A. L. P. GUÉRET.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED FEB. 11, 1913.

1,116,266. Patented Nov. 3, 1914.

Fig. 3.

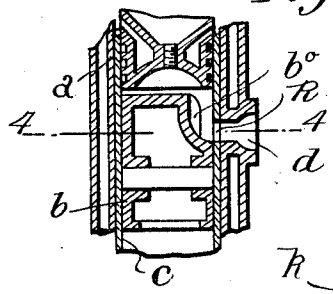


Fig. 1.

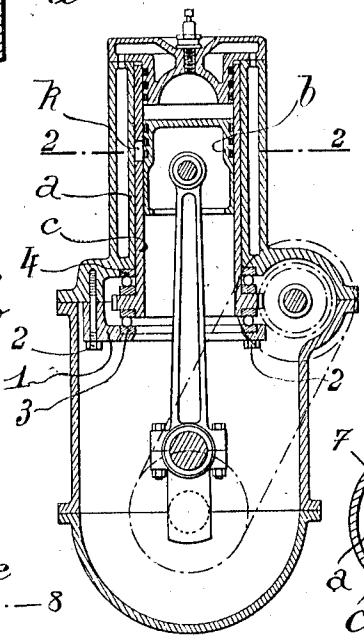


Fig. 5.

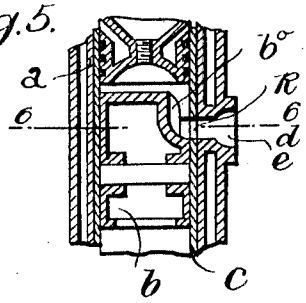


Fig. 4.

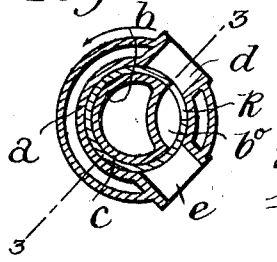


Fig. 6.

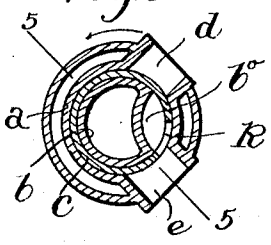


Fig. 7.

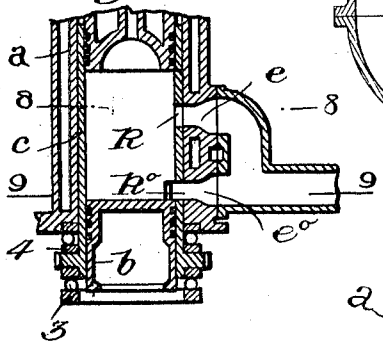


Fig. 8.

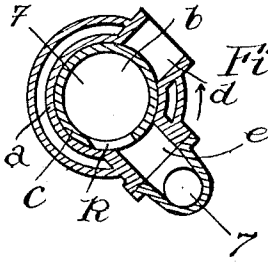


Fig. 2.

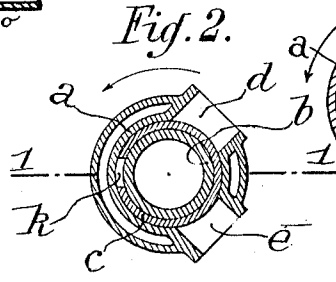
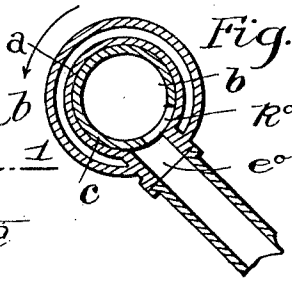


Fig. 9.



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,116,266. Specification of Letters Patent. Patented Nov. 3, 1914.

Application filed February 11, 1913. Serial No. 747,776.

To all whom it may concern:

Be it known that I, ANDRÉ LÉON PIERRE GUÉRET, a citizen of the French Republic residing in Paris, France, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines of that general type wherein a sleeve which functions as a valve is interposed between the cylinder and piston and is continuously rotated during the operation of the engine to positively govern the admission and the exhaust.

