(No Model.)

J. W. RAYMOND.

APPARATUS FOR STARTING GAS ENGINES.

No. 521,551. Patented June 19, 1894.

Fig. 1.

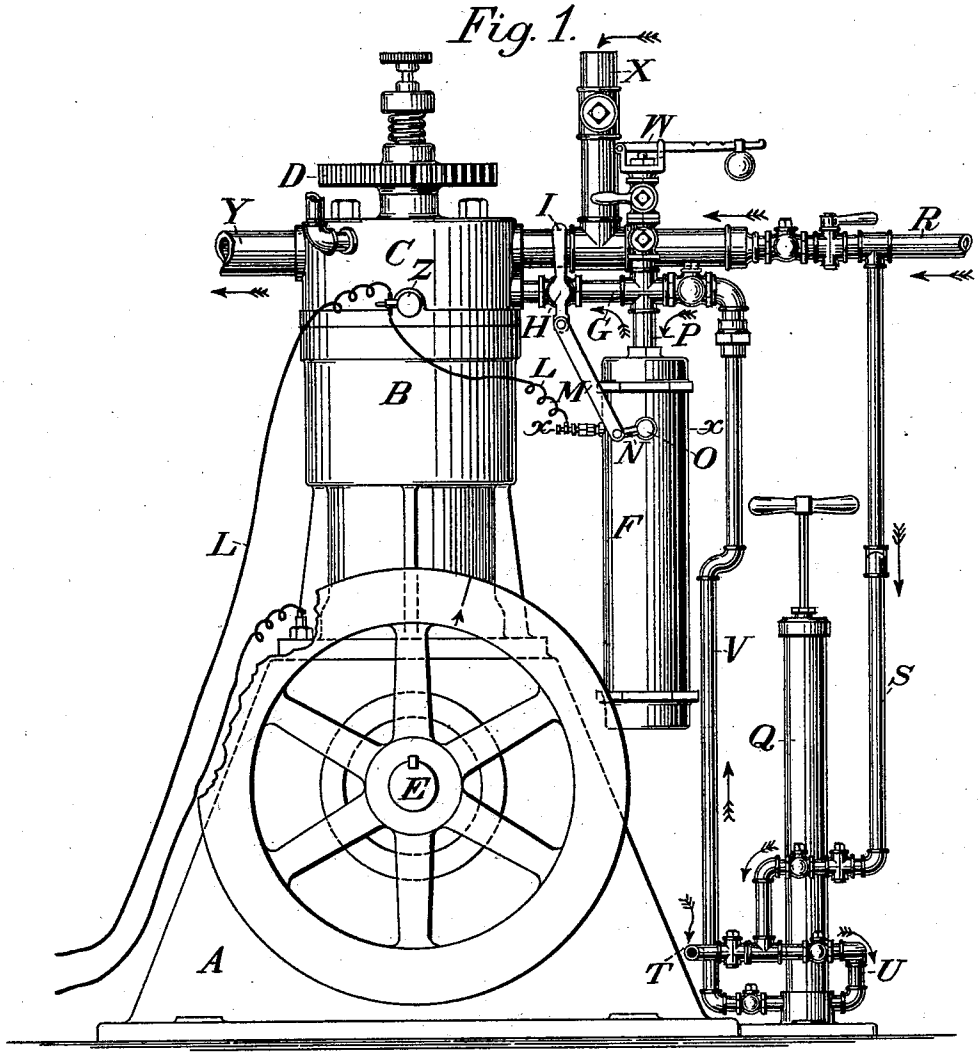


Fig. 2.

