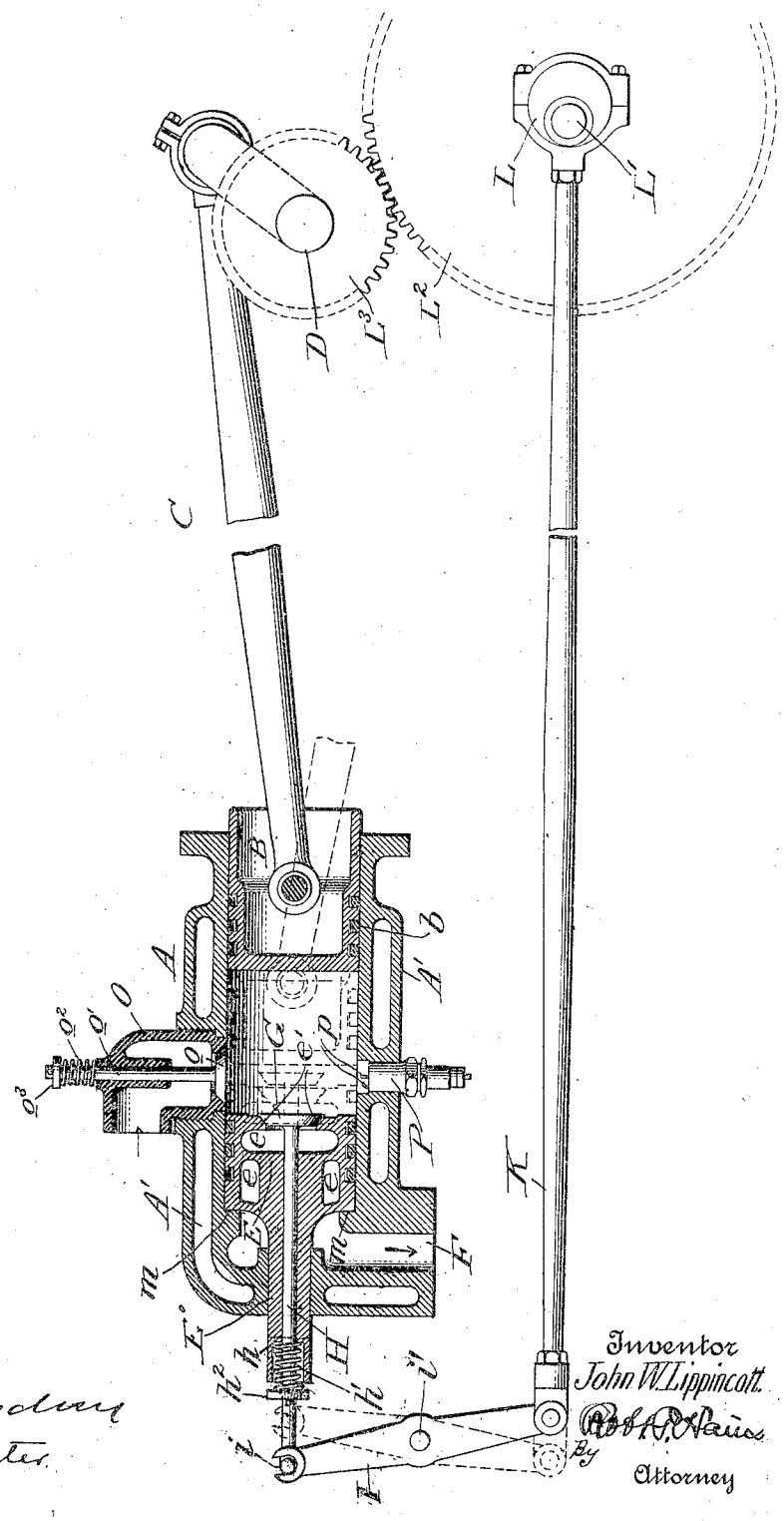
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J. W. LIPPINCOTT.

GAS ENGINE.

APPLICATION FILED JUNE 5, 1906.



Witnesses

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JOHN W. LIPPINCOTT, OF LITTLE ROCK, ARKANSAS.

GAS-ENGINE.

No. 851,176. Specification of Letters Patent. Patented April 23, 1907.

Application filed June 5, 1906. Serial No. 320,243.

