No. 762,833. PATENTED JUNE 14, 1904.

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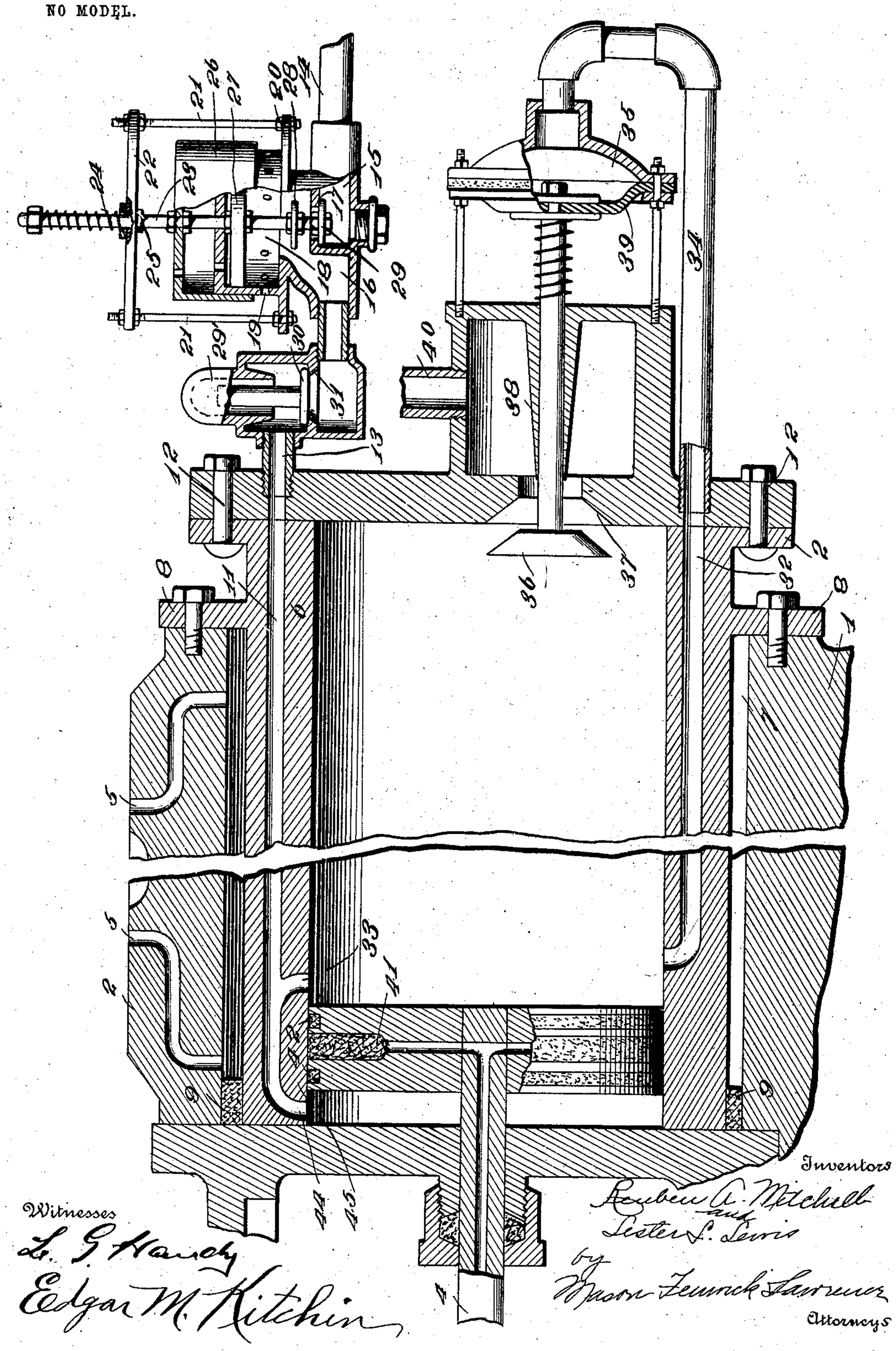
GOVERNOR VALVE FOR GAS ENGINES.

APPLICATION FILED JAN. 5, 1903.

NO MODEL.



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# UNITED STATES PATENT OFFICE.

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## GOVERNOR-VALVE FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 762,833, dated June 14, 1904.

Application filed January 5, 1903. Serial No. 137,926. (No model.)