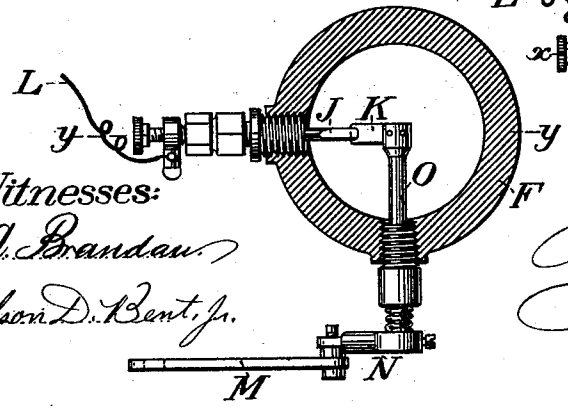
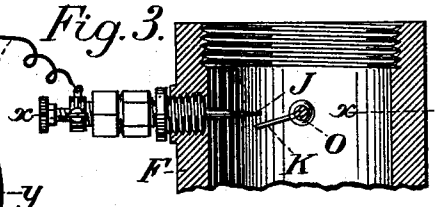


Fig. 3.



Witnesses:
E. A. Brandau
Wilson D. Bent, Jr.

Inventor:
Thos. W. Raymond
By John Richards
Atty

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN W. RAYMOND, OF SAN FRANCISCO, CALIFORNIA.

APPARATUS FOR STARTING GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 521,551, dated June 19, 1894.

Application filed April 10, 1893. Serial No. 469,772. (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 a new and useful Apparatus for Starting Gas-Engines, as set forth and described in the specification and drawings herewith, which I hereby declare to be a full, true, and exact description of my improvements and the manner of constructing and applying them in practice.

My invention relates to that class of motive engines impelled by explosive gases burned in the cylinders thereof, and consists in providing, in addition to the combustion chamber of the engine, a separate vessel charged with an explosive mixture under compression, from which connection can be instantly made to the combustion chamber and piston of the main engine, and the supplementary charge at the same time ignited, so the engine will at once start and automatically continue its functions the same as if it were first set in motion by hand or auxiliary power and mechanism.

The object of my invention is to avoid the necessity and danger of starting such engines by hand, or by means of some supplementary source of power derived from another motor, as set forth and explained in the drawings herewith, in which—

Figure 1 is an elevation of a gas engine fitted with my improvements. Fig. 2 is a cross section in plan on the line *x x* of the supplementary chamber, containing the explosive mixture for starting the engine, and also of Fig. 3. Fig. 3 is a partial vertical section on the line *y y* of Fig. 2.

Similar letters of reference indicate corresponding parts in the different figures of the drawings.

Describing now the construction and operation of my invention, A is the main frame of the engine, B the cylinder thereof, and C the combustion chamber, or extension of the main cylinder in which the charges are ignited.

D is a gear wheel driven from the crank shaft E, operating a rotary register valve on the top of the combustion chamber C, performing the functions of admission and release of the explosive and spent gases of combustion.

F is a supplementary chamber or receiver charged under pressure with an explosive gas or mixture the same as is used in operating the engine. This receiver F is connected with the combustion chamber C by the pipe G, and communication is opened between the two by moving the handle I which operates a common cock in the pipe G. In this receiver F are fixed two electrodes J and K, the one J being connected to an electric battery by the wires L in the usual manner, the other circuit being through the engine itself so that when the electrodes are separated, and the circuit broken, a spark is given off igniting the compressed gas and air in the receiver F, the force of the explosion entering the combustion chamber C, and in conjunction with, or without any entrapped gas in the combustion chamber acting on the piston of the engine and starting the same. To perform this operation the handle I is moved, opening the cock H, at the same time the link M acting on the crank N and stem O moves the electrode K, breaking the electric circuit and firing the charge in the receiver F, the explosion following into the combustion chamber C of the engine through the pipes P and G, igniting thus the residual charge of gas and air left from a former stroke, thus starting the engine, as before explained, which then goes on with its cycle of operations independent of the receiver F, which can be then closed and recharged for another occasion.

