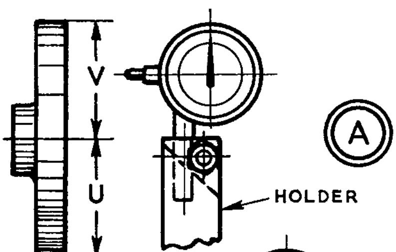
Using a test indicator (2)

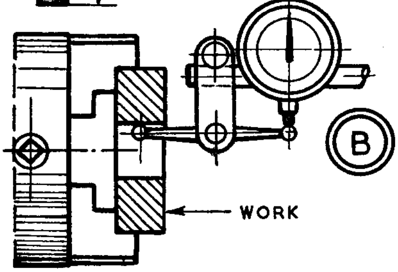
By Geometer

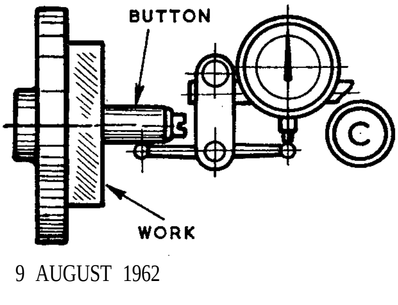
IN mechanical engineering all components and machines have a basis of geometry which settles the shape and alignment of surfaces. For the most part it is elementary geometry visible and tangible, consisting of plane surfaces, diameters and right-angles, all of which can be proved in straightforward ways with a test indicator.

But in proving visible features you often prove those that are invisible -except on drawings, where they form the framework as axes and centre-lines. To ensure accuracy in draughting, axes and centre-lines are put in first on drawings. Then you design components, in the flat, around them. When you test three-dimensional components, you prove the basic geometry.

Take as an example a connecting rod on which the axes of big-end and small-end are parallel. On a drawing, they are two parallel lines. In testing the connecting rod, you put a well-fitting mandrel in each bearing and support the connecting rod on a surface plate. Both ends of a mandrel should then give the same reading on a test indicator, when the connecting rod is lying horizontally, and when it is standing vertically. If there is an end-to-end difference in the height of a mandrel, it is shown by a variation in the reading on the test indicator, and you know that the axes are not parallel. (You forcibly true a mal-aligned connecting rod through a corrective twist or by applying pressure opposite the bend.)







Geometry offers us many opportunities for halving errors in seeking accuracy, and for doubling the amplitude of errors the better to find small ones. An example on the drawing board is the way that you check a celluloid square. Holding it to the edge of the T-square, you pencil a vertical line. Then you turn the square over-and any error is doubled. It is the same when you test a steel square by scribing lines on a straight-edged metal plate.

By a similar principle, the flatness of a lathe faceplate can be verified and the alignment of the cross-slide checked, with a test indicator used in a holder on the topslide, as at A. Turn the faceolate to discover wobble and then locate the run-out vertically. Using the cross-slide, run the test indicator across the near half of the faceplate U. With a long holder, repeat the test on the remote half V.

If the faceplate has been machined on the lathe, an error is concurrent between the faceplate and the cross-slide for the near half U. And so the first test reveals nothing unusual. But on the remote half V. an error runs counter to the one on'the cross-slide. The second test shows this clearly.

A universal attachment, or a lever attachment, equips a test indicator for use in bores and on outside diameters where clamps obstruct direct access. Examples of use are at B and C (clamps omitted).

When work is held in a chuck B, its face as well as its bore must be true. Place packing at low jaws; and for tapping the face of work, use a lead or hide hammer. If a faceolate wobbles. pack at the low point with paper. To true a button C, tap the edge of work with a brass or aluminium punch-the clamps can set a vertical slide to any angle just gripping. Then tighten them firmly.

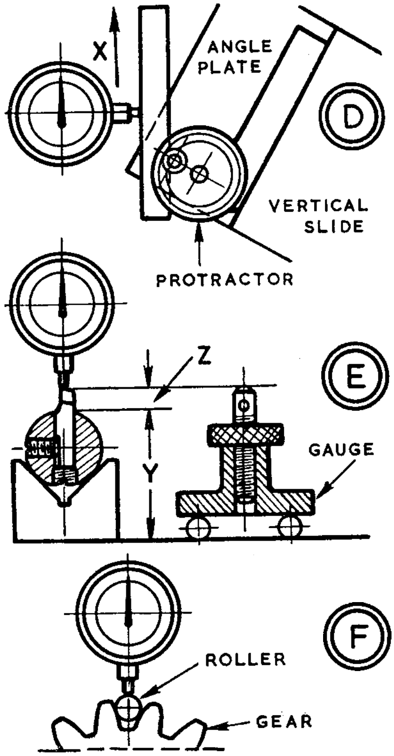


Diagram *D* illustrates how you for a milling operation. The test indicator is mounted in a chuck or on a driving plate for its plunger to bear on the blade of a protractor. You can set a vernier protractor to a fraction of a degree, and place the stock to the vertical slide with the blade across the lathe axis. To hold the protractor level, clamp it to an angle plate. Set the vertical slide so that the test indicator shows a steady reading by cross-slide movement X.

Two more typical uses of a test indicator are shown at *E* and *F*. To set a fly cutter, test over the bar for height Y and add the projection of the tool Z. Set a home-made height gauge to Y, and for Z place two turned rollers under the gauge. To test concentricity of the pitch circle of a gear put a roller in each tooth-space in turn, and rotate the gear under a test indicator.