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L. M. OSBORN & J. E. MANNIS.

VALVE MECHANISM FOR INTERNAL COMBUSTION ENGINES.

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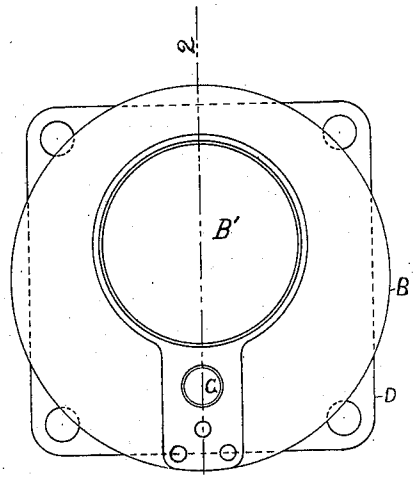


Fig. 1

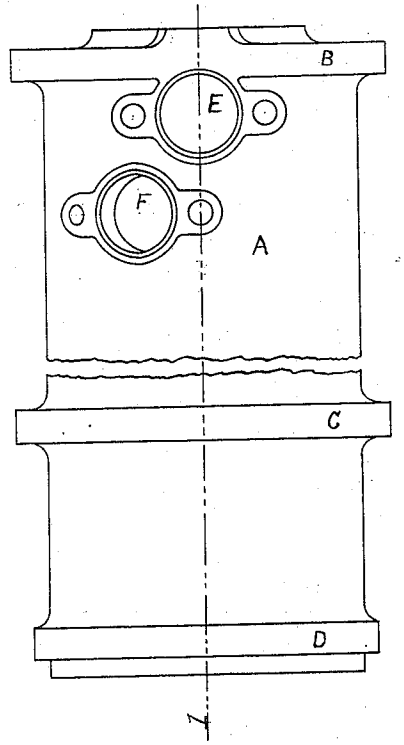


Fig. 2

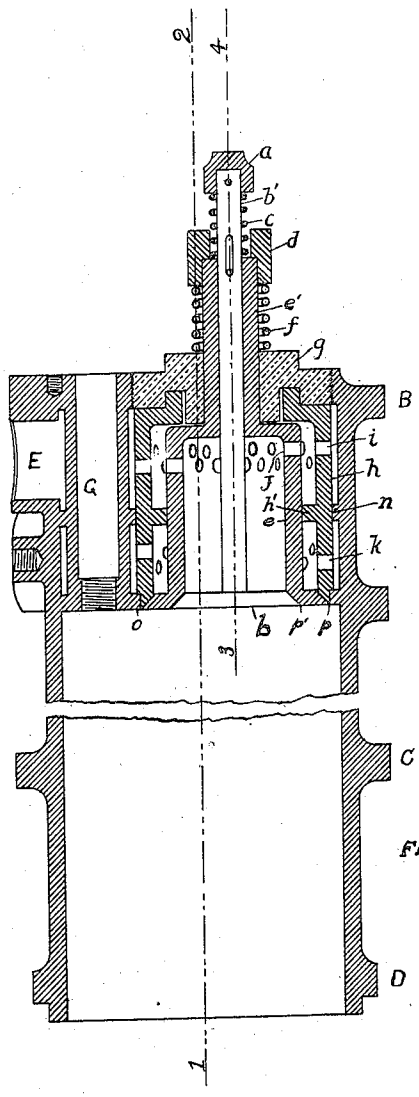


Fig. 3

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UNITED STATES PATENT OFFICE.

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VALVE MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

No. 862,100. Specification of Letters Patent. Patented July 30, 1907.

Application filed February 2, 1906. Serial No. 299,073.

To all whom it may concern:

Be it known that we, LAFAYETTE M. OSBORN and JAMES E. MANNIS, citizens of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented new and useful Improvements in Valve Mechanism for Internal-Combustion Engines, of which the following is a specification.

The invention relates to four-cycle engines adapted for comparatively high speed.

