# COUNTERSINKING and DEPTH DRILLING

WORKSHOP HINTS and TIPS

*By GEOMETER*

FOR functional purposes, countersinking of small numbers of holes can be done by judgment, checking frequently with a pattern screw or rivet. It is, however? a process on which uniformity is by no means easily obtained, and once an error has been made-a countersink produced too deep-there is nothing one can do about it. Unfortunately, too, such an error is rather obvious to a scrutinising eye.

When a countersink is too deep, there is an increase in diameter round the head of the screw or rivet-which a non-technical person can see after it has been pointed out. On the other hand, a countersink which is too shallow leaves the head of the screw or rivet upstanding, to catch anything such as a cloth rubbed over the surface. Of course, one may " correct " this effect by filing the screw or rivet flush. But by so doing, the head is made visibly small; and if there are several screws in an assembly, and they are ever removed,. they must all go back to their original holes.

For easy assembling, then, as well as for good appearance, the heads of countersunk screws or rivets should be just flush with the surface in which they fit, *Al* : and for important work, sorting is advisable to eliminate any that are non-standard. It can be done with a piece of plate that has been carefully countersunk as a gauge.

For cheesehead screws sunk in the surface, A2, the fitting is again fairly critical. Usually the heads should not stand proud; but if the holes are noticeably sunken, the edges can collect a chamfer of dirt-which normal wiping will not remove. Still, a little sinking in this instance is generally acceptable. Greater tolerance is possible for flat-bottomed counterbores to take hexagon nuts or screws with hexagon heads, A3. Even here, it is desirable to have near-flush fitting of nuts or screws and uniformity in depths of holes.

Usually, countersunk wood and metal screws, and rivets, have heads with included angles of 90 deg., which means that one must use a rose bit -particularly for wood or soft material-or grind a twist drill to angle, or make a tool in silver steel. This is essential for screws with a small parallel diameter at the top to which the countersinking tool should just give diametral clearance. The ordinary centre drill has an angle of 60 deg. A twist drill has an angle of 118 which agrees fairly well with rivets of 120, as does the centre drill exactly with those of 60, and so at times these drills can be used.

For a flat-bottomed hole, A2, a twist drill can be modified, A4, to follow in the hole enlarged by a twist drill of normal angle. A shallow flat-bottomed hole, A3 needs a pin-drill or flat-ended cutter in silver steel with integral pilot; while a countersinking tool, *A5,* which must have a pilot, is best made with it separate to facilitate filing the teeth.

A simple gauge to check the angle of lips on a twist drill, as they are ground, can be made from three pieces of flat strip metal, B. Two are bolted together at the ends with spacers, and the third is hinged between them. The drill lies in the two as in V-blocks. Setting of the gauge is done with a protractor, or from pencil or ink lines on paper, both for normal drilling angles of 118 deg. and countersinking angles of 90 deg.

In countersinking by hand drill, a flat scriber, *B, on* a small block, helps to control depth; it is held by one hand while the drill is used with the other. Either the shank of the drill, or a sleeve on it, has a line for reference? which is easily seen against a coating of marking blue.

On a drilling machine, depth control of countersinks or flat-bottomed holes is maintained by a suitable stop, C, or a gauge with a sensitive pointer, *D.* Sometimes, the pointer can be applied to the sliding sleeve or quill of the machine. When this is not possible, a collar grub-screwed to the drill is used. ❑