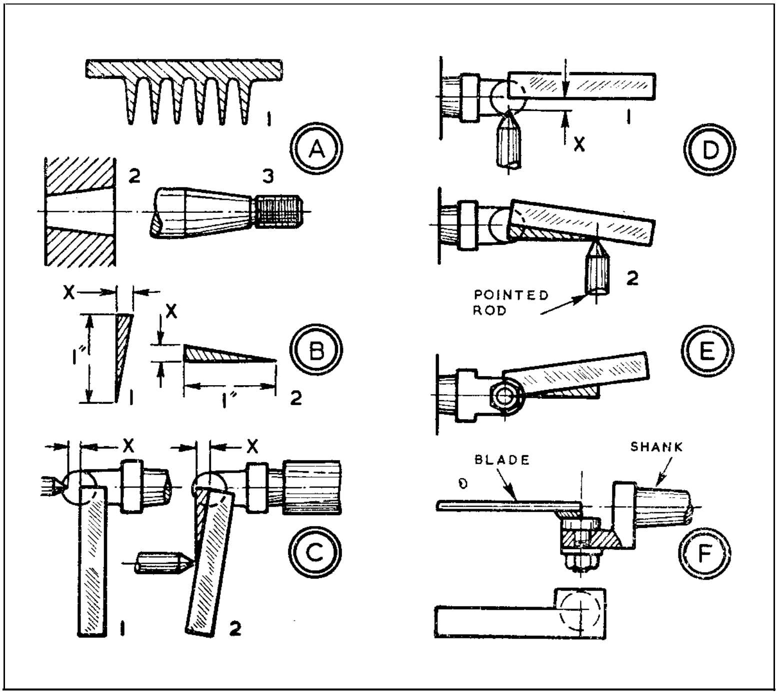
WORKSHOP HINTS AND *TIPS*

Turning angles and tapers

MANY components include among their features angles and tapers which must be turned with the topslide set at an angle and the tool at centre height. Examples are shown at diagram A: (1) a section of tapered fins on an air-cooled cylinder; (2) a taper in a wheel; (3) a taper on a shaft.

To turn tapered fins, the topslide must be brought round at right-angles to its normal position, and set at the small angle either side of this position for turning one side of each fin and then the other side. Some topslides are not graduated far enough round the base to make these settings.

By GEOMETER



To machine a taper in a' wheel, the topslide must be set so that the tool moves to a smaller diameter when it is traversed to the left; and to machine a taper on a shaft, the opposite setting must be made, so that the tool moves to a larger diameter. Both settings must be accurate, or the tapers will not fit together firmly. And such accuracy cannot be obtained with certainty by setting the topslide to graduations.

These examples show that angles and tapers cause problems for turners. Yet, in theory, they are simple, as every angle and every taper is based on a right-angled triangle, which has two sides at right-angles and a sloping side or hypotenuse. Anyone can draw a right-angled triangle, just as anyone can select the tangent value of the angle from trignometrical tables, where angles are given in degrees and minutes, and tangents as decimal fractions.

To use tables of tangents two facts must be known. One is the angle in degrees, which is obviously on the drawing or in one's mind. The other fact is the long side (or base) of the triangle. For working on the lathe, this long side can be 1 in. (or 2 in. if one prefers). If the long side is 1 in., as at ***Bl*** and 2, a glance in the tables of tangents wi11 show X as a decimal fraction. For I deg. X = 0.017 in.; for 2 deg. X = 0.035 in.; for 3 deg. X = 0.052 in. If the long side of the triangle is made 2 in., these fractions are doubled. All the fractions can be read directly on a micrometer; and short pieces of rod can be turned to size to be used as gauges.

Accurate setting of the topslide now demands, in addition to a gauge, a fitting which can be placed in either the tailstock or the spindle, and a pointer to hold on the slide at centre height. The fitting consists of a shank carrying a blade which can be set to angle and clamped with a nut. The end of this blade is on the lathe centre line.

Suppose the taper on one side of the fins (Al) is 2 deg., a gauge is turned to X which is 0.035 in. The fitting is put in the tailstock, and the pointer (pointed rod) is set from the blade, as at Cl, using the gauge. Then the pointer is brought back 1 in. with the cross-slide, and the blade is clamped to the pointer, as at C2. Here the triangle is the same as Bl. Then you can set the topslide so that the pointer moves along the blade-checking with white paper on the lathe bed. To set the topslide for the opposite angle, the fitting is turned 180 deg. in the tailstock.

The procedure is similar to set up for a taper, but the fitting is in the spindle. Suppose tapers A2 and ***A3*** are 6 deg. included angle, the triangle will be 3 deg. and the gauge for X will be 0.052 in. The pointer is first set as at Dl, and then it is moved 1 in. by saddle feed for the blade to be clamped as at D2. Here the triangle is the same as B2. After setting the topslide, you can machine the internal taper (A2). To set the slide for the external taper the lathe spindle must be turned 180 deg., as at ***E.***

The fitting for these settings is as at ***F.*** The shank is from rectangular stock, turned taper, and milled or sawn and filed to a step. The blade is prepared as in the lower diagram, and is brazed to the head of a turned pin. Then it is milled or file-finished for the end to be on the axis of the pm. ❑