PATENT SPECIFICATION

Application Date: Oct. 31, 1935. No. 30088/35. **448,384**

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COMPLETE SPECIFICATION

Improvements in Rotary Valve Internal Combustion Engines and Pumps

I, ROLAND CLAUDE CROSS, a British subject, of 33, Midford Road, Odd Down, Bath, Somerset, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to internal combustion engines and pumps of the type comprising a rotary cylindrical distributing valve mounted in a split housing which surmounts and is disposed at right angles to an axially slidable cylinder, the lower part of the housing being made rigid with the cylinder so as to have with the cylinder a certain amount of resilient movement in relation to the upper part of the housing. Engines of this type are exemplified in the Cross co-pending applications Nos. 20,382/35 (Serial No. 448,368) and 30087/35 (Serial No. 448,383), and the invention is particularly although not exclusively applied to such engines.

The object of the invention is to provide a simple and reliable multi-cylinder engine of this type wherein the cylinders can be cast in one block whilst the individual axial movement thereof is retained so that the inlet port of each cylinder is maintained in close contact with the valve at all times irrespective of distortions which may occur due to heat. Thus efficient port sealing is obtained without undue interference with the axial movement of the respective cylinders.

According to this invention an internal combustion engine or pump of the type defined, comprises a block of cylinders having at the head and foot and from end to end thereof flexible connecting members which allow of relative axial movement between the respective cylinders.

With this construction the cylinders can be cast in one piece with the lower valve housing part whilst the advantages of the axial cylinder play are retained, and when employed in conjunction with the sealing packing at the head and foot of each cylinder as described in co-pending application No. 20382/35 (Serial No. 448,368) and the sealing annulus around each inlet port as described in co-pending application No. 30087/35 (Serial No. 448,383) or with the springy lip at the edge of each inlet port according to Cross British Patent No. 373,660, the multi-cylinder engine of this invention will develop maximum horse power due to the efficient sealing at all points and under all conditions of running.

In order that the invention may be more clearly understood one embodiment thereof, by way of example only, will now be described with reference to the accompanying drawings, wherein:—

Figure 1 is a vertical section through one cylinder, and;

Figure 2 is a longitudinal section through the cylinder block.

Like parts are designated by the same reference numerals in both figures.

The housing of the rotary valve 1 is split longitudinally at right angles to the cylinders 2 to provide an upper part 3 and a lower part 4 which is cast integral with the cylinders with thin and flexible portions 4^a connecting the respective cylinders at the head of the cylinder block and from end to end thereof so as to allow each cylinder movement in an axial direction the resilience of which movement is provided by the sealing packings 9 and 10 inserted respectively in the joint 6, 7 between the valve housing parts and the joint between the crank case 8 and the foot of the cylinder as is described in the specification of Cross co-pending application No. 20382/35 (Serial No. 448,368).

Each cylinder is suitably shaped and stiffened at the upper end as shown to provide a good bearing surface to receive and to act as a strut to take the load of impinging gases due to a rise in pressure in the cylinders, this rise in pressure causing the cylinder block to be pressed hard up against the valve, and by the provision for the individual movement between the cylinders any distortions due to heat will not be effective, as would otherwise be the case if the block were cast absolutely rigid, to cause the middle

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cylinders to come away from the valve. Thus the escape of gases between the valve and the edges of the inlet ports 5 with consequential detrimental results to the efficacy of the axial play of the cylinders is prevented a definite and assured trapping of the gases in the upper end of the cylinder so as to cause the same to have maximum effect being obtained by providing the bearing surface of the lower housing part with a raised sealing annulus 13 around each inlet port 5 in the manner according to the co-pending application No. 30087/35 (Serial No. 448,383) above referred to.

The cylinder block will be surrounded by a water jacket which in the embodiment shown is formed by casting the block with open sides which are closered by plates 18 spaced from the cylinders and secured to the block by means of bolts 16 which pass through split bosses 19 disposed at the foot of the block and extending between the cylinders from side plate to side plate. One part of each boss is cast on one cylinder and the other part of the boss is on the next adjacent cylinder or on the end plate of the block in the case of either of the end cylinders, and over the bolts are inserted resilient bushes 17 of rubber or other suitable material, the whole being clamped together by means of nuts 16^a which engage the threaded ends of the bolts and are housed in recesses 12^a in the distance plates 12 located between the crank case 8 and the upper housing part 3. Such a construction not only secures the side plates but also constitutes the flexible connection between the cylinders at the foot of the block, as the resilient rubber bushes allow of the axial movement of the cylinders.

As an alternative to this dual form of resilient joint for securing the side plates, the split bosses may be replaced by corrugated flanges connecting the respective cylinders and the resilient joint between the plates and the block will thus be separate therefrom.

As a further means of holding the side plates to the block there may be provided at the head of the latter rods 20 which extend from side plate to side plate and are headed at one end and threaded at the other to engage the said plates.

In order to seal off the ends of the valve, there is inserted between the usual end flanges 14 and the block resilient packing 15 accommodated within a semi-circular recess in the block so that the packing comes round below the bottom half of the valve.

By employing the present invention in the construction of a multi-cylinder engine, the cylinders will be capable of deflecting the few thousandths of an inch necessary to obtain adequate port sealing and valve clearance without resistance of appreciable magnitude. Thus a block comprising six or even eight cylinders could be constructed in one piece and would be sufficiently resilient to maintain each cylinder in contact with the valve under all conditions.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An internal combustion engine or pump of the type defined, comprising a block of cylinders having at the head and foot and from end to end thereof flexible connecting members which allow of relative axial movement between the respective cylinders.

