

# and boring tools

**S**POT FACING nut and bolt seatings, facing bosses in pistons, boring rough castings, and machining recesses, are typical operations for which piloted tools are generally more suitable than others, ensuring as they do accurate location, and eliminating the springiness which would otherwise prove detrimental.

For spot-facing bolt holes in metal, a pin-drill with two cutting edges can be used in a hand-drill or drilling machine; and on a similar principle, but to provide recesses of some depth in wood, a multi-toothed cutter can be used—preferably in an electric drill to obtain sufficient rotational speed.

Piloted tools of this type are as at **A** and **B**, and can easily be made to requirements from round silver steel. For a pin-drill, rod of the seating diameter is turned down at the end to form the pilot to enter the drilled hole. Then from the shoulder, two flats are made by filing opposite sides, and finally the two end faces are backed off to cutting angle, which is not vital for soft metals if between about 7 and 12 deg.

### Multi-toothed cutter

For a multi-toothed cutter—which can be used on either metal or wood—the silver steel rod should be drilled at the end and the several teeth carefully filed. Then if the cutter is of relatively large size, the drilled portion can be cut off and fitted with a separate centre for piloting and driving, a taper pin securing the two; and this will economise in silver steel. In a small size, of course, rod can be left on the cutter for driving, and the pilot alone can be separate, pushed in the drilled hole.

Both types of tool must be hardened and tempered before use. Hardening is done by heating to bright red and quenching in water, and for tempering, the steel should be polished bright with emerycloth. Reheating should be done with a small flame, well back from the cutting edges, so the changes in colour and their progress towards the cutting edges can be observed at leisure. First it goes a faint yellow tinge, then a yellow,

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followed by straw, dark straw and brown verging into purple. When the straw-to-dark-straw colour reaches the cutting edges is the time to quench quickly again in water.

Separate round tool bits mounted in holders or boring bars also serve for facing and boring operations. A single-ended tool in a mild steel holder, as at **B**, left, can be used for spot-facing on a drilling machine given regulated down feed. The angle setting in the holder is to avoid weakening the pilot as would occur with a tool fitted straight through.

### Facing bosses

A straight-through tool, cutting on both edges, should be used for facing bosses, however, such as those of a piston, as at **C**. It can be secured by a grub-screw in a countersink or dimple. The piston may be gripped endwise (over crown and bottom of skirt) in a machine vice, or held by hand in a V-block on strips of soft packing.

On lathe set-ups, parallel holes can be bored with either single-ended or double-ended tools cutting on the periphery. As at **C**, left, a double-ended tool is centralised in the bar to cut its diameter. There is the disadvantage that this size cannot be varied. With a single-ended tool, adjustment can be made to take various cuts, and setting is facilitated using a simple gauge, as at **D**, with a micrometer to measure over the tool. This gauge is part of a thick ring, bored to fit the bar, and relieved at the centre to clear the tool-adjusting screw.

Examples of boring with piloted bars are as at **E** and **F**. For boring castings mounted on the angleplate, the bar can be used in the tailstock, with a pilot bush fitted either in the lathe spindle, or in some cases in the angleplate itself. For boring a tailstock worn bell-mouthed so the barrel wobbles under pressure, the rear end of the tailstock bore pilots the bar, and the tailstock is advanced by being placed ahead of the saddle. Finally, a split bush is fitted in the recess and held by screws. □

