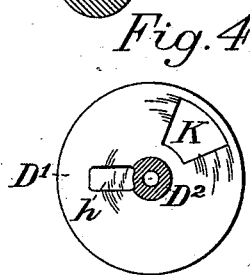
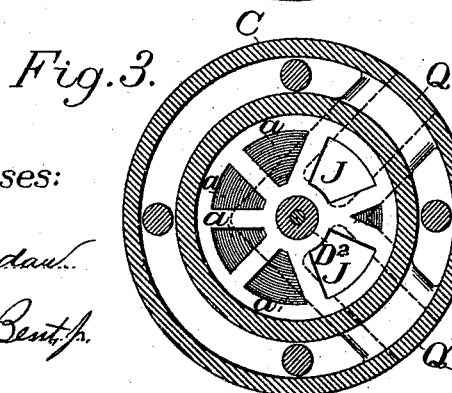
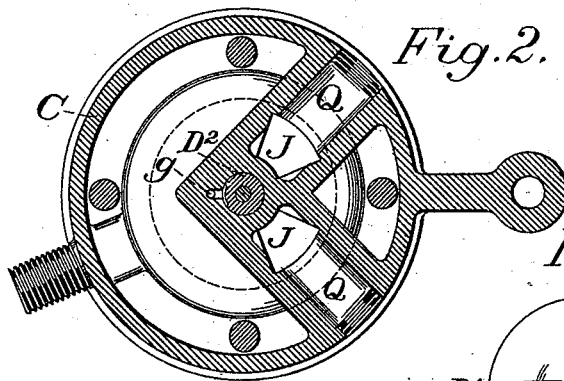
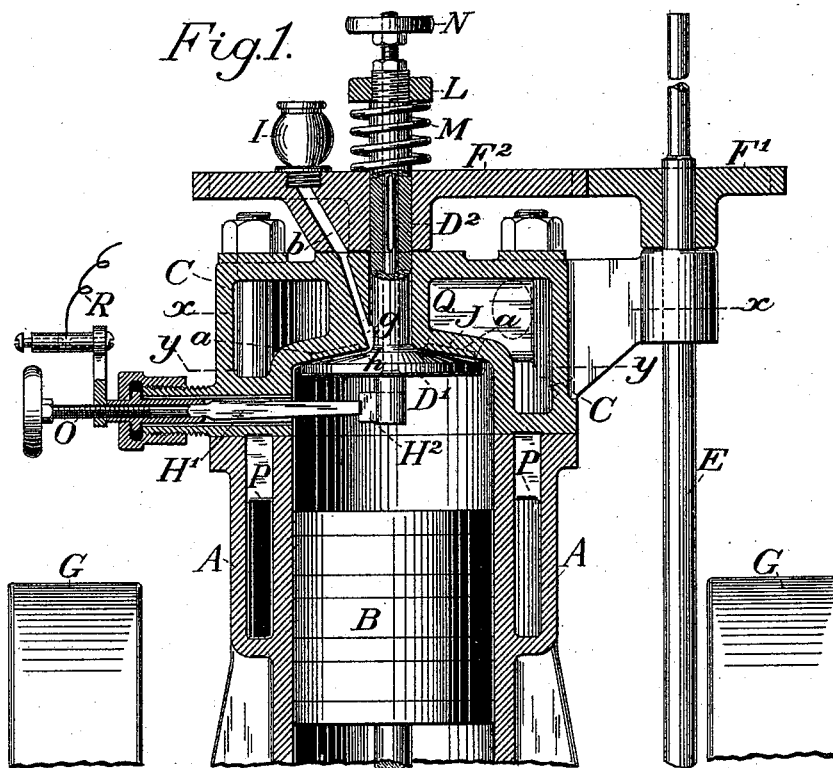


(No Model.)

J. W. RAYMOND.  
GAS ENGINE.

No. 491,855.

Patented Feb. 14, 1893.



Witnesses:

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# UNITED STATES PATENT OFFICE.

JOHN W. RAYMOND, OF SAN FRANCISCO, CALIFORNIA.

## GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 491,855, dated February 14, 1893.

Application filed January 13, 1892. Serial No. 417,965. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN W. RAYMOND, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Gas-Engines; and I hereby declare the following specification, with the drawings accompanying and forming part of the same, to be a full and exact description of my invention.

