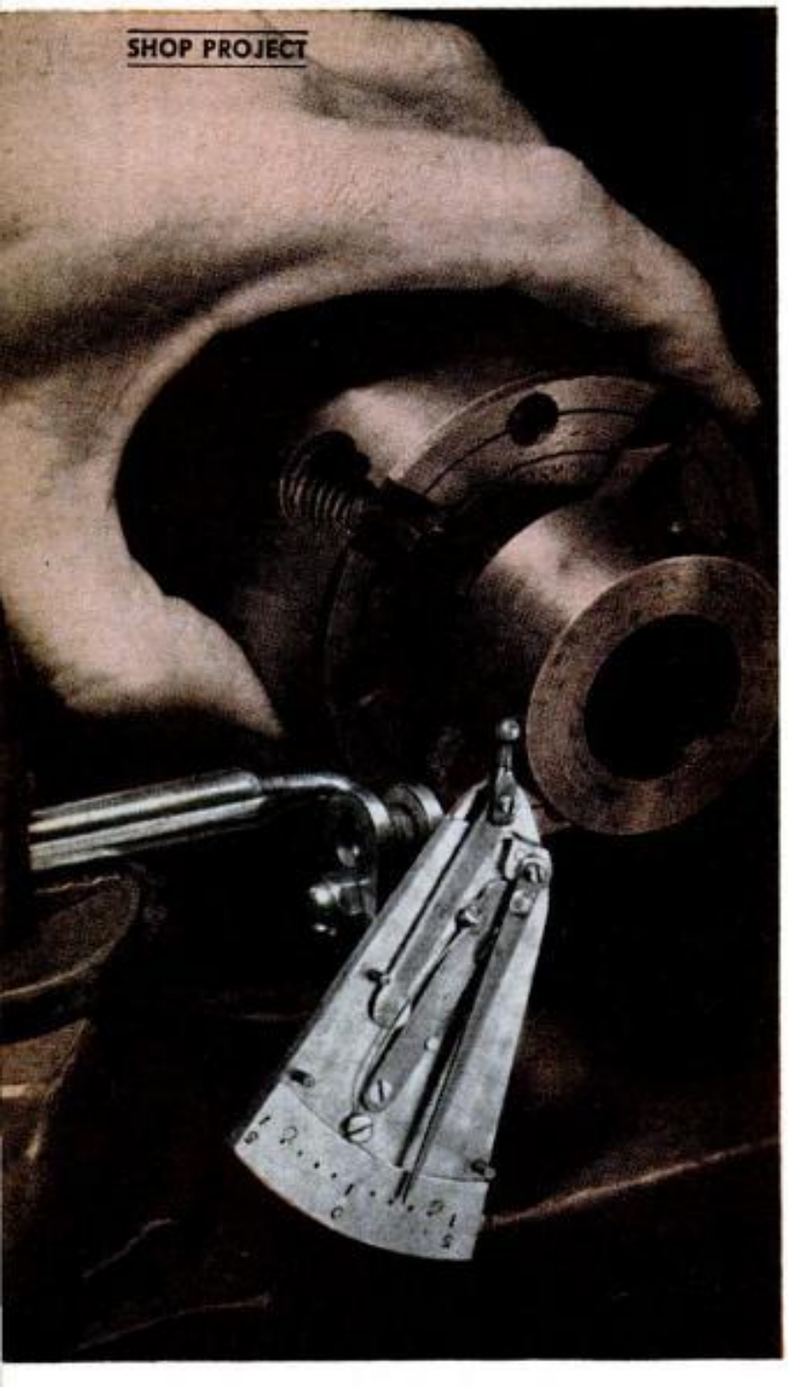

Make this handy indicator for your shop

With it, you'll be able to measure variations as small as 1/1000 inch

By WALTER E. BURTON

Technical Art by Graphic Presentations

YOU'LL GREATLY IMPROVE the accuracy of work done on a lathe, drill press, milling machine or any other machine tool by using this sensitive shop indicator. With it, you can center work in a chuck quickly, and also position milling cutters and other tools precisely with respect to the work. Mount it on a drill press, and it will indicate whether the table is perpendicular to the spindle.

