Marking tests for gears

WORKSHOP HINTS AND TIPS

By GEOMETER

PRECISE though gears may he in themselves, satisfactory operation follows only when they are aligned and meshing correctly and set at designed centres or with specified backlash. Alignment is dealt with in another article, and marking tests for tooth contact areas, in conjunction with verification of backlash, together reveal if the best setting obtains.

Checking contact areas of a pair of gears is straightforward enough. Both should be clean and dry; and into a few teeth of one of them a marking compound should be lightly brushed. Then they are rotated together-in one direction, then the other, and contacts are shown on the flanks.

In normal operation, one gear is usually the " driving " one and the other the " driven." When the driving gear applies drive, pressure is on the " drive side " of the teeth. But when drive eases off, and the driven gear continues by momentum (as in car transmission), there is over-run and pressure comes on the " over-run side " of the teeth.

Checking in both directions leaves marks on both sides of the teeth, and unless one gear is specified as that to be turned in tests there can be two tests, applying drive from one gear then from the other. The compound employed can be marking blue-ready made up, or powdered red lead mixed to a thin paste with engine oil.

Backlash is movement present when one gear is held stationary and the other oscillated. It is play at the pitch line, from a tooth being fractionally narrower than the space into which it fits. In general, it increases by setting gears away from one another, and within limits decreases by bringing them together. It is important, but not by itself an answer for meshing without marking tests.

In checking accurate gears like pinions and crown wheels, which are made in pairs and should never be mixed, both tests are essential. That for backlash, as at ***A,*** can be made with an indicator clipped to the casing flange.

Holding the pinion shaft stationary, backlash can be read, and the amount specified may be anything from 0.003 in. to about 0.008 in. With the indicator at an angle, a somewhat " high " reading should obtain, but with an arm giving a straight push, the reading should be spot on.

The outside diameter of crown wheel teeth is the "heel " and the inside the " toe " and by adjustments both crown wheel and pinion can be moved in and out, to obtain correct markings and backlash. Rotating the crown wheel and lightly braking the pinion shaft by hand, ideal markings are as at ***B,*** broad and central on both drive and over-run sides of the teeth.

Divergences from ideal markings indicate incorrect setting, and while the gears would still function, they would certainly be noisy either on drive or over-run. Typical divergences are heavy contact at the tips or root of the teeth, and heel-and-toe contact of one form or another.

Heavy contact at the tips of crown wheel teeth, as at C, indicates the pinion is too far out of mesh. It should be moved in towards the crown wheel, then moved out to adjust backlash. The opposite condition-heavy contact at the root of the teeth-reveals the pinion is too deeply in mesh. So it should be moved out, and the crown wheel in (if necessary) to maintain backlash.

With a heavy marking at the heel on the drive side and the toe on the over-run side, as at D, the remedy is to move the pinion out and the crown wheel in. For the converse condition, a heavy marking at the toe on the drive side and the heel on the over-run side, as at ***E,*** correction is made by moving the crown wheel out and the pinion in to maintain backlash.

Means of moving the pinion and crown wheel vary. Shims are often used at the pinion housing flange, crown wheel adjustment being threaded rings with locking devices.