution in the opposite direction. In this way the work is accomplished by pressing down on the bar and allowing it to rise again as the cord winds and unwinds upon the revolving shaft.

## A Tool for Turning Rubber

Many mechanics have had occasion to turn rubber and it is safe to say that all have had trouble with, at least, the first attempt. The tool which is shown in the sketch is all that is needed to

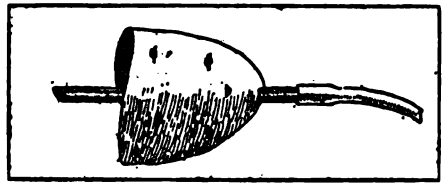



Rubber-Turning Tool

get results on such work. As can be observed, by reversing the tool it can be used either right- or left-handed, always feeding the pointed end toward the work. The tool is given no clearance between the cutting edge and the work. It is really given the opposite action, for the revolving rubber should bear against the tool about as shown by the arrow in the cross section sketch, the elasticity of the rubber being sufficient to induce a cut. This tool should be kept with a very keen edge and not run wet, as in the case of cutting rubber with an ordinary knife. A tool very similar to this can be used on felt, only it will need to have an edge like a razor.—D. A. H.

## Pipe Repair on an Automobile Gas Tank

The old adage, "Necessity is the mother of invention," proved itself true in the case of a correspondent of Motoring, who found himself and party on a country road several miles from home one evening, unable to light the lamps on his automobile. The connection between the gas tank on the rubber tubing was found to be missing. A temporary repair was made as shown in the sketch.



Crude, But Useful Emergency Connection.

It consists of a stem from a clay pipe (obtained from a passing friend) and a potato. One end of the potato was cut off and the stem of the pipe pushed through the center. The rubber connection was placed over one end of the pipestem and the other end inserted in the gas tank and the potato pressed in tight and tied. The connection thus made proved sufficiently tight to make the flow of gas and keep the lamps burning until home was reached.

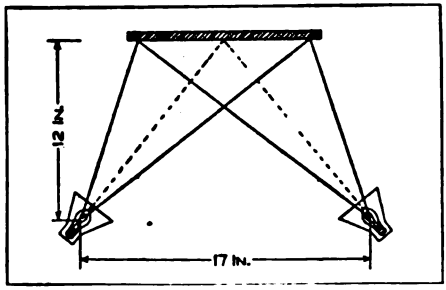
## How to Clean Dirty Chamois

Washing is the best way of cleaning a dirty chamois leather, says the Canadian Jeweler, but it is sure to come out stiff and hard unless special care is taken to prevent it. Use common soda, soft soap, and preferably soft water. First rub the soap well into the leather and allow it to remain for a couple of hours in weak, warm soda water. Then wash until clean. Instead of rinsing in clean water and removing all trace of soap, rinse in weak, soapy soda water such as was used for washing in the first place. It is the soap left

in the leather from the rinsing solution that keeps it soft and smooth. After rinsing, wring out the leather in a coarse towel and dry quickly; then brush well, and pull and rub it thoroughly in the hands. If you follow this method carefully your leather should come out as soft and pliable as when new.

### How to Illuminate Test Type Charts with Artificial Light

In the numerous small cities and towns glasses are sold by the local jeweler, and in many instances he does not have a complete apparatus for testing the eyes, says the Optical Journal. The accompanying illustration shows a scheme that can be used to illuminate a chart 10 by 25 in. by using artificial light. The reflectors around the globes are placed 17 in. apart and 12 in. back from the placard and pointing in the direction shown. This will give even illumination and at the same time entirely hide the light from the person's

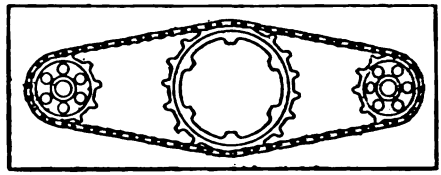



Used in Testing Eyes

eye that is being examined. The reflector should be painted with aluminum paint on the inside and black or green on the outside. Four 8-cp. lamps should be used on each side for best results.

### An Idler Wheel for a Long Chain Drive

A chain drive may be used in some places to better advantage than a shaft drive. On long drives the chain will cause trouble unless several idlers are used to keep the links from dragging. Cromwell Dixon, the young aeronaut, has overcome this trouble by using a spokeless idler in between the drive and driven sprocket. This middle wheel is considerably larger than the other two

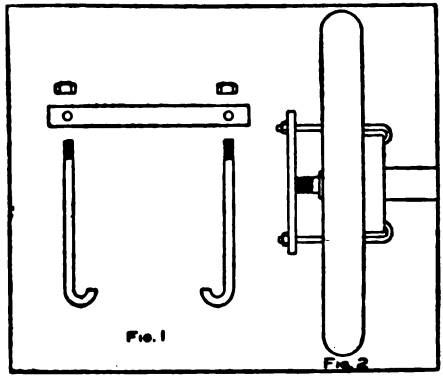


Idler Keeps Links from Dragging

and has no spokes or hub, the position being maintained by the chains going in opposite directions. The accompanying sketch shows the relative positions of the wheels.

### A Tool for Removing Automobile Wheels

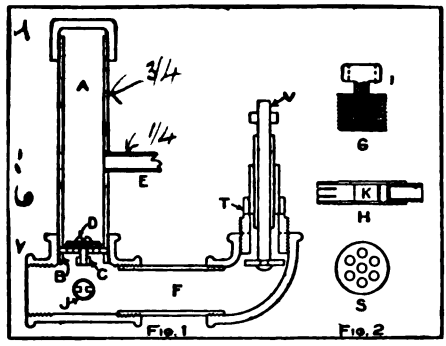
Automobile wheels are not always easy to remove, but by using the device as shown in the sketch they may be removed without much trouble. The device consists of a bar of metal, a little longer than the hub of the wheel, with a hole drilled near each end. Two pieces of $\frac{5}{8}$-in. round iron are cut with threads on one end and a hook formed on the other end of each, and of such a length as to equal the distance from the




back of the hub to the end of the axle, allowing for the thickness of the bar and nuts. Details of the device are shown in Fig. 1 and its application in Fig. 2.

## Home-Made Hydraulic Ram

A hydraulic ram may be used in a fall of water that is 4 ft. or over to elevate water to a higher level. The construction of such a ram is very simple and can be made from pieces of pipe and fittings. Galvanized parts should be used in its construction if possible, and all joints put together with white lead or graphite.




Made of Pipe and Fittings

The accompanying illustration shows the parts in cross section. The pipe used for a 4-ft. fall should be ¾ in. The pipe A, Fig. 1, is about 6 in. long and fitted with a cap on its upper end. The valve in the lower end of this pipe is held in place between the end of the pipe A and a small ring, B. This small ring is a piece cut from the end of a threaded pipe. The valve seat is a circular disc of hard fiber with several holes drilled around the center hole, as shown at S, Fig. 2. The valve is made by using a brass machine screw, D, put through a hole centrally drilled in a brass disc, which is soldered to the screw. Under this brass disc is fitted a rubber gasket. The valve is kept in place with a small collar, C, soldered to the end of the screw. The outlet pipe, E, is ¼ in. in diameter and is of sufficient length to elevate the water to the point desired. A ¾-in. nipple, F, 2 in. long, connects the elbow, in which is placed another valve. This valve is held in position by a combination of pipe fittings as shown. The valve rod, V, is made of ¼-in. brass and is 3 or 4 in. long, fitted with a brass disc on the lower end and an adjusting nut on its upper end. The valve rod works in a piece of pipe that is threaded to turn through a coupling and project about ⅜ in. The coupling is threaded on the outside to fit the threads in one part of a union, T. This union is fitted into the elbow as shown. A part of the union is cut out, as shown in Fig. 2 at G, to form an outlet for the waste water. A small air valve, H, Fig. 2, is used for admitting a small amount of air at J, Fig. 1, in the ¾-in. tee, which must be drilled and threaded for an ⅛-in. pipe. This air valve is made from an ⅛-in. pipe slotted at one end to form prongs to hold the valve K, which is a piece of hard fiber formed cone-shaped at one end. The other end of the pipe is fitted internally with a smaller pipe, whose end is drilled tapering to form a seat for the fiber valve.

The inlet or drive pipe should be ¾ in. in diameter and at least 20 ft. long and attached to the open end of the tee. The fall of water should be at least 4 ft. and of sufficient amount to keep the pipe full at all times. With a 4-ft. fall, water may be elevated at least 35 ft.

When the ram is in action the water flowing in the inlet pipe flows past the valve in the elbow until it has gained sufficient velocity to close the valve, which brings the column of water in the drive pipe to a sudden stop, or ram, which forces a portion of the water past the small valve in the tee into the air chamber, A. Immediately after the ram takes place there is a reaction or recoil, which allows the valve in the elbow to open, and the action is repeated. Air is supplied to the air chamber through the small valve in the tee at J at every ram of the water.

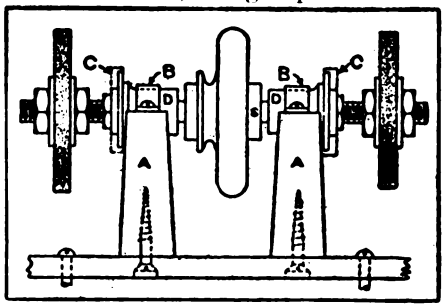
## How to Blue Steel

The articles to be blued must be polished very bright and made smooth with fine emery. Prepare some kind of an airtight iron box. A gas pipe of suitable diameter, threaded on both

ends and fitted with caps will answer the purpose. Pack the articles in this airtight receptacle with slaked lime. Heat the receptacle, with the enclosed contents, to a dull red and then allow it to cool. After it is cool remove the articles, which will have a blue that will last for years. Care should be taken that the lime is not damp or any dampness whatever placed in the pipe, as this might cause an explosion.

## Home-Made Ball-Bearing Emery Grinder

This emery grinder can be made with very little trouble, the emery wheels being the most expensive item to consider. In the first place secure an old bicycle hub and cut in half and throw away the shaft, as it will be too short. Cut two wooden blocks for standards, AA, cutting a groove in the tops to receive the bearings, or ends of the bicycle hub, DD, which are held in place by bent iron straps, BB. A new shaft is made about 12 in. long, threaded to take the cones about 4 in. from each end; the thread also is used to take the nuts that secure the emery wheels. An old sewing machine wheel and a few washers will complete the grinder. Mount the wheel on the center of the shaft, using a pin to fasten

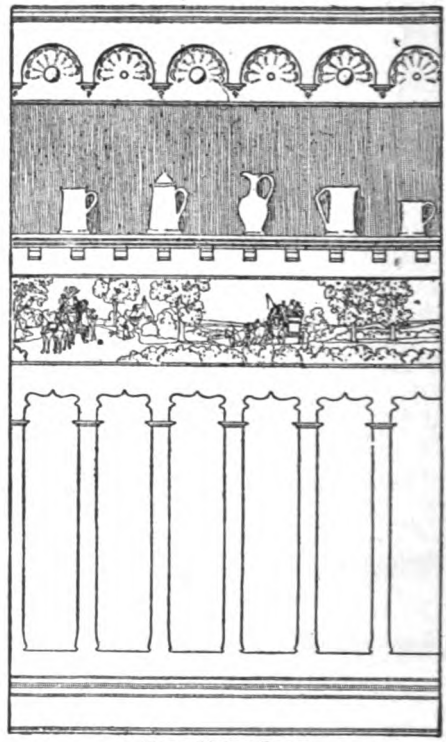



Details of Ball-Bearing Emery Grinder

it, and assemble the bearings. Dust may be kept from the bearings by fastening a tin guard over each one (CC). This emery grinder may be run on an old sewing machine table, says the Model Engineer, by a lathe flywheel or driven by power from a shaft.

## Pictorial Frieze Designs

Pictorial friezes can be used in a great many original ways by the decorator who is wide awake to their possibilities. Illustrated herewith is a suggestion in which a coaching frieze is utilized in the decoration of a dining



For a Dining-Room

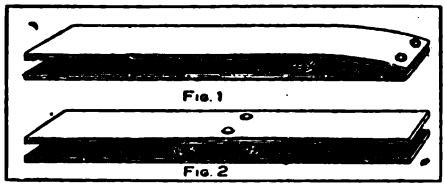
room. The frieze is made in 6-ft. lithographed sections, each is different, and the complete design is 30 ft. long before it repeats. The sections may be used in any order preferred, so there is no continued repetition in the room.

In the decorative treatment illustrated the frieze forms the keynote of the design and is used as the crowning feature of the tall paneled dado, which can be made of wood, or the panels may be filled in with burlap, and the stiling only made of wood. The dado is capped with a shelf molding that serves as a resting place for steins and jugs, the upper portion of the wall being hung with a grass cloth, says the American Carpenter and Builder. The

cornice is made up of a series of arches, with plaster or plastic relief shell ornaments, and under every other arch is an electric light bulb. This cornice should be in ivory white, of the tone of old ivory, the ceiling being somewhat lighter. The wainscot and the other woodwork of the room may be either in forest green or fumed oak, or may be finished in white or ivory enamel.

### A Driver's Spring Board Seat

When no spring seat for a wagon is at hand one can be made quickly from two boards 12 in. wide and about 4 in. longer than the wagon box is wide. Place a 2- or 3-in. block between the two boards about 6 or 8 in. from one end, according to the weight of the driver. The boards are securely fastened together at the end nearest the block, as shown in Fig. 1. This forms a spring board seat. If constructed for




Spring Seat for Wagon

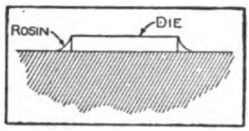
two, place two blocks between the boards near the center and bolt them together, as shown in Fig. 2.—Contributed by E. A. Fishback, Colorado Springs, Colo.

### How to Cover an Engine Foundation

To make an unsightly looking engine or pump foundation attractive and neat, take Russian sheet iron, or zinc sheets, and tack them to strips of wood around the foundation as shown in Fig. 1. The frame on which to fasten the metal is made from strips of wood nailed together in the shape shown in Fig. 2. This makes a good looking job, says Power, hiding all defects, dirt, oil, etc., and with a little ingenuity it can be arranged for any shape of foundation.

### How to Hold Thin Metal While Turning

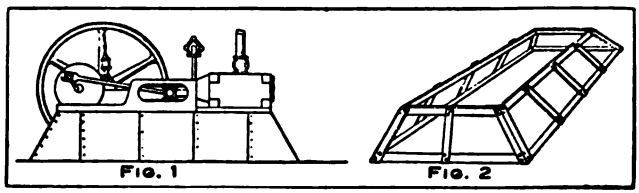
It is necessary sometimes for the machinist to take a small cut over some thin piece of work that is not safe to hold in the machine in the usual manner. When such work is to be done the method known as "gluing" is used.




The piece to be dressed is held against the face plate or table and melted rosin poured around the edge. Shellac will answer for this purpose, but a much better composition is rosin and beeswax. After the cut is taken the material is easily broken off and saved, which can be used repeatedly by applying each time with a soldering iron. Best results are obtained by having all parts free from grease.—Contributed by Donald A. Hampson, Middletown, N. Y.

