Novices' Corner

Making a Boring Bar

THE small boring bar illustrated in Fig. I is shown mounted in a square holder for clamping in the lathe toolpost, but the bar, when removed from its holder, can also be gripped in a chuck carried on the lathe mandrel nose. Where the tool is mounted on the lathe saddle, a component held in the chuck can readily be bored to any required diameter with the aid of the cross-slide index, and whether the bore is formed parallel or tapered will depend on the setting of the lathe slides. If, however, the bar is mounted in the lathe chuck, and the work is attached to the *lathe* saddle, the diameter of the bore then machined is regulated either by adjusting the setting of the cutter in the bar or, within limits, by altering the setting of the four-jaw chuck. In any event, a bar of this kind is apt to spring and so cause inaccurate machining if mounted with too much overhang.

The other type of boring bar in common use, shown in Fig. 2, is centred at both ends so that it can be mounted between the lathe centres and driven by a carrier from a dog attached to the lathe catch plate. Clearly, if the bar is of sturdy construction, there will be little possibility of the tool springing when rigidly supported in this manner. The work-piece, a cylinder casting maybe, is clamped to the boring table of the lathe saddle, and the boring bar will then machine a truly parallel bore in the component; moreover, the axis of the bore will be parallel with the guides of the lathe bed.

To regulate the diameter of the bore formed, the position of the cutter-bit in the bar is adjusted

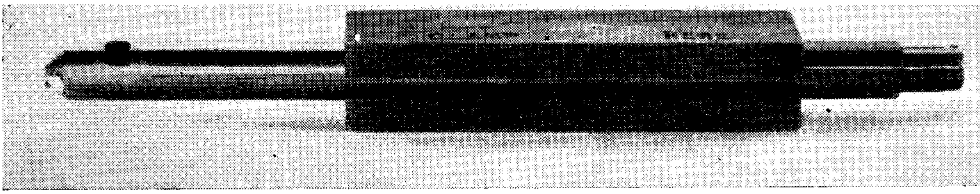

Fig. I. A small boring bar with its holder

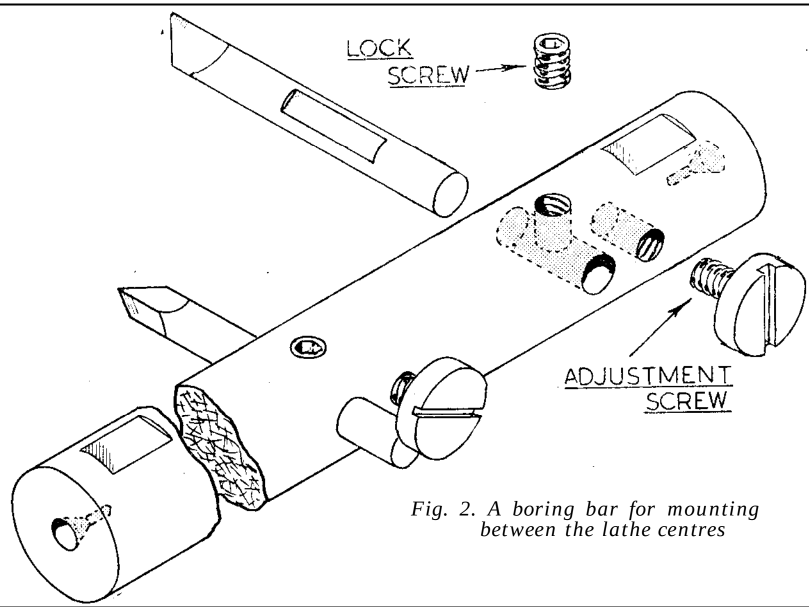

Fig. 2. A boring bar for mounting between the lathe centres

as required, and various methods of making this adjustment have been devised. If the cutter is secured with a wedge, there is always the danger that the setting will be upset as the wedge is tightened, or the tool may shift when actually cutting. These difficulties can usually be overcome by using a clamping-screw to hold the cutter, and fitting a second screw to move the cutter forward ; this adjusting-screw will also serve to keep the cutter from moving back away from the work under the pressure of the cut.

