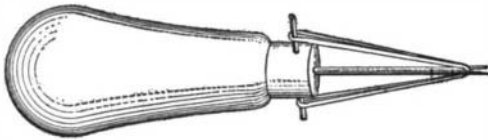




The Editor of Handy Man's Workshop will be glad to receive any hints for this department and pay for them if available.
Christmas Hints for the Handy Man will be published in next week's issue.

HANDY METHOD OF REPAIRING A PUNCTURED TIRE.
 BY GEORGE F. LINKE.

The accompanying sketch shows a handy device for mending punctures in bicycle tires. It consists of a common darning needle of a large size and with a



A TOOL FOR REPAIRING PUNCTURES.

large eye, with its point inserted into a wooden handle. There are two pins also in the handle, projecting from opposite sides, and the top of the needle is cut off, leaving the end of the eye open.

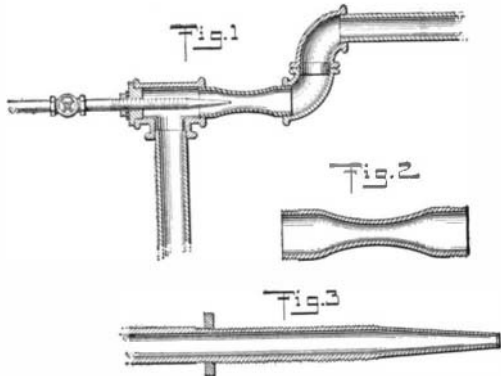
To mend a puncture, stretch elastic rubber bands over the pins and through the slot in the end of the needle as tightly as possible until judgment shows that there is enough rubber to fill the puncture. Then insert needle and rubber through puncture in tire, throw the rubber off the pins and withdraw the needle. The rubber being tightly stretched will contract when released, filling the puncture and leaving a small lump inside and outside of tire. This will wear off outside in a very short time. It is advisable to ream the hole smooth before applying the rubber. This can be done by heating the needle with a match and then searing the edges of the hole.

EJECTOR MADE OUT OF PIPE FITTINGS.
 BY B. A. JOHNS.

A simple ejector may be made out of ordinary pipe fittings, which will compare very favorably with some of the ejectors on the market. It may be used in draining a flooded cellar, in which case it may be attached to the ordinary water faucet for motive agent. It can also be used for emptying cisterns or in excavations for new work where water is struck. (Of course, in this case, steam will be used as motive agent.)

Some time ago I was engaged in building a reservoir, and at a depth of 15 feet a spring of water was struck. Having no means at hand to get the water out of the excavation, I decided to make an ejector out of some old pipe fittings I had in the tool chest. I succeeded in making four that kept the water level down while the work was being done. One of these ejectors worked night and day for nearly three weeks until completely worn out, owing to the fact that a great amount of sand and gravel was carried through.

These ejectors can be duplicated as follows: First take a 1 1/4 x 6-inch nipple; screw on each end of same any kind of fitting so as to preserve the threads. Heat same in the middle to a white heat. Then swedge down until outside diameter is about 3/4 inch. When cold remove the fittings, and the cone is made (see Fig. 2). Now take a 1/2-inch pipe, heat one end to a welding heat, and swedge down to a long point. A



THIS EJECTOR CAN BE USED FOR DRAINING FLOODED CELLARS.

3/16 rod may be inserted in the end to give the hole the right dimension, as it may be drilled out afterward. When cold, thread the pipe about 4 inches and screw on a jam nut (see Fig. 3). On the "rim" of a 1 1/4-inch tee attach the cone above described and then a 1 1/4-inch elbow into which screw a close nipple. On the other end of the nipple screw another elbow, forming a kind of step or stop. To this elbow may be attached either a hose or a pipe to carry off the water. On the opposite end of the tee attach a reducing bush-

ing, into which insert the nozzle shown in Fig. 3. Care should be taken to get the nozzle in perfect alinement with the cone, and when in proper place, screw up the jam nut with some packing behind it, to make it air tight. In the other opening of the tee attach a pipe or a very heavy hose, preferably "ironclad," as the suction will have a tendency to close it up.