In respect to the method of charging the receiver F, this can be done in various ways, preferably by the power of the engine and suitable pumps driven thereby, but to render my invention more clear I have shown the most simple form of charging suitable for small engines, employing therefor a hand pump Q drawing a supply of gas through the pipe S from the pipe R, which connects to the main engine, and proper proportion of air through the inlet T, so the two are mingled in the pipe U and the pump G. The explosive mixture is then forced through the pipe V into the top of the receiver F until the required pressure is attained and the charge ready for use in the manner before explained.

So effectual is this method of starting that the engines do not require to be disconnected from machinery they are driving, the whole being started together. If the engine has to be frequently started, and the charges in the receiver F cannot be prepared rapidly enough by means of a pump supplying directly thereto, I employ a second receiver to contain the necessary supply of the explosive mixture under pressure, and from this second receiver supply the one F as required. This becomes necessary because the volume of the receiver F has to bear a suitable relation to the contents of the combustion chamber C, otherwise there would be an excess of explosive gas that would have to escape at the safety valve W and be lost.

The pressure in the receiver F is made to correspond in degree to that of greatest effect, hence is limited, but in the case of a second receiver to contain a surplus supply the volume therein can be reduced by employing a high pressure, and a corresponding reduction of volume and pressure be made in filling the acting receiver F. The amount of gas and air thus provided is made sufficient to start the engine independent of any residual charge remaining in the combustion chamber C, or so the combined effect in that case will not exceed the starting impulse required.

In further explanation of the main engine, X is an inlet pipe for air, Y the exhaust pipe for the burned or spent gases, Z an electrode for igniting the charges in the combustion chamber C, connected to the same wires and operating by the same current as the electrodes J and K in the receiver F.

A is an inlet pipe for cooling water that circulates around the combustion chamber C, and the upper portion of the engine cylinder B.

Having thus explained the nature and objects of my invention, what I claim is—

1. In a gas engine, the combination of the engine cylinder or combustion chamber thereof, the supplementary chamber or receiver charged with explosive gas or vapor under pressure, a connecting passage between the cylinder and the receiver, having a cock therein, a firing device within the receiver and mechanism for simultaneously opening the cock and operating the firing device so as to start the engine independent of its regular source of supply, substantially as specified.

2. In a gas engine, the combination of the engine cylinder or combustion chamber thereof, a supplementary chamber or receiver charged with explosive gas or vapor under pressure, a connecting pipe between the cylinder and receiver having a cock therein, a compressing pump or other source of supply connected to the receiver so that it may be filled and prepared between the intervals of starting the engine, and the firing device within the receiver, together with mechanism for simultaneously opening the discharge cock and operating the firing device, substantially as described.

3. In a gas engine, the combination of the engine cylinder or the combustion chamber thereof, a supplementary chamber or receiver charged with explosive gas or vapor under pressure, a connecting passage between the cylinder and the receiver having a discharge cock therein, a compressing pump or other source of supply having a pipe leading to the receiver and another pipe leading to the engine cylinder, said pump being operated so as to fill the receiver and prepare it between the intervals of starting the engine, a firing device within the receiver and leverage mechanism connected to the discharge cock and to the firing device so as to operate them both simultaneously, substantially as described.

4. In a gas engine, the combination of the engine cylinder or combustion chamber thereof, a supplementary chamber or receiver charged with explosive gas or vapor under pressure, a discharge cock between the receiver and the cylinder, a firing device within the receiver and leverage mechanism connecting the discharge cock and the firing device so that both may be operated simultaneously by a single movement, substantially as described.

5. In a gas engine, the combination of the combustion chamber, a supplementary chamber charged with explosive gas or vapor under pressure, a discharge cock between the two chambers, a firing device within the receiver, consisting of two electrodes and an operating handle connected to the discharge cock and to one of the electrodes so that the operation thereof will open the cock and break the electric circuit so as to fire the charge in the receiver, substantially as described.

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

JOHN W. RAYMOND.

Witnesses:
ALFRED A. ENQUIST,
WILSON D. BENT, Jr.