

(No Model.)

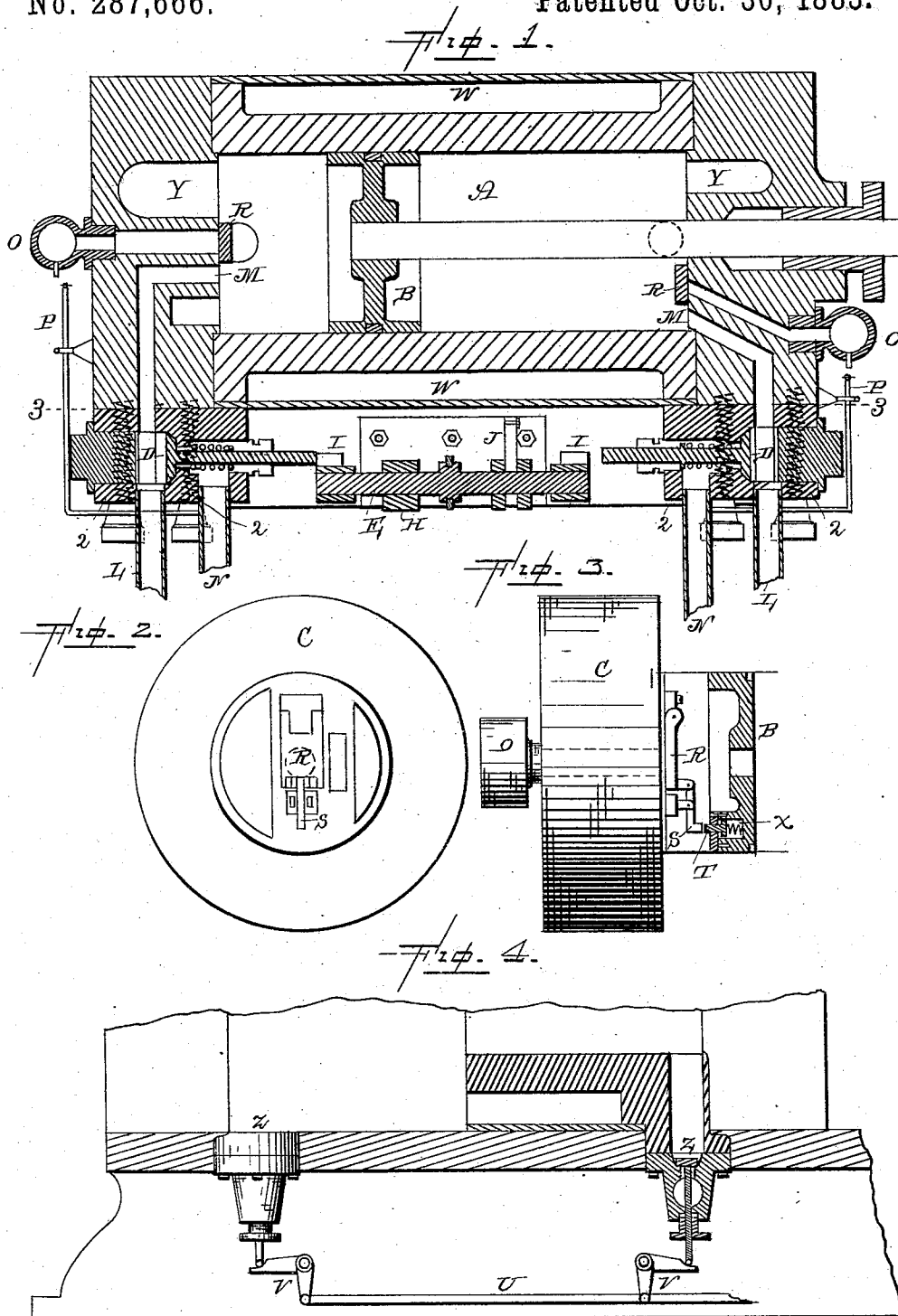
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G. B. & W. B. GRAY.

GAS OR VAPOR ENGINE.

No. 287,666.

Patented Oct. 30, 1883.



— Witnesses. —
Louis F. Cradner
J. W. Garner

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G. B. Gray,
W. B. Gray,
per J. A. Schumann, atty.

