E. H. RYON.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED DEC. 4, 1913.

1,193,620. Patented Aug. 8, 1916.

2 SHEETS—SHEET 1.

Fig. 2.

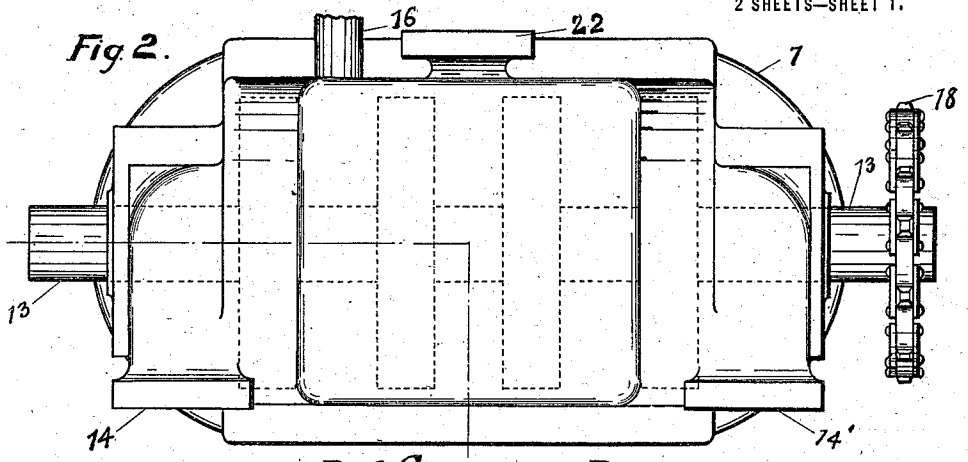
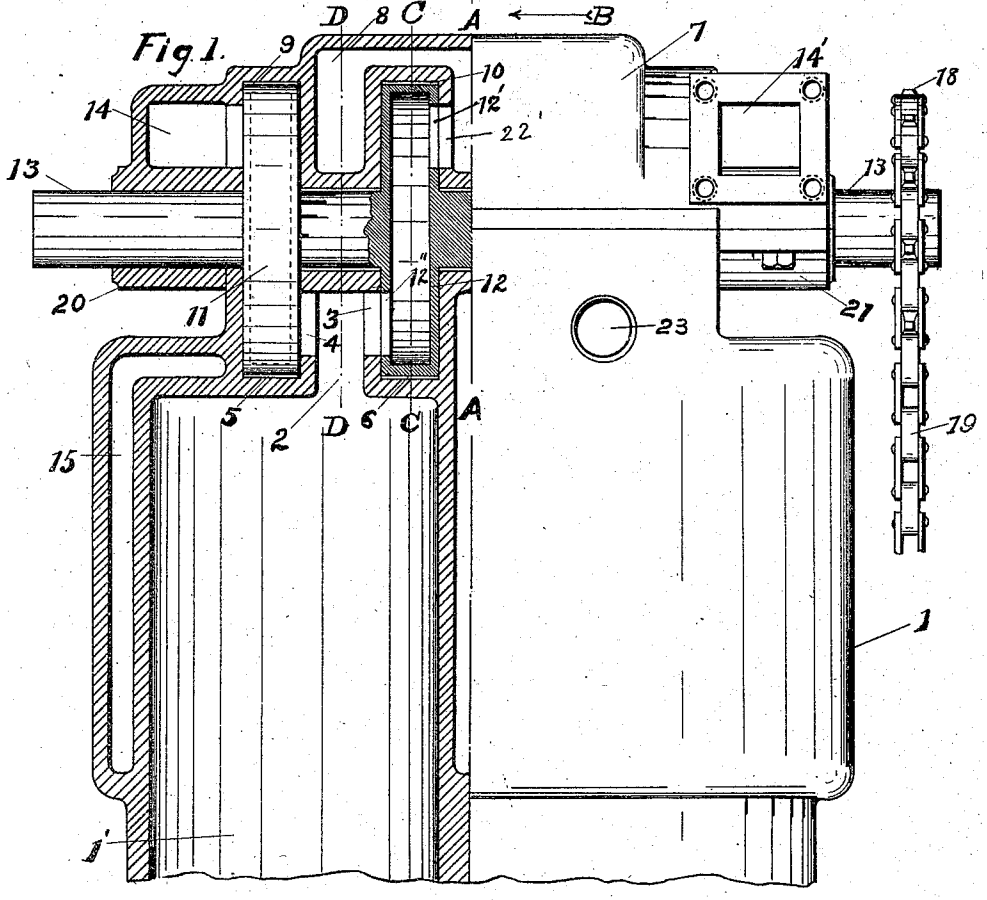


Fig. 1.