### How to Insert Electric Bell Wires Through Partitions

A good method of putting electric wires through partitions with an open space between walls for bell wiring is to provide a $\frac{3}{16}$-in. iron rod about 15 in. long and drill a number of $\frac{3}{32}$-in. holes through one of the ends. Drill the holes, commencing about 2 in. back from the end, about $\frac{1}{2}$ in. apart and in




A Neat Engine Foundation

a spiral around the rod. Pass the ends of the wires through the holes and turn back about 2 in. of the ends. Pass the rod through the hole bored in the partition and pull it out from the opposite side.

### How to Paint Automobile Mufflers

The muffler and exhaust piping of an automobile can be painted with a paint made as follows: Boiled linseed oil, 1/5 lb.; japan varnish, 1/5 lb.; spirits of turpentine, 2/5 lb.; lampblack, 1½ oz.; pure powdered graphite, 1½ oz.; powdered oxide of manganese, ⅜ oz. First mix the linseed oil and the japan varnish well together, then add in the order named, and stirring all the time, the lampblack, graphite and powdered manganese. The solids should be added slowly while the stirring is briskly maintained. As the mixture thickens, thin it down with the turpentine, until the quantity mentioned is added. This paint should be used at once, for it dries rapidly and every time the brush is dipped the mixture should be carefully stirred. It is well to paint the mufflers while they are hot, first cleaning them thoroughly.

### Blown Joints in Water Pipes

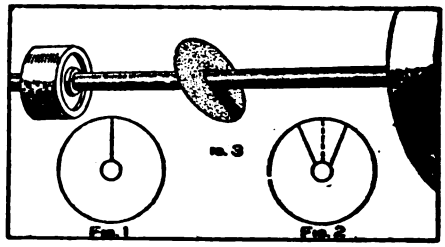
In a paper read before the American Water Works Association the following experiences with blown joints are given:

"A line of water pipes passed under the railroad tracks in our distributing system and the joint came directly under one rail. This joint was partially blown out several times and had been recorked. We were unable to keep it tight, and finally were compelled to take it out and place a full length under the track, so as to bring the joints of pipe between the tracks, or what is generally termed in railroad language as a 'fire foot' between each set of tracks. After doing this we experienced no further trouble from this particular joint, after some four years of use.

"In a similar case where we had a leaking joint under the rail, after trying many ways to repair it, we finally resorted to the use of lead wool and after making the repairs we found it to remain in good shape for about one year, indicating that a blown-out joint can be more successfully repaired with lead wool than with cold lead corked in."

### How to Keep Line Shaft Clean

In many places overhead line shafting must be kept clean and free from any oil that may form in drops and be thrown by the motion of the shaft. The sketch shows how to construct a device



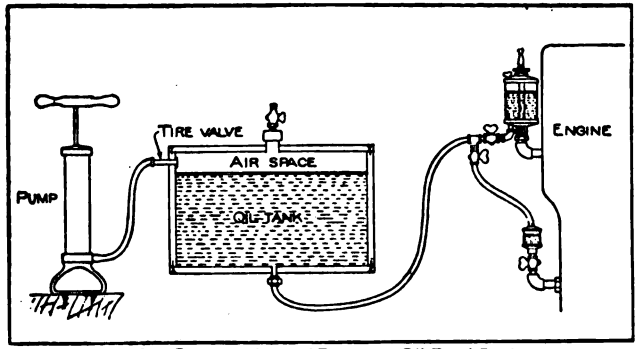

Pasteboard Disc Keeps Shaft Clean

to place on shafting between pulleys or bearings to keep the shaft clean. A piece of pasteboard is cut circular, from 12 to 16 in. in diameter, for small shafting, with a hole in the center a little larger than the shaft on which it is to be used. This ring of pasteboard is cut from the edge to the center hole, as shown in Fig. 1, to make an opening to slip the ring over the shaft and then held together by a piece of heavy paper glued on the face over the cut, as shown in Fig. 2. The ring or disk of pasteboard is shown in position on the shaft in Fig. 3. When the shaft is turning the disk will slowly travel from one wheel to another and then change position and return back over the shaft. This will keep the shaft clean from dirt and grease.

## How to Make a Pressure Oil Feed System

By Harry Bayer in Motor Boat

Secure a gallon can from a paint store, such as used for paint or varnish will serve the purpose, as the pressure required will amount to only a few pounds. Remove the handle from the can and cut off the cap from which the paint was to be poured. An ordinary bicycle tire valve is fastened to a piece of tin which is soldered to the hole where the opening was made in the can by cutting off the cap. This will be at the top of the can when it is placed on one of its narrowest sides, and when in place the valve will be above the oil. Solder an ⅛-in. brass nipple in the bottom of the can for an oil outlet. A piece of tubing threaded at one end for a cap is soldered in the top of the can to serve the purpose of filling the tank. A good plan is to purchase a small cock, tap the cap and screw the cock in so that the tank may be left open when it is not in use.




Showing Construction of Pressure Oil Feed System

The tank is now enclosed in a wooden box. The box can be made in any manner or kind of wood to suit the builder. It is best to enclose the tank in a wooden box, as the air pressure is likely to force it out of shape, and anyway the wooden covering gives it a much neater appearance. An ordinary bicycle foot-pump was cut down to about 4 in. in length, to be used for the air pump. The pump is fastened wherever most convenient with screws through the foot-piece.

The oil cups are lapped at the top or bottom for an ⅛-in. nipple. The remainder of the outfit consists of brass tubing, which costs a trifling sum. It is necessary to anneal the tubing first, after which it can be bent in any shape when soldered. The tubing is soldered into the fittings wherever possible. Unions should be used only when necessary. The tank can be put in any out-of-the-way place.

## An Ammeter Trouble

In a private lighting plant there was an ammeter which was supposed to show the total current drawn from the lighting bus. There was also a similar ammeter to show the current drawn from the power bus. The lighting bus ammeter readings did not agree, by several hundred amperes, with the sum of the readings of the individual ammeters of the generators connected to the bus, and before the cause was discovered and remedied, it had the engine room force, a good portion of the owners' engineering department and the makers of the instrument guessing for several months.

Comparison of the generator ammeters, singly and collectively, with the power bus ammeter indicated that these instruments were very nearly correct, so the lighting bus ammeter was blamed for the trouble and sent back to the maker to be overhauled, says the Electric Journal. In a week or two the instrument was re-installed and found to be no nearer correct than before, so it was again returned to the maker. This time the maker reported that there was nothing the matter with it and sent in a bill for overhauling and recalibrating it. The owners stated the facts and refused to pay the bill. The instrument maker's engineer then called upon the engineer to whom the

matter had been referred and suggested that a wrong connection was probably the cause, but an examination of the wiring diagram of the switchboard disclosed none. He then suggested that possibly a stray field was the cause and together with an assistant of the owners' engineer examined the back of the switchboard for wrong connections and stray fields; but they didn't notice any, and gave it up.

The lighting bus consisted of four bus-bars; positive, negative, and equalizer (to which the generators were connected by means of three-pole switches) and a fourth bar to which the feeder circuit breakers were connected. In the connection between the plus bus-bar and this fourth bar, the shunt of the offending ammeter was connected.

It was finally discovered that a new feeder which had been installed to reenforce an old feeder was connected to the plus and minus generator bus-bars above the ammeter shunt, instead of to the fourth or feeder bar and the minus bus-bar as it should have been. When this was corrected, the trouble disappeared, and the instrument maker's bill was paid with apologies.

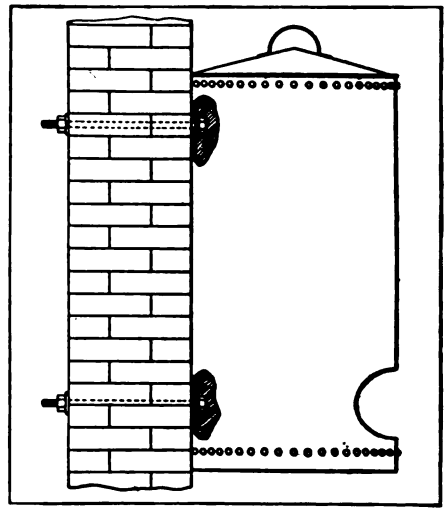
### Gasket for a Gasoline Engine Cylinder Head

If you have had the misfortune to get the exhaust chamber face or cylinder head casting of your gasoline engine sprung or cracked until the common asbestos gasket will not hold, the following method will prove of service until repairs can be obtained: Get some asbestos fiber that is used for covering steam pipes and add about one-third to one-fourth more than the usual amount of plaster of paris and mix into a stiff paste with water. Spread this mixture evenly over the surface of the head and quickly bolt the head in place. Allow the composition to set until it hardens before starting the engine.

The paste fills all the inequalities of the two surfaces when the nuts are turned down tight, and when set it makes a very good gasket for temporary use.

### Water Boiler Used for a Waste Holder

The accompanying sketch shows how an old water boiler was put into service as a waste holder. The top was removed by cutting the rivets and a small hand hole cut in one side of the boiler. Two holes were drilled in the



Handy Waste Holder for Plant

other side of the boiler to admit bolts which were used to fasten it to a wall. When painted with aluminum paint and filled with 50 lb. of waste it made a splendid addition to the plant, says a correspondent of the Practical Engineer. This makes a mice-proof, fireproof and water-proof receptacle.

### Checking Corrosion in a Boiler

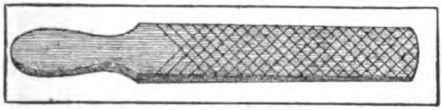
One of the best methods of checking corrosion in a boiler is to have zinc plates hung in it, says Power. Attach them to the tubes and braces. The galvanic action will then eat the zinc instead of the boiler. Especially is it necessary to use zinc if there is a surface condenser in the plant. The brass tubes of the latter set up an action that

is liable to ruin a boiler in a few months, if something is not done about it.

### A Substitute Whetstone

The sharpener is made from a piece of soft ash or white cedar, tapered from ⅜ to ¼ in. in thickness, 2 in. wide and 18 in. long. A handle is shaped on one end and cross cuts are made in each surface with a knife, as shown in the sketch.

Old broken glass is pounded fine with a hammer. This is done in a



Made of Soft Ash or White Cedar

shovel or other convenient receptacle. The fine glass is put in a bottle for occasional use. Ham fat, or any kind of grease, is spread on both sides of the stick and the fine glass sprinkled on and well spread over with a knife.

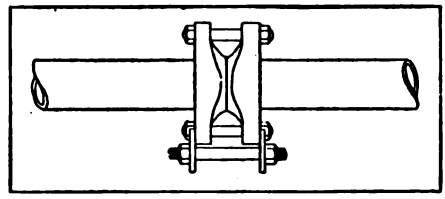
The more the sharpener is used the better it gets, as the tool being sharpened presses the glass well into the grease and wood, forming into a hard paste. The tool is first ground, and then a keen edge put on it with the sharpener, which is more satisfactory than when done with an ordinary hand stone sharpener, the edge being smooth like that of a razor, instead of resembling a saw cut. This sharpener is especially adapted for use on scythes and sickles.

### Stopping Leaks in Water Pipes

The usual method of stopping a small leak in a lead pipe is to close up the hole by hammering its edges together, but such repairs are apt to give way in time and be as bad as ever, says Woodworkers' Review. The following method was applied to a lead pipe in which half a dozen pin holes had been cut through so that there was a perfect spray coming out. The water having been turned off, a few strips of very strong muslin were provided, about 1 in. wide; these were coated on one side with plaster of paris mixed with water, as if for taking casts, and wrapped around the pipe, with the plaster coating inside, for three or four thicknesses. They were then bound firmly with fine linen twine and allowed to stand for three or four hours, so that the plaster might set before the water was turned on again. The repair shows no sign of giving out.

### Repairing an Ammonia Pipe Joint

There was a ½-in. union on a liquid ammonia line that gave considerable trouble, says a correspondent of Power. The bolts had been taken up until there was no thread left and still the joint leaked. It was impossible to shut off the line at that time, so the joint was repaired as shown in the sketch. By using a ¾-in. bolt with the thread long enough to go across the flange, and a



Repair for Leaky Joint

heavy washer on both ends, the flange was held tight so that washers were put under the nuts, one at a time, which allowed the nuts more space to be tightened and the joint closed, thus stopping the leak.

Covering the boiler setting with a layer of asbestos cement, passing over this a canvas, and painting the whole with a heavy coat of paint, is said to effect a saving of 12.5 per cent of the coal bill. It is also stated that thoroughly coating the brick work with red paint so as to fill the pores will cause a considerable saving of fuel in almost any boiler.

# BUILDING AIRSHIPS AND FLYING-MACHINES

By G. H. Curtiss, President G. H. Curtiss Mfg. Co., Hammondsport, N. Y.

## PART I—THE CONSTRUCTION OF SIMPLE AND PRACTICAL DIRIGIBLE BALLOONS

### How to Estimate Capacity for Lifting

The term airship, generally speaking, is applied to dirigible balloons, while the heavier-than-air classes are more commonly spoken of as flying-machines. The flying-machine, or aeronef, is divided into three classes: Aeroplanes, which consist of one or more horizontal planes designed to soar into the air by being propelled forward at an incline; the helicopter, in which the ascensive force is secured by the use of vertical screws, or propellers; and the orthopter, or wing-beating machine.

In this chapter we will endeavor to describe the most simple and practical form of dirigible balloons, while the other types will be taken up in successive issues.

### How to Build a Dirigible Balloon

The ascensive power of a dirigible or other balloon is secured by the use of gas contained in a large envelope of oiled fabric or rubber-coated cloth. For the dirigible balloon where the bulk of the gas bag is an important consideration, the use of hydrogen gas, which has the greatest ascensive power, is desirable; 1,000 cu. ft. of hydrogen gas will lift about 65 lb.

In building an airship, it is well to first determine the weight of the frame, propellers, engine, controlling mechanism and operator; then build, or purchase, the gas bag, of proper dimensions and sufficient capacity to lift the desired weight, together with a reasonable amount of ballast, which in a one-man outfit should be about 50 lb. Experience has taught us that a 7-hp. engine driving a suitable propeller will furnish sufficient pull to drive a one-man airship as fast as it can be readily controlled. Taking this as a basis, let us proceed to enumerate what our requirements and their respective weights will be: An engine of this power in the form of a 2-cylinder air-cooled motor will be the most desirable. This will weigh, with all appurtenances, about 100 lb., the engine alone only weighing 50 lb. From this it will be seen that in securing an engine we must not consider simply the catalog weight of the engine, which seldom includes the ignition system, oil or gasoline tanks, mufflers, etc. Placing the weight of an operator at 175 lb., frame 60 lb., propeller and shaft 40 lb., rudder, drag rope and ballast 100 lb., we have a total weight of 375 lb. Add 80 lb. for the weight of the gas bag and its suspension, and we have 455 lb., which divided by 65 gives us 7,000 cu. ft. of gas required to lift the machine.

It is apparent that an elongated balloon will pass through the air with much less resistance than a spherical balloon. We will, therefore, adopt a form in which the length is about four times the diameter. A diameter of 15 ft. and a total length of 60 ft. gives us the desired cubic capacity. With this in mind, it is evident that a frame of considerable length must be constructed in order to support this long gas bag for the greater part of its length. This frame should be 40 ft. in length and can be constructed of spruce in the form of a triangle and properly guyed with wires at a weight of about 1½ lb. per foot. The illustration, Fig. 1, shows the proper form and method of construction. The frame should be in the form of a triangle measuring about 3 ft. on a side. The length of the spruce sticks would be approximately 16 ft. These sections can then be butted and spliced together by short pieces, lapped on underneath, and fastened by bolting and

lashing. Lashing is one of the best ways of making the joint of two or more pieces on an airship.