(No Model.)

2 Sheets—Sheet 2.

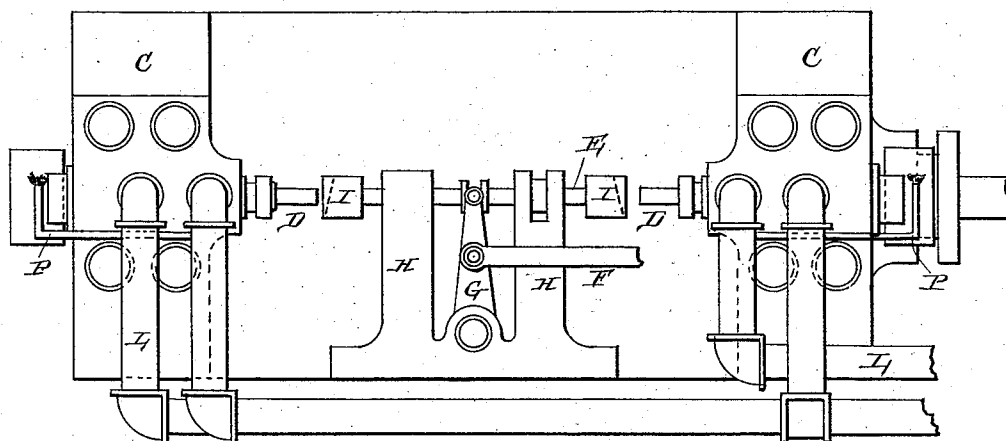
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Fig. 5.



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UNITED STATES PATENT OFFICE.

GARDNER B. GRAY AND WILLIAM B. GRAY, OF CARDINGTON, OHIO.

GAS OR VAPOR ENGINE.

SPECIFICATION forming part of Letters Patent No. 287,666, dated October 30, 1883.

Application filed May 23, 1883. (No model.)

To all whom it may concern:

Be it known that we, GARDNER BENNETT GRAY and WILLIAM B. GRAY, of Cardington, in the county of Morrow and State of Ohio, have invented certain new and useful Improvements in Gas or Vapor Engines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

Our invention relates to an improvement in gas or vapor engines; and it consists in the combination of the cylinder-heads provided with suitable ports, inwardly-opening valves, levers for opening the valves, and spring-actuated pins, which are carried back and forth by the piston, for the purpose of alternately opening the valves to allow a portion of the explosive mixture to enter the ignition-chamber.

It still further consists in the arrangement and combination of parts which will be more fully described hereinafter.

The object of our invention is to provide a cheap and simple engine which can be operated wherever gas or vapor can be obtained, and in which the piston is driven back and forth by explosions in each end of the cylinder.

Figure 1 is a vertical longitudinal section of an engine embodying our invention. Figs. 2 and 3 are detail views of the valves in the ends of the cylinder-heads. Fig. 4 is a detail view, showing the exhaust-valves. Fig. 5 is a side elevation of our invention complete.

A represents the cylinder, in which the piston B, provided with the usual packing-rings, moves back and forth. This cylinder may be inclosed in an outer inclosing case or shell, W, as shown, or may be constructed in any suitable manner. The piston has two recesses, X, formed on opposite sides, and which are covered over by means of perforated plates. In these recesses X are placed the inner ends of the headed pins T and suitable spiral springs. As the piston moves back and forth, when near the end of its stroke, these pins T are made to strike against the levers S, which are attached at their upper ends to the lower

ends of the valves R. These valves R are hung or pivoted upon the inner sides of the cylinder-heads C, and are alternately made to open at each stroke of the piston. The cylinder-heads C are provided with recesses Y, in which the explosive compound is compressed as the piston moves in that direction, and are provided with the ports M and the passages leading to the ignition-chambers O. To the ports M are connected the pipes L, which are connected with an air compressor or pump at their outer ends. The gas or vapor passes toward the cylinder through the pipes N, and the passage between the pipes N and L is controlled by the spring-actuated valves D. These valves are held closed by means of the springs which are applied to their stems, and only open to allow the gas to pass through the ports M with the air into the ends of the cylinder, when the valves are alternately opened by the endwise-moving rod or bar E, which is journaled in suitable bearings, H. Leading from the gas-pipe N, or from any other source, are the small pipes P, through which enough gas or vapor passes to keep a lighted flame constantly burning just below the ignition-chamber O while the engine is in operation.

