By GEOMETER

Repair gear cutting

IN cases of temporary repairs to gears, repairs by pegging, or otherwise where only moderate accuracy is required-and speed may be a factor-filing tooth profiles are acceptable methods, using simple contour and spacing gauges. Often, too, pegged teeth can be improved by filling in the curved spaces with soft solder or brazing material, to provide a longer effective contact line. This can reduce noise and shock, with the main strength of the substituted teeth residing in the screwed-in pegs.

A higher standard of accuracy in finishing, both in contour and spacing, naturally follows where machining is practicable--either planing, endmilling, or forming with a slotting-type gear cutter, in conjunction with suitable indexing. Nor need this last, even in the absence of dividing means, occasion a problem, for a gear with most of its teeth existing can be used with a simple fixture, and the work performed on a lathe, milling machine, or shaper.

Mounting **in the chuck**

For a mounting in the lathe chuck, when teeth may be finished by planing with a tool on the slide rest, or when a milling attachment can be mounted on the slide rest, the set-up can comprise a mandrel for the gear, and an arm of flat material for locating and indexing by means of a bolted-on jaw, as at A. The gear should be a push fit on the mandrel turned down to take it, and the bar can be drilled or bored to the same diameter-when a nut at the end will hold all together. Fixing of the arm to prevent movement can be from the lathe bed or stand, or the bench behind it, by bolting to a bracket; and an enlarged or slotted hole will permit slight adjustment for a tooth space to be set at lathe spindle height for machining. With the arm and jaw fixed, indexing is, of course, performed by removing the gear and turning it.

When it is proposed to finish the teeth by endmilling with a cutter running in the lathe chuck, the gear must be mounted on the slide rest or vertical slide. For the slide rest mounting, as at ***B,*** the mandrel can be from square stock, and the arm (at A) can then be a plate with a jaw functioning on the same principle. The reaction block for the slide rest clamp can supply the fixing for the plate; and, as before, indexing can be effected by taking off and turning the gear.

Using **slotting-type cutter**

If the tooth-finishing operation is to be done with a slotting-type gear cutter, the set-up must be on an angleplate on the vertical slide, with the gear lying flat, and a vertical upfeed bringing it past the cutter running on a mandrel in the chuck-possibly with tailstock support. The principle of clamping and indexing can be similar to that of the two previous mountings-and with appropriate adaptations mountings can be made on shaper or milling machine.

Before planing teeth to profile, whether the spaces have been completely filled in or partly produced by sawing and filing, a plain slotting operation, as at C1, using tool 2 is advisable to remove surplus material. The cross slide, of course, provides feed, and the saddle the cutting stroke. Subsequent cuts finish the profile as 3 with tool 4-which tool must be tiled to fit the teeth, given clearance, hardened and tempered (or ground), and in use carefully regulated for depth of cut. Lubricant may be helpful on occasion, as can easing of the feed on back strokes.

An endmilling cutter, as at ***D,*** can be made by turning silver steel rod to profile, filing flats and giving clearance. For improved front rake on the teeth, two grooves X may be ground along the profile on the blank, followed by backing off through angles Y and giving clearance.

The slotting-type gear cutter, as at ***E,*** is machined with the profile on its edge: then teeth can be formed and given clearance by sawing and filing.