C. DENEGRE.

VALVE FOR EXPLOSIVE ENGINES.

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955,390.

Patented Apr. 19, 1910.

Fig. 1.

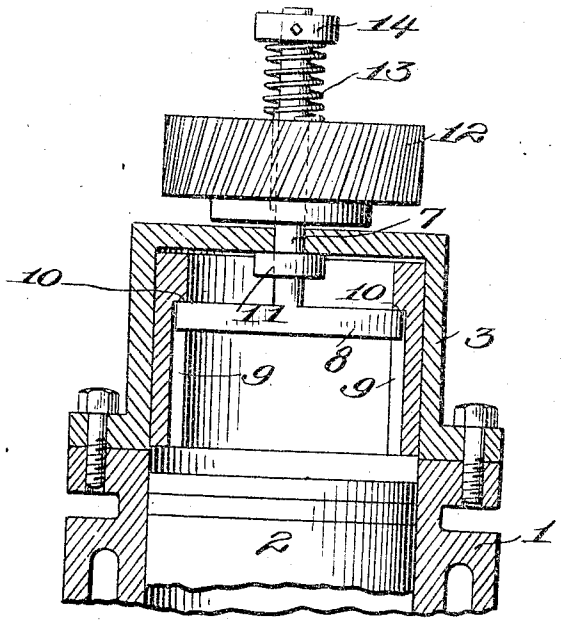


Fig. 2.

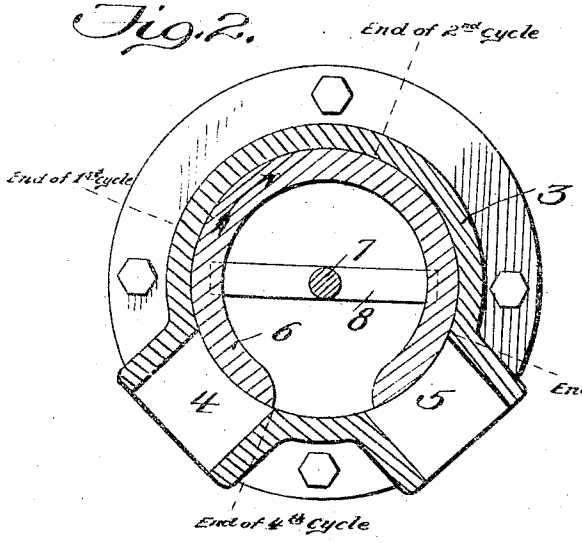


Fig. 3.

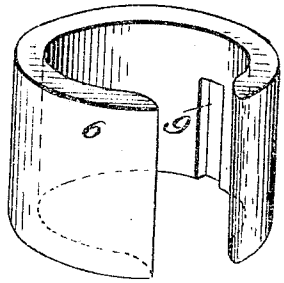
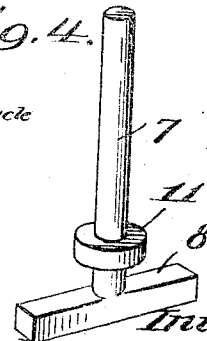


Fig. 4.



Witnesses:

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UNITED STATES PATENT OFFICE.

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VALVE FOR EXPLOSIVE-ENGINES.

955,390. Specification of Letters Patent. Patented Apr. 19, 1910.

Application filed September 12, 1908. Serial No. 452,736.

To all whom it may concern:

Be it known that I, CHARLES DENEGRE, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented new and useful Improvements in Valves for Explosive-Engines, of which the following is a specification.

My present invention relates to improvements in valves for engines, and more especially explosive engines of the four cycle type, and it has for its object primarily to provide a simple and improved valve of this character whereby the admission of the explosive gas through the inlet port and the exhaust of the consumed gases through the exhaust port of the engine may be properly controlled by a single rotary valve, the valve being so constructed that it is capable of relative expansion and contraction due to the temperature variations of the parts, and by rendering the valve expansible, the compression and explosion act to insure a tight fitting of the valve irrespective of the relative temperature of the parts.