*To all whom it may concern:*

Be it known that we, REUBEN A. MITCHELL and LESTER L. LEWIS, citizens of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Governor-Valves for Gas-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 appertains to make and use the same.

This invention relates to certain improvements in engine mechanism, and particularly to gas-mixing and charge-governing devices therefor.

The object in view is the provision of means whereby the operation of the piston of an engine will effect the introduction of a charge of gas and at the same time mix the same with air in given proportions.

To this end the invention consists in certain novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described and claimed.

In the accompanying drawing the figure represents a vertical longitudinal section through a cylinder and valve mechanism controlling and governing the admission of the motive fluid and embodying the features of the present invention.

Referring to the drawing by numerals, 1 designates the main body portion or base of any ordinary type or make of steam-engine, a fragment only of the same being illustrated, upon which base is mounted the cylinder 2, wherein a piston-head of ordinary construction, if desired, is adapted to move, such piston-head being connected with any suitable cross-head (not illustrated) by the piston-rod 4. At 5 5 we have shown the ordinary steam-ports of the engine. Within the aforesaid steam-cylinder we insert a casing or bushing 6, such casing being of less diameter in cross-section than the engine-cylinder to such a degree that a space, as at 7, is left between the engine-cylinder and the casing sufficiently large to perform the function of the ordinary water-jacket. The bushing or casing is preferably secured rigidly in place to the steam-cylinder by means of bolts passing through the radially-extending flange 8, (or lugs may be employed, if desired,) such flange being designed when the bushing is in place to abut against the end of the cylinder. Between the steam-engine cylinder and the inserted bushing we place, as at 9, a gasket or packing-ring designed to prevent the water from the cooling-chamber entering the interior or firing portion of the inserted casing or bushing. Within the inserted bushing, which we will hereinafter for the sake of convenience designate as the "explosion-cylinder," is formed a duct or port, as at 11, for the introduction of the firing or explosive charge or mixture. We will now proceed to describe in detail the mechanism we prefer to employ for governing the introduction of the gaseous charge to this duct 11. The head or end of the explosion-chamber is secured to the main body portion of the same by any suitable means, such as bolts 12 12, the port 11 extending through the head of the cylinder, and communicating with this port by means of the passage or duct 13 is the charge-governing mechanism. Gas is carried from any suitable source by means of the pipe 14 into the chamber 15, which chamber 15 communicates with the mixing-chamber 16 by means of the port 17. Immediately above the mixing-chamber 16 and communicating therewith is the air space or chamber, preferably cylindrical in form. The air to be mixed with the charge of gas enters this chamber 18 through the medium of ports, as at 19. The base of the chamber 18 is preferably formed with a flange, as at 20, and mounted near opposite extremities of said flange are two vertically-arranged rods or bars 21 21, supporting at their upper ends the plate 22. Extending through the said plate is the vertically-adjustable rod 23, the movement of which is limited and controlled by the tension-spring 24 and the nut 25, any suitable sleeve surrounding rod 23 and resting on plate 22 for receiving the lower end of spring 24. Mounted on said rod 23 and adapted when in its lowermost position to

cover the apertures in the air-chamber 18 is the cap 26, while midway of that portion of the rod 23 which extends through such air-chamber 18 is mounted a piston 27, adapted to effect vertical longitudinal movement of rod 23, responding to the engine-piston and opening and closing the valves carried by said rod 23 relative to the movement of such piston. Arranged at opposite sides of the port 17 and mounted on the lower part of the sliding stem 23 are two disks 28 29, which serve the purpose of controlling-valves between the gas-chamber 15 and the mixing-chamber 16.

Controlling the communication between the charge mixing and controlling mechanism above described and the explosion-cylinder is a valve mechanism of any preferred form. We have shown it in the drawing as composed of the valve-chamber 29′, containing a valve 30, said valve being adapted to rest upon the seat 31, formed in said chamber. When the piston is making its stroke toward the extreme outer end of the cylinder, the suction created thereby will lift the valve 30 from its seat, draw down the cap 26 over the apertures of the air-chamber, thereby preventing any more air coming into such chamber, at the same time taking the air from the chamber 18 into the mixing-chamber 16. The disk 27, drawing the sliding rod 23 downward, will close the space between the mixing-chamber and the air-chamber, and at the same time the downward movement of such sliding rod will for an instant open communication between the gas-chamber 15 and the mixing-chamber 16. The charge of air and gas mixing in said chamber 16 will then pass through the port 11 into the explosion-chamber, where it will be operated upon as hereinafter specified. When the piston again starts forward in its travel toward the extreme outer end of the cylinder, the old charge will be exhausted through the means now to be described. A port, as at 32, is formed in the explosion-cylinder opposite the intake-port and communicating, by means of the duct 34, with the chamber or portion 35 of the exhaust mechanism, which we shall hereinafter call the "diaphragm-chamber."