To all whom it may concern:

Be it known that I, JOHN W. LIPPINCOTT, a citizen of the United States, residing at Little Rock, in the county of Pulaski and State of Arkansas, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

The invention to be hereinafter described relates to gas engines and, more particularly, to that type wherein, after the expansion stroke, the spent gases are discharged or forced from the cylinder. In such type of gas engine it is obviously desirable that the expanded or spent gases of combustion be completely expelled from the cylinder prior to the suction stroke of the piston and the entrance of a fresh charge of explosive mixture.

With these general considerations in view the object of the present invention is to provide means, whereby the cylinder of a gas engine using any of the explosive mixtures as the motor power, may be more perfectly exhausted of the spent or burnt fuel, prior to the entrance of another charge, thereby increasing the effectiveness of the engine.

The invention consists of the parts and combinations which will be hereinafter described and definitely pointed out in the claims.

The drawing represents a longitudinal section and part elevation of a gas engine embodying one form of the present invention, the usual framework or bed being omitted for clearness of illustration.

The cylinder A may be generally of any usual or desired character, except as hereinafter noted, and, if desired, be provided with the usual water cooling jacket A'. Reciprocating within the cylinder A is the main piston B, connected by rod C to the usual crank shaft D, the piston being preferably provided with packing rings *b*.

Within the cylinder A, at the end thereof, opposite the main piston B is the valve piston E having a sleeve E' extending through the end wall of the cylinder A. The valved piston E has passage ways *e e* which communicate with the exhaust outlet F disposed, preferably, in the cylinder end beyond the valve piston, as shown, and is provided with a valve seat *e'* for a valve G which opens inwardly or toward the main piston B. Extending through the sleeve E' of the valved piston, is the valve stem H having a seat *h* at its outer end for a spring *h'*. Secured to the valve stem H at a point beyond the seat *h* is a stop or pin h^2, so that the valve and its stem may have a limited amount of motion longitudinally of the valved piston and its sleeve, as will be obvious.

Connected to the outer end of the valve stem H at *i* is the lever I, pivoted at *i'*, actuated from any suitable source of power for opening the valve G, and thereafter moving it and the valved piston E inward of the cylinder A, to thereby practically exhaust all of the spent products of combustion, as will hereinafter more fully appear. As one means for operating the lever I and its connected valve and valved piston, I provide a rod K pivoted to one end of the lever I, as shown, and having operative engagement with an eccentric or cam, as shown at L, said eccentric being preferably located on a countershaft L', having reducing gearing connection L^2 L^3, with the crank shaft D, as indicated in the drawings.

It will thus be seen that the valved piston E and the valve G may be moved at stated intervals inward of the cylinder A, and the construction and action of parts with relation to the piston and valve are such that, as the operating means acts to move the parts, as stated, the valve G will first be opened and, as the stop or pin h^2 takes against the sleeve E', the valved piston E and its connected valve G will be moved lengthwise of the cylinder substantially into the dotted line position, as shown in the drawing, such position being assumed at the end of the expansion stroke of the engine and as the main piston is returning to exhaust the spent gases. Obviously, various means might be employed for effecting these movements of the valve and valved piston within the scope of the present invention.

In order to take up the thrust of the valved piston during the explosion stroke of the engine, the cylinder is provided with shoulders or stops *m*, against which complemental shoulders on the valved piston abut, when such piston is in its retracted or end position, as shown by full lines in the drawing.

Connected to the cylinder A is the inlet O through which gas, vapor, or other explosive mixture, is introduced to the cylinder. This inlet O is controlled by a valve *o* having a stem *o'* extending through the inlet casing O, said valve being normally held to its seat by a spring o^2, disposed between the inlet casing O and a nut or washer o^3, as

shown. Suitably disposed or connected to the cylinder A is the usual ignition plug P, having the ignition points *p p*, as usual, whereby, at appropriate times, the spark for igniting the explosive mixture is formed.

