ALIGNMENT IN GEARING

WORKSHOP HINTS AND TIPS

By GEOMETER

SHAFTS driven one from another by gearing may be disposed parallel, at an angle or cross-wise-according to the type of gearing employed-and satisfactory operation can often depend as much on alignment of the gears on the shafts, as on the spacing of these or on precision in the gear teeth profiles.

In theory, a pair of gears runs with its " pitch circles " rolling together in contact, part of each tooth being above the pitch circle and part below; and spacing or centre distance of the shafts is equal to the radii of the two pitch circles. Anything resulting in marked divergence from that spacing is likely with good-class gearing to cause noisy or jerky operation.

Thus, in the case of change gears on the quadrant of a screwcutting lathe, it is necessary for them to be set Just right-neither too deep, or they will be stiff and harsh, nor too shallow or they will be loose and noisy. Where centres of gear shafts are not adjustable like that, but "fixed " by the bores of brackets or casings, divergence may still occur from wear of shafts, bushes or ball races.

With a ball race, a scarred ball or locally-worn area on the outer (fixed) track, can cause intermittent noise, and to discover such a fault the race must be cleaned of oil and carefully tested.

Assuming there is no fault in the gears or in the spacing of the shafts, there are two circumstances in which eccentricity can occur, as at Al and 2. Where a gear is mounted on a stub or spigot on a shaft, this must be concentric with the shaft or the gear will run eccentrically S. Where a gear (or cluster of them, as on a car lay-shaft) is hollow to turn on a fixed shaft it is important for any bush to be of uniform wall thickness, avoiding eccentricity ***T*** and varying mesh.

To a smaller extent mesh can vary where a gear is wobbling in relation to the shaft, when in the course of each revolution it will take on an angular attitude A3. Such a fault may be due to an error in the facing of the boss of the gear or the face of a flange against which it is mounted. Testing to a fixed pointer (or dial indicator) reveals this fault-and like-wise the other two.

In situations like car gearboxes, where on occasion gears with double helical teeth may be used, ordinary sideways alignment can be very important for smooth, quiet operation. Owing to clearances on the teeth a pair of such gears, as at B, can be pushed sideways slightly giving an overlap U. The thickness of any washer which is fitted must not, however, be so great as to cause malalignment, but only sufficient to keep the faces of the gears in line.

With bevel gears, pitch circles become pitch cones, the apex of each lying on a point, as at C, ***V.*** If one gear is drawn back and the other pushed forward, running clearance may be the same as when the gears are correctly positioned. But the pitch cones will be out of alignment and contact will not occur over the whole length of teeth, so noise and wear may be increased.

In a first test, as at ***D,*** on a pinion and crown wheel, the teeth may be flush one side, but a final check should be made with marking blue or red lead and oil on the teeth and revolving the gears together.

In worm gearing with a straight worm, positioning of this may not be vital; but the worm wheel must be properly centred for clearance on the worm. As at ***E*** clockwise rotation of this causes thrust in direction W while anti-clockwise rotation causes thrust in direction X. Incorrect centring or too much play can cause binding in one direction.

Where the worm is a " waisted " or enclosing type, as at ***F,*** its positioning is important to maintain clearances Y and on the worm wheel. El