GRINDING and SETTING tools

By GEOMETER

ALL turners who have served their time on a light lathe-the kind used by most amateurs up to a generation ago-know that a decisive factor in its successful use is unremitting care in grinding and setting tools. This enables you to get round many of the problems caused by the light construction and lack of refinements. Contrariwise, without unrelaxing attention to tools, you are soon in trouble with rough finishes or wavy surfaces on the work.

A production centre lathe has a broad bed, a spindle with widely-spaced bearings, and a range of feeds for the saddle. Straightforward work can be done on it with much less skill and attention than is needed for the same job on a smaller and lighter lathe of the sort that many of us normally use.

On the smaller machine, spindle and slides must be in good adjustment; and you may have to feed the saddle by hand from the leadscrew, there being no fine self-acting feed to give an overlapping cut with almost any round-nosed tool. To get a fine finish, you may have to hone a small flat on the cutting edge of the tool, and then watch the depth of cut and the rate of feed to avoid chatter.

A good general-purpose turning tool is shown at diagram ***A,*** with the essential angles and clearances. These comprise two rake angles, top rake ***V*** and side rake ***W,*** and three clearance angles, top clearance Y, front clearance X and side clearance Z.

The front rake ***V*** and the front clearance X permit the tool to cut freely when it is pushed straight to the work by the cross-slide feed. The side-rake ***W*** and the side-clearance ***Z*** do the same when the tool is fed sideways byeth topslide feed or the leadscrew. The top-clearance Y reduces the length of cutting edge which is in contact with the work during a sideways cut. If this were not done, the wide contact would induce chatter-particularly on a light lathe.

The angles are shown sharp to the square shank of the tool bit to emphasise them, although the shape of an actual tool is to the dotted lines. The tool bit is intended for mounting horizontally on a topslide, or in a turret. When it is mounted at an angle in a tool holder, the grinding must allow for this.

To begin grinding a tool bit, you can hold it as at Bl at an angle and above the centre on the periphery of a grinding wheel. This produces a curved surface on the end of the bit which you can flatten later on the side of the wheel. In this way, you reduce wear on the side which cannot be rectified so easily as the periphery by use of a dresser. Some of the other grinding can be done on this principle.

The first grinding leaves the bit with the front clearance angle X and the top clearance angle Y. You grind the side clearance angle Z as at B2,on the side of the wheel with a twist in the direction of the arrow.

The next step is to grind the two rake angles ***V*** and ***W.*** This you do as at Cl, holding the tool to the other side of the grinding wheel, at an angle, and again with a twist. Lastly, you grind the radius by swinging the tool as at C2. You can cool it in water between grindings, and finally polish its faces with an oilstone.

Diagram Dl illustrates how the tool should be mounted with its cutting tip at centre height. Use packing as required-and if the tip is above centre, you can pack under the back end of the bit, although by so doing you alter the cutting angles. With an above-centre setting D2, contact may be below the tool edge; with a below-centre setting D3,you lose top rake, and the work may tend to climb over the tool.

Diagram El shows the normal tool; E2 shows a tool for sharp corners; E3 shows the flat that you can hone for a fine finish.

A gauge for setting tools appears at ***F. You*** make it from sheet and angle metal, screwing on a strip for setting turning tools, and drilling holes for boring tools. ❑