May 16, 1944. L. R. SPENCER 2,349,203

INTERNAL COMBUSTION ENGINE

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Fig. 1.

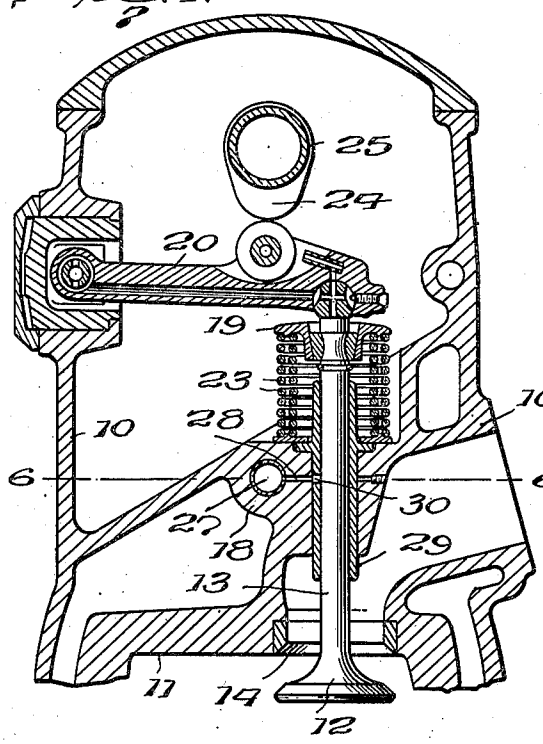


Fig. 2.

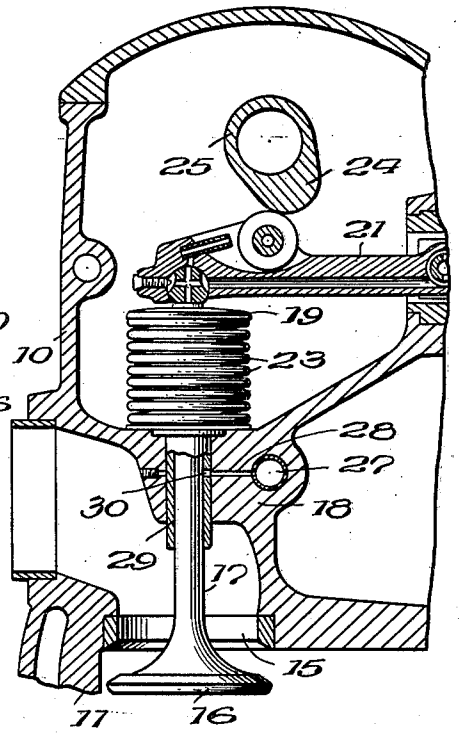
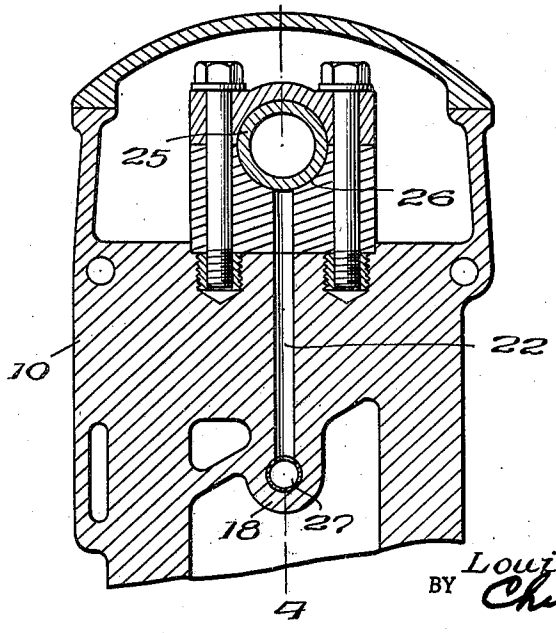


Fig. 3.



