

The making of tools to cut valve seatings is described by Geometer

## Valve seating TOOLS

**T**O BE pressure or liquid-tight, a valve of hard or rigid material demands an accurate seating. Of course, if a valve is of leather, rubber, or similar pliable material, or incorporates such in the form of a ring or disc, small inaccuracies in the seating can be accommodated though the finish should be smooth and free from sharp edges.

A valve, however, which is a flat disc, a ball, cone or poppet type, demands a geometrically accurate seating, since only by precise matching of valve and seating faces can leakage be prevented.

In small and model sizes, suitable cutters can be easily produced from silver-steel or cast-steel rod and, after hardening and tempering, used in a drilling machine or by hand where the purpose is simply to finish or correct the seating and where, consequently, machine use would be attended by the risk of removing too much material.

Before hardening and tempering, the tool is finished to shape and dimensions, and afterwards cutting edges are honed with hand abrasive slips.

### Colour changes

For tempering, it is polished bright with emery cloth, then warmed and twisted in a small spirit or blowlamp flame well back from the cutting edge. As heating proceeds, the surface changes colour—light brown, brown, blue, to dark purple. On the brown colour reaching the cutting edge, the tool is quenched again in water, and after honing it is ready for use. If the colour over-runs to purple the tool has been made too soft.

A and B illustrate a flat-seating cutter which can be used in a hole after a twist drill to square out the bottom for a disc or ball valve; C depicts a hollow cutter to remove material from the outer edge of a flat seating, leaving it raised for a disc valve; and D shows a cutter for a small cone or poppet valve, this having a screwed-in spigot or guide with locknuts on the end with which

to regulate the cut. This guide is fitted when the tool is finished and need not be hardened and tempered.

Cutting edges of a flat-seating cutter are produced by sawing and filing, E. A central tongue is produced, cut crosswise with a narrow saw, then the edges are filed oppositely with clearance or rake.

Cutting edges of a hollow cutter are filed as F, after drilling the rod centrally, and are opened out gradually. To save material, such a cutter can be a shell-drilled centrally and crosswise, countersunk, the teeth filed, the piece cut off, heat-treated, then riveted to a shank, G. Tempering should be done with the tool standing teeth upwards on flat metal. It should be heated slowly, and finally tipped off into water.

### Making the seating

In the absence of a lathe, rod ends can be trued in a drilled block rotating against the face of a grinding wheel H.

An example of producing a seating is that for a flat valve I. The central hole and a larger bore for the valve having been drilled, a flat-seating cutter is used to square out the bottom, J. This is followed by a hollow cutter, leaving the seating as at K.

Edges will remain sharp, however, and the face of the seating may be ringed from the flat cutter—which would prevent complete sealing.

The edges requiring radii are finished with coned rods as L and M, and the face with a square-ended rod as N, then lapped with line grinding compound. The rods can be of mild-steel, brass, aluminium, etc.

The small cone L, can be produced free-hand on a grinding wheel; the larger hollow one M, by drilling, the square end on the rod, N, by grinding as H. With a smear of grinding paste on the faces, the rods are twisted by fingers on the seating.

In the case of a ball valve, seating on the raw edge of a hole, O, is not effective, so with a soft rod and light hammer the ball is tapped down, the seating being shaped to its contour, P.

A poppet-valve seating cutter is used as Q, pressing the tool down by hand.

