Geometer discusses the tools and procedure necessary for

Beginner's Workshop

Measuring internal diameters

THERE ARE numerous ways of measuring inside diameters, depending on the accuracy necessary and whether the check is to verify an identifiable size, test size exactly, or compare diameters for dimensions or general truth.

For simple checks of identifiable sizes a rule can be used, or a rule and callipers, or for more precise work callipers and a slide gauge or outside micrometer. Thus,. to check the bore of a piece of tubmg a rule can be used direct, or the size can be taken on friction grip callipers and these checked on a rule.

Where a rule cannot be used, as for the bore of a ball race which has radiused ends? callipers are essential, with verification made on a rule, since the size will be standard and not subject to variation of a few thou.

On the same principle, callipers and outside micrometers can be used to higher accuracy. For example, a check on the diameter of a cylinder which could be standard, or plus 0.010 in., would need to be made with some care, and with a micrometer to verify the calliper setting. The same is true also if there is a possibility of confusion between millimetre and inch dimensions, when checking on a rule could leave the issue in doubt.

Friction grip callipers are subject to limitations in setting, but the screw type, as at ***A,*** will check a diameter to within about 0.002 in. when used correctly with a light touch. To obtain the size of a bore, one leg is positioned at X, and the callipers are rocked to carry the other leg to and fro across the shortest distance and on a diameter, Y-Y 1.

Adjustments are made until there is just-detectable friction across the shortest distance, then the callipers are verified in a micrometer, adjusting this until similar friction obtains on the callipers, when the size can be read in the normal way on the micrometer.

The principle is applicable when an internal diameter is being bored in a lathe; but the micrometer should be initially set several thou. undersize, and care exercised in trial cuts so as not to overrun the dimension. As the bore nears size, all cuts should be run right through, since this avoids variations in depth of cut and spring of the tool, which could result in a bore being bell-mouthed.

If a very large diameter is to be tested, the tailstock centre can be rhn up, a rule laid on the point, and a diameter marked on the face of the work with pencil or chalk so that the callipers can be kept across the diameter, as at Y-Yl.

For checking machined bores, alternatives to callipers are telescopic gauges and adjustable ball gauges, ***B*** and c, the latter for very small dimensions. A telescopic gauge is entered in the bore, expanded, then its sliding plunger locked from the handle; a ball gauge is expanded in the bore from the handle. Both are checked for size (or set) with an outside micrometer.

A gauge with a slight taper, as at ***D.*** affords means of checking a bore being finished in a lathe. Mild steel can be used for the gauge, the top diameter (0.750 in.) turned to finished size and the taper carried down several thou. less (0.740in.) in any convenient length, Z. A flat is filed and divided according to the difference in thou. between the ends, so that for each mark that enters, the bore increases by 0.001 in.

End gauges employed for bores must be provided with radii, as at ***E*** (right), not with flat ends (left), the comers of which would prevent an accurate check. This applies to the outside ends of gauges with sliding plungers, as at the inner ends being flat for feeler gauges to be placed between them, checking over a range. Bodies of such gauges can be mild steel; plungers hardened silver steel. ❑