Objects are: To provide larger port openings than heretofore, and to provide a mechanism in which larger port openings may be made through the valve or valves than heretofore, so as to more freely permit the passage therethrough of the gases; to provide for the complete exhaustion of the burned gases from the cylinder before the inlet gases are admitted; to condense the valve mechanism so as to simplify the construction thereof and lessen the space necessary for it; to do away with all valve ports leading to the side of the cylinder, and to locate the valve ports at the end of the cylinder, and so that the ports close up tight over the piston; to provide for bringing in the inlet gases close to the exhaust gases in order that the former have a cooling effect on the latter; to provide for a more-even expansion of the burning gases in the cylinder by reason of the even closing of the valve ports and their location at the rear end of the cylinder, as will be shown; to improve generally upon valve mechanism, to simplify the construction, and withal to provide for the more economical use of such engines.

The invention consists of the parts, improvements, and combinations herein set forth and claimed.

In the drawings accompanying and forming part of this specification, and in the description thereof, we have shown the invention in its preferred form and have shown the best mode of applying the principles thereof; but it is to be understood that the invention itself is not confined to these drawings and the description of the drawings, that it may be applied to other uses, that parts and combinations thereof as herein separately claimed may be used with or without other connecting parts of similar general nature to those herein described, and that we contemplate changes in form, proportions, materials, arrangement, the transposition of parts, and the substitution of equivalent members without departing from the spirit of the invention.

Figure 1 is an end view of the cylinder showing the opening in which our improved valve box is located at the end of the cylinder. Fig. 2 is a top view of the cylinder showing especially the inlet and exhaust openings which lead through the valve. Fig. 3 is a center section showing the mechanism in detail.

Like letters of reference indicate like or corresponding parts throughout the several views.

We have shown herein only those parts immediately concerned in our invention, the other parts being well known in the art.

A is the cylinder, and B, C, D are flanges for securing a water-jacket thereon.

B′ is an opening through the cylinder head adapted to take in and contain the valve-box constructed in accordance with the principles of our invention, and G is an opening into which the sparking plug may be screwed.

E is the inlet port, and F is the exhaust port; and both are extended, in the form of annular grooves, around the valve box, with the partition *n* between them, so as to form suitable passages for the gases to and from the valves.

h is the bushing or seat for the exhaust valve *e;* it has a series of openings, *i*, for the passage of gases from the port and annular groove E, and another series of openings, *k*, for the passage of gases to the annular groove and port F. The flange *h′* forms a partition between the two passages, and also forms a bearing for the valve *e*. A flange or shoulder *o* engages the inner rabbeted end of the bushing *h*, and a cap *g* is screwed into the cylinder at the other end of the bushing, and the bushing is held firmly in place between these elements. The valve *e* has a beveled engagement with the bushing or seat *h*, as shown at *p*, which forms a tight fit and may be properly ground. Valve *e* is hollow, has a series of holes J, which form a passage for the gases from the inlet port E and holes *i* into the interior of the valve, and also has a stem *e′* which extends out through the cap *g* and which is provided with a collar *d*, and a spring *f* between the collar and the cap *g* for normally holding the valve in closed position. At the inner end of the hollow valve *e* is a valve *b* seated in said valve *e* and having preferably a beveled engagement as shown at *p′*. Valve *b* has a stem *b′* which extends out through the stem *e′* of the valve *e*, and which is provided at its outer end with a cap *a* between which and the outer end of stem *e′* is a compression spring *c* normally holding the valve *b* in closed position. Collar *d* and cap *a* may be provided with hardened knife edge bearings adapted to be engaged by any suitable valve-operating mechanism, such mechanism being well known in the art and being adapted to cause the operations as herein described. Preferable, the inlet gases are taken in through the port E, holes *i* and J, interior of valve *e*, and are controlled by the puppet-valve *b;* while the outlet gases are controlled by the valve *e*, and find their passage through the holes *k* and port F. This arrangement gives a larger area of outlet ports by reason of the larger circumference of the bushing *h*, so that the burned gases may be freely and completely dis-

charged from cylinder even when the engine is run at a high speed. It will be understood, however, that if desired, this arrangement of inlet and outlet passages may be reversed.

