Making PISTON RINGS

By GEOMETER

THERE are four ways of making plain piston rings. Two of them are straightforward for the model engineer; but with the two others reservations must be made, though they would not necessarily be impossible for experts.

A piston ring should fit the cylinder exactly, which means that, with the ring compressed, its periphery must be circular; and it should exert a uniform outward thrust to the cylinder. For this, it must be slit at one point.

To give the required outward thrust, the ring when free has a considerable gap, Al, with which it is not circular; it attains this shape with the small working gap, A2, when in the cylinder.

Simple as the conditions are, they are by no means easily ensured in practice. Departure from them means loss of efficiency from blow-by of pressure; and in a small engine there may be extra frictional losses which seriously reduce mechanical efficiency.

If a piston is machined the same size as the cylinder, it will be circular, but will have no outward thrust, and so will not be efficient. On the other hand, if a ring is machined to a large diameter and a piece is cut out for it to be entered in the cylinder, it will have outward thrust but will not be circular. By allowing extra material on such a ring, it can be machined after the piece is cut out.

The ring can be clamped on a mandrel for turning the outside. For boring the inside, it can be gripped in a recess in a holder. The section will be uniform, but that is one way of making a ring.

A second way is broadly on the lines of the first, but the ring is made of varying section. It is eccentric, with the outside and inside diameters machined on different centres. The gap is cut at the point of thinnest section.

A third way, which is theoretically correct. was devised by Dr F. W. Lanchester. A ring of uniform section is machined to fit the cylinder, and wedged open with a small strut, A3, which is V-shape each end to touch at the line of average section, A4. From this shape, a cam is made to operate the cross slide of the lathe. Then a ring of uniform section is machined; and with the gap cut, it compresses circular in the cylinder, with uniform outward thrust.

The fourth way of making rings is the commercial method. From the opened ring, A3, a matrix is made, and rings of uniform section are specially hammered to fit it. They, too, compress circular, with uniform outward thrust.

Faulty fitting of a small ring usually takes the form of a reduction of outward thrust at two places on its periphery. They are along arcs W and X, Bl. Sometimes there may be tiny gaps which can be seen against a strong light. Lapping a ring (or a brief period of use) will show up these areas of reduced thrust,. which may occur even on an eccentric rmg, B2.

As lapping improves the fit of rings, it is recommended, with Brasso as the abrasive, but not with the rings on the piston. A holder can be made, C, with a screw in handle and a loose plate. Then they can be fitted without stretching. Their gaps should be kept to a minimum to allow for the increase with lapping.

To lap a ring in making, the set-up can be as at D. The lap should be a thou or two larger than the cylinder, and run in the chuck. The ring is loose in the holder, so that it can expand, hut is gripped opposite its gap with shimstock, Y-Z. Stops for the handle-as the ring is moved to and fro in the revolving lap-are set either side of a bar on the slide.

Diagram *E* shows a split lap which can be returned to size by filing its faces and reaming its bore; while *F* illustrates a typical mandrel on which rings are turned.