*Micrometer Calipers* are the direct offspring of the Whitworth measuring machine. In the original form of this machine a screw of 20 threads to the inch, turned by a worm-wheel of 200 teeth and single-threaded worm, had a wheel on the axis of the worm with 250 divisions on its circumference, so that an adjustment of 1/1000000 of an inch was possible. The costly measuring machines made to-day have a dividing wheel on the screw, but they combine modifications to ensure freedom from error, the fruits of prolonged experience. Good machines are made by the Whitworth, the Pratt & Whithey, the Newall (fig. 71), and the Brown & Sharpe firms. These are used for testing purposes. But there are immense numbers of small instruments, the micrometer calipers (fig. 72), made for general shop use, measuring directly to 1/1000 of an inch, and in the pitch is 40 to the inch, and the circular divisions number 25, so that a movement of one division indicates that the screw has been ad­vanced 1/25 of 1/40 or 1/1000 of an inch. Provision for correcting or taking up the effects of wear is included in these designs (*e.g.*) at *a* in fig. 72), and varies with different manufacturers. A vernier is sometimes fitted in addition, in very high class instruments, to the circular divisions, so that readings, of ten thousandths of an inch can be taken. Beam micrometer calipers (fig. 73) take several inches in length, the micrometer being reserved for fractional parts of the inch only.

*Depth Gauges*.—It is often necessary to measure the depth of one portion of a piece of work below another part, or the height of one portion relatively to a lower one. To hold a rule perpendicularly and take a sight is not an accurate method, because the same objections apply to this as to rule measurement in general. There are many depth gauges made with rule divisions simply, and then these have the advantage of a shouldered face which rests upon the upper portion of the work and from which the rule measurement is

taken (fig. 74). These generally have a clamping arrangement. But for very accurate work either the vernier or the micrometer fitting is applied, so that depths can be measured in thousandths of an inch, or sometimes in sixty-fourths, or in metric subdivisions.

*Rod Gauges.—*When internal diameters have to be taken, too large for plug gauges or calipers to span, the usual custom is to set a rod of iron or steel across, file it till it fits the bore, and then measure its length with a rule. More accurate as well as adjust­able are the rod gauges (fig. 75) to which the vernier or the micro­meter are fitted. These occur in a few varied designs.

*Screw Thread Gauges.—*The taking *of* linear dimensions, though provided for so admirably by the systems of gauging just dis­cussed, does not cover the important section of screw measurement. This is a department of the highest importance. In most English shops the only test to-day of the size of a screw or nut is the use of a standard screw or nut. That there is variation in these is evidenced by the necessity for fitting nuts to bolts when large