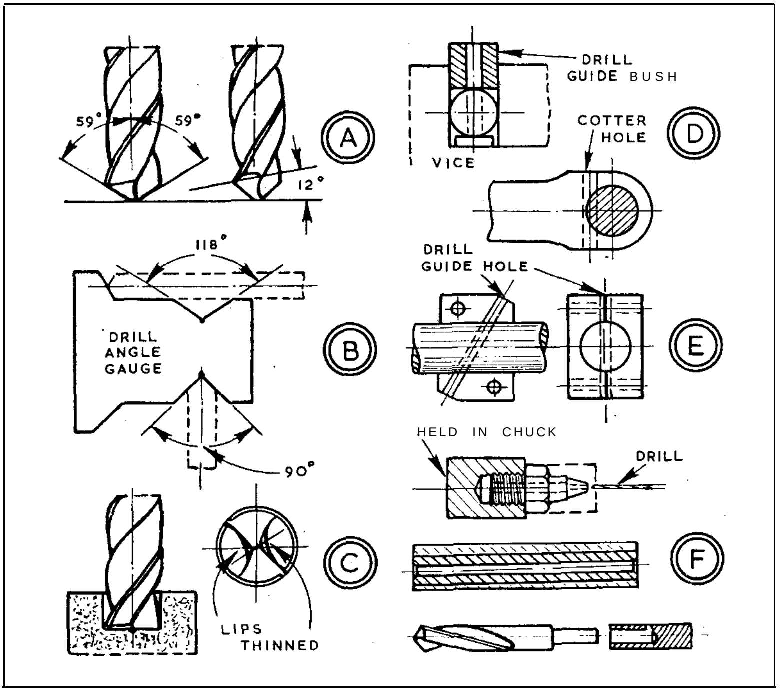
Sharpening and using drills BY GEOMETER

THE shape to which a drill is sharpened largely determines how it will cut and the quality of results produced. Properly sharpened, it should cut smoothly and cleanly in the usual workshop metals such as mild steel, cast iron, brass and alurninium alloys, producing straight holes reasonably to size. If its performance is indifferent, the probabilities are that either the drill has been sharpened carelessly, or it has suffered previous damage -though other possible factors are speed of rotation, rate of feed, lubrication, and swarf clearance when holes are deep.

Speed of rotation is often other than ideal-due to limitations imposed by the equipment, the drilling machine or lathe. Small drills should be run very fast, large drills slowly, and those in between at rates appropriate to their size. In hand drilling machines, small drills may be under-speeded, but larger ones can be over-speeded in some electric machines, particularly if the material being drilled is hard steel.

Under-speeded, heavily-loaded small drills break; but over-speeded large drills overheat, and the lands may be damaged for some distance up. In both cases a regulated feed is needed, with lubrication by oil for steel, and paraffin for aluminium. In deep holes, swarf must be brought out by withdrawing drills when advance has packed the flutes, so that cutting is no longer smooth and free; and to ignore this with small drills is to risk breakage. In similar circumstances, large drills propelled by ample power may seize in the holes and be difficult to remove-apart from the twisted or sheared driving tongues.



Best general-purpose angles for drills are as at A, an included angle of 118 deg. for the lips, and about 12 deg. clearance or rake. In free-hand sharpening on a grinding wheel these angles have to be judged, and a simple checking gauge, as at ***B,*** is helpful in getting the lip angles correct and the point central. The clearance angle is not so important, as long as it exists and is not carried to excess.

The gauge can easily be marked and filed from 1/16 in.. mild steel plate; and it is useful to mclude angles for grinding drills to 90 deg., which is the common angle for countersunk screw and rivet heads. This enables a large drill to be quickly converted to a temporary countersinking tool, which is better in metal than a rose bit, as being less likely to chatter or clog.

A drill sharpened with the tip off centre tends to cut oversize if used direct in metal-a helpful feature when slightly larger holes are necessary. Conversely, a drill following a small one tends better to cut correct size, and requires much less effort to turn it. Large drills with thick centres in particular demand heavy effort, and for cutting direct or in small pilot holes, are much improved by thinning the lips, grinding each side, as at C, on a thin wheel or the corner of a wider one.

Guiding a drill

A drill flattened at the end and given cutting clearance can be used to square out the bottom of a hole, as for a ball valve seating; and like a drill temporarily altered for countersinking, this can save another tool.

If a drill is likely to run off course, guidance is desirable. A bush, as at ***D,*** machined the diameter of a shaft to be drilled, and held with it in a machine vice, will ensure the hole being central. If a hole has to cross the edge of another, as where a cotter is used to secure a lever, the cotter hole should be drilled with the main hole plugged with similar material; this gives support in crossing the hole.

Holes at special angles are best drilled using a split jig, as at ***E,*** which can be bolted or clamped on the shaft. A small threaded nozzle or jet can be drilled from the back, then mounted in a collet, as at F, for drilling the orifice and turning the nose. In the case of a long hollow spindle, concentricity follows from drilling through then turning the outside-and for such work, a standard drill can be lengthened by reducing the shank and soldering into a rod.