2. A multi-cylinder engine as set forth in Claim 1, wherein the flexible connecting members at the head of the block are formed by making the metal of the lower part of the valve housing which is cast in one piece with the cylinders of a reduced section between the cylinders.

3. A multi-cylinder engine according to Claim 1 or 2, wherein the sides of the cylinder block are closed by plates spaced from the cylinders to form a jacket for cooling fluid and secured to the block by a resilient joint allowing of the relative axial movement between the cylinders whilst consolidating the block as a rigid entity susceptible to the pressure which is applied to effect the movement of the cylinders.

4. A multi-cylinder engine according to Claim 3, wherein the flexible connecting members at the foot of the block are constituted as split bosses extending from side plate to side plate with bolts passing between the boss parts and through intermediate resilient bushes, the ends of the bolts projecting through the side plates to receive nuts or equivalent members by which the said plates are clamped to the block with provision for relative movement between the plate and the cylinders due to the resilient bushes.

5. A multi-cylinder engine according to any one of the preceding claims, wherein the upper end of each cylinder is stiffened and shaped to provide an adequate bearing surface to receive impinging gases due to a rise in pressure in the cylinder.

6. A multi-cylinder engine according to any one of the preceding claims, wherein between the usual end flanges of the valve and the block are inserted resilient packings which form a seal preventing the escape of gases.

7. A multi-cylinder internal combustion engine constructed as herein described and as illustrated in the accompanying drawings.

Dated this 31st day of October, 1935.

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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig.1.

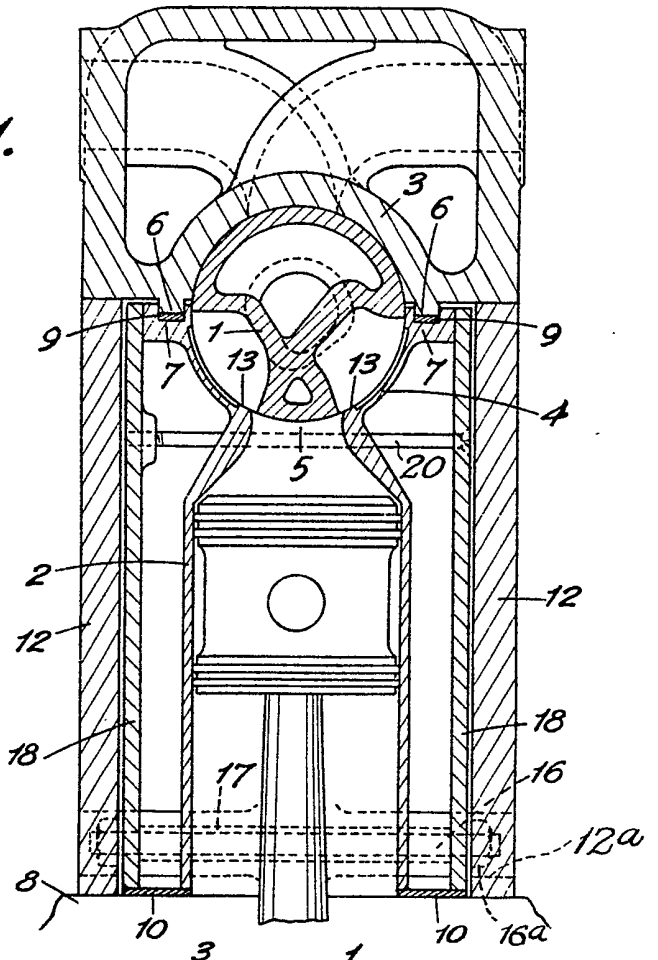
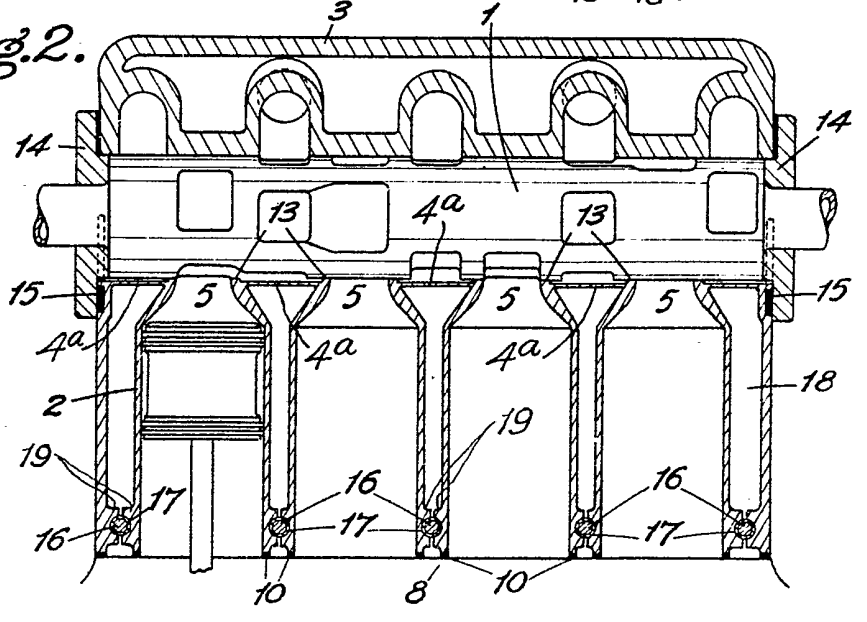


Fig.2.



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