# Lapping and grinding gears


## By GEOMETER

PARTICULARLY for repaired gears can lapping or grinding improve the accuracy of tooth profiles, though either process can legitimately follow a shaping or gear-cutting operation using a slotting-type cutter. Both processes, of course, will deal with hardened gears,. which may be helpful on occasion if warping occurs in hardening, or if, following welding, there should be hard spots.

As when using a slotting-type gear-cutter running on a mandrel in the chuck, a set-up for lapping or grinding is made on an angle plate on the vertical slide of a lathe, for the gear to be raised and lowered to pass the lap or grinding wheel through the space between two teeth. The lathe saddle is fixed to the bed by clamping or tightening the adjusting screws; and a cross-feed provides the advance to the required depth of penetration into the gear. Indexing, as for cutting repaired teeth, can be performed from a plate with a fixed jaw engaging sound teeth in the gear.

The general set-up is as at A. For the gear to be moved either side of centre height, it is usually necessary for the angle plate to be attached to the slide with the vertical portion above the platform-which demands an angle plate without' webs and of reasonable accuracy, though errors in angle may be counteracted by shim packing between the vertical portion and the slide.

A shouldered pin or short mandrel is bolted through a hole or slot in the angle plate, and carries on its top side the index plate and gear, held by a washer and nut. The index plate, with a piece of packing below it, is then bolted through another hole or slot to remain fixed with its jaw. This plate may well be capable of a small amount of rotational or angular movement, before finally fixing, to assist in aligning the gear teeth on to the lap or grinding wheel, although this can be done equally well by slight turning of the whole vertical slide on the cross slide platform.

This aligning of the gear rotationally, and the positioning of the saddle on the bed for the lap or grinding wheel to enter properly into the space between two teeth, must be done experimentally, with a piece of white paper on the lathe bed and a bright light directed *on to it, so* the light gap can be checked all round-with small adjustments and corrections. Fed right in, the lap should then fit as at *B.*

### Checking the contour

In machining the lap on its mandrel from a large washer-type piece of brass or aluminium alloy, the same principle can be adopted, employing two good teeth to verify the contour against a light background. Small corrections can be made using round files and emery cloth wrapped round rods for polishing.

During the lapping operation, the lathe should rotate in the normal direction at a speed at which abrasive and oil will not be flung about. Bed and slides should be protected with paper, however, and a small tray can be placed below the lap to catch drops for using again. A brush effectively feeds the abrasive, its bristles being drawn each way across the lap at a point close to where it enters the tooth space.

Should the lap wear out of shape, it can be corrected in the same way as in making, using files and emery-cloth; and a plate gauge is then advisable for checking. Such a gauge can be shaped almost to size by tiling, and then clamped to the tool slide for lapping as soon as the lap has been made.

For grinding teeth, the principles set out largely apply. A narrow wheel can be roughly shaped with a small dresser on a support, as at C. Trial cuts into a prepared plate reveal where corrections may be necessary, and lapping can follow grinding to reduce errors.

Lapping pairs of gears together can be done as at ***D,*** one on a mandrel in the chuck,. the other bracket-mounted on the slide rest.