Checking accuracy of gears

By GEOMETER

USING very simple workshop equipment, virtually without calculation, it is possible to establish whether spur gearing in its main dimensions and detail features, attains the expected precision and uniformity-and if not, where the errors occur. Thii can be particularly important for new gearing: while that which has been in use, can reveal, by comparision with the new, or by comparision of worn teeth with good ones-when wear has been irregular, just to what extent this has progressed, and resulted in noise and backlash.

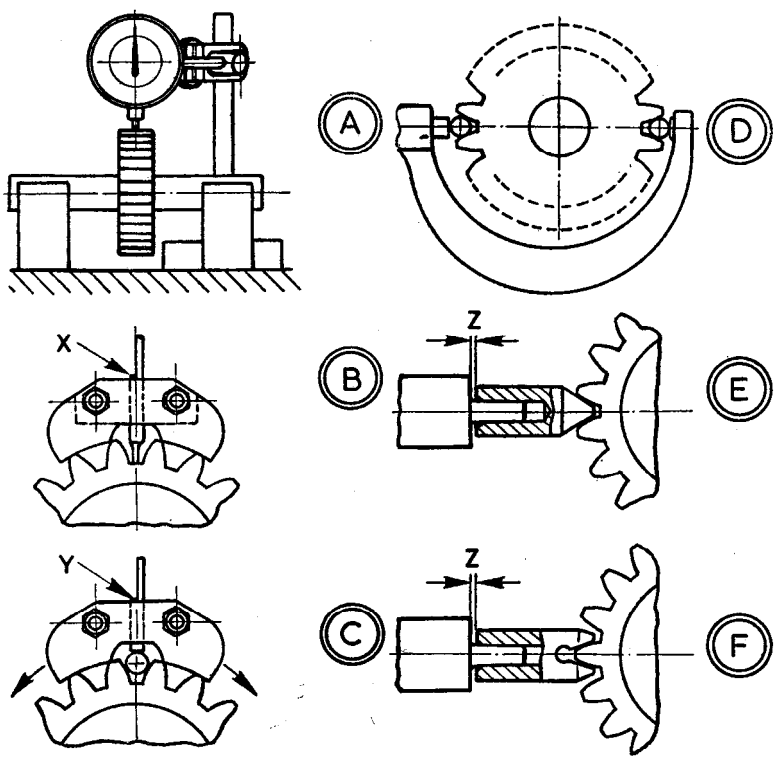
Noticeable variations in thickness and spacing of teeth occasion backlash and errors of pitch leading to whining in gears under load; and in applications where a few teeth only are subject to load, and wear more than the others, as in operating a cam, there inevitably arises a rhythmic clatter.

Checking concentricity of tips of gear teeth about the axis can be done on a surface plate, mounting the gear on a mandrel, and placing this in V-blocks, as at A. The most accurate test is made with a dial indicator on the surface gauge; but a reasonable one can be made with a scriber pointer, followed by a close scrutiny if suspicions are aroused.

With the same set-up, but using a roller in the teeth to make contact approximately at the pitch circle, the important condition can be estabhshed of the concentricity of this circle about the axis, the roller being changed from space to space and passed under the indicator. A gradual change in indicator reading, with extreme readings on opposite sides of the gear,. would indicate an over all eccentricrty, with the teeth cut, or generated about another axis.

Substantial variations in readings with the roller in closely adjacent teeth would indicate local wear in a used gear, or errors in tooth thickness or pitch m a generated gear. In a cut gear (one whose teeth have been shaped or formed with a slotting type cutter), errors of tooth thickness and pitch could exist without discovery by this test, as they would lie in the teeth, with all the spaces the same width.

With a gear tested for concentricity over the tips of its teeth, uniformity of their depth can be checked with a simple depth gauge, as at ***B. The*** body of this can be part of a thick ring bored to the outside diameter of the gear, or can consist of a block bolted between two plates cut from a thin bored ring. A drilled hole accepts a pm which can be filed half through on the top side, either with a small shoulder or flush at X, to function like a flush pin gauge. Then, with a roller in the gear teeth, as at C, such a gauge can be used for checking concentricity of the pitch circle, and uniformity of space width, a shoulder on the pin at Y.



Simple test

A large micrometer or gap gauge with an adjustable anvil can be used with rollers, as at ***D,*** in a simple test checking for wear on teeth or variations in space width. Eccentricity of the pitch circle would not be revealed, however, and neither would variations in tooth thickness where there is uniformity in space width.

For comprehensive checking, a la'he is as good as anything, the gear being mounted on a mandrel held one end in the chuck, the other supported by the tailstock centre.

Rotating the gear on the mandrel, an indicator or pointer will prove concentricity of the tooth tips; and using on the slide rest a holder with a turned down end, and on this a sleeve with a pointed nose, as at ***E,*** uniformity of space width can be checked by consistent clearance at Z-verifying with feeler gauges. The cross slide should not be moved, of course, the gear being slid on the mandrel or the saddle on the bed to change spaces. With a V-jaw sleeve, as at ***F,*** tooth thickness can be checked; and the two tests together prove accuracy or otherwise in tooth indexing.