My invention relates to motive engines impelled by explosive gases, derived from the vapor of petroleum, or in any other manner, and especially to valves for admitting such gases to the cylinders of gas engines, and releasing the spent gases therefrom, also to combining therewith mechanism for igniting the charge, and other features of construction as will be hereinafter set forth.

My invention consists of a valve having a rotary movement, performing the functions of induction and eduction by means of ports or perforations through the valve, parallel to the axis of its rotation, that at certain predetermined portions of the valve's revolution, communicate with corresponding ports or perforations in the valve seat, such ports communicating with the supply of mixed gas and air for induction, and also with the open atmosphere for exhausting or releasing the burned gases.

My invention further consists in the employment of this same valve and its movement to perform the office of igniting the charge in the cylinder by means of an electric spark, thus dispensing with special and independent mechanism for that purpose.

It further consists in so constructing rotary valves of gas engines as to relieve their moving faces from the friction caused by the pressure of explosion, and during that portion of their revolution when high pressure occurs, and thus avoid abrasion of the surfaces, which might otherwise take place.

My invention also consists in various constructive details relating to and connected with the improvements named, as will be more fully set forth in the drawings herewith, in which:—

Figure 1 is a vertical section through the upper portion of a gas engine cylinder, provided with my improvements. Fig. 2 is a

complete transverse section, on line *x x* of Fig. 1, showing the inlet and release ports, also the rotary valve in dotted lines beneath. Fig. 3 is a complete reverse view on line *y y*, of Fig. 1, showing relief recesses in the valve seat to prevent overpressure or friction on the surfaces during the time of the impulse or explosion, also the ducts in the cylinder head and combustion chamber through which the mixed gas and air enter and are expelled. Fig. 4 is a view on top of the valve, showing the perforation, or port, for inlet of the mixed gas and air, and release of the spent gases.

Similar letters of reference on the different figures indicate corresponding parts of the engine.

In notation, the main letters of reference are as follows:

A—is a gas engine cylinder. B—the piston of the engine.

C—is the combustion chamber, being an extension of the cylinder A.

D—is the main distributing valve, and D<sup>2</sup> the stem of the same.

E—is a shaft for communicating motion from the engine shaft to the valve D'.

F' F<sup>2</sup>—are spur wheels connecting the shaft E and the valve D'.

G G—are sections of the fly wheels on the engine.

H' H<sup>2</sup>—are electrodes for producing the igniting spark and firing the charge of mixed gases in the chamber C.

I—is an oil cup for supplying oil to the valve D'.

J J—are ports in the valve seat for the inlet and release of mixed gas and air.

K—is a corresponding port or perforation in the valve D'.

L—is a nut for compressing the spring M, and holding the valve D' against its seat.

N—is a screw for holding the electrode H<sup>2</sup>.

O—is a screw for adjusting the electrode H'.

P P—is a water space, or jacket, to keep the cylinder A cool.

Q Q—are ports or passages through which mixed gas and air enter, and afterward are discharged. R—wire to electric battery.

In the operation of the engine, the main distributing valve D' receives a positive rotary motion from the shaft E, which is connected by tooth gearing with the crank shaft

of the engine, and also with the valve stem  $D^2$  by means of the tooth wheels  $F'$  and  $F^2$ , as shown in Fig. 1, the valve making one complete revolution for each two revolutions of the engine shaft. This permits the adjustment of the rotary valve  $D'$ , with respect to the movement of the piston B, so that the perforation or port K, in the valve, comes opposite to one of the ports J in the valve seat at the proper time for admitting mixed air and gas, or at each alternate revolution of the engine, in the usual manner. The mixed charge of gas and air is thus admitted at one of the ports J, when the piston B is on its downward or outward stroke. The piston then, on its inward or upward stroke compresses this mixed charge of air and gas, which is ignited by a spark from the electrodes  $H'$   $H^2$ , and the piston is driven downward by the great expansion of the exploded gases. In the meantime the valve  $D'$ , continuing its rotary movement, the port K comes into connection with the second port J in the valve seat, and as the piston B rises on the next stroke, permits the spent gases to be driven out or exhausted into one of the chambers Q, and into the open air. The ports J J, and the chambers Q Q, are shown alike on the drawings, because either of these can be employed for induction, or eduction, as convenience may determine, or they may serve either of these functions by heavy cocks or valves to change the inlet and exhaust from one to the other the same as steam engines are sometimes reversed.