36 is a valve of a well-known type adapted when closed to rest upon the seat 37, the stem of said valve passing through the exhaust-chamber 38. The end of the valve-stem is secured in the flexible diaphragm 39, which diaphragm forms one of the walls of the chamber 35.

Of course it will be understood that a different piston must be employed with the gas-engine from that used with the steam-engine, and while the piston we employ may be of any desired form still our preferred form has been shown in the drawing, wherein is illustrated a piston the head of which is indented or annually grooved, and in such grooves we have placed a filling or packing of asbestos or other suitable material, as at 41. For the purpose of effecting lubrication the piston-rod is made hollow and communicates with any suitable oil-supply. (Not illustrated.) It will be thus seen that the oil flowing through the hollow piston-rod into the grooved piston-head will percolate through the asbestos and by the movement of the piston be caused to lubricate the interior of the cylinder.

The charge of gas within the cylinder may be exploded by any of the common and well-known devices, as a hot tube or electrodes arranged to operate in any preferred and well-known manner.

The operation of the mechanism is as follows: The piston is caused to move by any suitable mechanism from the left end of the cylinder to the right end of the cylinder, such movement forming a vacuum within port 11 and causing the valve 30 to lift and the chamber 16 to be exhausted, so that the vacuum therein will pull down the rod 23 and its contiguous parts, closing the openings 19 and opening the valve 17 for permitting the admission of gas, the charge of which gas, together with the atmosphere admitted within opening 19, is caused to move by the suction of the piston into the left end of the cylinder. The piston returning compresses the said charge, thereby reseating the valve 30, which operation releases the mechanism carried by rod 23 and permits the spring 24 to move said rod and the parts carried thereby to their former position, the stop 25 limiting such return movement to the desired extent. The continued return of the piston compresses the charge within the left end of the cylinder until the piston passes the port 33, when the charge will rush into the cylinder in front of the piston. The piston moving forwardly again will compress the charge within the right end of the cylinder, and when sufficiently compressed the igniting mechanism will cause the explosion thereof, effecting the return of the piston, said piston having during its previous forward stroke drawn in a charge of gaseous mixture, as before described, and the return stroke effecting a compression of such charge. The piston moves quickly across the cylinder on its return after each explosion, and as soon as it passes the other end of port 32 a charge of burned gases passes through said port into the chamber 35, actuating diaphragm 39 for lifting valve 36 from its seat, such valve-lifting operation occurring just prior to the admission of the new charge from the left end of the cylinder into the right end thereof, and immediately upon operation of the valve 36 the burned gas will escape and the compressed charge in the left end of the cylinder will move through port 33 into the right end of the cylinder, and the operation is repeated. It will be observed that the engine will be started by some auxiliary mechanism, as is common with gas-engines, and that after

such starting it will move by the force of its own explosions. The burned gases escaping through valve 36 will draw with it a sufficient quantity of the burned gas within chamber 35 to permit an almost immediate reseating of valve 36, so that the fresh charge enters a closed cylinder, and such fresh charge is not sufficiently compressed prior to the movement of the cylinder past the open end of port 32 to effect the diaphragm 39.

By a careful study of the drawing it will be observed that a nut is threaded onto the upper end of rod 23, whereby the spring 24 may have its tension increased or diminished, as may be desired, and such alteration of the tension will correspondingly increase or diminish the facility with which the piston or diaphragm 27 may be actuated, whereby the amount of gas permitted to pass through port 17 may be controlled and the speed of the engine thereby governed. When the spring 24 has its tension increased, a greater suction will be required to draw down the piston 27, whereby a comparatively large quantity of gas will pass through the port 17, owing to the comparatively slow movement of the disk valves 28 and 29. Of course the larger the quantity of power medium taken at each charge the greater the speed of the engine. When the tension of the spring 24 is decreased, less suction is required for closing the valve 28 upon the port 17 and the smaller the charge introduced into the cylinder, whereby a lower speed is acquired by the engine. The speed of the engine is thereby governed absolutely by the arrangement of the valves 28 and 29, the piston 27, and the spring 24, and, as will be apparent from the drawing, no other governing means is needed in connection with the present improved gas-engine.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a mechanism of the class described, the combination with a cylinder and a piston, of an intake-duct communicating with the cylinder, a port communicating with said duct, a plurality of valves, one of which is positioned on one side of said port and another upon the opposite side thereof, means normally retaining one of said valves in position for closing said port, and means connected with said valves actuated by the suction of said piston for unseating the normally seated valve and closing the port by the other valve.