The frame is hung underneath the balloon by attaching it to the netting on either side by light-weight linen cords, as shown in the sketch. The longitudinal sticks of the frame should be triangular in form, while the cross sticks should be square.

The engine should be mounted at about one-third the length of the frame from the forward end, and the power transmitted to the propeller shaft by the use of a heavy bicycle or motorcycle chain. The propeller shaft should be made of 1¼-in. 16-gauge tubing, supported by about five bearings and fitted with a thrust for taking the pull of the propeller.

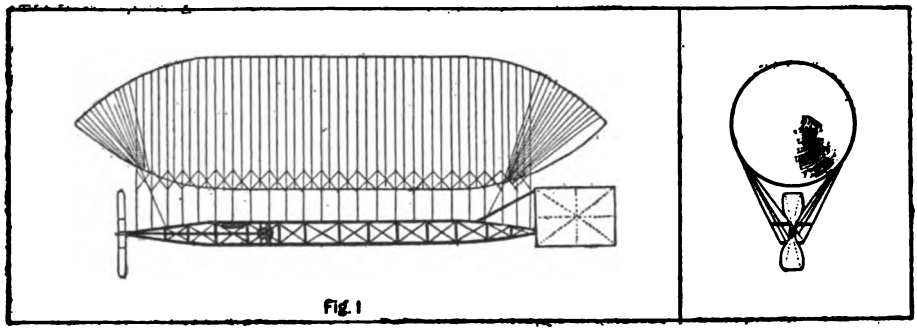


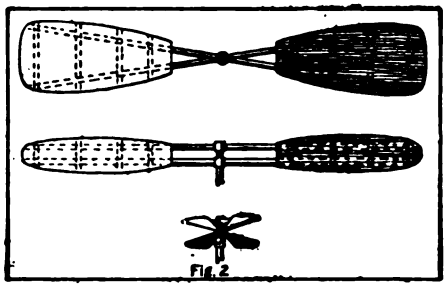
Fig. 1

Side Elevation of Dirigible Airship — End View

The propeller, Fig. 2, would be 10 ft. in diameter, with an equal pitch. The pitch can be secured by fitting the braces which hold the arms of the propeller to the shaft at an angle of 20 degrees from each other. The arms for the propeller should be made of hickory or ash, and the canvas covering tacked on over light ¼ in. by 1½-in. slats mortised into these arms. The blade at its widest place should be 2 ft. For convenience in removing or replacing, in case of accident, the propeller should be made up separately from the shaft and attached to the shaft by two ¼-in. tapered pins. The rudder should contain about 50 sq. ft. of surface and be braced in the manner shown in the sketch. It is preferable to cover this rudder with silk, the woodwork being of bamboo. The rudder, Fig. 3, is controlled by an endless cord running through a pulley in front of the operator, so that he can get hold of it with either hand.

To build the gas bag is perhaps the most difficult part of the construction and requires the most skill. The builder must, after determining the size of his bag, divide it into three sections: the forward taper, the straight cylinder, and the rear taper. The cylinder is composed of straight strips of equal length, while for the tapered ends the silk must be cut in the form of a triangle, with the sides cut on a slight curve. This can be secured by hanging the silk on the wall and attaching silk cord from end to end, marking the silk as the cord hangs. This will give a good form. All of the seams run lengthwise. There is no strain on the silk when inflated in a properly fitting net.

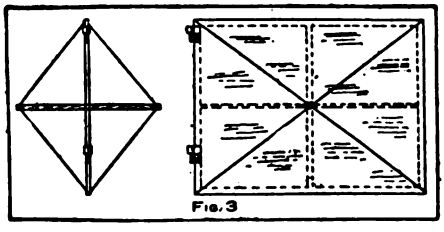
While cotton fabric may be used, silk is by far the better. If properly treated it will last indefinitely. It is much stronger and lighter than other fabric. The first operation in building the balloon is to oil the material. The fabric should be cut in lengths and treated with linseed oil. The oil can best be applied by dipping in a large vessel or tub. The strips should then be hung by one end in a large room, of moderate temperature. This first coat of oil should dry in three or four days, although in some climates it takes considerably longer. After the strips of silk are given one coat of oil and thor-




Details of Propeller

oughly dried they may be cut to the proper shape to form the cylinder and cone-shaped ends of the gas bag.

The seams should run lengthwise, and each lap should be double stitched. After all of the silk has been sewed up, a manhole of about 15 in. in diameter should be made in the center, and a small neck, 6 in. in diameter, a little to the rear of the manhole, fitted for inflation. The balloon should then be blown up with air from a centrifugal blower, and a coat of oil put on by brush from the outside. A strip should be oiled the entire length and the balloon rolled over slowly and another strip oiled, etc., until the entire surface is covered. It may then be turned inside out, through the manhole, and the process repeated. After it has been given a sufficient number of coats to make it airtight, powdered soapstone, or French chalk, should be sprinkled over the entire surface inside and out, to prevent sticking. Care must be taken that expansion shall not occur from change of temperature and burst the bag.



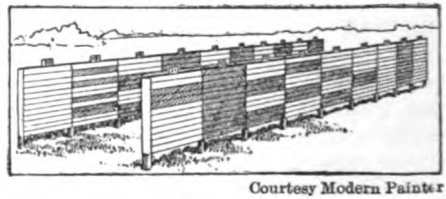

Details of Rudder

The framework is suspended from the balloon by linen cords attached to a square mesh of Irish linen net, as shown in the illustration, Fig. 1.

The net should be carefully adjusted over the bag before filling is commenced. After the balloon is fully inflated, the framework may be placed beneath it and the suspension cords attached, the rudder and propellers fitted on, and the machine is ready for a flight.

## PAINT TEST FENCES

Paint test fences have been erected at the North Dakota Agricultural College, at the Carnegie Institute in Pittsburg, Pa., and at Atlantic City, N. J., for the purpose of comparing the effect of weather on paints under the varying climatic conditions of these widely separated localities. The illustration shows



Courtesy Modern Painter

The Test Fences

the test paint fences erected in North Dakota. The same paint formulas had been used in each locality.

## REVENUE CUTTERS AS LIFE-SAVERS

The importance of the revenue cutter service as a means for saving lives along the American coasts is daily becoming more apparent to congress, with the result that there is a disposition to increase the size of the revenue fleet. With this in view, the U. S. gunboat "Vicksburg" is to be turned over to the Treasury department's navy and put into service on the Pacific coast. The revenue cutters, "Mohawk" and the "Thetis" have made an enviable record in the work of rescuing sailors from shipwrecked vessels.

To make a surface to paint on copper apply to the metal a solution of copper sulphate to which is added a little nitric acid.

# BUILDING AIRSHIPS AND FLYING-MACHINES

PART II—By Carl Shelley Miner, The Miner Laboratories

## HOW TO MAKE A HYDROGEN GAS GENERATOR

**Simple But Practical Apparatus for Inflating Balloons**

Notwithstanding recent promising developments of the aeroplane, especially the work of Farman, it is still true that the bulk of the really satisfactory results in aerial navigation have been secured by the use of the power-driven gas bag. While in many directions there have been great improvements on the balloons of former times, hydrogen gas generated by means of iron and sulphuric acid is still used to fill them, as it has been almost from the beginning of ballooning. A few attempts to use hot air have been made, but it is so inferior to the hydrogen that its use has never become general. The hydrogen gas, because of its extremely low gravity, the ease with which it can be produced and its cheapness, stands without a rival. It is so absolutely without competition in this field that there seems not the slightest probability of its ever being displaced. The efforts of those who are working on the problems of aerial navigation have been directed therefore not to discovering a substitute for it, but to evolving cheaper and more convenient methods for its production.

The method commonly employed consists in treating iron shavings with sulphuric acid. The increasing use of hydrogen in airships and, even more, its use in certain industrial processes, such as welding, have drawn the attention of various investigators to the problem of improving this process, and several excellent methods, some of them new, have recently come into use.

In the Russian-Japanese war the Russians produced gas for their balloons by treating aluminum with an alkali. This is a more expensive method than the use of iron and sulphuric acid, but has the advantage that the aluminum is lighter than the iron and that the alkali may be obtained in solid form, and so can be transported and handled much more easily than sulphuric acid. Recently metallic silicon has been substituted for aluminum in this process.

The French transport the hydrogen for their war balloons compressed under a pressure of 185 atmospheres in metal cylinders and have found this plan very satisfactory.

Two new methods make use of solids which, when brought in contact with water, generate hydrogen gas. One of these, manufactured in this country, is an alloy of lead and sodium. The reaction of metallic sodium when brought into contact with water is well known to even the most superficial student of chemistry. Hydrogen is evolved and caustic soda is formed. The object of using the lead sodium alloy is to obtain a material which is less violently reactive than the sodium alone, for even a small amount of moisture may cause it to react with explosive violence. The lead sodium alloy may be more easily and safely handled and is a convenient means of generating hydrogen.

Another material which is used in somewhat the same way is calcium hydride. This compound is formed by passing hydrogen over heated metallic calcium and is a solid similar in nature to calcium carbide. By treating it with water hydrogen may be generated just as acetylene is generated from calcium carbide. One pound of calcium hydride is capable of producing 17 cu. ft. of hydrogen gas, and when it is realized that 1 lb. of iron and 2 lb. of ordinary commercial sulphuric acid produce only 6¼ cu. ft. of gas, the immense superiority of calcium hydride will be apparent at once. The product is, however, so high priced that it is not practical for the ordinary investigator of the problems of aerial navigation. The old iron and sulphuric acid method is still the

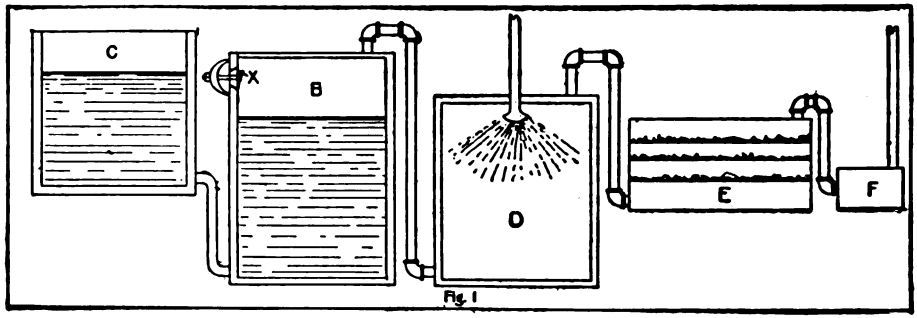



Fig. 1

Details of Apparatus for Generating Gas

best available, and it behooves him to understand it thoroughly.

Since hydrogen is the lightest of all gases, it follows that the purer the hydrogen, the more suitable it is for filling balloons. Air is 13 times as heavy as hydrogen; carbon dioxide, 22 times as heavy; hydrogen sulphide, 16 times; sulphur dioxide, 32 times. All these gases may occur in the hydrogen produced by the use of iron and sulphuric acid. When a very pure hydrogen is required, as in the case of André's balloon or Wellman's airship, great precautions are taken to remove all these impurities as well as the water and sulphuric acid which may be carried along with the gas mechanically. The accompanying sketch shows an apparatus which was designed for André:

C, (Fig. 1) is a lead lined mixing tank, where the 60 degree Bé acid is added to sufficient water to reduce the gravity to 16 degree Bé. The acid is then run into the generator, B, into which the iron is introduced through the valve X. A stop cock should be attached to the base of the generator, B, for the purpose of removing the sludge. The gas passes from the generator to the washing chamber, D, where it is thoroughly washed by fine sprays of water. It then passes through the chamber, E, which contains trays of chemicals for removing the residual impurities. Finally it goes to the testing chamber, F, where its actual purity is tested before it is passed on into the balloon.

The apparatus used by Wellman is similar. The gas is thoroughly washed and is passed through a cylinder filled with caustic soda, which removes acid and carbon dioxide. It is afterwards dried, tested and perfumed, the latter being an important precaution to aid in the prompt discovery of leaks, since hydrogen itself is odorless.

For filling ordinary balloons or airships such precautions are unnecessary. A simple apparatus such as is shown in the accompanying sketch (Fig. 2) will produce a gas quite satisfactory for the purpose. A is an ordinary 50-gal. barrel, having a pipe, B, connecting it with the lime tank, C. A should have an opening in the head through which the iron and acid may be introduced and which admits of being tightly closed by a bung or valve. It also has an outlet, O, near the bottom, for the removal of sludge and exhausted acid liquor. C is another barrel partially filled with milk of lime. This will remove acid and carbon dioxide. The removal of the acid from the gas is very important, as otherwise it may injure the envelope of the balloon. C has a flexible connection, H, which may be ordinary hose, through which the purified gas passes to the bag. The iron should be scraps or shavings, not large chunks nor fine powder. The ordinary 60 degree commercial sulphuric acid may be used, but should be diluted to 16 degree. This may be done by adding it to about 3¾ times its own weight of water. Add the acid to the water slowly, with constant stirring. *Do not add the water to the acid,* as that pro-

cedure has a tendency to reduce the surplus population.

For a bag of a capacity of 5,000 cu. ft., approximately 900 lb. of iron and 1,800 lb. of 60 per cent acid will be required. The actual operation of generating the gas is quite simple. It consists merely in filling the generator barrel about one-third full of iron, adding dilute acid to within about 1 ft. of the top and immediately closing the opening tightly; the gas then passes through the pipe to C, and after being purified by passing through the lime water is introduced into the balloon through the flexible tube H. Several generators should be ready, and as fast as one is exhausted it should be disconnected and a new one connected and put into operation. The exhausted generator should now be emptied of

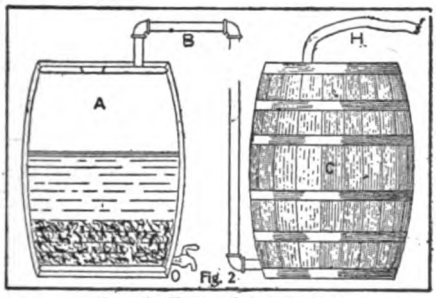


Fig. 2

Simple Type of Apparatus

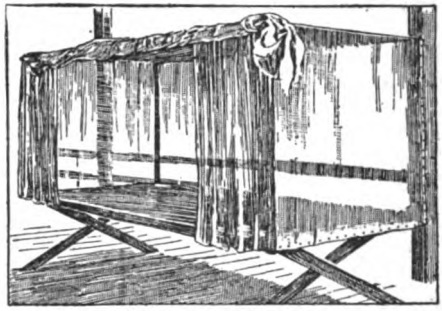
the acid liquor and sludge through the outlet O, and then refilled with acid, this process being repeated until all of the iron has been used up. Of course, as many generators may be used simultaneously as the operator desires in order to hasten the filling of the bag.

There are many more expensive forms of apparatus for this purpose, but the one here described will be found quite effective and very cheap. The barrels should be of hardwood and tight. All the connections should be close and the bung which closes the inlet and the generator should be accurately fitted.

Remember that hydrogen gas mixed with air is violently explosive and do not allow a light or a fire of any sort near the generator or gas pipe.