The bar E is operated by an eccentric on the main shaft of the engine through the rod F and the rocker-arm G. This bar E slides back and forth in the bearings H, and at the same time is free to revolve. Secured to each end of the bar is a cam, I, having a beveled face, as shown by dotted lines in Fig. 5, and which cams I alternately open the spring-valves D, for the purpose of allowing the gas to flow into the cylinder. Placed upon this bar E is an arm, J, which is feathered to the bar, so that while the bar slides back and forth through the arm J, which is held in place, the bar cannot turn without the movement of the arm J at the same time. On the outer end of the arm J, as shown in Fig. 1, is attached the rod which extends from the governor, which may be of any construction that may be preferred. When the action of the engine becomes too rapid and the governor pulls upward upon the arm J, the rod E is turned in such a position that the cams I do not strike the outer ends of the spring-valves D, and hence no gas or vapor is admitted into the ends of the cylinder

until the speed of the engine has been reduced, when the downward movement of the governor-rod again turns the bar E in such a position that the cam will alternately strike against the valves D and allow the gas to flow into the cylinder. The casing of the admission-valves is held to its seat at 3 3 by the spiral springs beneath the nuts 2 2, the object being to allow the casings to be lifted from their seat if there should be any overpressure in the cylinder, and thus allow the explosive compound to escape into the open air. At each end of the cylinder there is an exhaust-valve, Z, which are alternately operated by the cranks V, which are attached to the rod U, which is operated by an eccentric on the main shaft of the engine. As the rod U moves back and forth the cranks V alternately force the valves Z inward, so as to let the air which is being forced into through the ports M to escape. There will be suitable check-valves in the air-pipes close to the valve-casings, to relieve the pump from the force of the explosion when the gases are ignited in the cylinder.

25 Either ordinary illuminating-gas or vapor which may be generated from any hydrocarbon may be used in the operation of the engine, as we do not limit ourselves in this respect. The gas may be forced through the pipes N by means of a pump, by hydraulic pressure, or in any other way that may be preferred.

The operation of our invention is as follows: The explosive compound having been ignited in one end of the cylinder, the exhaust-valve in the opposite end of the cylinder opens and the piston is driven forward. At the same time the air-pump forces air through the pipe L into the cylinder, and this air is allowed to pass out through the open exhaust-valve until near the end of the stroke of the piston, when the exhaust-valve closes, and the admission-valve is opened by the movement of the sliding bar E, carrying the cam I against the end of the valve-stem V, admitting gas or vapor from the pipe end. This gas or vapor passes into the cylinder, mixes with the air passing

through the pipe L, and forms a combustible compound. As the piston nearly reaches the end of its stroke the spring-pin T in the piston-head presses against the lower end of the lever S and raises the check-valve R a short distance from its seat, and permits a small quantity of the explosive compound to enter the ignition-chamber O, where, in escaping through a small opening in the wall of the chamber, it comes in contact with the flame from the pipe P, or a lamp, and where it is ignited, when the explosion takes place in the chamber O. This explosion forces the check-valve R from its seat, and, driving a quantity of the flame into the cylinder, causes an explosion there, and this explosion both closes the valve and drives the piston toward the other end of the cylinder at the same time. It will be observed that this engine is worked from each end of the cylinder and an explosion takes place at every stroke.

Having thus described our invention, we claim—

1. The combination of the piston carrying spring-actuated pins with the check-valves placed inside of the cylinder, suitable levers for opening the valves, the ignition-chambers, and means for igniting the gas in the chambers, substantially as shown.

2. In a gas or vapor engine, the combination, with the exhaust-valves and the mechanism for alternately operating them, of the check-valves R, the piston and suitable means connected with the piston for operating the check-valves, the spring-actuated valves D, the pipes L N, and a mechanism, substantially as shown, for operating the valves D and the ignition-chambers, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

GARDNER B. GRAY.
WILLIAM B. GRAY.

Witnesses:

L. G. GROSBETY,
C. E. TERRY.