As one of the great advantages of the boring bar mounted between centres is its rigidity, this must not be sacrificed by making the bar too slender. That is to say, if a lengthy bar is used, the diameter should be increased accordingly ; moreover, if the bar is intended for machining a bore of small diameter, the length should be kept as short as possible in order to maintain rigidity.

The boring bar illustrated has a diameter of 3/4 in. and a length of 9 in. ; with these proportions, the tool has been found capable of doing quite heavy but accurate machining.

When making a slender boring bar, the weakening effect of the drill holes for mounting the cutter should be taken into account.

Making the Boring Bar

The construction of small boring bars and their holders for use in the lathe toolpost has already been dealt with in these articles, and the making of a boring bar for mounting between the lathe centres will now be described.

As already stated, a bar 3/4 in. in diameter and some 9 in. in length will be found sufficiently rigid for all ordinary work, and if the size of the bar is reduced for any special purpose, these proportions are best adhered to.

After a straight length of mild-steel rod has been selected, the next step is to machine a centre at either end to engage with the lathe centres. To enable the bar centres to be machined accurately in line, the rod is gripped close to one end in the chuck, as illustrated in Fig, 3, and the other end is supported in the fixed steady clamped to the lathe bed. The overhanging end is next faced, and then deeply drilled with a centre drill. To finish the centre so as to protect it from accidental damage. the centre of the bar is recessed as shown in Fig. 4. The work can now be reversed, and the other centre machined in the same way.

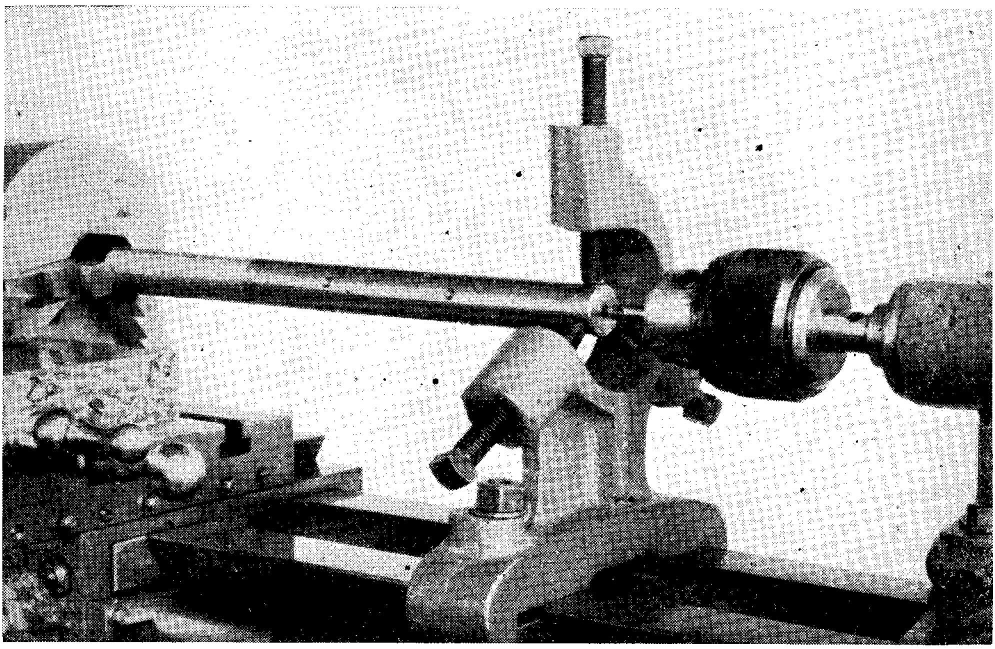

Fig. 3. Using the fixed steady when centre-drilling the ends of the bar

In addition, it is advisable to turn that portion of the bar where the cutter is to be fitted, as this will facilitate the accurate adjustment of the cutter itself when the bar is in use.