It will be understood that instead of one, two or more ports or perforations can be employed in the valve and its seat, but I have chosen the most simple construction to illustrate my invention.

To prevent abrasion or wear of the valve  $D'$  upon its seat, and also to provide efficient lubrication of the surfaces, I form the valve seat with shallow recesses  $a a a$  as shown in the section Fig. 3, and also by dotted lines in Fig. 1. To supply oil to these recesses  $a$  and to the face of the valve, there is an oil way  $b$  communicating with the supply cup I. This oil way in the wheel  $F^2$  is made coincident with the oil way  $g$ , in the combustion chamber C, so that, at each revolution of the wheel  $F^2$ , these oil ways coincide, and a small amount of oil passes from the cup I down into the oil way  $g$ , and to the face of the valve  $D'$ . The valve  $D'$ , on its bearing face, has a shallow recess  $h$ , as shown in Fig. 4, into which the oil from the aperture  $g$  finds its way, and from thence is carried into the recesses  $a a$ , so that the moving faces are regularly oiled by the introduction of a predetermined quantity, measured and fed in proportion to the engine's speed and the time of its use. Besides this, entrained lubricating oil can be fed in with the supply of mixed gas and air, if necessary, or if more convenient in the case of small engines. The electrode  $H'$  is con-

nected with a battery by means of the wire R and is insulated in the usual manner where it passes through the walls of the cylinder A, forming one pole. The other pole is formed by the current passing through the main cylinder and its connected parts.

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

1. In a gas engine, a main distributing valve having a rotary movement, in combination with the engine shaft to which said valve is geared, a stem for actuating the valve, another stem projecting adjustably through the valve stem and having thereon an electrode for igniting the charge in the engine so that the distribution and ignition of the gases is performed by the same mechanism and in definite relation as to time or period in the manner and for the purpose set forth and described.

2. In a gas engine, the combination of a rotary main distributing valve, the main cylinder having at one end a combustion chamber within which said rotary valve is located, said valve being provided with a port coincident at certain periods of revolution with other ports for inlet and exhaust formed in the valve seat and communicating with a supply pipe or chamber and also with the atmosphere, a hollow valve stem connected to and supporting said valve and another stem projecting adjustably through said valve stem and having thereon an electrode for igniting the charge in the engine, substantially as described.

3. In a gas engine, the combination of a rotary distributing valve, a hollow valve stem for driving the same and another stem projecting through the valve stem and having on its inner end an electrode for igniting the charge in the engine said latter stem being adjustable so that the electrode may be adjusted, substantially as described.

4. In a gas engine, the combination of a rotary valve, a hollow valve stem for driving the same, a spring arranged upon said stem for the purpose of holding the valve to its seat, the engine shaft, gearing connecting said shaft with the hollow valve stem, and another stem located within the hollow valve stem and carrying on its inner end an electrode for the purpose of igniting the charge in the engine, substantially as described.

5. In a gas engine, the combination of a rotary valve, a hollow valve stem for supporting and driving the same, a spring on said stem for holding the valve to its seat, said valve being provided with a port coincident at certain periods of revolution with other ports for inlet and exhaust formed in the valve seat and communicating with a supply pipe or chamber and also with the atmosphere, the engine shaft, a gearing connection between it and the hollow valve stem, and the electrode for igniting the charge in the engine

which electrode is carried by a stem projecting adjustably through the valve stem, substantially as described.

5 6. In a gas engine, the combination of a rotary distributing valve with a port for distributing mixed air and gas and the products of combustion, said valve being geared with the engine shaft and moving in definite relation to the piston of the engine, a hollow  
10 valve stem for said valve, a rod passing

through said valve stem and an electrode connected and revolving with the valve, substantially as described.

In testimony whereof I have hereunto affixed my signature in the presence of two  
15 witnesses.

JOHN W. RAYMOND.

Witnesses:

ALFRED A. ENQUIST,

WILSON D. BENT, Jr.