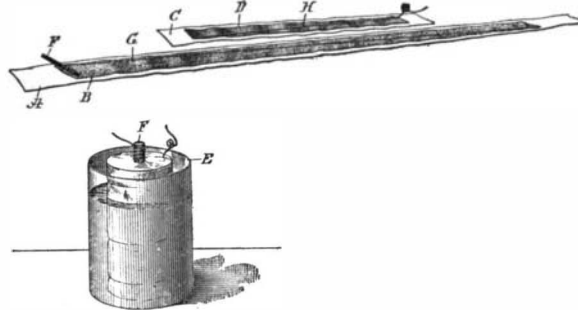
STORAGE BATTERY WITHOUT CHEMICALS.
 BY WALTON HARRISON.

An experimental storage battery, having qualities of interest, and at least remotely suggestive of commercial possibilities, may be constructed at a cost of a few cents, as follows:

Provide four strips A, B, C, D, of thin cloth (calico will answer), the strip A being 20 feet long and 4 inches wide, the strip B 18 feet long and 3 inches wide, the strip C 10 feet long and 4 inches wide, and the one designated as D 9 feet long and 3 inches wide. Procure an ordinary battery jar E of cylindrical form, a pound of commercial flake graphite, a few gum bands, and two pieces of No. 30 bare copper wire, one (G) being 20, and the other (H) 10 feet in length. These parts and materials, together with a carbon rod F of the kind used for arc lighting, comprise everything needed except water and enterprise.

Spread out the strips B and D, shower them liberally with water, and dust the graphite upon them. Then stroke them off with the hand. This will remove all excess of graphite, and leave them shining like strips of new tin plate. A single coating of the graphite upon one face of the cloth is sufficient.

Spread out the strip A, which remains uncoated, and lay the strip B centrally upon it, so as to leave exposed all margins of the strip A, its ends extending equally and in opposite directions beyond the ends of the strip B. Extend the wire G along the strip B from one of its corners to the opposite corner, the wire thus being slightly oblique relatively to the strip, and extending a couple of feet beyond one corner. Next place in position the strip C, which remains uncoated, centering it lengthwise in relation to the other strips, and bringing its longer edges flush with those of the



STORAGE BATTERY WITHOUT CHEMICALS.

strip A. Place the strip D on the strip C, leaving all margins equally matched. Stretch the wire H along the strip D, from one corner to the corner opposite, the wire being slightly oblique to the strip, so as to cross the wire G and leaving a foot of the wire H projecting.

Wind the projecting end (2 feet long) of the wire G tightly around the carbon rod F, and lay the rod squarely across the adjacent end of the strip B, so as to make good contact with the graphite. This will leave a foot of the strip A extending from the rod F. Bend this extending portion back over the rod so as to cover it, and then, using the rod F as a spool, roll it along, pressing it down hard; and thus wind tightly upon it all of the strips and both of the wires, so as to form a hard roll having generally the appearance of a solid white cylinder. Stretch two or three rubber bands around the roll, so as to hold all of its parts rigidly in position. Find the projecting end of the wire G, and leave it exposed. Set the roll into the jar, so that the exposed portion of the wire G and also a portion of the carbon rod F extend upwardly. Now fill the jar with water, preferably submerging the roll to within half an inch of its top.

This completes the battery. In some instances it may be improved by making the strips A C of cloth thicker than that above designated.

The battery may be charged from an ordinary dry cell, by connecting the zinc shell of the dry cell with the carbon rod of the storage battery, and the carbon of the dry cell with the protruding wire of the storage battery. After being thus charged for fifteen or twenty minutes, the storage battery may be disconnected, after which it will yield, for a few minutes at least, a current not differing greatly from that with which it was charged, and adequate to operate a telegraphic sounder or an electric bell. If the energy of the battery be conserved by leaving the circuit open, the charge may last for several days. Like other storage batteries, this one, after being partially exhausted, will recuperate to some extent if the circuit be left open, though of course the total energy it gives out can never exceed that with which it is charged.