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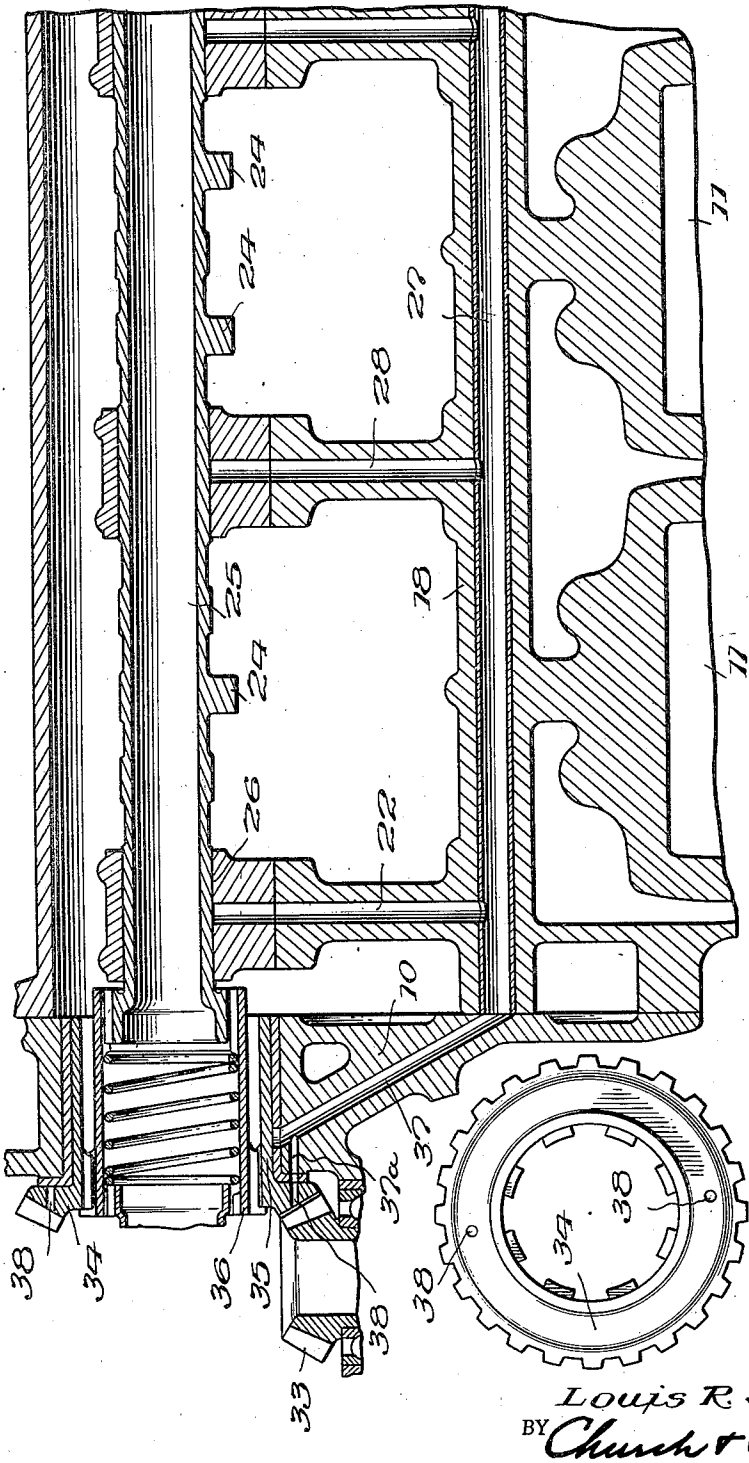


Fig. 4.

Fig. 5.

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Fig. 6.

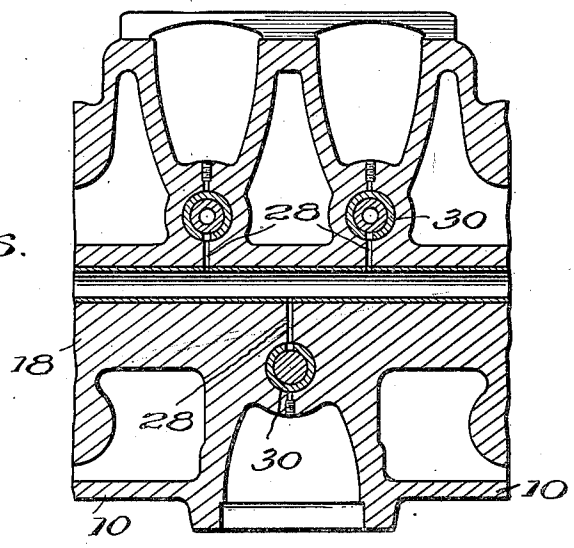


Fig. 7.