Witnesses.

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2 SHEETS—SHEET 2.

Fig. 7

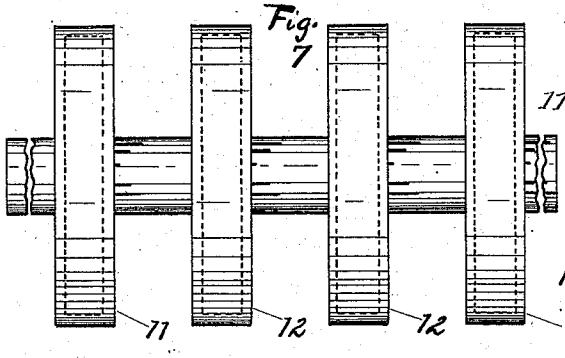


Fig. 8

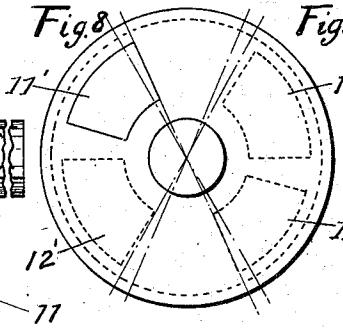


Fig. 9

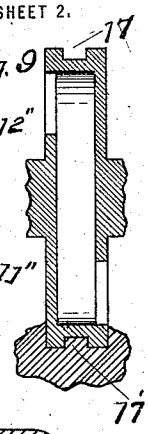


Fig. 5

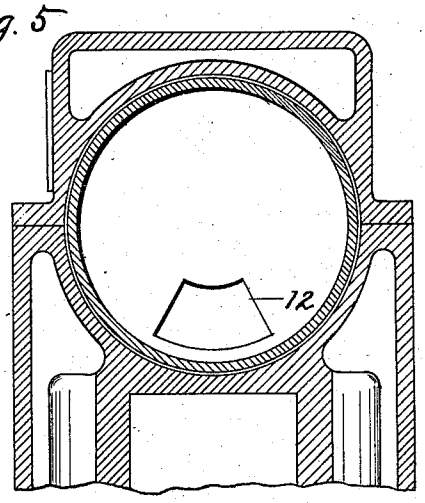


Fig. 6

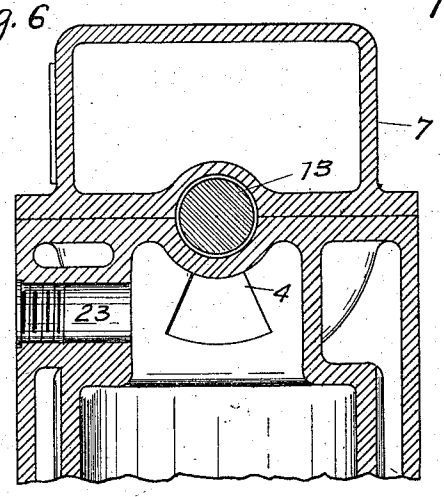


Fig. 3

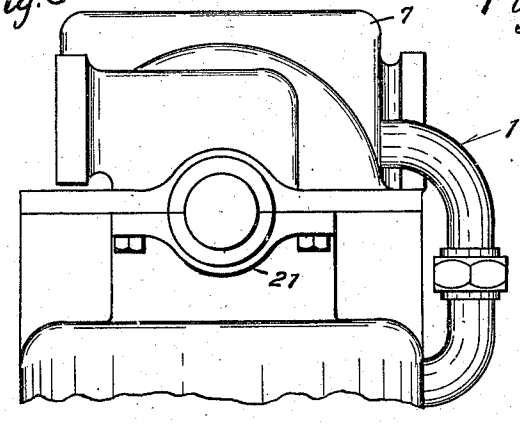
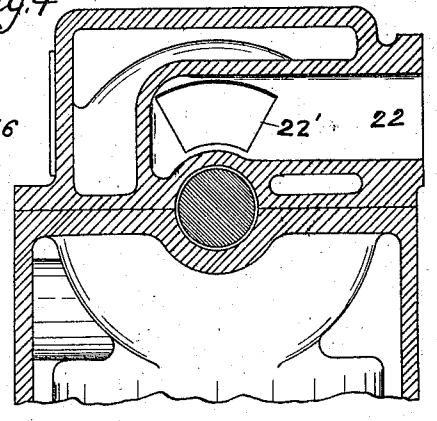


Fig. 4



Witnesses

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UNITED STATES PATENT OFFICE.