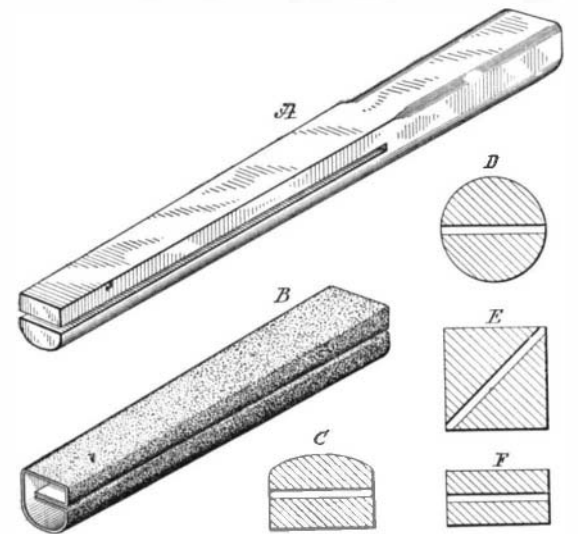
This device is in every sense a true "gas" battery as well as a storage battery. While it is being charg-

ed, the current sent through it disintegrates a portion of the water into its two component gases. The hydrogen, being disengaged throughout the entire length and breadth of the graphite coating carried by the strip B, is simply absorbed or occluded within the pores of the cloth, and thus effectively held as a free gas in a state of captivity. The oxygen, being in part in its allotropic form of ozone, is similarly collected and held in the strip C. The strip A holding the hydrogen, being twice as long as the strip C holding the oxygen, is adapted to hold twice as much gas, thus compensating for the difference in volume between the hydrogen and oxygen. Both gases, being freshly liberated, are in their nascent state and eager to recombine. After the charging is completed, therefore, and a conducting path is established from one of the coated strips to the other, the gases recombine, forming water, and in so doing they generate an electric current flowing in a direction opposite to that of the current previously used for breaking up the water and forming the gases.

It is a fact not generally known that if a quantity of hydrogen and a quantity of oxygen be subjected as nearly as practicable to the same physical conditions, they will present relatively to each other a difference of potential of about a volt and a half.

CONVENIENT HOLDER FOR SANDPAPER.
 BY EDWARD J. TIEDE.

In sandpapering irregular shaped woodwork, the paper is laid over a stick of wood and used practically as a file. For holding the paper I have often used a simple holder for different kinds of work with satisfactory results. The holder consists of a stick, preferably of pine wood, of the required shape and size and tapering slightly toward one end. Into the narrow end saw a slot in the center to about two-thirds its length. Cut off a piece of sandpaper wide enough to go around the stick, allowing a liberal margin to fit into the slot. Fold the paper so it can be slipped



CONVENIENT HOLDER FOR SANDPAPER.

into the slot and around the holder from the end; pull it down until it fits snugly, when it is ready for use. Emery cloth can be used in the same way for polishing parts of machines and the like.

In the drawing the holder is shown at A, and the paper folded ready to apply at B. The sections C to F suggest some shapes that may be used.

THE CONSTRUCTION OF A WORKSHOP.
 BY I. C. BAYLEY.

The interest taken by the boy in a shop that is his very own, particularly if he is allowed to build it himself, will be very manifest, and the good derived, by keeping him off the street, if nothing else, will well repay the small outlay of the first cost.

Fig. 1 shows the inside view of a workshop good enough for any boy, no matter what his station in life may be. The framework was put up by a first-class mechanic, but the furnishings are all home-made, such as any boy will be able to construct. Such a shop as this is hardly necessary for the average young mechanic, the object of the sketch being more to show how a shop can be fitted up inside. The lathe, and also a jig saw, not shown, will be described, in a later number, as will also the bench, drawing table, and other accessories.

A shop about 9 feet by 12 inside dimensions will be ample enough, and if it is made as an addition to the house, but three extra sides will be necessary, or if built in a corner, as is sometimes convenient, then but two extra sides will be needed.

The ground must be leveled, and prepared for the six piers, which can be of concrete, brickwork, or timber. If of timber, let them be 6 to 9 inches square by 2 feet long, buried in the ground about 18 inches. Holes should be dug of suitable depth and the stumps dropped in, care being taken to get them the proper distance apart, 9 feet by 12, out to out, so that the sides of the building, when erected, will be flush, and not have to be cut around the piers, or offset in an

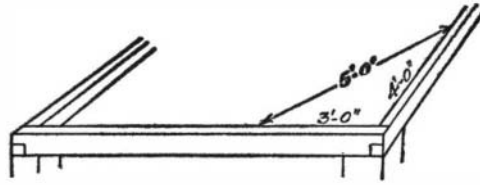
unworkmanlike manner. The first pier can be permanently set by ramming broken bricks and earth into the hole with a piece of heavy timber brought down on end. The remaining piers are leveled up from this one, by means of a builder's level.

