WORKSHOP HINTS and TIPS

Turning contours and profiles

By GEOMETER

IN plain turning, tools are fed along straight lines by the saddle, the cross slide and the top slide of the lathe. Thus the rotating work is machined with the parallel diameters, the square-end faces and shoulders, that are in the majority on turned components. For machining a taper, the top slide is set at an angle to the lathe axis, and again the tool is moved on a straight line. It is the same when a large chamfer or other conical face is turned. The job is done with the top slide set at the required angle.

Some components carry contours that cannot be produced by any of the above simple movements; and for these we may use either form tools or free-hand turning methods, which combine the movements of top slide and cross slide. Both methods may be employed in machining radii on shafts.

For a small radius, a turning tool is ground and honed to fit a standard radius gauge, and is fed carefully to the junction of diameter and shoulder, where sufficient metal remains from previous operations. If the radius is large, this forming method may result in chatter, to counteract which it is helpful to run the work at reduced speed. But should this not be effective, there is the free-hand turning method which uses a tool of smaller nose radius in conjunction with combined movements of top slide and cross slide. Progress, of course, is frequently checked with the radius gauge.

Obviously, this method may result in ridges in the radius at the finish. To smooth them down, the emery cloth which is used for polishing the shaft part of the job can be run up the radius to the shoulder. When it is pushed up, it rolls back naturally, and can be pressed to the radius by finger and thumb. Alternatively, emery cloth. can be wrapped round a metal rod and used carefully on the radius alone.

An example of a component on which free-hand turning can be employed is a poppet valve; as at A. On a production lathe, the large radius beneath the head of such a valve can be machined with a form tool. On a toolroom lathe, it can be machined with a radius-tummg fixture. On a centre lathe, the only method is free-hand turning to a gauge..

A suitable gauge can be made from steel plate, 1/16 in. thick; and a steel washer,. turned to size, will serve as a guide for filing the gauge. Two hardened washers bolted one each side of the plate are, of course, better.

When we use bar material, it is not important whether the valve is machined with its head at the tailstock or at the headstock. If the head is at the headstock, as at B, turning is in the natural direction, with thrust on the spindle, and as we have ample material we can work at the radius until it is right. Cuts with a parting tool reduce the diameters at the ends; and for safety, a saw can be used to remove the surplus from the stem and the valve from the bar.

A split bush will mount the valve in the chuck for facing; but if the head is to be hollowed for lightness, a holder as at C may be advisable. Two pieces of rectangular material are bored to grip the valve at stem and head. This saves the stem from strain as the hollow is machined in the head.

In small sizes, contours and profiles can be machined with form tools which can be made in various ways. The best for many purposes is the circular type, which is easy to sharpen. For screwcutting, such a tool can be as at *D* and *E*, turned from cast steel and taper-fitted to its holder. A similar tool, as at ***F***, may be used for turning ball ends. After hardening, tempering can be done in hot sand.

The cutting edge of a circular form tool is usually below its centre, resulting in a slight change of form from that at a diametral line. Thus, Y is less than Z. If necessary, allowance can be made for this when turning the tool.