## COT COVERED WITH MOSQUITO NETTING

In the summer time when the nights are hot it is pleasant to sleep in the

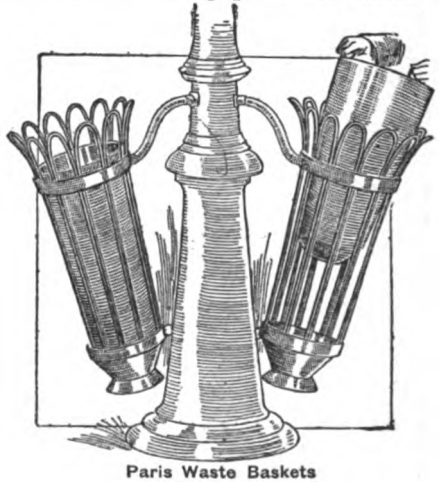


Covering for Outdoor Cots

open, providing that some protection is arranged to keep mosquitoes and other insects and bugs at a distance. A folding bed cot, fitted with a simple frame about 3 ft. high and covered with cheese cloth or mosquito netting makes sleep possible on the hottest of nights.

## STREET BASKETS FOR WASTE

One of the many sanitary and street-cleaning devices of Paris is the waste paper and refuse basket shown in this illustration. Lamp posts were utilized

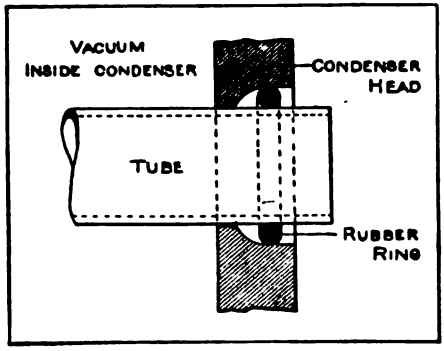


Paris Waste Baskets

for standards and to these were fastened steel baskets or racks which hold removable galvanized-iron refuse cans.

## A Method of Packing Condenser Tubes

The customary method of expanding tubes in the condenser heads always means delay in the renewal of defective tubes. A much simpler plan is the application of rubber rings into conical recessed holes in the heads for getting




Rubber Insulation Saves Trouble

tight joints, as shown in the accompanying sketch. This joint also allows a free expansion of the tube, says Practical Engineer, and the rubber insulation interrupts all the destructive galvanic currents usually giving rise to many of the troubles with condenser tubes.

Further, as without exception surface condensers require a thorough cleaning of the cooling surface, inside as well as outside the tube, it is a comparatively easy operation to remove and insert tubes with this style of packing.

## Care of Large Bearings

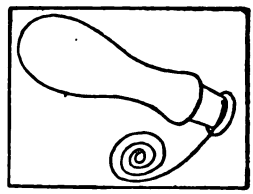
When babbitt attains a certain degree of heat it expands very quickly, and the first thing to do is to slack up on the cap-bolts (and quarter-boxes, if there are any); but if it is a very large box, it is not sufficient to slack up on the cap-bolts, as the weight of the cap still bears on the shaft and will cause considerable friction and prevent the cooling of the shaft. Some large boxes are provided with screws for the purpose of raising the cap, but if not, a small wedge made of 1- by ⅛-in. flat iron, about 2 in. long, must be driven under the cap on both sides. Then apply a liberal supply of good cylinder-oil that will stand high temperature before it will burn, says a correspondent of Power. What the babbitt needs is room to expand in, and plenty of good lubrication that will prevent it from becoming worse and gradually cool it. If the bearing has been lubricated with grease, do not use oil. Slack up as before and apply more grease.

After the box has been very hot the cap should be removed at the earliest opportunity and all the oil grooves cleaned out, or else it will give trouble soon again. Never molest a box that is running all right, just to see if the grooves are in good order, as the chances are it will heat up the next day.

Run all the oil out of the cups just before shutting down on Saturday and fill them with kerosene, allowing it to run down through the bearing and wash out all grit that may have accumulated. The best oil is none too good for a bearing. While filtered oil is used many times, it is usually only half filtered and the bearings suffer in consequence. While it may keep them running cool, it cannot preserve them as well as if new oil were used.

## Ferrule for a Wood Handle

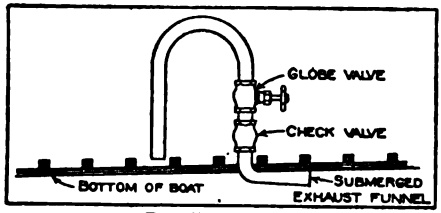
The accompanying sketch shows how to make a small size ferrule for wood handles. The handle is turned with a small rim on the end and a flat surface adjacent to the rim. A small hole is made in the flat surface in which to insert the end of a wire. Broom wire may be used for making the ferrule. One end of the wire is inserted in the small hole to hold it while wrapping the flat surface full of coils. When full, solder the coils together and a ferrule will be had that fits the wood tightly.



# SHOP NOTES

## Automatic Bilge Pump for Boats

This device consists of a submerged exhaust funnel fitted to the planking aft and under the flat stern. A check valve, globe valve and a bent half-circle of pipe, as shown in the sketch, com-



Details of Pump

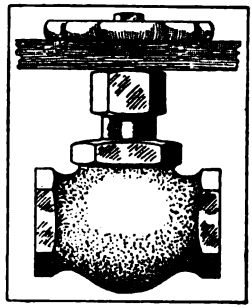
plete the novel pump. When speeding the bow rises up causing the bilge water to run aft to where the pipe is fitted, the suction of the water rushing by the funnel draws the air out of the bent elbow of the pipe and starts the water flowing from the inside out just as a siphon works. As long as there is water covering the inside end of this pipe and the boat is running to produce a suction, the water simply leaks in, runs aft and is siphoned out again automatically. When the boat stops the "pump" stops. —C. G. Davis, in Motor Boat.

## An Angle Iron Settee

The supports of this settee are made from 1-in. angle iron bent in the proper shape, as shown in the sketch. The wooden strips forming the seat are ⅞ by 1¼ in., and fastened to the angle iron supports with common stove bolts. The braces for the supports are made from ½-in. round iron. Three pieces are used between each support. The ends of the angle iron at the bottom should be turned to form a surface that will prevent its settling in the ground.

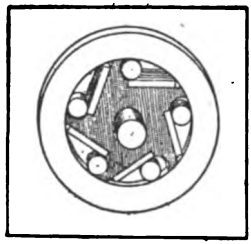
## Turning a Damaged Packing Nut into Place

When a packing nut on a globe valve becomes damaged so that the threads will not follow their course, place a piece of wood between the hand wheel and the nut, as shown in the sketch, and turn both at once. This will greatly assist in turning the nut down to its proper place.—Contributed by Henry H. Brand, Silver Creek, N. Y.



## An Indestructible Ratchet for Wave Motors

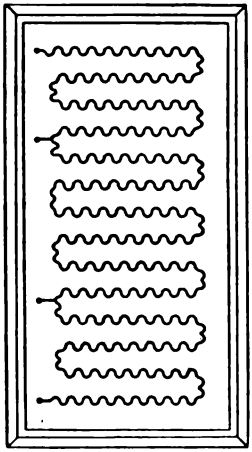
The accompanying illustration shows the construction of a ratchet that is practically indestructible. It consists of a serrated segment with hardened steel plates and solid rolled steel rollers, one of which is always in action on the right-hand side. Gravity keeps the roller in the wedge-shaped place, momentarily locking the device. When worn, new plates can be placed in. This style of a ratchet has been used suc-



cessfully on large wave motors. When used on wrenches, small springs will keep the rollers in the wedge-shaped opening and in a locking position.

### Repairing a Rheostat

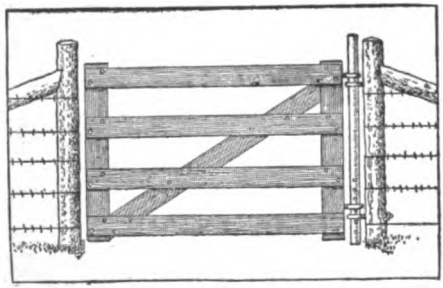
During the operation of a machine propelled by an electric motor one of



the rheostat plates burned out, says a correspondent of Practical Engineer. As it was necessary to have the machine in operation as soon as possible he could not wait for a new plate to come from the factory. A hardwood board was secured, 1 in. thick, 11 in. wide and 26 in. long, and covered with asbestos. A german silver wire was placed on the board, as shown in the sketch, and this board put in the place of the plate burned out. This repair has given good results for more than six months.

### A Gate for Snow Banks

The drifting of snow about fences will cause trouble in opening gates when the snow becomes packed. A gate that may be used under these circumstances is hung on hinges made from eye-bolts. One pair of eye-bolts

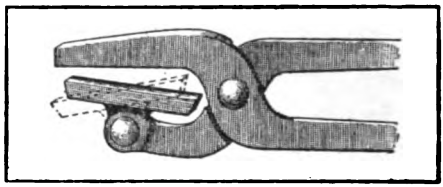


Will Swing Clear of Snow Banks

are fastened to the gate and the other to the post. An old shaft or gas pipe is fitted to the eyes of the bolts as shown in the sketch. Holes are drilled at intervals in the bottom of the shaft or pipe in which to insert pins. The whole gate may be lifted to such a height that it will swing clear of a snow bank. A pin is inserted beneath the lower eye-bolt of the gate when the right height is attained.

### Tongs for Wedge-Shaped Iron

The accompanying sketch shows the construction of tongs to hold wedge-shaped metal. One of the jaws is made with a hinge joint in the middle so it will tilt either way, says a correspondent



For Handling Wedges of Iron

of Blacksmith and Wheelwright. These tongs will hold either end of a wedge.

### Steady Power from a Windmill

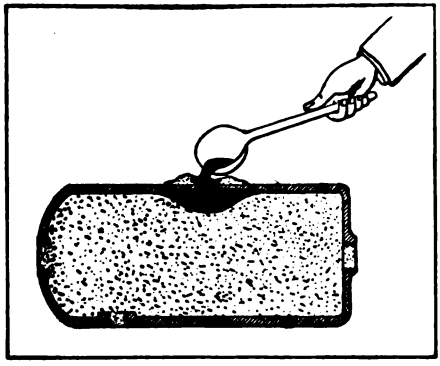
The windmill is used but very little for purposes other than pumping water. This is on account of the unsteady power. Here is a description of a device showing how in one instance this disadvantage was overcome. The rod that connects the pump to the pitman on the mill was removed and replaced with a shorter rod to connect with an air pump. The air pump that was used has a 3-in. bore and the stroke of the pitman is 6 in. The wheel of the mill is 12 ft. in diameter. This arrangement pumps air into a battery of 25 tanks, such as are used for hot water boilers, to a pressure of 150 lb. A safety valve is used and set to release at the above pressure. An ordinary steam engine of 2-in. bore and 3-in.

stroke is used, the air passing through a very hot pipe before entering the engine. This causes the air to expand and prevents freezing which is caused by the moisture in the air. An air-tight swivel joint is provided under the mill to allow the wheel to adjust itself as the wind changes direction. This gives plenty of power to run a lathe and has seldom failed to pump the tanks to full pressure every day.—Contributed by L. G. Stepzinski, Peoria, Ill.

### How to Repair a Broken Lubricator Cup

When casting lubricator cups sometimes they are made thin on one side, due to the shifting of the core when pouring the metal. This was the case of a cup which caused a burst, making quite a large opening from which ran cracks up and down the cylinder, says Power.

The repair was made by plugging up the cup full of clay and a cavity made by digging out some of the clay behind all of the weak and injured portion, taking the clay out through the opening. A ladleful of melted babbitt was poured into this cavity, forming a button over the fracture inside the cup. The gate was cut off with a hacksaw and the cup smoothed up with a file,

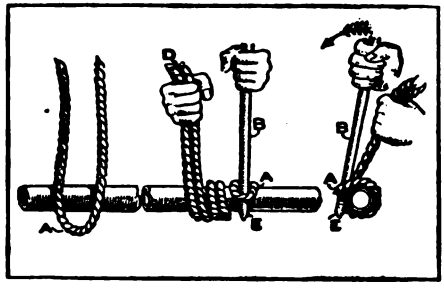


Pouring the Babbitt

the clay removed and the cup put in place. The lubricator works as good as a new one.

### How to Turn a Pipe Without a Wrench

A piece of rope makes a good substitute for a pipe wrench if used as shown in the accompanying sketch. Double the rope and form a loop, A, in the middle and wind it around the pipe




Will Not Crush the Pipe

a couple of turns, pass a bar or piece of pipe, B, through the loop with its end, E, against the pipe as shown.

Hold the end, D, of the rope taut and push the handle end of the bar in the direction as shown by the arrow. This will tighten the rope and make it grip the pipe which will turn in the direction the bar is pushed. Slack up on the bar and rope and bring them back again to the first position for another grip. Repeat the operation until the pipe is turned out or in. This device will turn a pipe as well as a pipe wrench and will not crush the pipe.

### How to Make a Hole in Glass

Cover the glass with clay or putty for a few inches around the place where the hole is wanted. With a pencil or small stick make a hole in the clay or putty the size of the hole required. Pour this hole full of melted lead. The hot lead will go through the glass and duplicate the hole in the clay.—W. O. H.

When opening up a boiler in which kerosene has been used, never use lights in or near it until the interior has been thoroughly aired out.

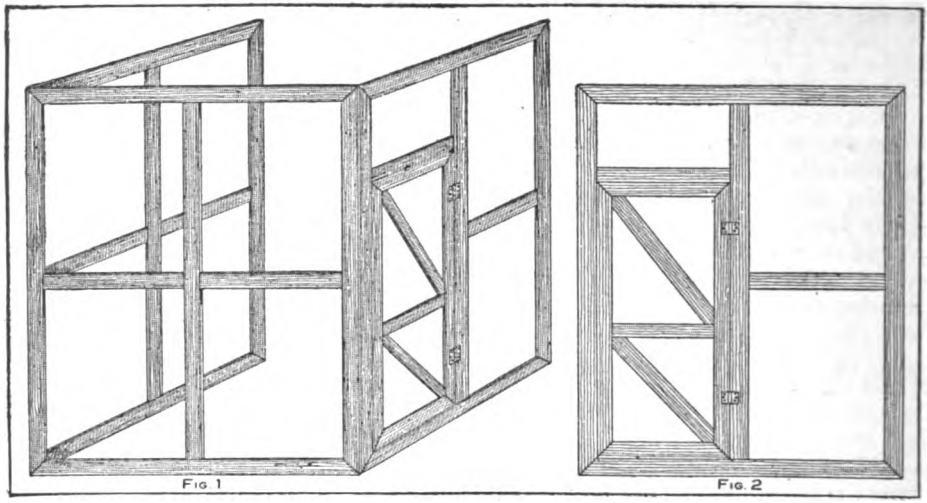


FIG. 1 FIG. 2

## How to Make a Storm Entrance

Where a door side of the house is exposed to the wind, a storm door or entrance is a very necessary adjunct during the winter months. The object of this article is to show how to build a storm door or entrance enclosure from cloth. This is an easy thing to make and presents a very good appearance when finished and painted.