Since it is a very important matter that these piers should be true and level with each other, it will be well to make a suitable straight-edge, or leveling board, for this purpose. This can be 12 or 16 feet in length, cut from a 1-inch board, and shaped as shown in the cut. A hand-hole is formed in the center, at the top, and a small shelf, upon which is placed the spirit level, is nailed to one side, immediately below. The leveling edge must be planed very true, while the small shelf on the side must be made exactly parallel with it. Place the level upon the shelf, and, holding the leveling board on the tops of each pair of piers successively, commencing with the permanent one, level them all by raising or lowering them in their respective holes, when they should be permanently set, as was the first.

The wall plates or bottom framing are made from 4 x 6 timber, half jointed at each corner, and secured to each pier with tenpenny nails driven in from either side. The four corner piers being 9 x 12 feet out to

and the door lintel. Rails and door lintel are 2 x 3 inches.

The rafters are made of 2 x 4-inch timber, notched where they rest upon the plates, which are 2 inches by 3. One rafter can be cut to the proper length and notched, using it for a templet, or as a guide for cutting the others. The two end rafters should be secured to the plates first, by driving in tenpenny nails through the sides, as in the case of the floor joists,



Laying out a square corner.

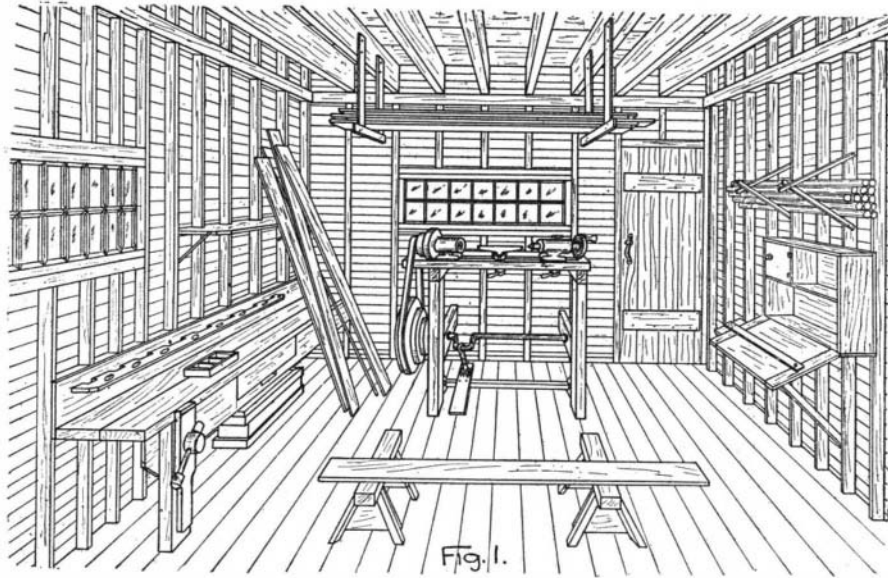
then the others may be evenly spaced from end to end, about 2 feet apart.

The framework of the building is now complete, as shown in Fig. 2. A detail of construction is shown to the right. Rough boards, with a space between them of about one inch, are laid across the joists for

