

BITS AND FACING CUTTERS

By GEOMETER

All amateurs and experimental engineers have recourse at times to home-produced bits and cutters which have many practical advantages over bought-out tools, including lower cost and suitability for unusual jobs.

Silver steel rod is the favourite material for small bits and cutters as it is in standard sizes which require no machining. Cast steel rod, which must be turned to size, is used for the larger varieties of tools. Both these materials are carbon steels, can be easily hardened and tempered, and will machine cast iron, mild steel, and all softer metals.

For occasional one-off jobs in soft metals like brass and duralumin, cutters can be in good quality mild steel, which is cheaper than cast steel and more readily obtainable in larger sizes. The cutters must be thoroughly casehardened, and used carefully, with light cuts at moderate surface speeds.

Small tools made from unmachined silver steel rod include D-bits; which can be used instead of reamers for finishing bores, with the advantage that blind bores can be finished parallel to the end. Ordinary reamers have a taper which prevents this. A typical D-bit is as at A. The silver steel rod is filed half through, T, for a short distance to form a cutting edge at the diameter. The front edge is given a relief angle U, and the non-cutting half of the diameter is cleared to angle V.

To harden the bit, it is heated red and **plunged in water**. For tempering, it is polished bright with emerycloth. Then it is heated with a small flame at a distance from the end, and on turning dark straw colour, the bit is quenched again.

An ordinary D-bit cuts mainly at the front edge which has the relief angle U. The edge at the diameter is not relieved, and is without top rake. It has a scraping action in the bore. To improve the cutting, top rake can be given, as at B, by grinding an arc WX in the flat. Alternatively, relief can be given through a filed or ground flat YZ, though care is needed not to take the edge below the diameter. These are features of D-bits used for commercial work. Again, a groove

may be planed or ground the whole length of a D-bit to admit cutting oil and clear swarf.

Piloted pin-drills and spot-facing cutters are other tools made from unmachined silver steel rod, hardened and tempered. Normal uses are to spot face castings for nuts and bolts and to square ends of drilled holes for sunken screws. A home-produced tool is as at C. In making, the pilot is turned to size and two flats are filed, C2. Then the ends are relieved, C3, by careful filing, and the tool is hardened and tempered. These operations are generally performed after the tool is cut from the parent rod; but if the seating to be spot-faced is down the side of a casting, there is an advantage in extra length of shank—not provided on a commercial tool. Consequently, for a special job, the tool can be left on the rod, and then cut off at normal length.

A large facing cutter can be as D1, with the shank in mild steel, drilled

for the hardened tool, and drilled and tapped for a grubscrew. This should enter a drilled dimple or a ground groove in the tool. On occasion, a drilled hole can be squared at the end by altering the drill, D2. Each cutting lip is relieved by grinding, after the end of the drill has been flattened. A diamond-pointed bit, D3, can be used for boring deep holes in wood—beyond the length of a twist drill. Silver steel or mild steel rod can be used. The end is swelled slightly by hammering and filed to shape. Then the tool is heat-treated. For one use, however, it can be soft.

Machining piston bosses, as at E, is a job which is performed with a silver steel cutter on a mild steel shank—the cutter secured by a grubscrew or taper pin.

A large piloted spot-facing cutter, as at F, can be made with a mild steel shank, first machined as in the lower diagram for the hole for the cutter to be drilled. □