The present invention provides an improved relation between the valve sleeve aforesaid and the piston whereby at the moment of ignition, and during a short initial portion of the ignition stroke, the port in the valve sleeve is covered by the piston, notwithstanding that said valve sleeve is in position to cut off the communication between the interior of the cylinder and the inlet port. The object of this relation is to provide against any escape of gas between said sleeve and the cylinder at the time when the pressure in the cylinder is greatest, a result which would otherwise obtain were the port in the valve sleeve uncovered at the time referred to.

In combination with the feature above referred to, the invention also and preferably provides an improvement in the construction of the piston according to which the piston is provided adjacent its working face with a recess which establishes communication between the respective inlet and exhaust ports and the portion of the cylinder above the working face of the piston, during the periods when the said working face is at an elevation above the elevation of said inlet and exhaust ports. The object of this feature is to permit the explosive mixture to enter the cylinder at the very beginning of the inlet stroke and to permit the exhaust gases to escape from the cylinder even to the absolute end of the exhaust stroke.

Embodiments of the invention are illustrated in the accompanying drawings wherein:

Figures 1 and 2 are vertical and horizontal sectional views of an engine in which the principal feature of the invention, as above pointed out, is incorporated, the plane of Fig. 1 being indicated on the line 1—1 of Fig. 2, and the plane of Fig. 2 being indicated on the line 2—2 of Fig. 1; Figs. 3 and 4 are vertical and horizontal sectional views showing an engine having the same features of construction as the engine shown in Fig. 1, but wherein the piston is provided with the recess above referred to. The plane of Fig. 3 is indicated by the line 3—3 of Fig. 4, and the plane of Fig. 4 is indicated by the line 4—4 of Fig. 3; Figs. 5 and 6 are views similar to Figs. 3 and 4, respectively, and showing the same engine which is shown in Figs. 3 and 4 but with the parts thereof in exhaust position, Fig. 5 being in a plane which is taken on the line 5—5 of Fig. 6, and Fig. 6 being in a plane which is taken on the line 6—6 of Fig. 5; Fig. 7 is a vertical sectional view illustrating an engine in which the features of the invention are incorporated and in which the cylinder is provided at its lower end with an auxiliary exhaust port. The plane of this figure is indicated by the line 7—7 of Fig. 8; Figs. 8 and 9 are horizontal sectional views on the lines 8—8 and 9—9 of Fig. 7.

Similar characters of reference designate corresponding parts throughout the several views.

The engine includes a cylinder *a* which is provided at an elevation lower than that of the operative face of the piston *b* at the end of an up stroke of said piston, with a pair of ports *d* and *e*, the port *d* serving as an inlet port and the port *e* serving as an exhaust port. The flow of gas through the ports *d* and *e* is controlled by a cylindrical valve *c* which is fitted concentrically within the cylinder *a*, extending the length thereof, and of course surrounding the piston *b*. The valve *c* is provided with a port *k* and is continuously rotated during the operation of the engine whereby the port *k* is periodically brought into register with the respective ports *d* and *e*.

Any desired means may be employed for effecting the rotation of the valve *c*, the means shown in the drawing comprising a worm shaft which is parallel to the crank shaft of the engine and is driven by chain and sprocket gearing from said crank shaft, and a worm wheel which circumscribes the

lower portion of the valve *c* and is driven by said worm shaft. It will be understood that the sleeve *c* is rotated at half the speed of the crank shaft.

The support for the valve *c* preferably comprises a collar 1 which is secured by bolts 2 to the base of the cylinder *a* and provides an abutment or ledge to take the thrust of the lower end of the valve *c*, ball bearings 3 being preferably interposed between the collar 1 and the said lower end of the valve *c* and other ball bearings 4 being preferably interposed between said valve and an adjoining annular shoulder formed internally and at the lower end of the cylinder *a*.

