

Poppet valves and seatings

AFTER FIFTY YEARS, and despite ingenious alternatives, the poppet valve has established itself as the standard valve for four-stroke i.c. engines. Its construction and servicing inevitably concern in some degree all who have to do with such engines—motorcyclists, car owners, mechanics and engineers.

Though the causes of valve (and seat) trouble may be various and often interacting, all stem broadly from the following: the heat to which the valve is subjected; the hammering it receives along with the seating from the spring action on closing; wear of stem and guide; incorrect servicing or adjustment.

Valves run very hot, exhausts in particular. They scale on the heads, burn on the faces. Added to this, the "skin" acquires a burnished impacted structure from hammering, different from the clean precision before use. In time, faces indent, seatings broaden. When stem and guide wear occurs, the valve may not strike the seating squarely, but tilt or roll on closing, eventually causing a wide or eccentric seating.

Correct fitting

Main features of correct fitting appear at A. The included angle of the valve face, W, is usually 90 deg. or 120 deg. Taking measurements from the seating these are 45 deg. and 30 deg. angles. All valves may be the same angle, or exhausts may be 90 deg. (45 deg.) and inlets 120 deg. (30 deg.). The included angle of the seating, X, is the same as that of the valve, except in the case of some exhaust valves, when there is about 1 deg. difference. For example, with W = 90 deg., X may = 89 deg., this tending to cause seating on the outer part of the seating.

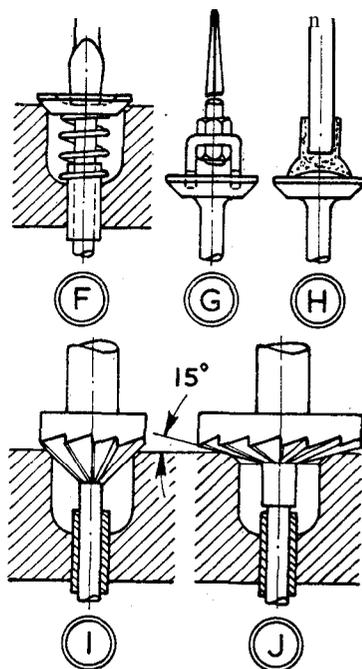
For most cars and motorcycles, the valve head width or land, Y, new, may be 1/16 in. to 3/64 in. Facing the valve reduces this, and advisedly it is not made less than about 1/32 in. The seating width, Z, new, averages 1/16 in. (a few thou. bare to full). Valve hammer and grinding increase this and when exceeding about 3/32 in. it is advisedly reduced so the valve face contains the seating centrally, B.

Common faults are shown at C, D

and E. Burning and pitting on the face are typical of all exhaust valve seatings after considerable use, and to some extent of exhaust valve seatings. On valves, faces are trued to original angle by turning or grinding (usually requiring a lathe or valve facing machine) and unless the seatings are bad, this can be followed by grinding in. When the seatings are defective, however, they must be trued in turn, either with a cutter or coned abrasive stone located from a stem in the valve guides—the cutter turned slowly by hand and the abrasive stone rotated rapidly by a machine like a portable electric drill.

After facing, valves must not be thin on the heads, D, or the edge may overheat and burn quickly, particularly on exhaust valves. Actual pocketing of seatings, E, only occurs after considerable time and numerous grinding in of valves. Nevertheless, it is what tends to occur, and should be watched for on older engines.

To permit rotation when grinding in, valve heads may be slotted for a screwdriver, F, or carry two holes to accept a tool like a small fork, G. Where heads are plain, a rubber suction tool, H, is used—wetted and



pressed on the head to force out air and obtain a firm hold.

A forked tool, G, can be made from flat stock, rod, nuts and a file handle. The flat stock is bent U-shape, drilled for the rod, fixed by the nuts and the ends tapered and rounded to enter the holes in the valves. The other end of the rod is tapered square to drive in the file handle.

For true valves and good seatings, fine grinding paste is sufficient and should always be used for finishing, even though when seatings are pitted coarse paste may have been needed previously. A smear is applied evenly to the valve face, and grinding is accomplished with an oscillating movement, frequently lifting the valve and changing its position on the seating—for which a light spring below the head is helpful, F. Valve faces and seatings at the finish should be a uniform grey colour without excessive rings.

For truing defective seatings, a typical cutter is as Z, while for narrowing wide seatings, or eliminating pocketing, a chamfering cutter, is used.