Another object of the invention is to provide a valve of this character which is mounted substantially within the compression and explosion chamber of the engine cylinder, the valve being rotatable preferably about an axis parallel to or in alinement with the axis of the engine cylinder, and also to provide improved connections between the rotatable valve and the gearing which operates the same from the engine shaft.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawing: Figure 1 represents an axial section of a portion of the cylinder of an explosive engine equipped with a rotary valve constructed in accordance with my present invention; Fig. 2 represents a transverse section of the valve casing showing the valve mounted therein and the inlet and exhaust ports; Fig. 3 is a perspective view of the valve ring; and Fig. 4 is a perspective view of the operating device which is adapted to couple to said ring and to the valve driving gear.

Similar parts are designated by the same reference characters in the several views.

Rotary valves constructed in accordance with my present invention are capable of use generally in connection with fluid-operated engines of various kinds, and it is to be understood that in applying the invention to engines of different types, certain changes in the construction and the relative arrangement of the parts may be made in order that the desired results may be obtained in each particular case.

In the present instance, I have shown one form of the invention and the same is applied to the cylinder of an explosive engine of the four cycle type, 1 designating the upper end of the cylinder within which the piston 2 reciprocates, as usual.

The valve is preferably mounted in a space which serves as the compression and explosion chamber of the cylinder and while this space may be formed within an integral part of the cylinder, I have shown in the present instance a supplemental casing 3, which is bolted or otherwise secured by suitable means to the head of the cylinder, this casing serving to inclose the valve and having in the present instance a cylindrical bore within which the valve rotates, this bore being preferably of the same diameter as that of the cylinder and in the present instance it is arranged in alinement therewith.

An inlet port 4 and an exhaust port 5 are formed in the wall of the valve casing at a suitable angle relatively to one another, this angle being usually ninety degrees. The pipe for conducting the mixed air and gas from the carbureter may be connected to this inlet port, while the exhaust pipe is connected to the exhaust port as usual.

The valve which rotates within the casing 3 is composed of an annular or ring-like member 6 which is of cylindrical form or a form to closely fit and revolve within the valve casing, this ring-like body being split from top to bottom for the dual purpose of providing a port for the valve and to render the annular body expansible so as to form a tight fit between it and the walls of the valve casing due to the pressure of the explosion and the compression within the engine cylinder thereby preventing leakage, and this annular valve member is capable of expansion and contraction acording to the variations in the temperature thereof.

Any suitable means may be employed for operating the valve from the exterior of the casing, a rotatable stem 7 being provided in the present instance which extends through a bore in the head of the valve casing and is provided at its inner end with a cross arm 8, the ends of which rest in diametrically opposite recesses or grooves 9 formed in the inner walls of the annular valve member, these recesses or slots being preferably spaced at opposite sides of the port of the valve member. This cross arm engages the thrust shoulders or abutments 10 formed at the ends of the grooves or recesses in the valve member so as to support the latter within the casing and prevent movement of the valve member toward the engine piston, and the valve stem is provided with a collar 11 which coöperates with the head of the valve casing and thereby serves to prevent leakage around the valve stem.

Any suitable valve operating gear may be employed, the valve being connected so as to revolve once to every two revolutions of the engine shaft, a spiral gear 12 being splined to the valve stem in the present instance above the valve casing and a helical compression spring 13 encircles the valve stem and bears at one end upon the upper side of the gear 12 while its opposite end abuts against a collar 14 which is fixed to the valve stem. The expansive action of this spring tends to exert a yielding thrust in a direction to lift the valve stem and thereby hold the collar 11 thereon in close relation to the head of the valve casing, while the cross arm upon the stem which has a thrust connection as hereinbefore described with the valve member operates upon the valve member to support the same. The spline connection between the valve stem and the gear 12 permits the stem to operate axially through this gear although it has a driving connection therewith.

The operation of the valve is as follows: Assuming that the valve occupies the position shown in Fig. 2, the piston of the engine will be at the innermost limit of its stroke, the crank being on the dead center. As the engine shaft revolves to carry the piston on its outward stroke, the valve is revolved so as to bring the port therein into communication with the inlet port 4 and the out stroke of the piston will draw a charge of explosive gas into the cylinder. As the piston reaches the limit of its outward stroke, the port in the rotatable valve will be found to have passed the inlet port and this port in the valve at this time will be closed. Upon the next inward stroke of the piston, the charge of explosive mixture contained in the cylinder will be compressed and at the highest point of compression, the port in the valve member will occupy the position indicated in Fig. 2 at the end of the second cycle. The explosive mixture under compression is then ignited and during the power stroke of the piston, the valve member rotates into the position indicated in Fig. 2 as designating the end of the third cycle, and on the next return stroke of the piston, the port in the valve member is brought into communication with the exhaust port 5 through which the burned gases in the cylinder are discharged, this cycle of operations being repeated in the order described during the operation of the engine.

