Using, a test indicator (3)

IT is a principle in engineering that accuracy leads to accuracy. Conversely, from one error can come several others.

Consider a shaft which runs in a pair of plumber block bearings that are bolted to a flat surface. The two bearings must have the same rise to centre, and the axis of each must be parallel to the base. Then the shaft runs freely without strain or binding.

But you are put to a great deal of trouble when errors have occurred in the machining of plummer blocks. The lower one of a pair must be packed up to the other. A plummer block whose axis and base are not parallel must be corrected by careful filing and then by packing. When two plummer blocks are inaccurate, both must be corrected to prevent the tilting and binding of the shaft.

By GEOMETER

This is an elementary case-an example of the implications contained in a single error in a simple assembly. Obviously, the greater the number of errors among components in an assembly, the more formidable become the combinations of faults.

With inaccurate plummer blocks, the fault lies in the setting of the angle plate on which they are machined on the faceplate. It is not a difference in centre height when two have been machined,_ one after the other, at a single setting of the angle plate. The fault is that the angle plate is not square, with the result that an error from parallelism occurs between the base and the bearing axis of a plummer block. Similarly, facing a component on an inaccurate angle plate introduces an error from squareness between the base and the rising face.

You can avoid errors by packing the angle plate square on the faceplate, after finding the direction of error with a test indicator. You mount the instrument on the slide, and run it along the angle plate, as at A, to see whether the angle is more or less than 90 deg. According to the direction of error, you pack the angle plate top or bottom, using a strip of shimstock to the faceplate. It is advisable to test all unproven angle plates, as errors can always be corrected like this.

Unless you are sure of a cross-slide and vertical slide, it is advisable to make a check, as at B, with a test indicator. It should be mounted on a driving plate, or in a chuck with an off-set, so that it can be turned on the face of the vertical slide. Any difference in reading from where the indicator is shown to point X reveals an error which you can correct by packing the base of the slide at Y or Z.

A dropped centre caused by wear of the base of the tailstock is not uncommon when a lathe has been in use for several years. Test for it as at C. Mount the test indicator on a driving plate, as shown left, and turn it on the tailstock centre. By this method, you can see if there is a horizontal error-the kind that causes a taper in turning between centres, which can be corrected by setting over the tailstock (when it is adjustable), or by using an adjustable centre.

The extent of error with a dropped centre can be found from the extremes of reading when the test indicator is mounted with its plunger square on the centre, as C right. If the centre has a parallel part which can be held in the independent chuck, the error can be repeated in setting up for grinding. Then the centre must be put in the tailstock with the lift upwards. The same can be done with a holder for a silver steel centre. To turn this taper before hardening and tempering it, set up as at *D* with the error on the indicator. Mark the centre and fit it with the lift upwards.

Concentricity of the base circle of a cam can be verified, as at E, with a test indicator, turning the cam from one flank (1) to the other (2). By the same method with a circular protractor or division plate, you can check the opening angle.

Diagram *F* shows another use for a test indicator-in a built-up caliper for testing the splay which is given to the bearing caps of some car differentials when the bearings are adjusted.