To explain the operation: The piston being in starting position at the valve end of the cylinder, the valve *b* is opened by a lever bearing against the cap *a*, which admits the inlet gases to the cylinder behind the piston as the piston makes the first stroke. At the end of the first stroke, the valve *b* is closed, and upon the return stroke of the piston the gas in the cylinder is compressed, all valves being closed. Upon the next stroke, the gas is ignited in the usual manner, forcing the piston forward, all valves being closed; and upon the second return stroke, the valve *e* is opened by a lever engaging against the collar *d*, which forces valve *e* open and permits the burned gases to escape between the valve opening *p*, holes *k*, and port F. When the valve E is opened, the valve *b* is carried with it, closed; but when the valve *b* is opened, it acts independently of valve *e*. The holes J do not pass at any time beyond the partition *h'*, so that the inlet passages are always open through valve cylinder *e*, except through valve *b*.

It will be noted that by the arrangement of the valves as herein described, at the rear of the cylinder, we procure a large opening for both inlet and exhaust gases; that both valves close up tight against the cylinder-piston, the clearance space being only that which is required for the compressed gases; that we do away with all ports leading to the side, permit the piston to come as close to the ports as practicable, allowance only being required for the compressed gases, and that therefore, the burned gases are practically completely exhausted from the cylinder before the inlet gases are brought in; that we have a chamber of regular contour behind the piston in which the combustion takes place, and that therefore the combustion itself is more regular and uniform, and that the cooler inlet gases coming in through the valve *e* keep the said valve and adjoining parts cool, and thereby also tend to cool the exhausting gases.

It will be especially noted that the areas of the valve openings, ports, and passages are very large for the size of the valve box as well as for the size of the cylinder, which permits the free passage of the gases therethrough, and this feature, together with the location of the valves so close up behind the piston, are items of much importance, especially in rapidly running engines.

It will also be noted that by reason of the practically complete discharge of the burned gases from the cylinder before the admission of the inlet gases, the waste of gases is avoided, and a perfect combustion is secured.

It will also be noted that the valve itself, and the cylinder and valve as a whole, are very compact, yet the valve openings are very large and the valve efficient. Obviously, too, the construction is simple.

The valve-box may be gotten at, or entirely removed, by the simple operation of unscrewing the cap *g*.

In the drawings, we have shown both the valve-box and the sparking plug in the cylinder-head. If, however, it should become desirable to increase the size of the valves, the sparking plug may be inserted through the side wall of the cylinder, and the valves may then be made larger, indeed, they may be made the full diameter of the cylinder, if so large a valve is wanted.

What we claim is:

1. The combination of the outer casing provided with ports E and F and the annular channels extending around the inside, a valve bushing *h* having a partition *h'* and holes *i* and *k* leading to said respective channels, a cap *g*, a hollow cylindrical puppet-valve *e* having the holes J to always form passage from port E to the interior of said valve, and the hollow stem extending out through the cap and provided with a collar *d*, a second valve *b* seated at the open end of the cylindrical valve which thus forms the bushing therefor, the second valve being provided with a stem extending out through the hollow stem of the first valve and provided with a cap *a*, a compression spring between the collar and the cap *g*, and a compression spring between cap *a* and the hollow stem, substantially as set forth.

2. The combination of the outer casing provided with ports E and F and the annular channels extending around the inside, a valve bushing *h* having a partition *h'* and holes *i* and *k* leading to said respective channels, a cap *g*, a hollow cylindrical puppet-valve *e* having the holes J to always form passage from port E to the interior of said valve, and the hollow stem extending out through the cap, a second valve *b* seated at the open end of the cylindrical valve which thus forms the bushing therefor, the second valve being provided with a stem extending out through the hollow stem of the first valve, substantially as set forth.

3. The combination of the outer casing provided with ports E and F and the annular channels extending around the inside, a valve bushing H having a partition *h'* and holes *i* and *k* leading to said respective channels, a cap *g*, a hollow cylindrical puppet-valve *e* having the holes J to always form passage from port E to the interior of said valve, and the stem extending out through the cap, a second valve *b* seated at the open end of the cylindrical valve which thus forms the bushing therefor, the second valve being provided with a stem, and means for operating said valves, substantially as set forth.

In testimony whereof we have hereunto signed our names in the presence of subscribing witnesses.

LAFAYETTE M. OSBORN
JAMES E. MANNIS.

Witnesses:
Z. T. FISHER,
C. J. ROSEN.