EPPA H. RYON, OF WALTHAM, MASSACHUSETTS.

INTERNAL-COMBUSTION ENGINE.

1,193,620. Specification of Letters Patent. Patented Aug. 8, 1916.

Application filed December 4, 1913. Serial No. 804,636.

To all whom it may concern:

Be it known that I, EPPA H. RYON, a citizen of the United States, residing at Waltham, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines and particularly to the valve mechanism thereof.

The object of my invention is to simplify the valve mechanism of engines of this class and to provide a positive valve mechanism that will cause the timely opening and closing of the cylinder ports, forming joints that will not leak when subjected to pressure and which will not change from wear, thus requiring the least possible attention. This and other objects of my invention will be more fully described in these specifications, set forth in the appended claims and illustrated in the accompanying drawings, in which:—

Figure 1 is a side elevation and partial section of a two cylinder engine, embodying my improvements, one of the cylinders and one of the valves being shown in section. Fig. 2 is a plan view. Fig. 3 is an end view of the upper portion containing the valves, the lower portion or cylinders being broken away. Fig. 4 is a section on line A A Fig. 1 looking in direction of arrow B same figure. Fig. 5 is a section on line C C Fig. 1 looking in the direction of arrow B. Fig. 6 is a section on line D D Fig. 1 looking in the direction of arrow B. Fig. 7 is a detached view of the valves. Fig. 8 is an end view of the valves shown in Fig. 7. Fig. 9 is a sectional view showing modification of one of the valves.

In the accompanying drawing the main cylinder casing of a gas engine is indicated at 1, said casing having one or more cylinders 1′ each provided with a piston of the usual construction (not shown), and being also connected at its upper end with a combustion chamber 2 having an outlet port 3 and an inlet port 4. Substantially semi-cylindrical valve recesses 5 and 6 are formed in the main cylinder casing 1 on opposite sides of the combustion chamber 2.

The recess 5 is provided for the inlet valve 11 and is connected to the combustion chamber 2 by the inlet port 4, while the recess 6 is designed to receive the outlet valve 12 and is connected to the combustion chamber 2 by the outlet port 3.

A casing cap 7 is bolted to the upper portion of the main cylinder casing 1 and may contain a space 8 connected to the water circulating system. Additional semi-cylindrical valve recesses 9 and 10 are formed in the cap 7, said recesses corresponding to and being in alinement with the valve recesses 5 and 6 formed in the main casing 1. The inlet valve 11 and the outlet valve 12 are each entirely inclosed within the complete cylindrical recesses thus formed.

The valve 12, as shown in Fig. 1, consists of a hollow disk which in this instance is part of a solid shaft 13 which extends entirely through the valve casing, which casing is composed of the cap 7 and upper portion of the main cylinder casing 1 and is divided along a plane passing through substantially the longitudinal center of said shaft. On opposite sides of the valve 12 are openings 12′ and 12″ for the escape of the burnt gases. These openings are also shown in broken lines in Fig. 8, and are out of axial alinement, the opening 12″ being placed a considerable distance around the center of rotation of the valve shaft 13 from the opening 12′.

The valve 11 is of a similar construction to that of the valve 12 the only difference being in the size of the openings 11′ and 11″ (Fig. 8) for the inlet of the fuel gases, these inlet openings being somewhat smaller than the exhaust openings 12′ and 12″ of the valve 12. There is one of each of these valves 11 and 12 for each cylinder.

The opening 14 communicates with the valve 11 and is for the passage of the fuel gases to the cylinder 1′. The opposite opening 14′ serves a similar purpose for the other cylinder.

Pipes 16 connect the water space 8 in the cap 7 with the water space 15 in the main cylinder casting 1.

In the modified valve shown in section Fig. 9 I provide an annular recess 17 and an annular ring 17′ therein, said ring in this instance being formed in the casing inclosing the valve. The purpose of this recess 17 and 17′ is to provide extra joints to more surely prevent leakage of the gases from the cylinders under pressure.

