

PRECISION

in length dimensions

FOR many purposes, accuracy on non-functional features of models and mechanisms need be no greater than that given by reasonably careful working to a steel rule. This can be in machining on the lathe, as well as in hand operations.

It is another matter, of course, if first-class appearance or fidelity to scale should be required. For an experienced eye will notice small errors—even he way in which a coat of paint has increased in thickness in a corner, with the attraction of two

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surfaces, and resulted in a heavy effect. In such cases, accuracy as high as possible is desirable.

The principle applies, too, where a feature which is visible involves a subsidiary function, such as clearance: 0.003 in. may be all that is required mechanically, though 0.015 in. say, might be given. Then, depending on conditions, the one gap might be barely visible, and the other all too plainly seen—when preferably it should not.

Of course, when the function of the model or mechanism is involved in length dimensions, it is particularly important for them to be as accurate as possible to avoid the circumstance of several small errors summing to a sizeable one that can obstruct or modify operation. It applies to all features like overall lengths, distances to steps, widths of flanges, and depths of recesses. Precision on these obviates rectification and the time that would be lost in fitting when assembling.

Fortunately, in lathe work, there is considerable choice of means for achieving this precision, using micrometer collars—if these are fitted to the feedscrews, width and end gauges, stops at the headstock or on the bed, and various types of depth gauges. A short step which is required on many components can be obtained, as at A, using the top slide feed micrometer collar.

Noting the setting of this, a facing cut can be taken over the end of the

smaller diameter, and then the tool be moved by the feedscrew through dimension X for finishing the shoulder at the larger diameter. A normal feed-screw should give the dimension within 0.002 in. Longer lengths than can be comfortably dealt with in this way can be obtained using the leading screw—either from the micrometer collar fitted, or by rotating it some definite number of turns, and completing with topslide feed.

Standard tools such as drills and lathe tools, and accurate material like silver steel, provide for tiny short dimensions, as at B, while end gauges can be made from rod for longer ones, facing carefully to micrometer or vernier gauge. For short dimensions, gauges are used between tools and shoulders of larger diameters to give the setting for facing cuts at the smaller diameters. Longer dimensions can be obtained in the same way from end gauges on the work, or applied to the chuck face.

A stop, as at C, in the spindle nose locates work at a definite position in the chuck. Then, using a gauge at the face, as at B, correct overall length is obtained—particularly useful if there are several parts to finish. A recess as at D, or other internal step, can be machined to depth, setting the tool to a gauge, then facing over the outside face, the recess having initially been over-depth.

Annular grooves in bores to take circlips or act as undercuts for threads can be accurately located with two gauges, as at D, using a square-ended holder. In setting the tool, one gauge is placed between it and the holder; while in setting to the work, the other gauge is used to the holder. The in-set of the groove is the difference between the gauges.

Accuracy in drilled holes follows from over-drilling, checking with a depth gauge, as at E1, obtaining the over-depth from a vernier depth gauge, and finally advancing the tool from the micrometer collar.

An ordinary depth gauge, set by block gauge and straight-edge, can be used to locate the tool for a flange, as at E2; though to eliminate inaccuracy from tipping, the type as at F is recommended—set in the same way. □

