Suggestions for the Workshop

Ingenious Expedients of Resourceful Mechanics

An Emergency Two-jaw Chuck

By N. M. Powell

ONE often needs the two-jaw chuck when it is being used by others. This difficulty can be overcome without loss of time, by using as a substitute two pieces of angle iron, about three inches long, in the universal

Holding flat work in a four-jaw chuck.

four-jaw chuck. Let the flat ends of two adjacent jaws bear against the two sides of the angle, as shown in the sketch. The size of angle necessary will depend upon the size of the stock you wish to mill.

Inside Pulling Grip

By H. D. Chapman

THE accompanying sketch shows a clever little device for pulling bushings. The writer had a large number of telescopes to repair, and there was a small bushing to be taken out of the main tube of each. As the bushings were flush with the outside face of telescopes, it was hard to get them out. It was to solve this difficulty that the pulling device was devised and it worked very well. This device was made of tool steel, and three grooves were equally spaced and cut as

Device for pulling bushings.

shown at A. These grooves were cut on an angle, so the balls would have chance to ride up on the angle and grip the inside of the bushing or pipe. The balls were hard and of a size to fit the bushing that was to be pulled. The tool was easily released by laying it horizontally and pushing it in until the balls rolled back in their recesses.

How to Clamp a Mitered Door Frame

By Joseph Vaghi

THE task of clamping a door frame while the glue is setting is not as difficult as may appear at first sight. The accompanying illustration shows how the

Simple method of clamping a mitered frame.

clamping may be done in a very simple way. About the frame of the door, three pieces of wood may be fitted, each provided with a notch near the corner, adapted to receive the jaws of a pair of cabinet-

maker's clamps. The side pieces are also cut to provide a shoulder on which the lower ends of the door frame are supported. When the clamps are tightened, the door frame is drawn tightly together and the parts are thus held until the glue sets.

Drills for Screws and Taps

By Albert F. Bishop

THIS drawing shows a number of machine screws which are frequently used by the model maker or mechanic. He selects the size screw that he desires to use, compares it with the screw on the drawing, quickly sees the number of drill for drilling hole for the body size, also the number for tapping out for the thread. The most convenient way is to attach these machine screws themselves to a cardboard by sew-

Drills for machine screws.

ing with thread and placing numbers about the screws like the drawing.

SIZE DRILLS FOR PIPE TAPS.	
1/8 inch	21/64 inch
1/4 "	7/16 "
3/8 "	37/64 "
1/2 "	45/64 "
3/4 "	29/32 "
1 "	1 5/32 inches
1 1/4 inches	1 1/2 "
1 1/2 "	1 3/4 "
2 "	2 7/32 "
2 1/2 "	2 21/32 "
3 "	3 9/32 "

Burnt-gas Exhaust for a Garage

By H. M. Nichols

WHEN running an automobile engine with the car standing in the garage, the burnt fumes accumulate in a short time, and make the air very disagreeable to breathe. These fumes are poisonous, and if the

Exhaust outlet for a garage.

engine is not working properly they are also likely to be explosive. The average automobilist runs his engine a considerable amount with the car standing in the garage, for the purpose of adjusting spark coils, timers, carbureter, etc., and while in the summer time he can leave the doors open, and thus get rid of the most of the burnt gas, this is inconvenient in cold weather.

The accompanying sketch shows the general details of a burnt-gas exhaust for the garage, designed to carry all of the poisonous exhaust fumes out of doors. All the materials required are a piece of iron pipe about two feet long, having the same diameter as the exhaust pipe on the car (or it may be slightly larger), a piece of flexible rubber hose about two feet long, and some sheet asbestos.

Cut a circular hole in the rear wall of the garage in line with the exhaust pipe on the car. This hole should be two inches larger than the outside diameter of the pipe. Where the pipe fits in the wall, wrap it with the sheet asbestos until it fits snugly. Wrap the asbestos with copper wire to hold it in place, allowing the ends of the asbestos to project two or three inches beyond

each side of the wall. The distance A from the floor to the center line of the pipe should be made the same as the height of the exhaust pipe on the car. Slip the hose over the end of the pipe, and wire it in place with copper wire. When testing out the engine, before starting, slip the free end of the hose over the exhaust pipe.

After long use the hot gas will destroy the life of the flexible hose; but the cost of renewals is small, and is more than paid for by the comfort and safety obtained by conducting all the products of combustion outside of the garage.

A Simple Resister

By Frederick E. Ward

IN practical electrical work, as well as in experimenting or testing, a crying need is often felt for a suitable form of resistance adapted to the particular purpose in hand. When it happens that it is necessary to use an arc lamp on a circuit of a higher voltage than that for which it was made, or to charge or discharge storage batteries, or to do any other of the many things that require the use of a resister, it is but seldom that one can be found having a suitable resistance in ohms combined with ample current-carrying capacity.

In the sketch is shown a form of resister that can be improvised in a few minutes from materials readily obtained. It consists of a sheet of roofing tin, or sheet iron (the thinner the better) slit with a pair of snips and tacked on two insulating strips with carpet tacks as shown. Where no great amount of heat is to be liberated wood strips can be used, but it is always safer to use some fireproof material such as asbestos board or magnesia board. Terminal wires, as A and B, are best attached by small stove bolts.

Such a resister may be expected to dissipate one and one-half watts per square inch of plate at moderate tem-

Details of the simple resister.

peratures, or four or five watts per square inch without being heated to redness.

The resistance that any given sheet will acquire on being slit depends upon the width W of the strips into which the sheet is divided. This width can be calculated from the formula

$$W = \sqrt{\frac{0.005 \times A}{T \times R}}$$

where

- W = width of strip in inches,
- A = area of sheet in square inches,
- T = thickness of sheet in thousandths of an inch,
- R = the desired resistance in ohms.

A practical example will make the use of the above clear. Suppose it is desired to make a resister through which to charge an 88-volt vehicle battery from a 120-volt circuit at the rate of 25 amperes.

The voltage to be consumed by resistance is 120 - 88 = 32 volts. At 25 amperes the necessary resistance, R, to do this is 32 ÷ 25 = 1.28 ohms.

Now, the watts to be dissipated are 32 × 25 = 800 watts. Allowing about 1½ watts per square inch of plate, it will be seen that a standard sheet of 20 x 28 roofing tin, having an area of 560 square inches, will be large enough to become only reasonably warm in use.

Suppose the thinnest sheet that can be obtained measures 11½ thousandths of an inch thick. Then, by substitution in the formula we have

$$W = \sqrt{\frac{0.005 \times 560}{11.5 \times 1.28}} = 0.436 \text{ inch.}$$

This is so near 7/16 inch that the latter value may be used, and it will suffice to mark the tin in 64 strips of 7/16 inch each and make the required 63 incisions in the manner shown in the drawing.