Teeth on cutting tools

By GEOMETER

WHILE teeth and flutes can be produced in various ways on cutting tools, no method is easier than drilling, when applicable. Often it is the quickest method for producing teeth and flutes,. and it is preferable to the alternatives of shaping or milling if for no other reason than the difficulty of setting up or lack of equipment. Drilling also leaves teeth with rounded roots, and gives positive rake to cutting tips, by suitable choice of size and location of drilling in relation to edges of teeth. And positive rake is generally an important factor in the free cutting of tools, particularly when working on soft materials.

Making teeth on the end of a piece of steel tubing for cutting discs, or using as an end or face-mill, illustrates the basic principle. The tubing, as at A, is drilled round the circumference near the end, which is then faced back into the holes, and finally clearance or relief is given up to the cutting tips by hand filing. First, with the tubing held in the chuck, a line is scribed round with a pointed tool for the holes to be drilled in the same plane (1). Rechucking the tubing and facing back the end leaves teeth with positive rake (2). Then careful filing gives the clearance (3).

Holding thin tubes

If the tubing is thin-walled, it should be plugged with solid material to hold it firmly for facing-and also later when it is being used as an end or face-mill. If it is to be used for cutting discs, a mild steel shank with pilot can be fitted in the bore, with a cross-pin or rivet transmitting drive. Mild steel tubing should be case-hardened, of course, following which the tips of the teeth can be hand-honed sharp.

Small shell mills can be made on this principle from silver steel or cast steel rod? which is prepared by facing, centring, drilling up-and for boring if necessary-before the circle of holes is drilled. Heat treatment is by normal hardening and tempering.

On a small endmill with two teeth, drilling has the advantage of giving radially disposed cutting tips with positive rake. The drilling is done from each side, but not diametrically. After the drill ls started, adjustment is made so its centre passes one side of the material centre, and this is done when drilling the opposite side. Finishing to the centre can be done with a flat-ended drill; then when the material is faced, as at B, the tips of the teeth are left radial, V and W, to provide free-cutting right to the centre-with the shaded areas relieved by filing. An endmill made by filing two flats on material has tips of teeth on planes X and Y.

Flutes on small special reamers-which can be quite short for many purposes-can be effectively produced by drilling, and the teeth given positive rake. Silver steel or cast steel can be used-turned to size if required and a collar fitted, as at C, for drilling from the same size as the drill can be fitted in flutes, bent down to the shank and clamped.

A short tap in silver steel or cast steel can similarly be fluted by drilling, using a nut or piece of material bored and screwcut, as at *E*. *The* teeth will have positive rake in both directions, the tap cutting backwards in clearing -which can be an advantage when it is not possible to give clearance to t e e t h .

A silver steel tool in a mild stee holder, as at *F* (left) can be used for cleaning threads; and if another holder (right) is used for drilling and tapping, an off-set, Z, will give relief on the teeth of the tool. El

For use on the lathe, a short special reamer can be centred for support from the tailstock, and cross-drilled to hold with a tommy bar. The shank can be reduced for clearance. To protect the cutting edges of the teeth when filing, a piece of wire