The frame consists of 2 by ⅞-in. white pine surface on one side. The lumber can be ordered from any planing mill. Fig. 1 shows the general arrangement of the frame. The height is made to fit neatly between the porch floor and the ceiling as are also the two sides. The joints are mitred at the corners and nailed with finishing nails. The middle piece is cut to fit neatly and toenailed in place. The back and the sides are screwed to the floor with wood screws that pass through the frame. This allows the frame to be readily put up for the winter and taken down in the spring. Fig. 2 shows the construction of the door section. The door is made 30 in. wide by 6 ft. high and swings outside on a pair of hinges. A knob is used on the outside of the door for opening. A spring pulls the door and holds it shut. A wooden turn latch locks the door from the inside.

The plan view, Fig. 3, shows how the corners are screwed together and how the sides are fastened to the house with wood screws.

The entire outside is covered with heavy unbleached muslin and is fastened to the frame with tacks. The muslin comes a yard wide and must have lapped seams which are sewed the entire length. The cloth is tacked all around the outside and over the cross pieces. The cloth is then given two coats of paint and tinted the same as the house. This storm door or entrance is nice and light inside, is easily put up and taken down and presents a neat appearance when finished.

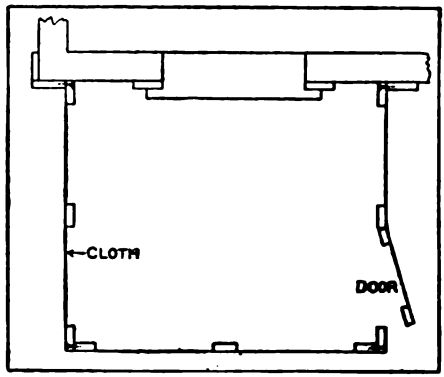


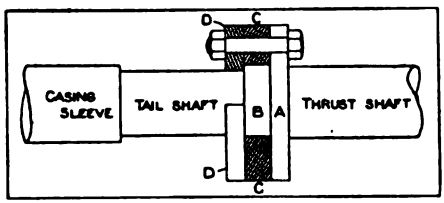

Fig. 3—Storm Door

## A New Keyless Loose Coupling

By Capt. A. B. Willits

The accompanying illustration shows the construction of a novel loose coupling for use in small steamers and launches where the withdrawal of the tail shaft having a solid flange coupling usually necessitates the removal of the engine machinery. The peculiarity of this coupling lies in its being keyless.

A portion, B, of the forward end of the tail shaft is turned to a larger diameter than the shaft (not to exceed the diameter of the tail shaft casing or journal at stem bearing), and out of center as much as will give all the eccentricity possible with such increased diameter without quite fairing it at any part of the circumferenec with the tail-shaft surface. The loose coupling, C, is turned to an outside diameter exactly equal to that of the solid coupling, A, of the crankshaft, and is then bored



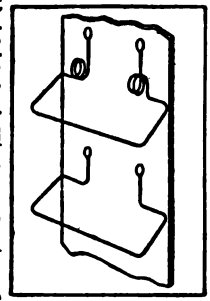

Details of a Coupling

eccentrically to the exact amount and with the same diameter as the eccentric portion B.

Center lines are permanently scribed on the forward end of the tail shaft and on the loose coupling disc before eccentric turning and boring are done, the new centers being in these lines in both cases. This permits the ready adjustment of the coupling disc, C, on the eccentric, B, without disturbing the alignment of tail and thrust shaft when bolted up, and with the disc C snugly and properly in place the coupling bolt holes are drilled and reamed out true and fitted with bolts. Two half discs, D, are fitted snugly to the tail shaft diameter, facing against the lips of the eccentric B and the loose coupling, and holding the shaft from pulling out when backing. These also prevent the tail shaft from turning on its axis around the axis of the eccentric, and these half discs, therefore, must be fitted up and bolted as accurately as are the couplings. To draw out the tail shaft all that is necessary is to remove the coupling bolts from the half discs.

## How to Keep Elevator Legs Clean

The accompanying illustration shows the manner of making and applying to elevator belts the best device for keeping clean elevator legging that is inclined to become foul from moisture and accumulated dust, says the American Miller. The wire is so bent as to make it barely touch the leg on all sides. Two styles may be used, either with a coil or straight springs, as shown in the sketch. They are fastened to the belts with elevator bolts. The wire should be about No. 9 in size.



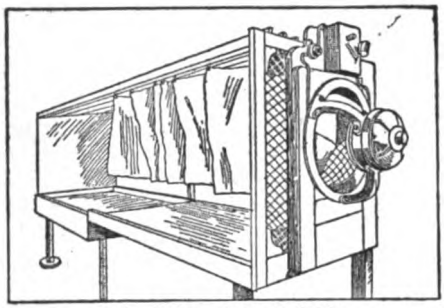
## Treatment of Fading Blueprints

If it is found that blueprints from a certain lot of paper are apt to fade in sunlight or even in a strong light without being in direct sunlight, the following remedy is recommended by the American Machinist:

Expose the prints until badly burned and then wash in clear water until all the emulsion is removed. While still wet lay print with the blue side up on a smooth surface and by means of a paint brush cover the print smoothly with peroxide of hydrogen. This will bring out the background very blue and the lines perfectly white, and make a print that will not fade to any extent in the sunshine.

### Drying Blueprints with an Electric Fan

A quick way to dry blueprints is by the use of an electrically operated propeller fan, as shown in the accompanying illustration. The fan is mounted in



Dries Blueprints Quickly

one end of a long frame, in which the blueprints are hung up ready to dry. It would ordinarily require several hours for the prints to dry out by themselves, but with the aid of the propeller fan the air may be circulated around the prints so rapidly that they will be dried in a small fraction of that time, says Popular Electricity. As shown in the sketch, the fan is mounted in a circular opening in the end of the frame. The motor is attached directly to the shaft of the fan.

### Making Hay Caps

Make the cap of the size to suit, but large enough to cover a shock of wheat or oats, from 8-oz. duck. Get good cloth, muslin, if you cannot use duck; make the holes and buttonhole-stitch them for the tying cords; then paint with waterproofing material. The best and the cheapest, as well as the most easily applied, material is a mixture of paraffin dissolved in gasoline. Apply this solution to the cloth with a whitewash brush, and keep it well away from the fire. The gasoline will evaporate, and the paraffin will coat the cloth and make it waterproof. Get paraffin with high-melting point. Such a hay cap is very inflammable, and must be kept away from sparks or flame.

If the cloth is white and it is desirable to keep it white, and the expense is not considered, it might be well to paint with a mixture of sugar of lead and alum, in the proportion of 1 lb. of sugar lead to 5 lb. of alum, dissolved in 7 gal. of water. In either case repaint each spring.

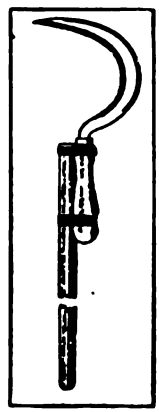
It is best to thoroughly dry them out before putting away for the winter, says the Country Gentleman. The trouble is that most people will not properly care for the caps when through using them. They may seem rather dry, and there is no time to waste, so they are chucked away damp, and soon mildew, mold and spoil.

### How to Find Small Leaks in Pneumatic Tires

A small leak in an inner tube is often hard to locate, more so at night. Place an incandescent electric light in the bottom of the water tub and the slightest bubble will show up plainly. It is a general supposition that the light will explode if placed under water, but it will not. Try it. I have used this method for several years.—Contributed by E. W. Smith, St. Catharines, Ont.

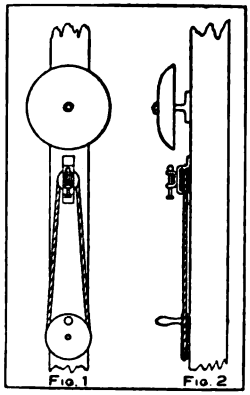
### Extension Handle for a Sickle

Grass or weeds that are too high to be cut with a lawn mower must either be cut with a scythe or hand sickle. If a scythe is not at hand the sickle will cause a backache if used for any length of time. The handle of the sickle should be lengthened, as shown in the sketch, and it can be used without stooping. The handle of the sickle is cut with a slight hollow to allow a broom handle to fit it nicely. The two handles are then bound tightly together.—Contributed by S. R. Speirs, St. Louis, Mo.



### Gong for Sounding Working Hours

In a certain machine shop an electric gong had been used to sound the working hours. The occasional renewal of the batteries prompted one of the men to construct a bell-ringing device which he made in spare time from odds and ends. Two grooved pulleys of different diameters were suitably fastened to a post, on which the gong was attached and connected by a belt of sash cord. Rotating with the upper and smaller pulley is a fork in which slides the bar having the bell hammer on one end. This pulley is so set that when it revolves centrifugal force throws the ball out far enough to just nicely strike the gong. A vigorous turn of the handle on the larger pulley causes the gong to ring with no uncertain sound. Fig. 1 shows the front and Fig. 2 the side view.—Contributed by Donald A. Hampson, Middletown, N. Y.




### Steel Belting

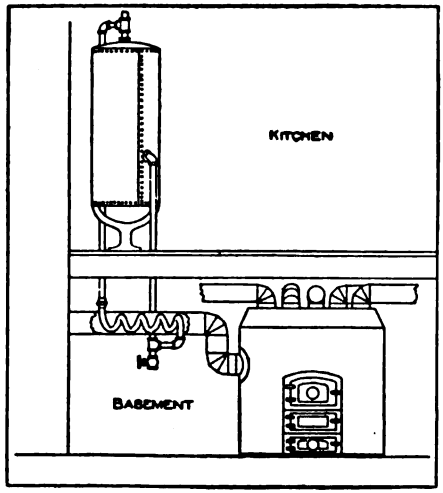
The transmission of power with the use of steel bands has proven practicable after a number of tests. A much narrower belt can be used, one-sixth of the width of the usual leather band being sufficient. The steel band is not so heavy as the usual leather band, and, as it can be very tightly adjusted, the distance between the engine and the machine is not a matter of importance, as in the case with the leather belting, where the transmission of power is dependent upon the weight of the hanging belt. The slipping is much reduced and experiments show that this does not exceed one-tenth of one per cent. Owing to the lightness of the steel belting, the influence of the centrifugal force is not so great and allows of a much increased velocity.

### Utilizing Waste Heat in a Furnace Flue

Last winter an auxiliary hot water heater in conjunction with a hot air furnace was put in operation in a residence which demonstrated that the efficiency of the old type of house heating furnace could be materially increased, and the coal bill thereby reduced. As the latter seems to be the chief object of the maker, a description of the plan may not come amiss for many that own furnaces.

This heater not only gives something for nothing by using a waste product, but makes possible the warming up of exposed rooms, halls, etc. Also, when gas stoves are used for cooking, and have no water back, connections can be made to the house service boiler, furnishing an ample supply of hot water at all times.

The sketch shows the device installed for use in connection with a range boiler. A ¾-in. brass pipe (which is easily bent) is coiled and placed in the smoke flue of the furnace and connected to the water supply and the radiators or hot water boiler, or both. In this




Connected with a Range Boiler

case it is used for hot water supply only, as a gas range is used for cooking.

The smoke pipe is short and only 7 in. in diameter and the coil takes up a large part of its cross sectional area. As the draft is strong this loss of area does not prevent satisfactory operation.

When the furnace is started in the early morning and before new coal is supplied, the outgoing gases in the smoke pipe easily reach 300 to 400 deg. heat. At this time the water in the heating system is at its lowest temperature and can best absorb this waste heat and utilize it.

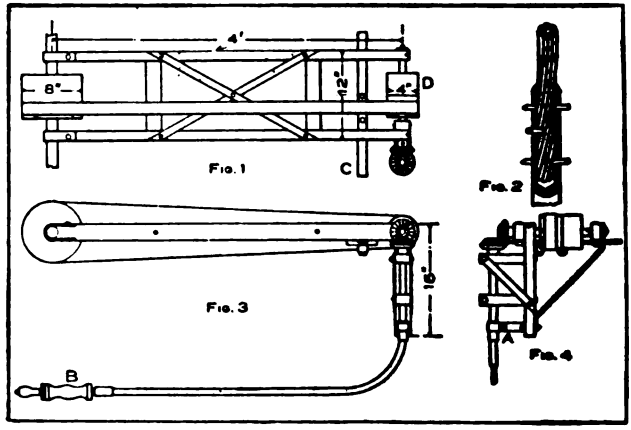
It must be remembered that the coil should be placed between the furnace and the check damper, as the cold air admitted by this damper will decrease the heat absorbing capacity of the coil.

## Home-Made Flexible Shaft Boring Machine

The frame of this machine is made of 2 by 1½-in. well seasoned beech and is fastened together with 3-in. screws. The side pieces are about 4 ft. long and braced in the center of the frame with two pieces of 1-in. band iron. One end of the frame is mounted on the main shaft, while the other is held parallel with the ceiling by means of hooks.

The shafting is ¾ in. and runs in babbitt metal bearings. The gears were taken from an old reaper. A piece of ½-in. steel cable containing seven strands of nineteen wires each was used for the flexible shaft. The method of fastening the ends is shown in Fig. 2. A ½-in. hole was drilled 3 in. deep into the end of the gear shaft and one end of the cable put into it and held with three pins. When using wire nails for pins they can be driven through the cable without drilling which will expand the end of the cable and make it fit the hole tightly. Holes must be drilled through the shaft to take the pins. The pins are then cut off outside the shaft and smoothed down level.

The cable was covered with a piece of ½-in. rubber hose and fastened with a clip, A, Fig. 4, to keep it from turning. The handle, B, Fig. 3, is made of wood, and each end is fitted with bearings taken from the crank hanger of an old bicycle. A piece of ¾-in. shafting runs through the handle, B, and the other end of the cable is fastened into this in the same manner as shown in Fig. 2. A chuck taken from an old brace was fastened to the other end of the shaft in the handle. The slide, C as shown in Fig. 1, is used to shift the belt to the loose pulley, D, when the machine is not in use. The device may be used on either side of the main shaft by unhooking and swinging the frame under the shaft.




May Be Used on Either Side of Main Shaft

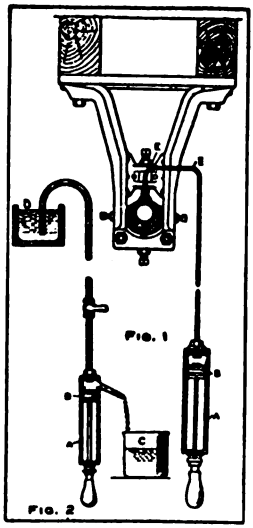
## Grounding Fence Wires

Two-thirds of the heavy loss of stock caused by lightning comes from the wire fence. The remedy for this is easily applied and may be done on a wet day or at a time when other work is not pressing. Cut galvanized No. 12 wire in 8-ft. lengths. Place one of these wires on a post about every 64 ft. apart and staple good and solid to every fence wire and the post. The

upper end of the wire should project a little above the post, while the lower end should extend into the ground about 3 ft. A hole may be made for grounding this wire by using an end-gate rod and pushing it into the ground.

### Oiler for Overhead Bearings

The accompanying sketch shows a device for oiling overhead bearings. It consists of a cylinder, A, Fig. 1, about 2½ in. inside diameter and 12 in. long, provided with a piston, B. To the opposite end of the cylinder is connected a small pipe with its end bent in the form of a hook, EE. To operate, the piston is pushed to the end of the stroke, the bent pipe is immersed in a vessel of oil and the piston is drawn back, drawing the oil into the cylinder. The end of the pipe can then be inserted in the oil hole of the bearing, the piston pushed up and the oil forced out onto the shaft.