As shown, the indicator has a range of 0.010 in., with calibration marks scribed into a scale about 1⅜ in. long. The parts can be made of mild steel and then case-hardened for maximum wear resistance, or be formed of high-carbon steel.

The body of the indicator is made of 3/32-in. steel plate. The three levers are formed from 1/32-in. steel, while the ball-shaped contact or "feeler" point is machined from drill rod. The scale segment can be made from either 1/32 or 1/16-in. steel.

The lever-return spring should be bent as shown from a length of 0.010-in. music wire. Here it's best first to shape a long piece of wire to conform to the outline shown in the drawing on page 198 and then snip off the excess. The anti-backlash spring fitting the slot in one of the levers is a length of watch hairspring.

Greatly simplifying construction of the indicator are the full-size templates in the detailed drawing. However, instead of cutting them out and destroying what appears on another page, use this method to transfer the template to suitable stock:

First tape a sheet of carbon paper to the cardboard, heavy paper or hardboard you're using for a template. The inked side of the carbon, of course, must face

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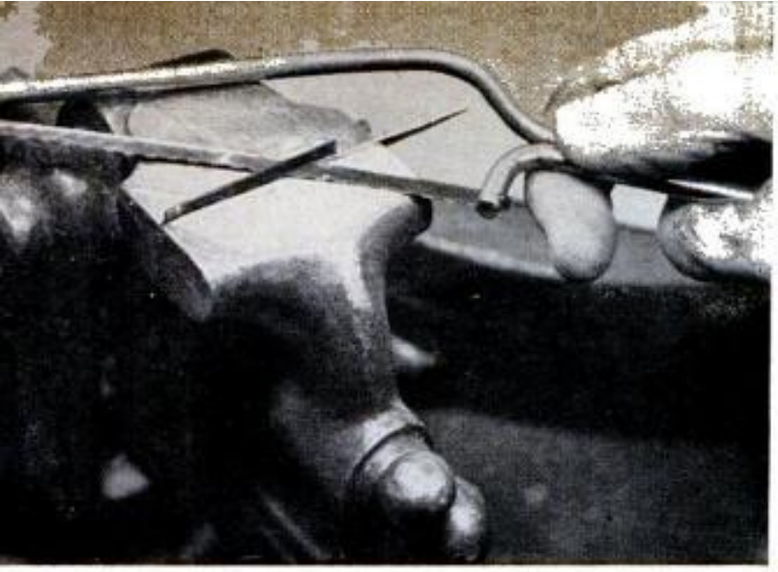
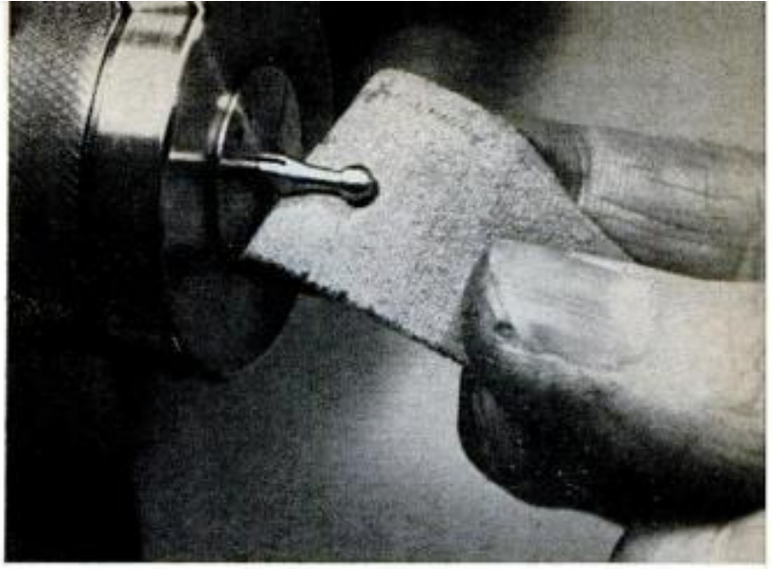