Assuming that the piston B, as shown in the drawing, is nearing the end of its expansion stroke, the rod K, which is connected to the actuating means therefor, is pushed to the left in the drawing far enough to cause the lever I to assume the position indicated by the dotted lines, which movement acts first upon the valve stem H and opens the valve G in the head of the valved piston, and by the time said valve is wide open, the stop or pin h^2 on the valve stem has compressed the spring h' and bears against the end of the sleeve E', whereupon the valved piston is pushed forward to the position indicated by the dotted lines, the valve remaining open and permitting the used gases to escape. During this action of the valve and piston E, the main piston B, having completed the expansion stroke, nears the end of the exhaust stroke, arriving at the position indicated by dotted lines and about the time the piston E arrives at its dotted line position. When the two pistons are in the positions indicated by dotted lines, the main piston nearly touches the valve G and the lever I is now reversed with the effect that the valve G slowly closes, while the main piston B completes the exhaust stroke, the spent gases being forced through the valve opening so that, by the time the valve G is completely closed, the two pistons are nearly touching each other, with the effect that the cylinder is practically exhausted of the spent gases. At the end of the exhaust stroke, the main piston B starts forward on the suction stroke and the valved piston E is pulled back into its position, as shown by full lines in the drawing, against the shoulders or stops *m m* in the cylinder, the valved piston remaining in this position during the compression stroke, thus allowing space for the compression of the fresh charge of explosive mixture, which is taken in through the inlet valve *o*. The piston D remains seated against the shoulders *m* during the compression and expansion stroke of the main piston B and the valve E is kept seated during the suction stroke, as will be apparent.

In the present drawings and specification I have illustrated and described only one of the many forms in which my invention may be embodied, and it will be obvious to those generally skilled in the art that various changes may be made in the disposition and relative arrangement of parts and that the valved piston may be disposed in other relations to the cylinder without departing from the spirit of the present invention, which contemplates the substantial and complete exhaust of the cylinder by means of a valved piston through which the spent gases of combustion are allowed to escape, said piston being movable to minimize the size of the exhaust end of the cylinder when the main piston is at the end of its exhaust stroke, or approaching it.

Having thus described the nature of my invention, what I claim and desire to secure by Letters Patent of the United States is:

1. In a gas engine, the combination of a cylinder having an inlet and an end exhaust or outlet, a main piston within said cylinder, a valved piston disposed in the cylinder opposite the main piston and having passageways therethrough communicating with the end exhaust or outlet, a valve connected to the valved piston, and means for first opening the valve and then moving it and the valved piston inward of the cylinder to exhaust the burnt gases or fuel.

2. In a gas engine, the combination of a cylinder, having an inlet and an end exhaust or outlet, a main piston within said cylinder, a valved piston disposed in the cylinder opposite the main piston and having passageways therethrough communicating with the end exhaust or outlet, said cylinder having shoulders or stops for taking up the thrust of the valved piston, a valve connected to the valved piston, and means for first opening the valve and then moving it and the valved piston inward of the cylinder to exhaust the burnt gases or fuel.

3. In a gas engine, the combination of a cylinder having an inlet and an end exhaust or outlet, a main piston within said cylinder, a valved piston disposed in the cylinder opposite the main piston and having passageways therethrough communicating with the end exhaust or outlet, said valved piston having a sleeve extended through the end of the cylinder, a valve seated in said valved piston and having a stem extended through said sleeve, and means acting on the valve stem to open the valve and thereafter move the valve and valved piston inward of the cylinder to exhaust the spent gases.

4. In a gas engine, the combination of a cylinder having an inlet and an end exhaust or outlet, a main piston within said cylinder, a valved piston disposed in the cylinder opposite the main piston and having passageways therethrough communicating with the end exhaust or outlet, said valved piston having a sleeve extended through the end of the cylinder, a valve seated in said valved piston and having a stem extended through said sleeve, a pin or stop on said valve stem, a spring disposed between the pin or stop and the sleeve of the valved piston to maintain the valve seated, and means acting on the valve stem to open the valve and thereafter move the valve and valved piston inward of the cylinder to exhaust the spent gases.

5. In a gas engine, the combination of a cylinder having an inlet and an outlet, a main piston within said cylinder, a valved piston disposed in the cylinder opposite the main piston and having passageways therethrough communicating with the said outlet, said valved piston having a sleeve extended through the end of the cylinder, a valve seated in said piston and having a stem extended through said sleeve, a seat formed in the end of said sleeve, a spring in said seat, a pin or stop on the valve stem and means for positively moving the valve inward of the cylinder and causing the pin or stop to contact with the sleeve to thereafter move the valve and piston together.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN W. LIPPINCOTT.

Witnesses:

JAMES W. HOOPER,

P. V. FERGUSON.