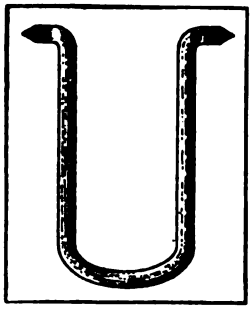



Where drip pans are used, the oil may be drawn from them by this same device, says a correspondent of Power. The oil is drawn from the drip pan D, Fig. 2, in the same manner as filling the oiler, with the exception that the oil runs out as through a siphon after the first suction of the piston B, running through a side outlet into a receiving tank, C.

A new vitrified protector is used for anchor bolts to prevent destruction of the enclosed bolts by electrolysis, and also prevents the escape of electricity through columns to bolts and thence to water mains, etc.

### Cleaning the Threads of a Chuck or Face Plate

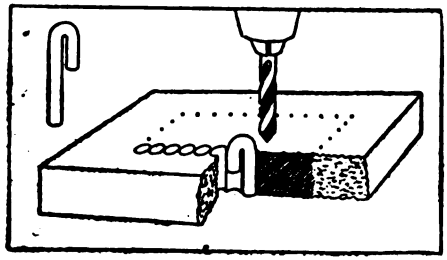
The accompanying sketch shows a handy tool for cleaning the chips and dirt from the threads of a chuck or face plate of a lathe or milling machine before turning them on the spindle. The tool can also be used for cleaning nuts or any internal thread.



This tool, as illustrated, is U-shaped, being made from ¼-in. steel rod with ends or points flattened and ground the shape of a thread with 60-deg. angle. The points are then case-hardened. The tool will spring to suit different sizes if the length is about 4 in.—Contributed by George Long, New York City.

### How to Drill Holes Close Together

The accompanying sketch shows a simple device for drilling holes close together. Take a piece of steel wire the same size as the drill and bend one end over, as shown. Lay out the work and drill two holes to make a start. Put the long end of the wire in the last hole and the short end in the next one to it, says a correspondent of American Machinist. Allow the drill to follow down beside the wire pin, and when the holes are all drilled you will have them all connected and the piece drops out without any trouble or broken

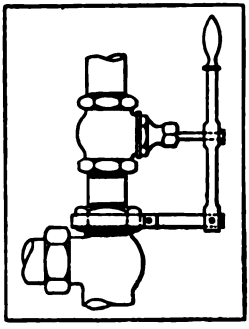


Drilling Close to Another Hole

drills. This will be of special interest to die makers.

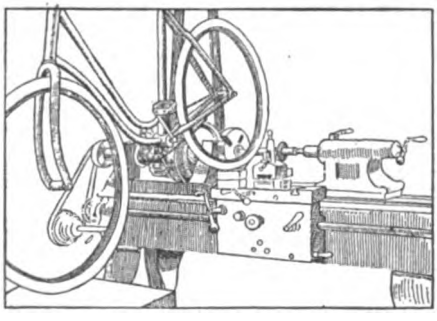
### Utilizing a Worn Valve

The threads on the valve stem of a globe valve used with an injector became worn and the valve was made to do service in the following manner: The threads were filed smooth with the rest of the stem and a lever fitted to the stem as shown in the sketch. All that was necessary to operate the valve, says Power, was to pull the handle.



### A Kink on Jointing Slotting Cutters

In a small job shop we use a good many slotting saws in a common lathe for different kinds of work. Not having any cutter grinder the saws were placed on an arbor and the arbor put in the centers of a lathe which were set loosely so the arbor would turn quite freely. The rear wheel of a bicycle is then placed on the arbor as shown in the illustration. When the bicycle wheel is turned by the cranks the arbor will spin very fast. While turning, the tool post, with a piece of emery whetstone previously clamped in, is fed up to the cutter and all the teeth joined the same length. After the saw has been jointed it can be taken to a common emery grinder and, with a little care, be ground up in good shape.—Contributed by Harry C. Foster, Connersville, Ind.

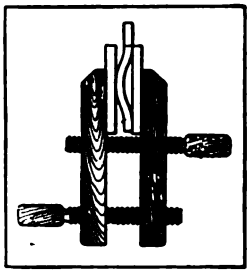


Jointing Slotting Cutters

The average velocity of chimney gases is 600 ft. per minute.

### Storage Battery Troubles and Their Remedies

Sulphating is caused by overdischarging a battery and allowing it to stand in that condition, or letting the battery stand without being overdischarged, but with the electrolyte too strong. The remedy is to remove by scraping the plates and then charging at a low voltage for a long period, says Practical Engineer. In this way, by fully charging and only partially discharging, the sulphating is eliminated. Sulphating can also be removed by adding a small quantity of sodium sulphate, which decomposes and dissolves the sulphate.



Buckling is caused by an unequal expansion of the plates, which is due to the sulphate lodging on the plates, thus preventing action from taking place at that point and by excessive charging. If the plates are not badly buckled they can be placed between two boards and with a little pressure applied, as shown in the sketch, they can be straightened out.

Disintegration is caused by sulphating and buckling, which forms scale on the plates, thus reducing the capacity of the cell. The positive plate suffers from this disease more than the negative, and as the positive plates are expensive the operator must be very careful to prevent this action. To avoid disintegration, do not allow the battery plates to

become sulphated or buckled, and attend to all trouble at once.

Short circuits are caused by sediment forming at the bottom of the cell. Raise the plates and place them on glass or wood separators; in small cells the clearance is generally 1 in. and in large cells about 6 in.

### Improving the Compression of a Gasoline Engine

When the piston rings and the walls of the cylinder become worn, open the crank case and sprinkle about one tablespoonful of flake graphite in the front end of the cylinder. Repeat this application once every two weeks and you will find that the graphite will fill in the low or worn places, which will bring the compression up to normal again.—Contributed by W. O. Hay, Camden, S. C.

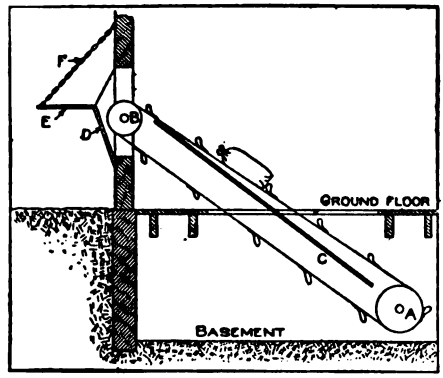
### Sack Carrier and Loader

A cheap and easily constructed sack carrier and loader for carrying screenings and other stuff out of the basement of a mill to the ground floor and for loading sacks on the delivery wagon can be made from an old belt and a few pulleys.

The drive pulley, A, is on the shaft of a jack and is thrown in gear by pulling a rope hung in the most convenient place on the ground floor. This rope is attached to a lever in the basement that straddles the shaft on which pulley, A, is attached and bears against a collar on the shaft. A spring placed between the bearing and a collar on the end of the shaft is used for the release. When the rope is slackened the spring pulls the shaft out of gear. In this manner the sack loader is thrown in or out of gear instantly.

The driven pulley, or the return for the belt, is shown at B. If a wide belt is used and there is no wide pulley of small diameter at hand, use two small pulleys together.

The lugs are made by attaching to the belt pieces 8 or 10 in. long cut from an old 6-in. belt and doubled, allowing them to roll up. They are fastened by



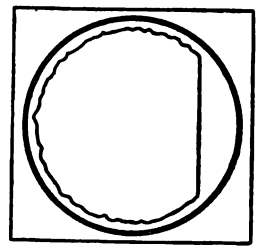
Handy for Mills

means of elevator bolts with the nuts on the top side. The roll will fall back over the nuts and prevent them from tearing or touching the sacks. A hardwood board, C, is placed in such a manner that the upper end is nearly flush with the face of the pulley, B, and the lower end points to the center of pulley A. This will allow the weight of the bags to act as a tightener on the belt by sagging it down, says American Miller. This takes up any slack in the belt and prevents slipping.

A hopper, D, is built on the outside of the building; the lid of the hopper, E, is thrown down and held by chains, F. The lid of the hopper, E, forms the top when closed.

### A Kink for the Painter

When using mixed paints that come put up in round pails, cut the thin cover in the shape shown in the sketch. The straight edge thus formed will make a place to remove the surplus paint from the brush, also will prevent the paint from running down the outside of the can.—Contributed by Clare A. Poland, Atchison, Kans.



## How to Produce Gold Color on Brass

Condensed Article From the Brass World

A gold color may be obtained upon small brass articles by a simple dip that is used so frequently for imparting a steel blue color to brass or other metal goods. The dip is made as follows:

Water .....1 gal.
Sugar of Lead (Acetate of Lead).....4 oz.
Hyposulphite of Soda (Hypo).....4 oz.

Improved by Dipping

The sugar of lead is dissolved in the water previously heated nearly to boiling, and then the hyposulphite of soda is added. The solution turns a milky color from the precipitated hyposulphite of lead, but it should not be filtered out.

In order to get the best results the solution should be heated to a temperature of about 200 deg. F., or just short of boiling. It deteriorates very rapidly when actually boiled and turns black. When immediately made, the white precipitate in the solution is fine and adheres to the articles being colored, but after heating for five or ten minutes, it collects in clots and settles to the bottom. It is then that the best results are obtained in coloring brass. After some time the solution does not work as rapidly and finally a new one must be made. A large quantity of work can be passed through, however, without deteriorating it, as the color is a mere film.

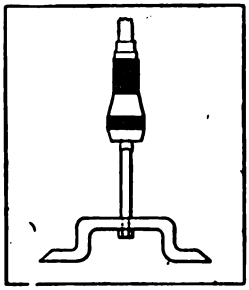
The brass to be colored should be cleaned in the usual manner and may be polished or dipped. It makes no difference about the result. The articles are immersed in the hot solution (nearly boiling) and carefully watched. It takes a few seconds for the first shade of color to appear and it is then very light. Soon a darker yellow forms and then a brownish-gold shade is produced. The articles are removed as soon as the desired color is reached and should not under any circumstances be allowed to remain, as the shade rapidly darkens until the surface becomes purple. As the different tints form slowly it is not a difficult operation to obtain the desired color. By allowing the articles to remain in the solution for a longer time, a purple, blue and finally steel-black color can be produced.

When the desired shade has been obtained on the articles they should at once be removed, rinsed in cold water, then in hot water and dried in sawdust. They are then lacquered. The lacquering is quite necessary, as the gold-colored film on the surface of the metal will fade in time if not thus protected.

The colors that are produced in this manner are not so rich as the gold, to be sure, but answer the purpose on cheap work. The brownish shade, which appears just before the purple color begins to form, is quite rich and is very pleasing. The general application of this solution has been for the production of the blue color to imitate blued steel, and for such a purpose it is only necessary to allow the articles to remain in the solution for a longer time.

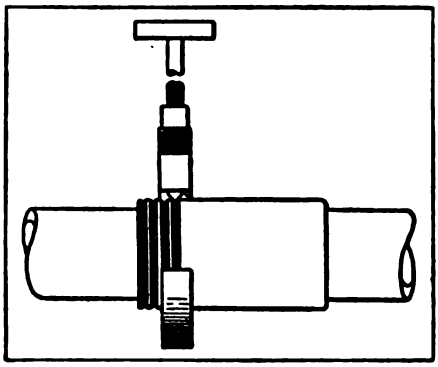
### How to Make an Old Gasket Cutter

A device for removing such old gaskets as may stick to the water leg of a water tube boiler is shown in the accompanying sketch. The cutter can be made from a piece of steel or an old file, says Power. The steel is bent as shown and made as long as the diameter of the hole in the water leg. One will be surprised at the good work this device will do when used with a bitstock.



### How to Repair a Leaking Pipe Coupling

To avoid the expense for coupling or other material and to save time, which is always limited when pressure is on a leaky pipe, the following method has been used in a number of cases and has held permanently, says a correspondent of Practical Engineer. The coupling is swaged on the pipe about the threads, which is done with an ordinary pipe cutter of the hand-power type. The cutter should be placed as near the end of the coupling as will work



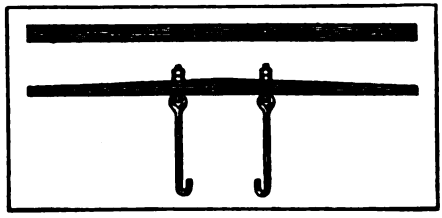
Saves Time and Expense

satisfactorily and operated the same as in cutting pipe until the cutter has run to a depth of perhaps $\frac{1}{16}$ in. About three or four different positions as near each other as possible will generally crimp or swage the coupling to a tight fitting joint.

The objection to this method is generally advanced that it weakens the joint by cutting the coupling, but when the amount of metal still left is compared with that left in the pipe at the base of the thread the danger as will be seen is slight.

### How to Make a Jack Carrier

In many shops jacks are used quite frequently, and to truck them over rails and around blockings is in many instances quite impossible. A jack carrier constructed as shown in the sketch makes it quite convenient for two persons to carry a jack to the place desired.



Handy Jack Carrier

The carrier consists of a piece of wood $2\frac{1}{2}$ in. wide and $2\frac{1}{4}$ in. thick in the middle and tapering toward the ends, making them $1\frac{1}{4}$ in. thick. Two hooks are made from $\frac{1}{2}$-in. round iron and fitted with an eye on their upper ends. These hooks should be 12 in. long after the hook and eye is formed. Each hook is attached to the wood handle with an eye bolt as shown. The holes for the eye bolts should be bored through the wood handle each at an equal distance from the center to make them $12\frac{1}{2}$ in. apart.

### The Use of Gasoline

Keep a glass-stoppered bottle full of gasoline for use in cleaning and sterilizing instruments, as it will absolutely destroy any animal immersed in it from a microbe to an elephant, says a corre-

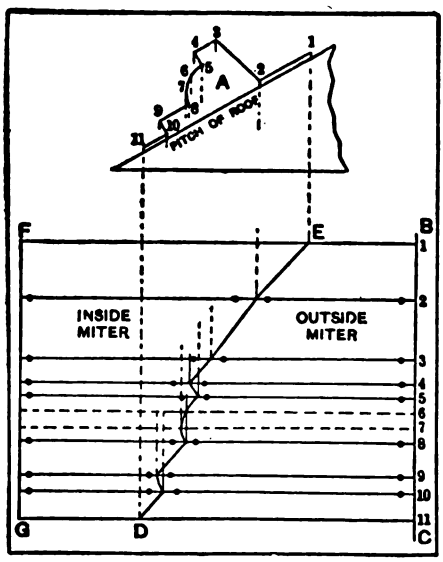
spondent of the Pacific Dental Gazette. By the use of gasoline steel instruments may be kept bright and free from rust. Gasoline is cheap, ready for instant use at all times, and gives one a sense of security in its use that is a constant source of joy.

When operating in particularly unsavory months, never let an instrument touch the bracket until it is dipped in gasoline and polished with a dry towel.

Gasoline will clean your oil stones, wash basin, machinery, linoleum, woodwork, light your office, do your furnace and blowpipe work, vulcanize, cook your meals and carry you to and from your office in a trice.