The construction shown in Figs. 3 to 6 embodies the same principles of structure and operation as the construction shown in Fig. 1, differing, however, in that the piston is provided at one side thereof with a recess *b*° which extends to the upper or working face of said piston and permits of communication between the space above said upper or working face and the respective ports *d* and *e*, even in the uppermost positions of said piston when its working face is at an elevation above the elevation of said ports. By virtue of the provision of the recess *b*°, when the port *k* registers with the port *d*, the explosive mixture may enter the cylinder even at the very beginning of the suction stroke and when the port *k* alines with the port *e* the exhaust gases may escape from the cylinder even to the absolute end of the exhaust stroke.

By reference to Fig. 2, it will be observed that the portion of the cylinder *a* which extends between the ports *d* and *e* is but very slightly longer than the port *k*. It follows that the interval between the completion of the exhaust stroke and the commencement of the suction stroke is of such short duration as to be negligible in so far as any interference with the efficient operation of the engine is concerned.

The operation of the engine will be readily apparent from the foregoing description. It should be noted, however, that in most engines involving the four-cycle principle of operation, the moment of ignition occurs during the latter part of the compression stroke of the piston and that from such moment the pressure produced by the ignition progressively increases, attaining a maximum degree, however, after the piston has commenced what is commonly termed the "ignition" or "power" stroke. As above pointed out, the ports *d* and *e*, and consequently the port *k* which alines therewith, are at an elevation which is below the elevation of the upper or working face of the piston, in the uppermost position of said piston. By virtue of this feature of arrangement, and in consideration of the fact that the moment of ignition occurs during the latter part of the compression stroke of the piston, the port *k* is covered at least during the said moment of ignition and is maintained covered throughout a short initial portion of the ignition or power stroke, and during such period that the port *k* is maintained covered, the pressure developed consequent to the ignition obtains its maximum degree and commences to recede.

Figs. 7, 8 and 9 illustrate an engine embodying the features of construction embodied in the engine shown in Fig. 1 and having the added feature of an auxiliary exhaust passage which includes a port *e*° formed in the lower portion of the cylinder *a* and a port *k*° formed in the lower portion of the sleeve *c*, and in the course of the rotation of said sleeve, periodicaly brought into register with the port *e*°. The ports *e*° and *k*° are arranged at an elevation above the working face of the piston in the lowermost position of said piston and the location of the port *k*° is so selected that said port comes into register with the port *e*°, before the port *k* comes into register with the port *e*, in order to insure a relatively large exhaust area at the beginning of the exhaust stroke, and, if desired, to permit of the inception of the exhaust immediately upon the completion of the power stroke.

Having fully described my invention, I claim:

1. In an internal combustion engine, in combination, a cylinder, a piston working therein, a cylindrical valve arranged concentrically in the cylinder and in surrounding relation to the piston, and means for continuously rotating the valve during the normal operation of the engine, the cylinder having a fuel inlet and exhaust ports arranged below the upper or working face of the piston in the uppermost position of said piston and the cylindrical valve having a port which is periodically brought into register with the respective inlet and exhaust ports, during the rotation of said valve, and which is covered by the piston at least at the moment of ignition.

2. In an internal combustion engine, in combination, a cylinder, a piston working therein, a cylindrical valve arranged concentrically in the cylinder and in surrounding relation to the piston, and means for continuously rotating the valve during the normal operation of the engine, the cylinder having fuel inlet and exhaust ports arranged below the upper or working face of the piston in the uppermost position of said piston and the cylindrical valve having a port which is periodically brought into register with the respective inlet and exhaust ports, during the rotation of said valve, and which is covered by the piston at least at the moment of ignition, the piston having a lateral

recess which opens to its upper face and establishes communication between the port of the valve and the combustion chamber of a cylinder at the inception of the suction stroke and at the completion of the exhaust stroke.

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

ANDRÉ LÉON PIERRE GUÉRET.

Witnesses:
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PAUL BLUM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."