CHECKING RACKS AND WORMS

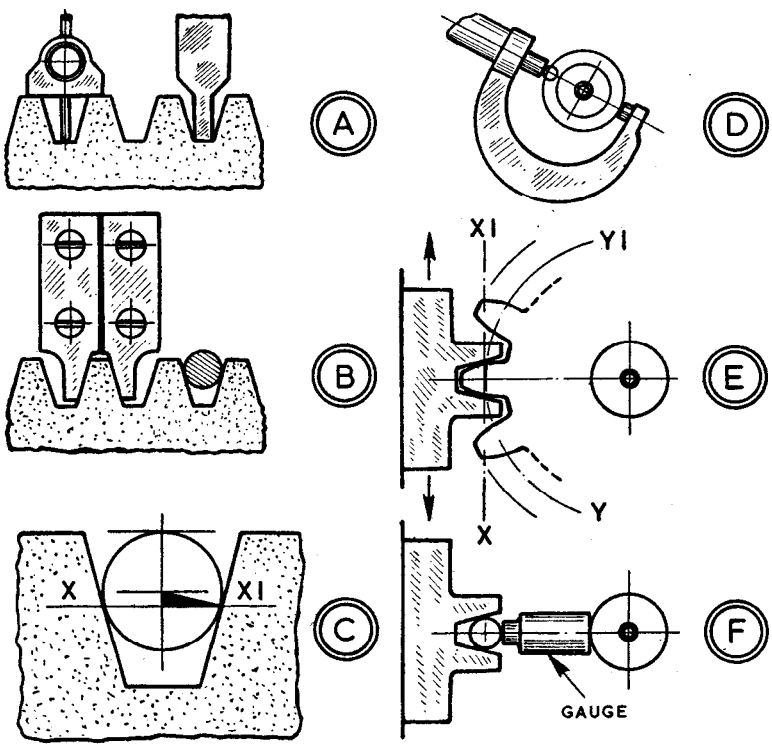
WORKSHOP HINTS and TIPS

By Geometer

GIVEN the pitch-and the proportions which relate to the pitch-of a standard rack or worm thread, the actual dimensions of the whole profile can be obtained by simple multiplication Hence, in machining, one knows how far to go in certain directions; and when inspecting the result, its accuracy or errors may be realised.

In cutting a rack with a cutter carrying the tooth space profile, the two main considerations are the depth of tooth and the pitch Depth of tooth may be arrived at by feeding the material the given amount, using a micrometer feed collar; while pitch can be obtained in a similar manner from a feed screw, or by using spacing blocks, or from a jaw fitting into finished teeth. Nevertheless, a cutter even if originally correct-may wear, and there is always the possibility of spring or slight movement taking place.

In cutting a worm thread in the lathe, similar considerations apply. Depth of form can be taken from the cross feed micrometer collar, while pitch is obtained from the leadscrew and gearing. But owing to the virtual impossibility of employing a full-form tool for the work-from the cuts on three faces jamming-it is necessary to use a narrower tool, taking cuts first on one flank of the thread; and then on the other; which introduces the factor of possible variations in form-a thread either wider or narrower than standard.



A check on depth of tooth or thread is possible using any simple depth gauge, as at A, left, first removing any burrs with a smooth file Depth setting for such a gauge can be from a disc or ring faced in the lathe, tied, or lapped so it can be laid on the surface plate with the depth gauge on top.

Following this check, the width of the tooth space, or of the thread form at the bottom of the groove, can be verified with a small plate gauge, as at A, right-which in making can easily be checked with a micrometer for width Ordinarily, the tooth space settles the result, with the cutter or tool of proper angle, and correct depth obtaining; and even when the profile checks correct in major features by other means, there can still be small errors in the bottom corners (owing to wear on the cutter or tool) -when a gauge of this type is of value in revealing them.

Uniformity of teeth or of a thread throughout its length can be checked by a simple plate gauge, as at ***B,*** left, made in two pieces adjustable on a backing plate for setting; while uniformity of the spaces or groove may be verified with a rod or ball, as at ***B,*** right.

A rod or wire making contact at the pitch line, as at C, X-Xl, can ensure that tooth width and space are equal. The sloping side of the small black triangle passes at right-angles from the flank to the centre of the wire; and slope angle is half included angle (14-1/2 deg. for 29 deg.), while base length is equal to 1/4 pitch.

The ratio slope-length/base-length is the secant of the angle; so secant 14-1/2 deg. x 1/4 pitch is the radius of the wire. The height pitch line to centre is tangent x 1/4 pitch-which added to radius of wire gives overall height.

For a worm thread, the spiral angle has an effect, but if it is single-start, large in diameter, and the wire is fitted slightly loose, results are reasonably accurate. A ball being used, as at ***D,*** grease holds it in place.

Any involute gear of the same pitch and variety will mesh with an involute rack; so an accurate test of gear teeth is possible, as a ***E,*** mounting the rack on the vertical slide, the gear on a mandrel in the lathe, their pitch lines X-Xl and Y-Y1 touching, from setting up as a ***F.*** t ❑