## How to Draw a Miter for Gutter Molding

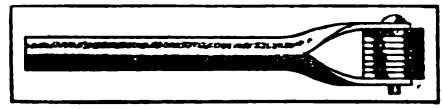
The accompanying sketch shows a method of drawing an inside and outside miter for a gutter molding without the use of a plan. Let A represent the profile of the gutter mold, placed upon the proper pitch of the roof, as shown. Divide the mold A into equal spaces, says the Metal Worker, and place its girth upon the vertical line BC, through which horizontal lines are drawn and intersected by vertical lines dropped from similar numbered points in the mold A. A line traced through points thus obtained, as shown by DE, will be the miter cut, and EBCD will be the outside miter cut and EDGF the inside miter cut.




Method of Drawing Miter

## Home-Made Grindstone Dresser

Procure a piece of ½-in. gas pipe about 2 ft. long and split one end down about 4 in. Bend the sides out in the



shape of a fork and drill a ¼-in. hole through the ends, which are flattened. Use a ¼-in. bolt for a pin and put enough washers on the pin between the forks to loosely fill the space. By holding the washers diagonal with the surface of the stone and reversing them occasionally, a stone of any kind can be dressed in a few minutes. By letting the washers roll parallel with the stone they will finish the surface smooth.

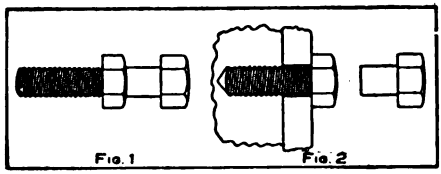
## How to Prevent Rust on Automobile Rims

If the wheel rim is painted with a mixture of shellac and finely pulverized flake graphite, mixed to a stiff paste, rust on wheel rims with its attendant bad effects upon tires may be largely eliminated or entirely eradicated, says Motor Age. After treating the rims as indicated above, it will be found that they are very even and a waterproof film of great smoothness is formed. The graphite is absolutely inert and there need be no apprehension regarding the detrimental effect on the rubber. If the whole inner shoe is painted with a mixture of graphite and shellac, there will be little tendency for the tube to stick.

Tar coated water pipes must be covered with shellac before being painted, else they will show tar stains.

### Substitute Cap Screw

When a cap screw is needed for repairs in small shops one is cut from stock, or a stud bolt is used with a nut. An ordinary carriage or machine bolt

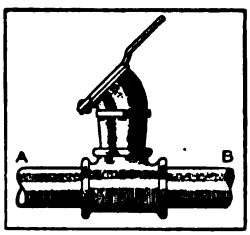


Details of Cap Screw

may be used by turning the nut on backwards and jamming it as far back as possible, as shown in Fig. 1. Screw the bolt in place by turning with the bolt head and then saw the remaining part off flush with the nut as shown in Fig. 2. This will make a neat and lasting job as the nut cannot work loose. —Contributed by W. O. Hay, Camden, South Carolina.

### A Cut-Out for Under Water Exhaust

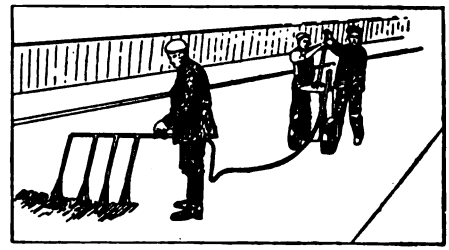
In order to do away with the noise from my boat engine I fitted an under water exhaust. The direct piping from the cylinder to the water was not entirely satisfactory at first, as the water, which backed up into the exhaust pipe when the engine was not running, caused a back pressure that rendered the starting of the engine impossible until the pressure was released. This made considerable cranking necessary before it was safe to cut in the switch. To remedy this it was necessary to have some arrangement so that the exhaust could be turned into the open air when starting the engine and return it under water after sufficient speed had been attained. When looking around the shop for something suitable to make a valve cut-out I found an old molasses gate.




This was attached in a tee, as shown in the sketch. The exhaust pipe going under water is shown at A and that from the engine at B. No boat on the lake runs as quietly as this one supplied with this arrangement.—Contributed by E. W. Ripley, Brandon, Vt.

### Laying Tar with a Giant Air Brush

When roads are tarred they are free from dust, but this makes it unpleasant for the motorist when the tar is wet. The accompanying illustration shows a giant air brush in operation which lays the liquid tar on the surface very even. This makes a thin coat of tar that dries


Lays a Thin Coat of Tar

quickly and the usual uneven and thick places on which the wheel of a car may slide do not occur.

### Pounding Prevented in Steam Pipes on Railroads

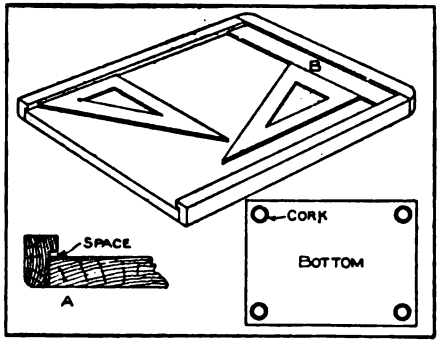
The annoying noise from pounding of steam pipes can be easily overcome by attaching a ¼-in. check valve to the pipe or radiator, setting it so that air will be admitted to the pipes but not to release any pressure. Either horizontal or vertical check valves may be used.

A vacuum in the pipes is caused by turning hot steam into cold pipes, and the result is condensation and the water-hammer or pounding. The check valve relieves this by admitting air. When once installed the device works automatically and does not require any attention.—Contributed by Frank Will, Oakland, Calif.

A horizontal engine will require more oil than a vertical one of the same size.

## How to Make a Field Sketching Board

Cut a piece of ⅝-in. straight grained pine board 10⅛ by 15⅛ in. and make it perfectly square. Fasten a piece of pine on two sides and one end of the board as shown in the sketch. This piece of pine is rabbeted a trifle wider than the



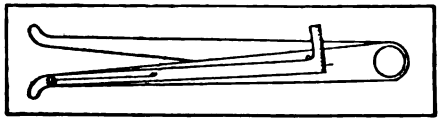

Field Sketching Board

board is thick, as shown in the end view at A, allowing a small space between the board and the rabbet edge. Both outside and inside edges of this strip must be made straight for the T-square and triangle.

If the board is to be used for patent office drawings, it will be found handy to have a piece of old T-square, B, fitted into the closed end of the board. The space on the drawing paper under this piece of T-square is the space reserved for patent office drawing sheets. Four corks or pieces of felt are fitted to the bottom of the board as shown. Paper clips may be used to hold the piece of T-square, B, and the drawing paper. The paper or bristol board is slipped into the space left between the board and the edge of the rabbet and held in place with thumb tacks.

## An Attachment for Inside Calipers

Many times in difficult places it is impossible to find the largest diameter of a hole with common inside calipers. The device shown in the sketch is simple, accurate and easily constructed for use in finding the largest diameters of holes. The foot is cut from one side of an ordinary inside caliper and the



For Finding Diameters of Holes

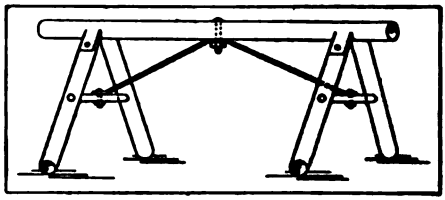
graduated arm with a foot, as shown, is pivoted in its place. A very light spring is soldered to the head of the rivet or screw and its extending length pressing against a pin located on the arm keeps the arm at zero on the scale. The graduations mean nothing more than marks to note the position of the arm while making the measurement.

The main object of this device is that the spring will cause the attached arm to find the largest diameter of the hole and will not measure to one side.

The graduations may be made to suit the operator. A test indicator could be clamped to one leg of the caliper with the same result.

## How to Make a Gas Pipe Trestle

Procure a piece of pipe about 5 ft. long and 1½ in. in diameter and saw two cuts across the seam of the pipe about 6 in. from each end, using a hack saw to do the work, says the American Blacksmith. The cuts should be about three-quarters of the way through the pipe and 1¼ in. apart. The pipe is now



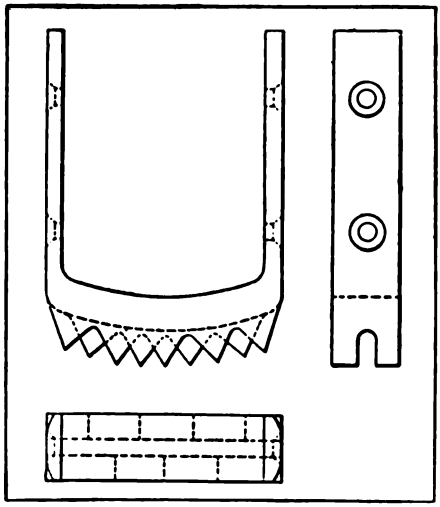
Made of Gas Pipe

opened between these cuts at the seam and the two lips bent back in the same angle at which the legs are to stand. Secure four pieces of 1¼-in. pipe 2½ ft. long for the legs. Drill a small hole in one end of each piece and rivet them to

the lips of the other pipe with rivets to fit the holes drilled. A cross piece made from 1-in. pipe is fastened to each pair of legs at a point about half way and a brace fastened with each end to the middle of each cross piece with rivets, as shown. This brace is also bolted to the middle and under side of the top pipe.

### How to Prevent Ladders from Slipping

The bottom of machine shop ladders often slip on the wooden floor on account of so much grease. A correspondent of the American Machinist devised a foot as shown in the illustration which has been quite successful. It is



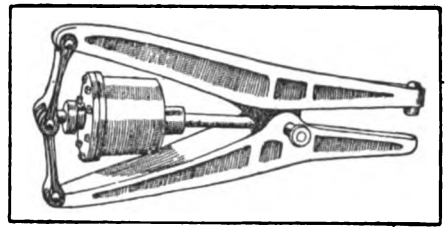
Keeps Ladder from Slipping

made from malleable iron and is inexpensive. The one shown is for a ladder 3 in. wide at the foot and has 10 staggered teeth on the bottom about ¾-in. centers. It is fastened to the ladder with ordinary wood screws, and adds almost nothing to the weight.

Spilled mercury may be collected by rolling a piece of tin foil tightly to the size of the lead in a pencil and touching the end to the scattered globules. When as much mercury is gathered as the tin foil will hold, squeeze the amount collected into a suitable receptacle.

### How to Make a Pneumatic Riveter

The accompanying sketch shows the construction of a riveter using an old steam cylinder for the power. Two large and heavy castings are made with

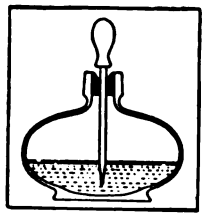


Construction of Riveter

a hinge joint about two-thirds the length of the arms and connected on the long ends with a toggle joint. When steam or compressed air is applied to the cylinder the piston pulls the toggle joint almost straight, which causes the riveting end of the arms to close on the heated rivet.

### Handy Soldering Acid Bottle

Procure a low and wide bottle, a common glass alcohol lamp such as



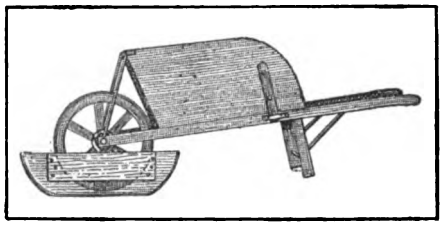
jewelers use is the best, and fit into the neck a hard rubber bushing. Cut a hole in the bushing to a size that will accommodate a common medicine dropper or fountain pen filler. Supply the bottle with a dropper or filler, as shown, and you will have an ideal acid bottle. The hole in the bushing should be cut out larger in the top similar to a funnel.—J. E. Ganaway.

Old tape may be made "sticky" by applying a little heat.

A soft carbon brush that sparks may sometimes be cured by raising it to a red heat and then plunging into a bath of ordinary lubricating oil.

## A Wheelbarrow Runner for Winter Use

Secure a board as thick as the wheel of the wheelbarrow, about 6 in. wide and 3 ft. long. Round each end of the board in the shape of a sled runner.

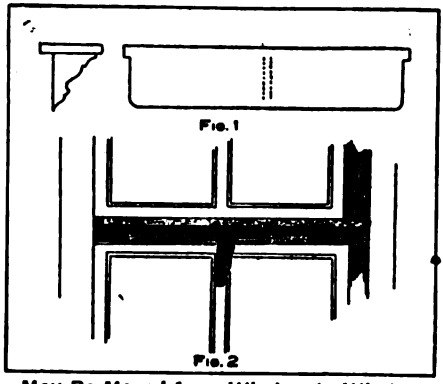


Runs Over Snow Easily

Cut an arc of a circle in the top and middle of the board with a radius the same as that of the wheelbarrow wheel, leaving 1 in. of the material between the periphery and the bottom edge of the board. Place the wheel in the part cut out and nail a cleat on each side as shown in the sketch. Cover the under edge and rounded ends of the board with a piece of old tire iron.

## Home-Made Window Shelf for Plants

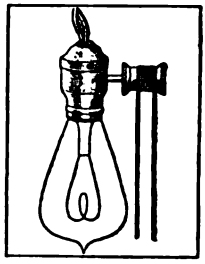
When a few plants are kept about the house during the winter months it is necessary to provide a stand or shelf near or in a window in order to give them proper light for growing. The accompanying sketch shows how to make a shelf that may be changed from one window to another as desired. A 1-in. board is cut as shown in Fig. 1 with a projection on each end to fit into the sash grooves and a bracket fastened on the under side. If the shelf is to be used on a two-light window, one bracket placed in the center to rest on the middle piece of the sash, as shown in Fig. 2, is all that will be necessary. When used on a single-glass sash, one bracket at each end of the shelf will be needed.




May Be Moved from Window to Window

## Operating Switch for High Electric Lamps

Electric globes are sometimes placed so high that they are not easily reached by hand. Turning on and off the current may be effected by an arrangement as shown in the sketch. Remove the hard rubber thumb piece on the lamp socket and supply a common spool in its place. Fasten a strong cord with extending ends to the spool, giving each end a few turns around the spool in opposite directions. Pulling one string will turn the current on, and pulling the other will turn the light out.



## Home-Made Packing

A company owning a starch plant considered the boiler and engine room as a necessary evil, and never purchased manhole gaskets or packing. Muslin was used to strain the starch, and when the cloths became too old and sour they were turned over to the engineer for use as packing. They were torn in strips and a braid made about 1½ in. wide. The braids were then saturated in cylinder oil and put in place, and as the steam was raised, the manhole cover was drawn up tight. This packing seldom gave out.

Old hose which had been used for transferring starch was used for packing pumps and engines, says a cor-

respondent of Power. They were split and laid flat on a board and gaskets cut out the size wanted with different sizes of pipe ground on the outside edge on one end and using a mallet on the other end. These gaskets were soaked in oil before using and served the purpose very well.

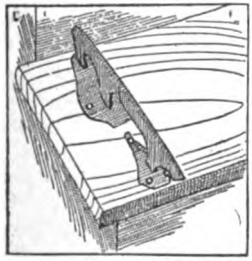
### How to Measure Gasoline Supply

Secure a glass tube about ¼ in. in diameter with a ⅛-in. hole and 2 in. longer than your tank is deep. This tube may be purchased from your druggist. Put the glass tube down into the tank and place your finger over the top, then withdrawing the tube, all the gasoline that entered the hole is held there by atmospheric pressure, showing immediately the depth of the liquid in the tank, says Motor Age. When the finger is removed, the gasoline runs out.

