

FINISHING SMALL CYLINDERS

By GEOMETER



WHEN the set-up of a cylinder casting or sleeve has been made-in a chuck, or on a faceplate or angle plate jig-the process of producing the bore for the piston consists first, of machining out parallel and nearly to size. Then follows the finishing operation, which may be reaming, though lapping is often better and requires no expensive tools.

The number of cuts necessary to rough out the bore and bring it nearly

to size depends mainly on the amount of metal to remove and the type of lathe and tool employed. Where considerable metal is present and the lathe is small, numerous cuts are required,; and where the bore of the casting is small in relation to length, springiness in the tool will slow the operation and call for extra cuts, even on a lathe of adequate power.

On early cuts, finish left in the bore is of little importance so long as parallelism obtains and there are no chatter marks. So far as possible, each cut should be taken completely through; if the tool wears or goes off cut for any reason, a start after re-sharpening should be made on the same cut, or on one a very little deeper. This principle may have to be modified if there should be a hard spot or low part which destroys the tool edge. Then a deeper cut to get under the hard area may be essential.

early or deep cuts, and may be increased on later light cuts, subject to running without chatter. In the absence of slow feed, the whole operation may have to be performed by hand feed, attempting to achieve continuous motion without pauses-which could result in rings in the bore or a tendency towards chatter.

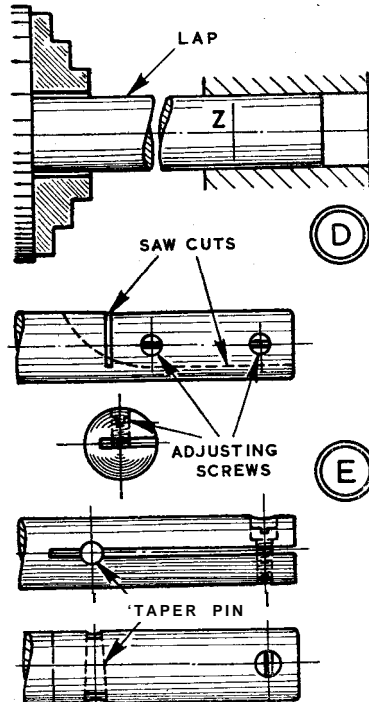
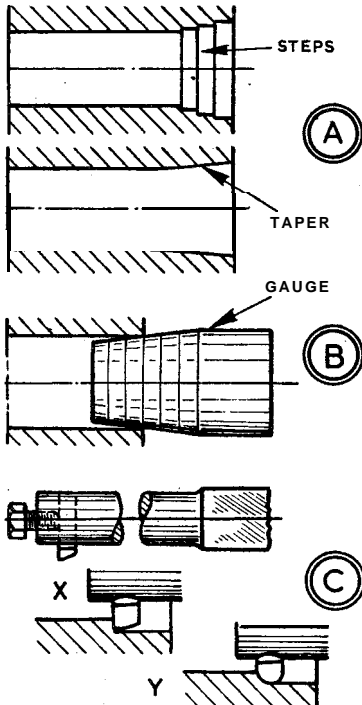
Careful use of inside callipers at different positions in the bore, as soon as the rough surface has been removed, will reveal parallelism. If not, adjustments must be made to the lathe, followed by further tests cuts and checking. Final cuts should leave a finish which feels smooth and looks bright without being polished. Cast iron can be machined dry, and swarf kept blown out, while bronze or steel require coolant with lubricating properties-and ensure that swarf does not curl round the holder.

A taper gauge, as at **B**, can be used for checking size, reference marks or rings being made between the two diameters. With a smooth tooled surface, a dimension of 0.001 in. on the diameter is ample to leave for finishing. A suitable toolholder, as at **C**, can be turned from square steel and the tool held in a cross-wise hole by a setscrew. A tool with a square edge and small round tip, as at **X**, has the minimum tendency to chatter, as against the maximum tendency of a tool, as at **Y**, with a large radius.

The lap for finishing can be of aluminium alloy, as at **D**, turned (and tiled) for the cylinder just to go on, there being a slow taper from the end to **Z**. Fine valve grinding paste should be smeared evenly over the lap and the cylinder tried each end (held in the hand), the lathe pulled round by hand or running slowly. The top diameter of the lap may have to be eased for the cylinder to go right on.

At the finish of lapping, the lap and cylinder should be scrubbed, followed by application of metal polish, then paraffin and lubricating oil, to work abrasive out of the metal.

Adjustable laps, as at **E**, can be made by slotting round material and fitting grub screws, or a taper pin and a screw.



But as soon as possible a return should be made to the principle of taking cuts right through.

A series of steps or partial cuts, as at **A**, should be avoided, particularly as the bore is nearing size. Otherwise the tool may spring and the surface of the bore acquire a glaze, which will result in taper or bell-mouthing. Rotational speed should be low on