DRILL LEVERS as shown in drawings, then rough out shape by making saw cuts flush with vise jaws

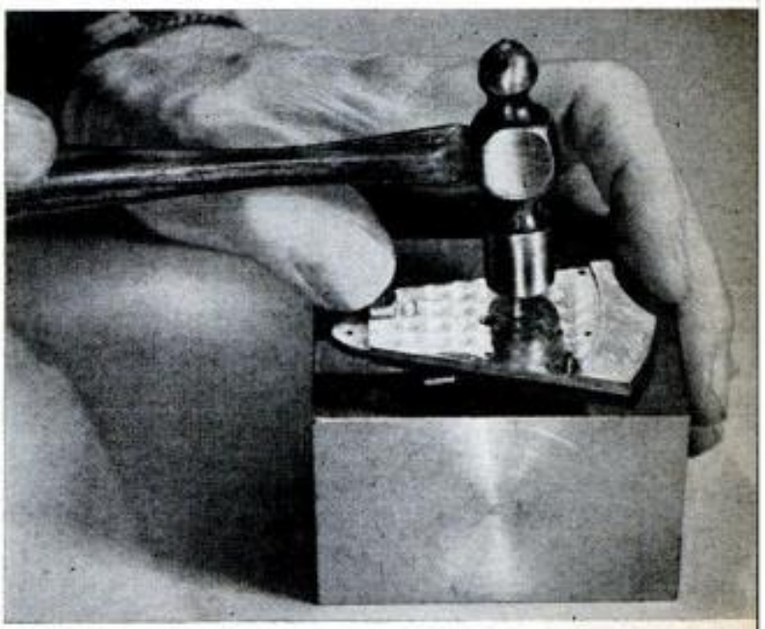


POLISH BALLS to required dimensions by chucking in a lathe or drill, using fine-grit abrasive cloth

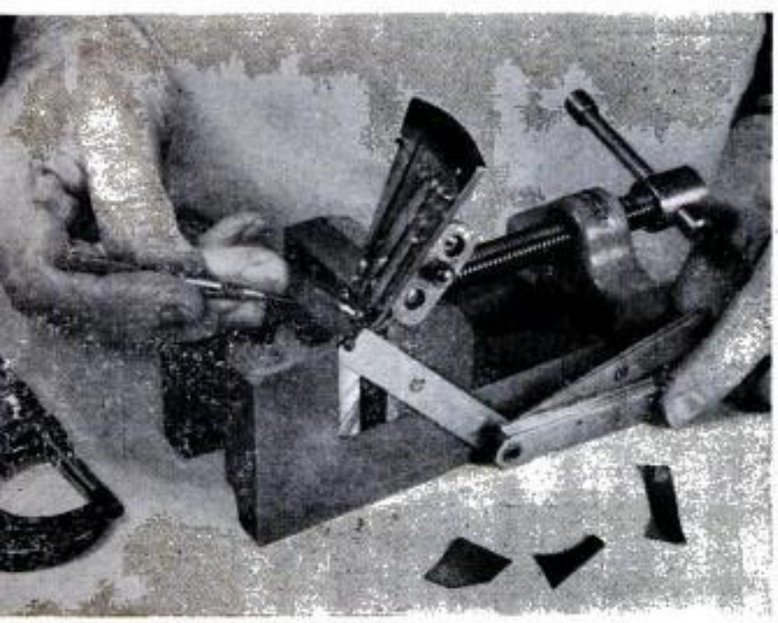
the template material. Then lay the carbon and template material underneath the page of drawings and tape the edges of the page to the template board. Finally, use an accurate straightedge and a fine-tipped ballpoint pen to transfer the drawings to the template board. There's no need, however, to try to transfer the circles to the board. Simply mark their center points and drill the holes as indicated.

Once the template of the body has been made, it becomes a simple matter to clamp it to the steel plate and then drill through the holes in the template. The same holds true for the holes in the various arms or levers. After they're drilled, just scribe the outline of each piece, cut it out and finish by grinding or filing.