Two small leather loops placed on the under side of the seat over the tank in an automobile will provide a safe place to carry the glass tube.

### Home-Made Boot Scraper

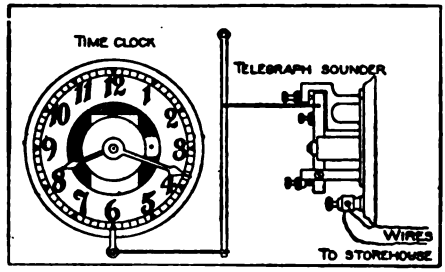
The accompanying illustration shows a boot and shoe scraper made from the blade and top of an old ice skate. The clamps are removed and the skate turned bottom side up and placed on the end of a step as shown. The skate is held fast with wood screws put through the rivet holes and turned into the wood of the step.—Contributed by Jas. E. Noble, Toronto, Canada.



Headaches caused by handling nitroglycerine may be remedied by drinking strong, black coffee, and the application of cold wet bandages to the neck and forehead.

### Timing and Numbering Ice Blocks Stored

When putting up ice it is desirable to know the number of ice blocks stored during the day. The accompanying sketch shows the construction

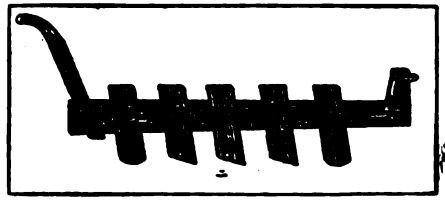



Records Ice Storage

of a device made from a watchman's old time-clock and a telegraph sounder, for recording ice blocks stored. When a block of ice goes into the vault the automatic door will close the circuit by means of a simple switch, and the telegraph sounder will pull the punching mechanism of the clock. The dial or drum of the clock will tell the exact number and time of each block stored. This arrangement can be connected to any kind of ice storage plant.—Contributed by E. C. O'Neil, Clarksville, Texas.

### How to Make an Ice Plow

Secure the cutter bar from an old grass mower; the bar will be about 5 or 6 ft. long. Remove the guards and space off places on the bar for the cutters. Drill holes for ½-in. bolts, drilling them so they will be at an angle with the bar and so the front edge of each cutter will rest against the top, and back edge against the bottom bolt,



For Plowing Ice

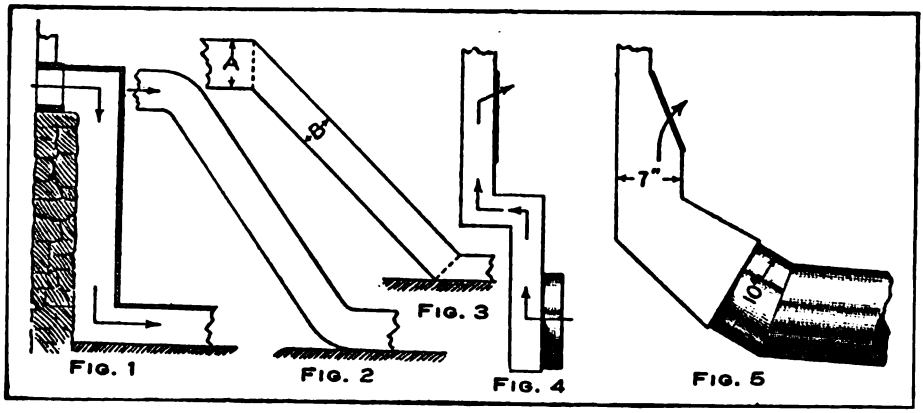
as shown in the sketch. This will prevent the lower or cutting end of the cutters from pushing back when at work. Drill holes in pieces of metal used for clamps to match the holes drilled in the bar. Use old agricultural seat springs for the cutters. The front and back pieces are not to be cutters and must be made rounded on their lower ends for runners. Each cutter is clamped to the bar with its cutting point about ½ in. lower than the point of the runner or cutter next in front. A handle attached to the rear and a clevis fastened on the front completes the plow. Two bars and sets of cutters placed about 16 in. apart and held with cross bars clamped or riveted together makes a double plow that will work more satisfactorily than the single bar cutter.

### Eliminating Friction in Hot-Air Pipes

The importance of enabling air to travel in a natural way from out of doors clear through a furnace system to the registers was once thoroughly realized by all men engaged in furnace heating, but there seems to be quite a majority of men who do furnace work at the present time who have never realized that this is important. To look at the cold air supply duct as arranged in most buildings, made of rough boards of different thicknesses, with little attempt to make the joints airtight and invariably without attempt to make the turns easy for the air, as shown in Fig. 1, is to be convinced that there is a necessity for change of method to improve services. One important authority is positive that it is as essential to make easy turns by means of round elbows and to preserve a slant or pitch in the cold air pipe as it is to provide them in the hot air piping system, says the Metal Worker, and his idea and common practice are shown in Figs. 2 and 3. The slant is not enough, unless the miter is made at the right place, so that the dimension at A will be preserved at B and not reduced again as it turns toward the furnace.

In the work of the expert mentioned the curved elbow is used at the inlet window, and the pipe, whether round or square, instead of dropping down vertically, passes off from the round elbow with a slant toward the furnace, and at the bottom the turn toward it is again made by means of a curve, so that the air can naturally fall, slide or tumble along the cold air duct until the heaviest air naturally falls to the lowest point and reaches the hot firepot of the furnace.

Here is the first impetus for an upward movement, and the pipes should be taken from the top of the furnace in such a way as to enable the rising warm air to flow naturally from the furnace through outlets and facilitate




Curves Should Be Used Instead of Square Turns

its movement in the leader pipe and not as shown in Fig. 4. After it flows along the leader pipes to the different registers and rises in the smooth round pipe in which is a pitch of at least 1 in. to the foot, the connections with the registers and risers should never be abruptly made, even when the pipe ends in the floor register box. The air current should also find a curved sheet to gently turn it upward through the register. If the pipe is to connect with the riser, equally great care should be taken to provide a curve, and in the best work the riser will be of the same size and shape as the horizontal leader in the cellar. One of the greatest evils in the furnace trade has come from the use of thin, wide, hot-air risers in partitions.

However, the method of connecting the horizontal pipe in the cellar with the riser is of greater importance than is generally considered. By all means they should be made to provide as few turns as possible at this point, and the change of the shape from the natural round pipe to the unnatural riser should be made so as to reduce to the minimum the disadvantages attending the change, as indicated in Fig. 5.

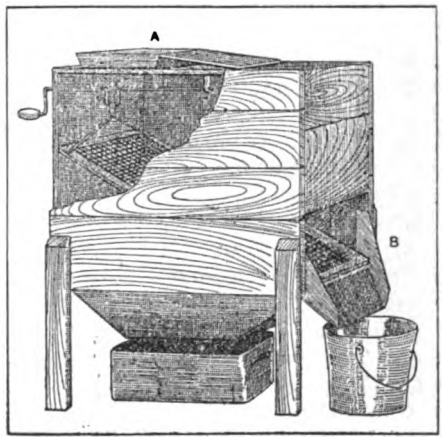
### Waxing a Steel Shovel for Shoveling Snow

During last winter there came a deep snow, and we had nothing to use for cleaning the walks except a pressed steel shovel. The snow would not slip from the shovel without a hard jerk on the shovel handle. This tired me and I began to think of a remedy, which resulted in taking the shovel and heating it with hot coals from the fire. When hot I applied a wax candle to the surface, covering it all over. The snow then would readily slip from the shovel.—Contributed by Henry Bisbing, Trenton, N. J.

**When opening up a boiler be careful that there is neither pressure nor vacuum in it. Do not rely on the steam gauge; open the gauge cocks.**

### Home-Made Ash Sifter

The attendant of a large furnace found it necessary to sift the ashes and as he only had a hand sifter, which made considerable dust, he decided to make a sifter, which resulted in constructing one as shown in the sketch. A box 1 ft. wide, 1½ ft. high and 2½ ft. long was secured and a hole 1 ft. square cut in the top at A. A small hopper about 3 in. high with a lid covered this opening. The bottom of the box was removed and a hole made in the end at B about 6 in. wide across the box. A chute made from an old lard can was fastened in this opening as shown. A frame 11 in. wide, 2 ft. 9 in. long was made, covered with ½-in. mesh wire and hinged to the edge of the box at B on each side of the opening. An old curtain rod was bent to form a crank on the end and one in the middle and fitted to the top of the box as shown, for the purpose of shaking the frame covered with the wire screen. The bottom of the box was formed into the shape of a hopper and the whole device set on four legs high enough to place a box beneath the lower hopper and a pail under the end of the screen.

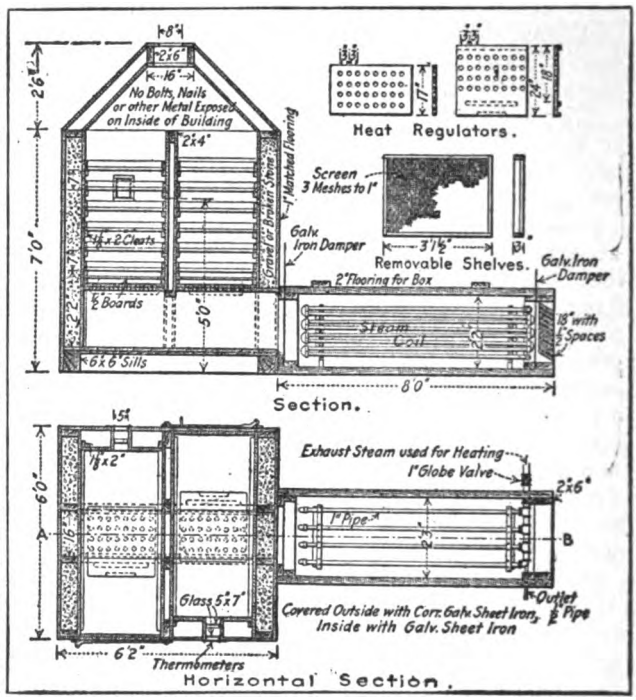


Handy Ash Sifter

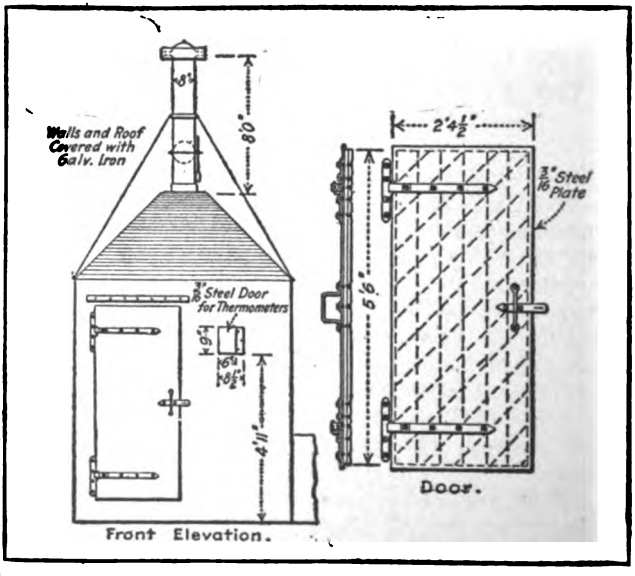
A cheap paint can be made from a solution of borax and water mixed with linseed oil.

# HOW TO MAKE A THAW HOUSE FOR DYNAMITE

The design of a thaw house shown in the accompanying cuts was suggested in a discussion of this subject and an experimental thaw house was built and tested at Aetna, Indiana, says Engineering News. The house is about 5 by 5 ft. inside, and is divided for convenience into two compartments for storing the material to be thawed, and a separate compartment for heating the air. The space to be used for the dynamite is so arranged as not to allow room for a man to enter, requiring the attendant to remain outside the building while handling the trays, thus avoiding the danger of overturning a lamp in the building. The air is heated by passing over the steam coils, and a positive circulation is secured by the stack, which has an effective height of about 15 ft. The quantity of air admitted to each compartment is regulated by dampers with circular holes in the bottom of the thaw house, and the draft is regulated by the damper in the stack.




**Details of Thaw House**




The trays containing the dynamite to be thawed are staggered on their supports, presenting a series of baffles; these prevent the air from short circuiting, and force it to come in contact with all the trays. The house is covered with galvanized iron to protect it against creeping fires in grass or underbrush. The $\frac{3}{16}$-in. steel plate over the door and the

gravel filling between the walls form protection from stray bullets. Gravel is preferable to sand for filling, as the heat tends to shrink the wood on the inside, giving rise to cracks through which the sand escapes.

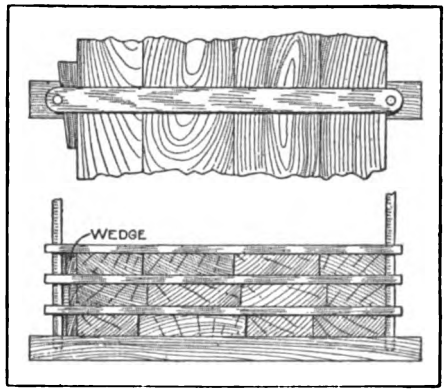
Thermometers placed inside the house, but so arranged that they can be read from the outside, allow the attendant to keep the temperature under control. A temperature of 80 deg. F. is considered desirable for thawing the dynamite. Good grades of gelatin dynamite may safely be thawed at higher temperatures, but with low grades of dynamite the nitroglycerine is liable to separate if heated much above this temperature. The box containing the steam coils is lined inside and outside with galvanized iron to protect it against fire. Where exhaust steam is used, about 70 sq. ft. of heating surface is required to raise the temperature from zero to 80 deg. F. If live steam is to be used it must be run through a reduction valve and the pressure reduced to 2 lb., the temperature at the pressure being about the same as that of exhaust steam. The capacity of the thaw house is 540 lb., and its cost $165.

### How to Prevent a Bolt from Turning

In going over the various points of a car that were showing signs of beginning to rattle, there was found a bolt on a lamp bracket that would not tighten on account of the bolt turning, says a correspondent of the Automobile Dealer and Repairer. The bolt had a conical head with no slit for a screwdriver. The slit was soon supplied by means of a file, and, though the slit would serve the immediate want, it was thought best to make provision for the future. The slit was made quite deep and a piece of copper hammered tightly into it and down along the sides of the slanting head. This copper embedded itself into the wood and proved an effective prevention to turning.

### How to Glue Table Tops

Use a beam 6 in. square and as long as necessary; place holes for holding the pipes as close together as required. The straps that go across between the tops must be a board the same width




Method of Clamping the Table Tops

as the beam and be about $\frac{3}{16}$ in. thick with a hole bored at each end so as to fit over the pipes, says Woodworkers' Review. The pipes are set upright in the beam and wedges are driven between the front piece of pipe and the table tops. The illustration explains the clamping of the table tops in the device. With this simple gluing clamp not much room is required for 50 table tops.

### How to Remove Insulation from Electric Wires

One of the quickest methods to remove insulation from the ends of electric wires is to lay the wire on a solid flat surface and strike the insulation with light blows from a hammer. This will flatten out the insulation and make it come loose, which can then be removed from the wire without much trouble.—Contributed by Edw. E. Harbert, Chicago.

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