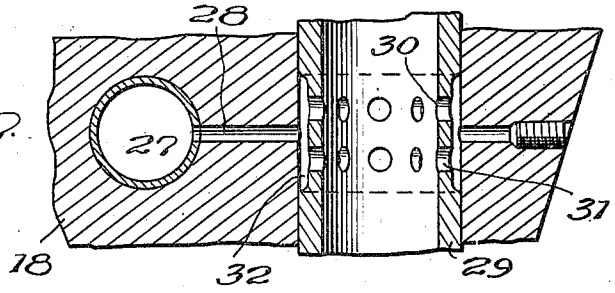
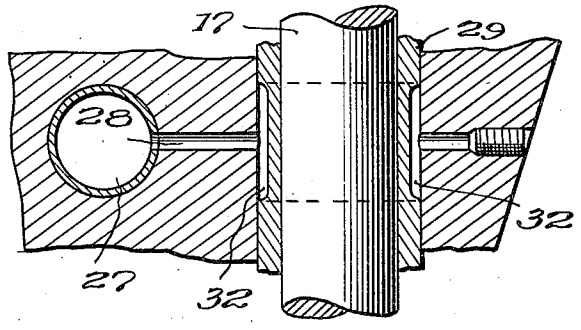


Fig. 8.



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UNITED STATES PATENT OFFICE

2,349,203

INTERNAL-COMBUSTION ENGINE

Louis R. Spencer, West Hartford, Conn., assignor to Spencer Aircraft Motors, Inc., West Hartford, Conn., a corporation of Connecticut

Application January 5, 1942, Serial No. 425,686

3 Claims. (Cl. 184—6)

This invention relates to improvements in internal combustion engines and particularly to such engines of the in-line type of cylinder block, wherein a plurality of cylinders are formed in line longitudinally of the block.

The primary object of the invention is to provide an improved system for lubricating the poppet valves controlling the intake and exhaust of the cylinders and also lubricating the mechanism by which said valves are actuated.

A further object is to provide a lubricating system for the valves and their actuating mechanism, wherein the arrangement of said system or the principal portion thereof will materially facilitate the foundry work involved in producing the engine block casting. More specifically, the arrangement contemplates the location of the main lubricant supply duct centrally of the casting so that, with the molds and cores split on their center lines, an insert for forming the duct can be very readily placed in position in making the casting.

With these and other objects in view, the invention consists in certain details of construction and combinations and arrangements of parts, all as will hereinafter be more fully described and the novel features thereof particularly pointed out in the appended claims.

In the accompanying drawings—

Figure 1 is a sectional view through the upper portion of a cylinder block in a plane intersecting one of the valves of a cylinder and the valve rocker arm.

Fig. 2 is a similar view illustrating the other valve of said cylinder;

Fig. 3 is a similar view taken in a plane intersecting one of the bearings for the rocker arm cam shaft;

Fig. 4 is a sectional view through the upper portion of the cylinder block with the rocker arms omitted, this view being taken longitudinally of the rocker arm crank shaft on the line 4—4 of Fig. 3;

Fig. 5 is a plan view of one of the gears for driving the cam shaft;

Fig. 6 is a sectional view on the line 6—6 of Fig. 1;

Fig. 7 is a detail sectional view illustrating one arrangement for controlling the supply of lubricant to the valve stems; and

Fig. 8 is a similar view illustrating a modified arrangement for supplying the lubricant to the valve stems.

The present invention is especially applicable to the so-called in-line type of cylinder block, the upper portion of which is illustrated at 10 with two of the alined longitudinally spaced cylinders indicated at 11. Each cylinder is provided with three ports, two of said ports 14, which are intake ports, being controlled by valves 12 carried on valve stems 13, and the third port 15 for the exhaust being controlled by a valve 16 on valve stem 17. As shown more particularly in Figs. 1, 2 and 6, the intake ports and their valves and the exhaust port and its valve, of each cylinder, are located at opposite sides of the longitudinal center of the cylinder block, the several valve stems being positioned in a mass of metal 18, a portion at least of which is located at the longitudinal center of the block. Each valve stem is provided with a head 19, and mounted in opposite side walls of the cylinder block are rocker arms 20, 21 adapted to depress and open their respective valves against the tension of springs 23. The rocker arms are depressed by cams 24 on the cam shaft 25, it being understood that springs 23 return the valves to their closed position as the pressure of the respective cams is relieved.