The ball-tipped arm is the only section



FORCE STOP PINS into holes in body. The drive-fit pins prevent the levers from overshooting body



CALIBRATE INDICATOR by inserting gauges of known thicknesses between the ball and a flat surface

PERMANENTLY SCRIBE the calibration marks on the scale plate by using a punch and a fine-edged chisel

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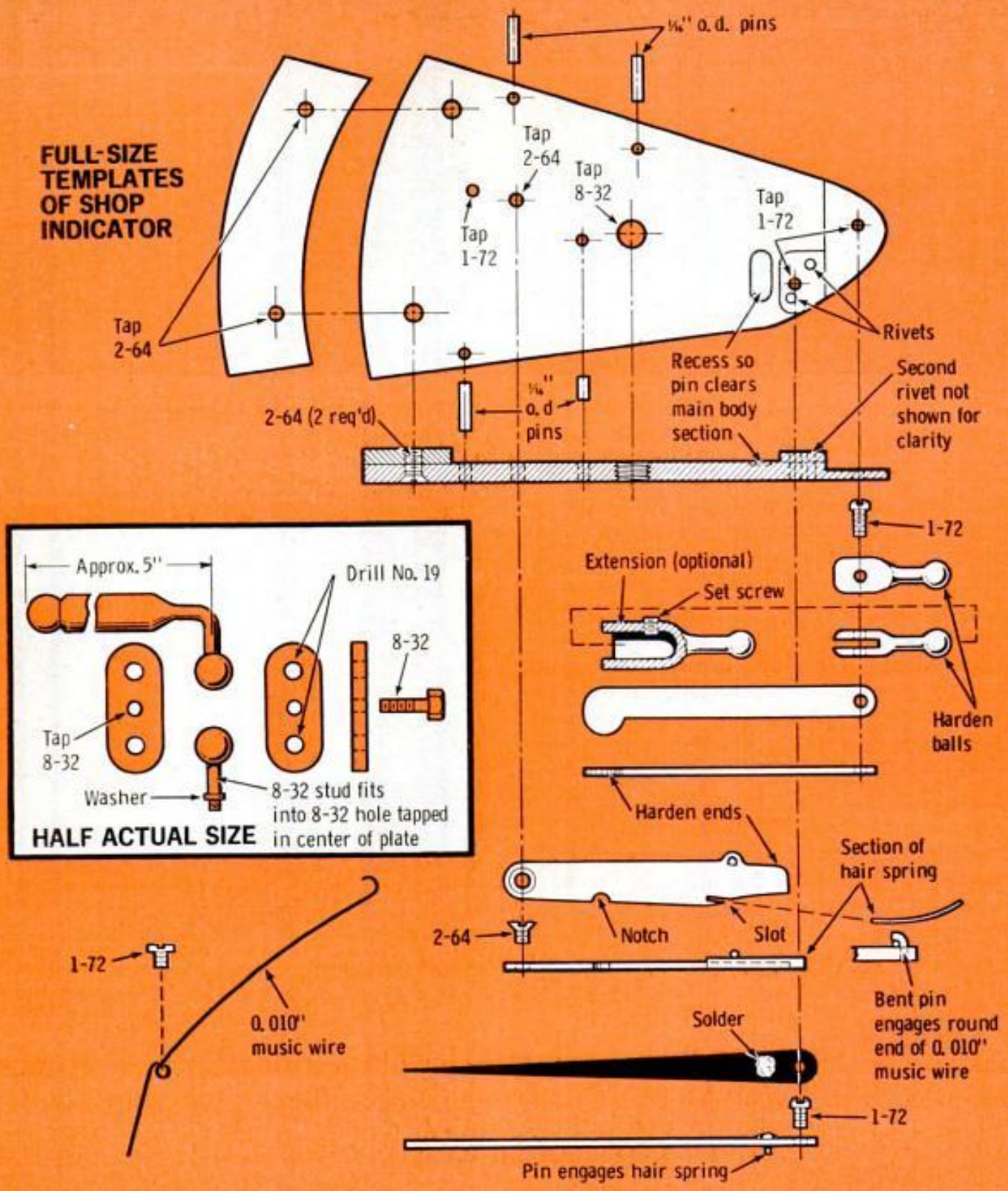
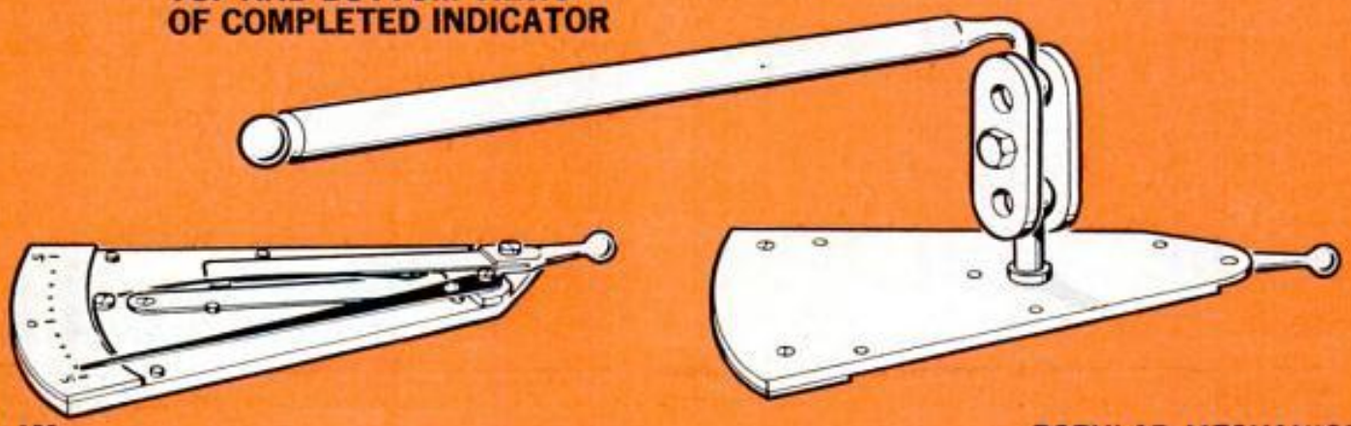
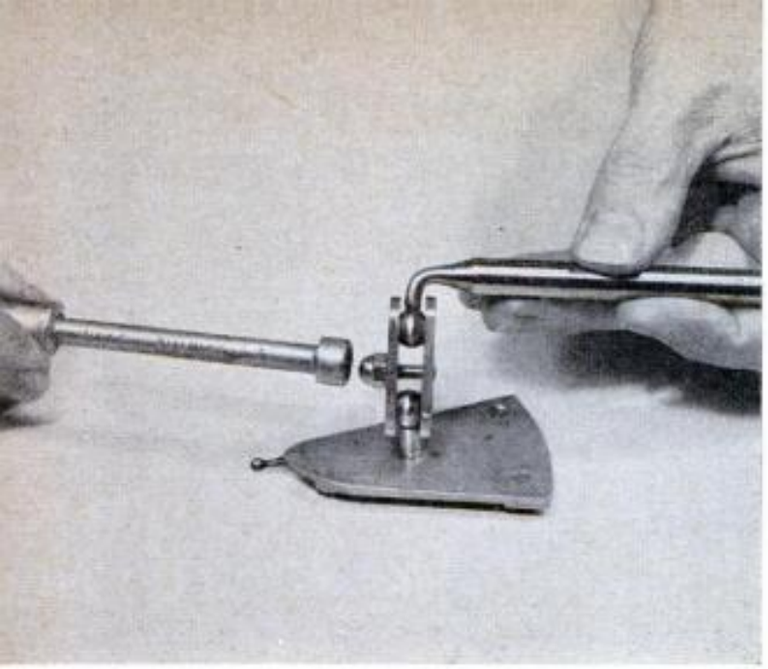
FULL-SIZE TEMPLATES OF SHOP INDICATOR