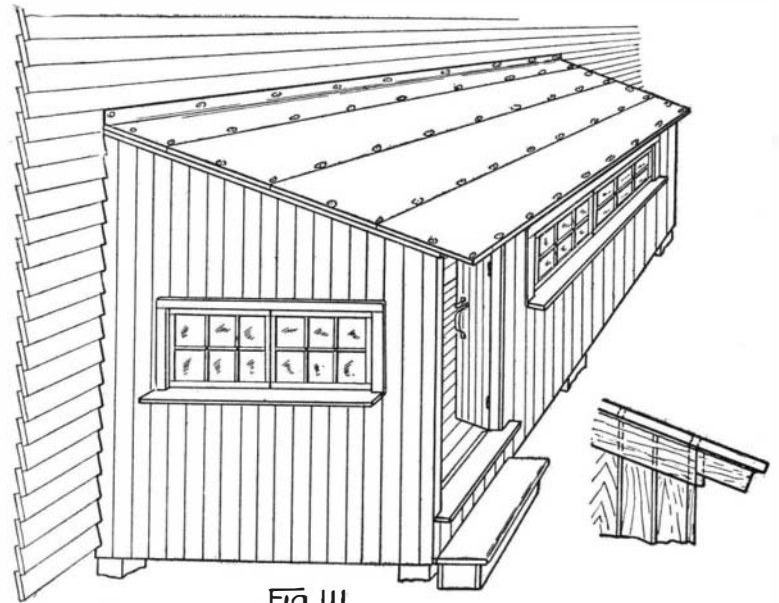
on one side only, are cut to fit close up to the sides, and around the studding or posts, and nailed to the joists with eightpenny nails. The joists are 2 x 4, notched 1 inch, as shown.

It will be noticed that the first board of the sides, nearest the house, is notched all the way down, to fit up snugly against the weather boards. This is done by means of a pencil and a small stick, held as illustrated. The stick is traced along the outline of the weather boarding, while the pencil, being held against the upright board of the shop, makes an exact copy of the outline, as a guide for the saw. Narrow boards, sometimes called plates, are nailed all around the top of the sides, under the eaves of the roof, notching them out where the joists of the roof come through.

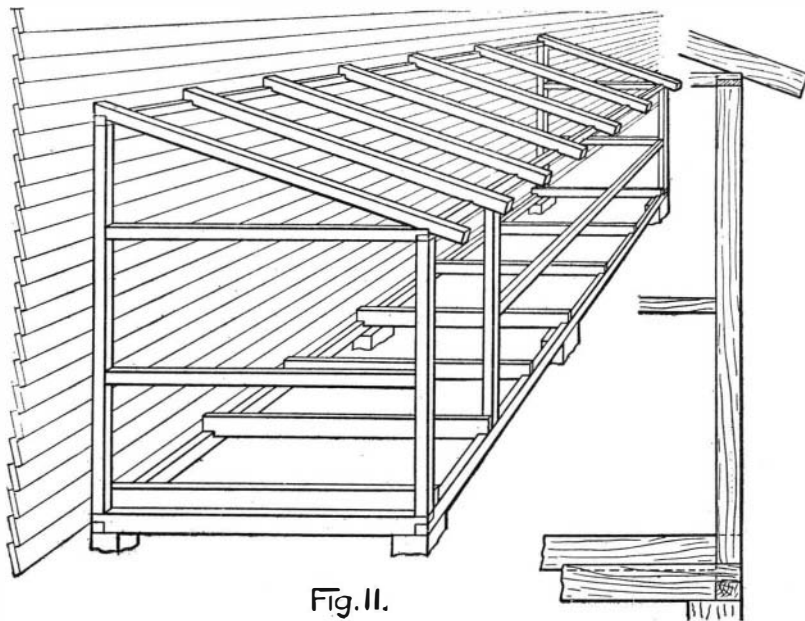
The door can be made of the same stuff as the sides, strengthened with battens as shown in Fig. 1. A diagonal batten can be put on also, letting it bear top and bottom against the horizontal battens, and taking care to let it slope in the right direction, the lower end being near the hinges. Hinges and a latch, also a draw-bolt, are all the furnishings necessary for the inside, and a padlock for the outside. A plain narrow frame can be put around the outside of the win-



A model workshop for the amateur.



Exterior view of the finished building.



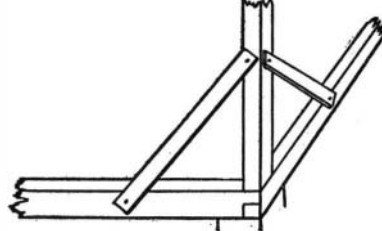
Setting up the frame of the shop.



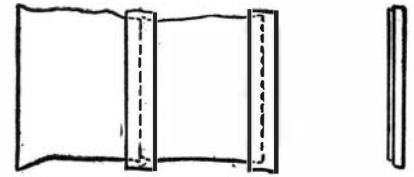
A builder's level.