As best illustrated in Figs. 3 and 4, cam shaft 25 is journaled in bearings 26 at points spaced longitudinally of the block and more or less in vertical alinement with the longitudinal center of the block. Formed in the mass of metal and extending along the longitudinal center of the cylinder block is a main lubricant supply duct 27 with vertical branch ducts 22 terminating at the bearings 26 for the cam shaft and with smaller branch ducts 28 terminating at the bearings for the several valve stems. Lubricant under pressure is thus directed to all of these bearings. The pressure may be developed by a pump (not shown) driven by the motor itself, in accordance with usual practices.

It is readily appreciated that it would be exceedingly difficult to drill a hole of the proportions of the main duct 27 through the block lengthwise thereof. On the other hand, the present arrangement, i. e., with the main duct located at the center line of the casting, the molds and cores used in forming the same can be split along the center line of the casting so as to permit a steel tube of the desired size to be placed in the mold at the point where said duct is to be formed. The foundry work required for producing the engine block with a duct of this type formed therein is, therefore, greatly simplified.

If desired, valve stem guides 29, formed with openings 30 in registry with the ducts 28, as shown in Fig. 2, may be used for distributing the

lubricant on the surface of the valve stems. Preferably, these guides are made of a porous or absorbent metal which will allow a slight seepage of the engine oil when under pressure. As shown in Fig. 7, the openings 30 may be filled with such a porous metal, as indicated at 31, or, as illustrated in Fig. 8, an imperforate sleeve of a porous or absorbent metal. Where the holes 30 are filled with the porous material 31, the metal best suited for use as a bearing surface can be used in the guide itself, as the porous material will allow sufficient seepage of lubricant to the surface of the valve stem. It is also preferable to recess the outer face of the valve stem guide sleeve to form a chamber or reservoir 32 in which a small quantity of lubricant can accumulate.

In addition to affording lubrication for the valve stems and crank shaft, the present arrangement also renders it possible to provide lubrication for the gears by which the cam shaft is driven. In the present instance, the driving gear 33 is shown meshing with the driven gear 34 with the hub 35 of the latter splined to a sleeve 36, which, in turn, is splined to the cam shaft. This form of connection is used principally with sectional cam shafts, but the specific form of connection is immaterial, so far as concerns the lubricating feature. Formed in the wall of the cylinder block is a conduit 37 which extends from one end of the main supply duct 27 to the bearing for the hub 35 of the driven gear. This conduit 37 has a branch passage 37a which leads to the rear face of said driven gear, and the latter has a number of openings 38 extending from its rear face to points between the teeth thereof. As the driven gear is revolved, these openings 38 move into and out of registry with branch duct 37a, permitting lubricant to be forced through to lubricate the teeth of both of the gears. Thus, not only are the teeth of the gears amply lubricated, but the same is true of the bearing for the driven gear, by reason of part of the lubricant passing straight through conduit 37.

What I claim is:

1. In a lubricating system for the valve stems of an internal combustion engine and the cam shaft, including the intermeshing driving gears, for actuating said stems, a main lubricant passage extending parallel to said shaft with a plurality of branch ducts leading therefrom, said branch ducts terminating at the bearings for said stems and shaft and at one of said intermeshing gears, the last-mentioned gear having passages therein intermittently movable into registry with the associated branch duct for supplying lubricant to the second of said intermeshing gears.

2. In an internal combustion engine, a cylinder block having cylinders formed in line longitudinally thereof, valve stem bearings at opposite sides of the longitudinal center of said block, a valve stem actuating shaft, bearings for said shaft, a driven gear on said shaft, a bearing for said driven gear, a driving gear meshing with the driven gear, a main lubricant supply passage, branch ducts extending from said passage to the bearings for the valve stems, cam shaft and driven gear, and a branch duct extending from said passage to the face of one of said gears, the last-mentioned gear having supply openings therein movable into and out of registry with the last-mentioned duct as said gear revolves.

3. In an internal combustion engine, a cylinder block having cylinders formed in line longitudinally thereof, valve stem bearings at opposite sides of the longitudinal center of said block, a valve stem actuating shaft, bearings for said shaft, a gear on said shaft, a driving gear meshing with the first gear, a main lubricant supply passage, branch ducts extending from said passage to the several valve stem and cam shaft bearings, a branch duct extending from said passage to the face of one of said gears, and a plurality of transverse ducts in said last-mentioned gear through which lubricant from the duct leading to said gear is supplied to the teeth of the other gear, the ducts in said gear being movable into and out of registry with the last-mentioned duct as said gear revolves.

LOUIS R. SPENCER.