The present invention provides a simple valve mechanism wherein a single valve may serve to control both the inlet and exhaust ports of the engine, the valve member being rotatable so that it may be geared to the shaft of the engine with the greatest facility, thereby avoiding the use of cams and other parts which when worn require resetting of the valve of the ordinary reciprocating type, and as the valve member is split, it may expand during the compression and explosion of the gases within the cylinder so that a tight fitting of the valve is insured at these times, thereby compensating for any wear between the valve member and its casing, and the split construction of the valve member also enables it to compensate for expansion and contraction due to the temperature variations without interfering with the fit of the valve.

I claim as my invention:

1. In an internal combustion engine, the combination of the cylinder having a bore to receive the piston and provided with an axial elongation the bore of which is of the same size as that of the cylinder, said elongation forming a valve casing and having inlet and exhaust ports therein, a ported valve member revoluble in said casing for controlling said ports, and an operating part connected to said valve member for turning it and also having means for preventing axial movement of the valve member toward the space in said cylinder within which the piston operates.

2. A valve for explosive engines comprising a ported valve casing communicating with the compression and explosion chamber of the engine, an annular valve member embodying a cylindrical shell rotatably mounted in said casing and split at one side to provide a controlling port and to render the valve member expansible, the valve member being also provided at points removed from the split portion with recesses the walls of which recesses form thrust shoulders, and an operating stem for the valve member having a cross arm the ends of which rest in said recesses and coöperate with said thrust shoulders to prevent axial displacement of the valve member.

3. A valve for explosive engines comprising a ported valve casing attached to the

head of an engine cylinder and forming a compression and explosion chamber therefor, a ported valve member rotatably mounted in said casing for controlling the admission and exhaust of gases, and an operating part provided with means for exerting a yielding thrust on said operating part and having a thrust connection with the valve member.

4. A valve for explosive engines comprising a valve casing having means for attaching it to the head of a cylinder so as to form the compression and explosion chamber thereof, said casing being provided with angularly spaced inlet and exhaust ports, an annular valve member rotatably mounted in said casing, said member being split at one side to form a controlling port for the ports of the casing and to render the valve member capable of expansion or contraction, and an operating part extending through the end of said casing and having a driving and thrust connection with the valve member and provided with means for exerting a thrust thereon.

5. A valve for explosive engines comprising a ported valve casing, an annular valve member rotatably mounted in the casing, a rotatable valve stem extending axially through the valve casing and having means for exerting a thrust movement thereon, and a cross arm rotatable with the stem and having a combined driving and thrust connection with the rotatable valve member.

6. A valve for explosive engines comprising a ported valve casing, a valve rotatably mounted therein for controlling the ports of said casing, said valve having interior thrust shoulders, a rotatable valve stem extending axially through the head of said casing and engaging said thrust shoulders and having a driving connection with the valve member, a collar on the stem arranged to coöperate with the head of the valve casing, and a spring acting upon the stem to retain said collar in coöperative relation to the head of the casing.

7. A valve for explosive engines comprising a ported valve casing, an annular valve member rotatable within the casing and having a port for controlling the ports of the casing, the valve member being provided with axially extending recesses formed in its inner walls and providing thrust shoulders at their ends, a rotatable valve stem extending through the head of the valve casing, and a cross arm rotatable with the stem and having its ends resting in the said recesses and engaging said thrust shoulders of the valve member.

8. A valve for explosive engines comprising a ported valve casing, an annular valve member rotatably mounted therein and provided with a controlling port, a rotatable valve stem extending through the head of the valve casing and having a driving and thrust connection with said valve member to turn the same and also to prevent axial movement thereof in one direction, a collar mounted on said stem and arranged against the head of the valve casing, an operating gear arranged exteriorly of the valve casing and having a spline connection with the valve stem, and a spring encircling the valve stem and acting upon the latter and said gear for retaining the collar on said stem in coöperative relation with the head of the valve casing.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES DENEGRE.

Witnesses:
H. D. BREEDING,
H. S. HARVEY.