

veneers, etc. ; they are driven in and snapped off flush with the surface ; they are obtainable in six degrees of fineness.

It is difficult to drive small nails, pins, etc. into hardwood without bending unless small holes have been bored to receive them. Driving is facilitated if the points are dipped in grease.

SCREWS.—There are several forms of screws, but those chiefly used for fixing woodwork are the flat-headed (see K) and round-headed (see L) types. These are made of wrought iron, steel and brass, and as the thread is effective in cutting into wood, they are sometimes called *wood screws*. Screws are fixed by means of the screwdriver or brace and bit (see 40 and 45, Fig. 67), and their advantages over nails are : (1) they can be easily removed when required, (2) they can be fixed in positions where jarring has to be avoided, and (3) they give a stronger job on account of their greater holding power.

Flat-headed or Countersunk Screws.—As shown at K, the circular flat head (which is notched to receive the screwdriver) is tapered down to a point ; the thread proceeds in a spiral form from the pointed end to midway along the shank, and this threaded portion cuts into the timber as the screw is turned ; the flat head can be brought flush with the timber ; it is obtainable in sizes varying from $\frac{1}{4}$ to 6-in. long and from $\frac{1}{16}$ to $\frac{5}{8}$ -in. in diameter. It is desirable (and for hardwoods it is essential) to bore a hole of a smaller diameter than that of the screw by one of the several boring tools illustrated in Fig. 67 prior to inserting the screw.

Cups (see N).—These are of brass and are obtainable in various sizes to suit the head of the screws which they are to receive. They should be used wherever mouldings, beads, etc., are to be removed subsequently, otherwise the woodwork will become damaged by the removal and reinsertion of the screws. A section with a cup in position is shown at O, and examples of its use are shown at J and R, Fig. 60, in connection with the inner beads. A hole, slightly smaller than the diameter of the top of the cup, is formed by a centre bit (see 46, Fig. 67) in the required position, a little glue is placed round the hole and the cup is driven in.

Round-headed Screws (see L).—These are similar to those described above, except that the head is almost hemispherical. They are generally used for fixing metal to wood, e.g., locks and similar hardware.

Concealment of Fastenings.—When nails and brads are driven into softwood their heads are driven about $\frac{1}{8}$ -in. below the surface by using a hammer on a steel punch (see 10, Fig. 67) and the holes are filled or "stopped" with putty before the work is painted. For hardwoods which are not to be painted, the heads are punched and the holes are stopped with material which is coloured to conform with that of the wood ; this stopping, which is melted and applied with a knife as a mastic, sets hard and is then smoothed over to the surface of the wood to render the positions of the fixing inconspicuous. Another method of concealing brads is shown at J ; a sharp chisel is used to carefully cut and lift a small portion of the wood, the brad is punched below the surface and the chip is glued down.

Pelleting is resorted to for concealing the heads of screws ; this consists of sinking the head below the surface by means of a centre bit and a cylindrical plug or pellet of wood of similar grain to that of the member is glued, driven in and chiselled off flush.

COACH SCREWS (see M).—These are of similar construction to the wood screw, except that the heads are square or hexagonal so that they can be turned by a spanner ; they are from $\frac{3}{4}$ to 8-in. long and from $\frac{3}{16}$ to $\frac{1}{2}$ -in. in diameter, and are often used for connecting metal plates, straps and angles to wood.

CORRUGATED SAW EDGE FASTENERS (see P, Q and R).—These are corrugated pieces of steel or brass which are shaped and sharpened along one edge to give what are called "tack points" ; each succeeding point is sharpened on opposite sides like a saw (see R) ; they are made in depths varying from $\frac{1}{4}$ to 1-in. They are being extensively used for making light framings, boxes and similar temporary work, repairing cracked boards, etc. Two applications are shown at S and T, the former showing a butt joint and the latter a mitred joint. These fasteners are easily fixed by simply driving them in with a hammer, during which the wood members are drawn together.

Wrought iron bolts and rivets are described on pp. 158-159.

TOOLS

Whilst machinery has very largely displaced hand labour, particularly in shops where standardized units such as doors and windows are produced, the joiner is called upon to perform many tasks which necessitate the use of hand tools. The following are those which are in general use and are essential parts of a kit :—

CLASSIFICATION.—Hand tools may be classified into those required for : (1) marking and setting out, (2) cutting and shaving, (3) boring, (4) impelling, (5) abrading, (6) cramping and holding, and (7) miscellaneous. Most of these are shown in Fig. 67.

(1) **MARKING AND SETTING OUT TOOLS.**—These include rules, marking knife, straight edge, try square, mitre square, bevel, compasses, callipers and gauges.

Rules (see 1).—These are of boxwood ; there are several varieties, including the one-foot four-fold, two-foot four-fold, etc.

Marking Awl and Cutting Knife (see 7).—Used for setting out accurate work (see p. 104), the awl (or point) being used for pricking points from the rod and the sharp edge being used to cut the shoulder, etc., lines.

Straight Edge is a 3 to 4-in. wide board, $\frac{1}{2}$ -in. thick and 7 or 8-ft. long, carefully dressed out of winding ; one edge must be perfectly square and the other is usually bevelled down from the centre to distinguish it from the true edge ; used for testing surfaces, marking lines, etc.

Try Square (see 2).—Used for setting out right angles and for testing square angles during the planing up of stuff ; is obtainable with 4 $\frac{1}{2}$, 6, 7 $\frac{1}{2}$, 9 and 12-in. long blades.

A larger square is also required ; consists of a mahogany blade which is usually 2 $\frac{1}{4}$ -in. by $\frac{1}{2}$ -in. by 30-in. long tenoned to a 16-in. long stock.

All metal try squares are available and the blades of these are graduated like rules.

Mitre Square or Fixed Bevel has a steel blade fixed at 45° to a wood stock ; this is a useful tool for setting out 45° angles.

Bevel (see 3).—The slotted blade can be secured at any desired angle by tightening the screw with the screwdriver ; used for setting out angles other than right angles ; the blades are 9, 10 $\frac{1}{2}$ and 12-in. long.

Compasses (see 5).—Used for marking parallel lines to irregular surfaces such as scribing skirtings to floors (see p. 124) and mouldings to walls, and for describing circles and setting off distances ; stocked in 6, 7, 8, 9 and 10-in. sizes.

A *trammel* is used for striking large arcs or circles ; consists of two metal heads, each