From the foregoing description it will be understood that the two valves 11 are similar and have the same size openings the

only difference being in the position of the openings and that the two valves 12 have the same size openings which are also in different positions.

A sprocket 18 operated by a chain 19 connected with the crank shaft of the engine (not shown) serves to rotate the valve one revolution for every two of the crank shaft as is usual in the ordinary four cycle type of internal combustion engine.

To provide proper joints and prevent leakage of the gases I make the sides of the valves 11 and 12 fit very closely the sides of the recesses in which they are inclosed and I provide a space around the peripheries of the valves in the recesses in which they are inclosed. A space is also left around the shaft 13 between the valves. Said shaft 13 is supported in bearings 20 and 21 outside of the valves and should there be slight wear of the bearings 20 and 21 or of the shaft in said bearings, the peripheries of the valves will not come in contact with the casing. As the pressure in the combustion chamber 2 is balanced, being practically the same on the inner side of each valve, there will be no undue wear from this source.

23 is an opening for an ordinary electric spark plug.

In the operation of my improved engine it will be understood that the gases will be drawn into the cylinder 1' through the opening 14 and through the valve 11 and the exhaust gases will be expelled through the opening 3 and the valve 12 and into the atmosphere through the exhaust opening 22, which serves for both cylinders.

22' is an opening through the valve casing 10 to the exhaust opening.

It will be understood that the details of my improvement may be varied if desired without departing from the spirit of my invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a gas engine, in combination, a rotary valve comprising an inclosed hollow cylinder having a gas passage through each end wall thereof to the hollow interior of said valve, said openings being angularly disposed with reference to each other, and a casing for said valve having a cylindrical recess formed therein closely fitting said valve, said casing including end walls adjacent said valve and having gas passages therethrough angularly disposed with reference to each other and corresponding in relative angular position to the passages in the end walls of the rotary valve.

2. In a gas engine, in combination, a valve shaft, a plurality of spaced separate cylindrical valves having gas passages through their end walls only and rotatable with said shaft, a valve casing having a plurality of spaced substantially semi-cylindrical recesses formed therein to receive said valves, and a casing cap having a corresponding number of similarly disposed substantially semi-cylindrical recesses formed therein, said casing and cap being separable along a substantially axial plane, whereby said shaft and valves may be removed as a unit without loss of relative adjustment, the parallel walls of the recesses in the casing having ports formed therein connecting with the engine cylinders and the parallel walls of the recesses in said cap having ports formed therein connected to the gas supply and to the exhaust.

3. In a gas engine, in combination, a cylinder, a combustion chamber connected therewith, inlet and outlet ports formed in opposite sides of said combustion chamber, a pair of rotary disk valves located in recesses on each side of said combustion chamber, and a cap for said valves having additional ports formed therein, each of said valves having a hollow interior portion formed between the sides thereof and having an opening through one of said sides adapted to register with one of the ports in the combustion chamber, and a second opening through its opposite side adapted to register with one of the ports in said cap, the openings in the opposite sides of said valve being out of axial alinement with each other.

4. In an internal combustion engine, a cylinder casting, a removable cap for said casting, means to secure said cap to said casting, a rotary valve shaft, a disk valve on said shaft having an opening therethrough, and means to rotate said shaft and valve, said casting and cap being separable substantially in the plane of the axis of said valve shaft and having oppositely disposed valve recesses therein, and said casting and cap having ports formed therein to register with the opening in said valve.

5. In an internal combustion engine, a cylinder casting, a removable cap for said casting, means to secure said cap to said casting, a rotary valve shaft, a hollow disk valve on said shaft having openings through the end walls thereof, and means to rotate said shaft and valve, said casting and cap being separable substantially in the plane of the axis of said valve shaft and having oppositely disposed valve recesses therein, said casting having a port to register with the opening in one side of said valve and said cap having a port to register with the opening in the opposite side of said valve.

6. In an internal combustion engine, a cylinder casting, a removable cap for said casting, means to secure said cap to said casting, a rotary valve shaft, a hollow disk valve integral with said shaft and having openings

through the end walls thereof, and means to rotate said shaft and valve, said casting and cap being separable substantially in the plane of the axis of said valve shaft and having oppositely disposed valve recesses therein, said casting having a port from one of said valve recesses to said cylindrical space and said cap having an exhaust port from the other valve recess to the atmosphere.

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