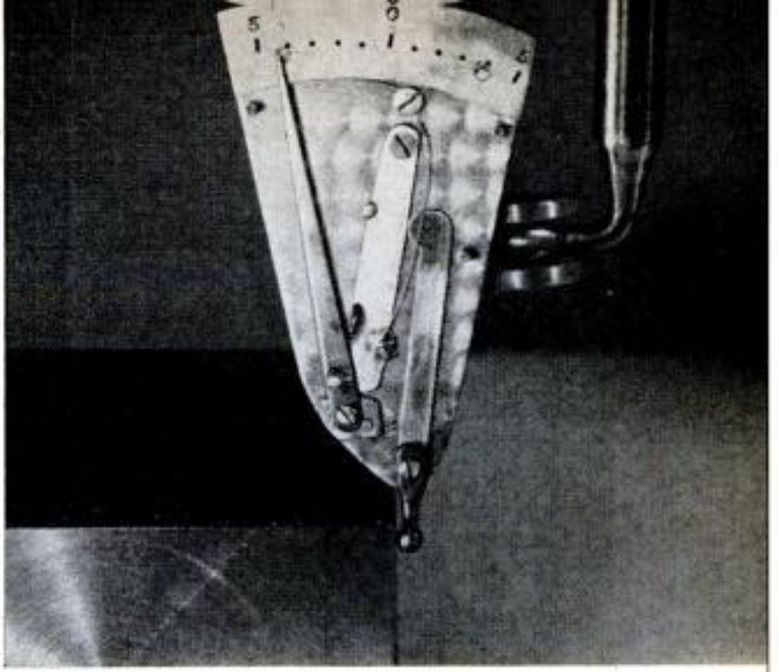


TOP AND BOTTOM VIEWS OF COMPLETED INDICATOR





BALL-AND-SOCKET mounts are easy to adjust. Wide range permits mounting in almost any position



CLOSEUP VIEW of completed indicator shows how pressure of block against ball is magnified by levers

of the indicator mechanism that can't be made using a template. Its slotted portion fits tightly over the end of the cam-tipped lever, while its ball tip is adjustable through an arc of nearly 180°, as required by the position of the instrument with respect to the work being gauged.

Calibration procedure

The indicator is basically a magnifier of the amount of movement applied at the ball-tipped contact point. Theoretically, the total magnification of movement works out to about 130 times the initial travel. Thus, for every 0.001 in. of travel at the ball-tipped contact point, the pointer will move more than ⅛ in. along the length of the scale.

Dividing the scale into a number of equal parts of arbitrary size would be adequate for many operations, such as centering a piece of round stock in a chuck. However, to measure accurately or indicate variations as small as 1/1000 in., the instrument must be calibrated.

The easiest method to use is to coat the scale plate with blue layout ink. Clamp the indicator in a drill-press vise so the ball touches a smooth, flat surface on one jaw. Then insert feeler gauges of progressive thicknesses between the ball and the jaw, marking the position of the pointer at each 0.001-in. step. Do this two or three times to recheck the calibration marks. Once the marks agree over the range, make them permanent by scribing them with a punch and a narrow chisel.

However, the use of the optional extension on the ball-tipped contact arm essentially doubles the length of the arm and, in effect, cuts the magnification factor in half. This results in a scale range of approximately 0.020 in., so the scale also should be calibrated with the extension attached. Just use the same calibration method and simply scribe the second band of calibration marks either above or below the first band.

Mounting the indicator

The 8-32 threaded hole near the center of the body plate is used for attaching the indicator to the adjustable mount. As shown in the inset drawing at left and in the photos above, the mounting arrangement can be varied to suit almost any requirement simply by loosening a single 8-32 bolt. The indicator also can be attached to machine tools by clamps, a lathe toolpost or permanent-magnet base.

One of the most useful functions the indicator will perform is the checking of a drill-press table. To determine whether the table is at right angles to the spindle, first chuck the indicator into the spindle and adjust the height of the table so the pointer on the indicator falls at about mid-scale. Now slowly rotate the spindle by hand and watch the pointer. If the table is canted to one side, the reading on that side will be positive, while directly opposite, the indicator will show a negative reading of the same amount. When the table is perfectly level, the pointer will hold a single, steady position even though the indicator is rotated 360°. ★★★

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