To afford a secure seating for the lathe carrier used to drive the bar, a flat, or a shallow drill-hole, should be formed on both ends of the bar, so that if required, the tool can be reversed and driven from the opposite end. Before cross-drilling the bar for the cutters and their fixing-screws, the question of whether to fit round or square tools must be decided, for high-speed steel cutter-bits of either form are obtainable from the tool-merchant. However, round silver-steel will serve well for making these tools, and, when this material is used, the cutter can easily be filed to shape before being hardened and tempered.

The round cutter shown in Fig. 5 is easily

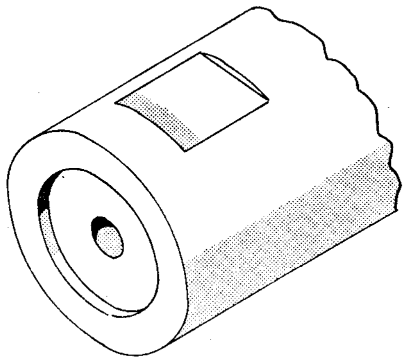

Fig. 4. Showing the recessed end of the bar and the driving flat

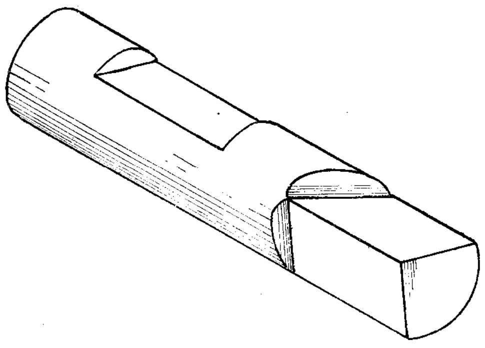

Fig. 5. A round cutter-bit for use in the boring bar

fitted, as the mounting hole in the bar can be accurately reamed to size, but a square hole for the other type of cutter is not so readily formed by filing. The tool illustrated has both side- and end-clearance, and the amount of cutting rake given will, of course, depend on whether brass, steel or cast-iron are being machined. A rake of 15 deg. to 20 deg. will be found suitable for steel, and rather less for cast-iron, but if a rake angle of about 5 deg. is exceeded, the tool may tend to dig in when machining brass.

The rake is, of course, formed on the upper surface of the tool and lies at an oblique angle with line of the tool's travel.

When marking-out the bar for the position of the cutter, it is a good plan to provide for mounting two cutters, as this arrangement will at times be found useful when machining the two end portions of a lengthy component ; moreover, an alternative position for mounting a single cutter may also be required.

The holes to receive the cutters and their fixing-screws can be accurately drilled by using the small cross-drilling jig described in a previous article.

A Useful Design of Hammer

(Continued from page 489)

is not satisfactory, and often leads to splitting of the shaft at that point.

Immediately behind the shank the shaft *is* formed with an enlarged square shoulder, whose overall dimensions are identical with those of face a on the underside of the head. (See Fig. I.)

This shoulder has to be abutted closely against face a at the final fitting of the head to the shaft, which, after shaping, is finally given two coats of clear varnish.

Securing the Head to the Shaft

To overcome the irritating tendency of the hammer head to work loose on the shaft, another useful feature is incorporated in this design.

The shank of the shaft is carefully fitted into the elliptical socket hole in the head, until the shoulder is about 1/16 in. clear of face a.

A small steel plate, rectangular in shape and about 3/32 in. in thickness, having its overall dimensions the same as those of face a, is drilled for an ordinary countersunk wood screw. This plate is situated on the face opposite to a and the screw passed centrally into the wooden shaft' thereby drawing the shaft completely into the head and with the shoulder closely in contact with face a. By reason of the slight side taper on the shank and the contact of the square shoulder, a very powerful grip will be obtained. To enable the plate and screw to exert the maximum locking pressure, the shank should not project beyond the opposite side of the head, hence the reason for making this portion 1/16 in. less than the head thickness.

One advantage derived by this simple form of fixing is that the bulk of the shock and hammering pressure has not to be taken solely by the shank fitting in the head. The enlarged shoulder will take a considerable portion of such shock and loads, so preventing the head from working loose, or the shank from splitting.

If desired, instead of using a plate and screw, the shank may be split to receive the usual tapered wooden wedge, but the shoulder formation on the shaft could still be employed with great advantage.