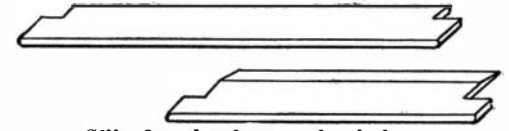
Tracing a profile of the weather boards.



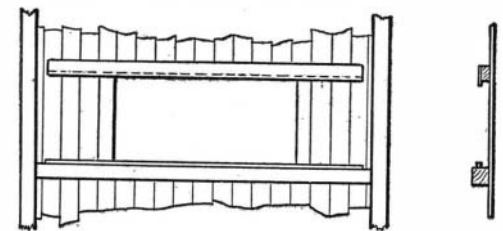
Temporary bracing for corner posts.



Cracks in the siding covered by narrow strips



Sills for the door and windows.



A window opening, showing grooves for sash.

THE CONSTRUCTION OF A WORKSHOP.

out, one pair of the 4 x 6 timbers will be 12 feet in length, and the other 9 feet. The framework must form a perfect right angle at each pier, which can be tested by means of the carpenter's square or laid out in the following manner:

Along the inside edge of the framework lay off a line 3 feet in length on one timber and 4 feet on the other, when the two timbers must be closed, or opened, until the distance between these two points measures exactly 5 feet, as shown in the sketch.

The posts, or studding as they are sometimes called, are made from 3 x 4-inch timbers. Two are cut 10 feet 6 inches in length, and three are made 7 feet 6 inches long. The ends are cut true and square, to get a good bearing, when the posts are set up. The rear posts can be secured to the side of the house, after being tried with a plumb bob, or level, and can be secured to the bottom plate or framing by toenailing; but the two front corner posts, after being erected plumb, and secured to the framing, must be held temporarily, in the manner illustrated. The top plates and rails are next put up. Make a half joint at the front, and nail the other ends to the rear posts with nails driven through either side. The other door-post is erected, then the intermediate rails

of the roof, and secured with eightpenny nails. The sides can either be made of tongue-and-grooved boards, or ordinary boards like the roof, only built close, with narrow strips of wood nailed over the joints.

Space must be left in the sides for the windows and doorway; the latter should measure 2 feet 6 inches by 6 feet 6 inches. The windows had better be double sliding, on three sides of the building, to get a good light. If 10 x 8 glass is used, the framework or sash will be about 2 feet 4 1/4 inches by 1 foot 11 1/8 inches high. The window openings in the sides of the building, therefore, should be 1 foot 11 inches high by 4 feet 8 inches long for a double sash. They should be centrally located in the sides and front, the boards being cut flush with the top of the middle rails, to which they are nailed. The boards at the top of the opening are nailed to an inside strip, 2 1/2 by 1 1/4 inches, detailed in one of the sketches, which sketch also shows the grooves in which the sash moves. A tongue-and-groove connection should be made where the two sashes meet, or a strip of wood should be nailed on either, to overlap the other, and keep out the wind and rain.

The flooring, which can be made of ordinary boards or a cheaper grade of tongue-and-groove boards, planed

down, and a sill made from 1-inch stuff, for the door and windows, will improve the appearance. A door-step can be made from the same stuff as the sides, or from 1-inch boards, nailed to the front of the shop, before the tread is put on. The ground should be made level, and a large stone, or bricks, put under the bearing edge.

The roof is covered with tar paper, which can be made of sheets of brown paper, covered with pitch and sanded, or it can be purchased already prepared. Commence at the eaves, allowing enough to tuck under the eaves on both sides and in front. The next layers are allowed to lap over by about 2 inches, and the last one is tucked under the weather boarding, on the side of the house. Large-headed galvanized nails are used to hold the tar paper or felt covering to the roof; or barbed wire nails with tin caps will do. Space them not less than 2 or 3 inches apart, all along the edges of the laps, and under the eaves of the roof.

The shop should be given two coats of paint on the outside to match the house or surrounding buildings. A small stove, either oil, gas, or coal, will nicely heat the shop in cold weather, a chimney connection being made in the roof or one of the sides if a coal stove is used.