2. In a gas-engine, the combination with a cylinder and piston, of an intake, a port communicating therewith, a valve on each side of said port, means effecting synchronous action of said valves, devices retaining one of the valves in position for normally closing said port, and mechanism for closing the port by means of the other valve controlled by the pressure created by said piston, substantially as described.

3. In a gas-engine, the combination with a cylinder and piston, of an intake therefor, a port arranged in the intake, a valve on each side of said port, means connecting said valves, a spring normally retaining one of said valves in position for closing said port, and means governed by the pressure created by said piston for positioning the other valve for closing said port, substantially as described.

4. In a gas-engine, the combination with a suitable cylinder and piston, of an intake, a port communicating therewith, a valve normally closing said port, a spring retaining said valve in its normal position, means for adjusting the tension of said spring, a valve spaced from the first-mentioned valve and designed at times to close said port, and means governed by the pressure created by said piston for moving the first-mentioned valve from said port and said second-mentioned valve in position for closing the port, substantially as described.

5. In a gas-engine, the combination with a cylinder and piston, of an intake, a port in communication therewith, a valve beneath said port, a rod engaging said valve and extending through the port, a spring normally retaining said valve in position for closing said port, a valve carried by said rod above the port, and means controlled by said piston for dropping the first-mentioned valve from its set and positioning said second-mentioned valve for closing said port, substantially as described.

6. In a gas-engine, the combination with a cylinder and piston, of an intake-port communicating with the cylinder, a valve on one side of said port, a valve on the opposite side thereof, means effecting synchronous action of said valves, means retaining one of the valves in position for normally closing the said port, and mechanism for adjusting the other valve in position for closing the port relative to the movement of the piston, substantially as described.

7. In a gas-engine, the combination with a cylinder and piston, of an intake-port for the cylinder, a valve normally closing said port, means retaining such valve normally in its closed position, a second valve, and means actuated by the pressure within the cylinder for unseating the first valve and closing the port by means of the second valve, substantially as described.

8. In a gas-engine, the combination with a cylinder and piston, of a duct communicating with the cylinder, a chamber in communication with said duct, a piston in said chamber, power-medium-supply means communicating with said chamber, and a plurality of valves controlling said supply and actuated by the piston in said chamber, substantially as described.

9. In a gas-engine, the combination with a cylinder and piston, of a duct communicating with the cylinder, a valve-chamber in said

port, a valve-stem within said chamber, means carried by said stem and actuated by the pressure within said cylinder for actuating the stem, and a plurality of valves controlling the intake through said valve-chamber, substantially as described.

10. In a gas-engine, the combination with a cylinder and piston, of an intake-duct for the said cylinder, a valve-chamber in communication with said duct, a valve-stem within said chamber, a plurality of valves carried by said stem and controlling the intake through said chamber, means controlled by the pressure within said cylinder for actuating the valve in one direction and auxiliary means for actuating the same in an opposite direction, substantially as described.

11. In a gas-engine, the combination with a cylinder and piston, of an intake-duct for said cylinder, a valve-chamber communicating therewith, a valve-stem within said chamber, a plurality of valves carried thereby and controlling the intake through said chamber, means connected with said stem and actuated by the pressure within said cylinder for moving said valve in one direction, and a spring for moving the valve in an opposite direction, substantially as described.

12. In a gas-engine, the combination with a cylinder and piston, of a duct communicating with the piston, a chamber communicating with said duct, a piston in said chamber, power-medium-supply means communicating with said chamber, a rod connected with said piston, a valve carried by said rod and adapted to cut off the power-medium supply, and a valve spaced from the first-mentioned valve and also carried by said stem adapted to cut off the power-medium supply when the said rod is at the opposite extreme of its movement from its normal position.

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

REUBEN A. MITCHELL.
LESTER L. LEWIS.

Witnesses:
JOHN M. MCGILL,
CLYDE C. SIMMONS.