(No Model.) 2 Sheets—Sheet 1.

R. E. OLDS & M. F. BATES.

GAS OR VAPOR ENGINE.

No. 565,786. Patented Aug. 11, 1896.

Fig. 1

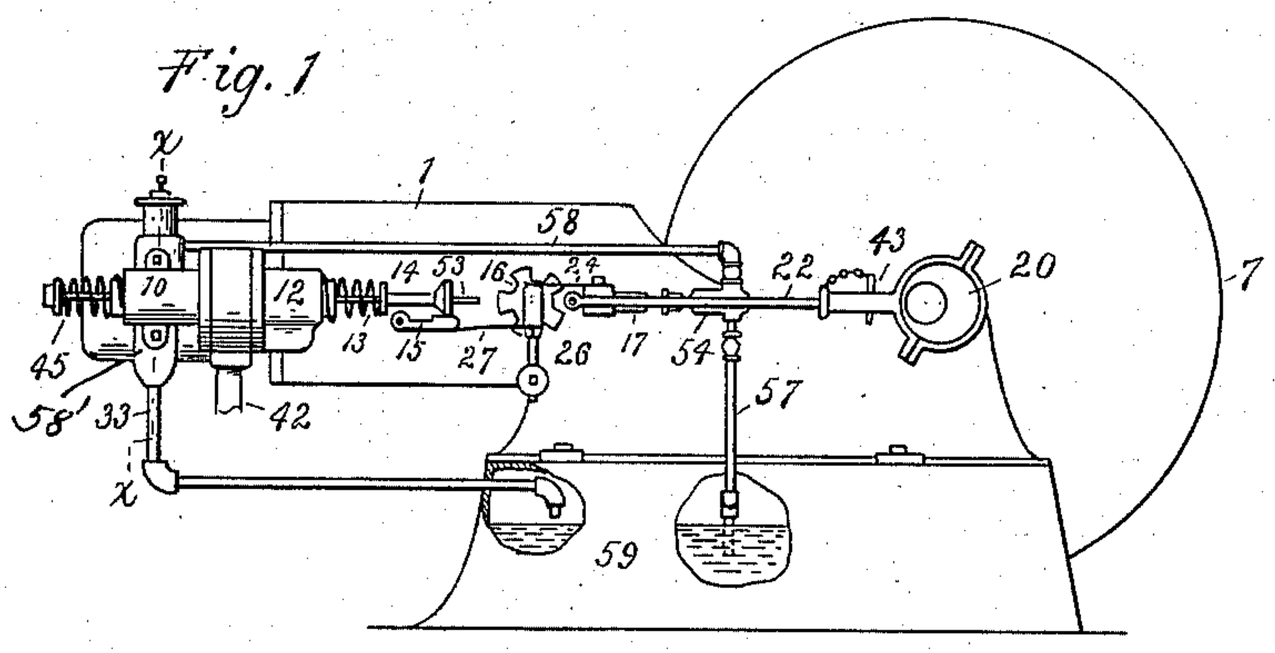


Fig. 2

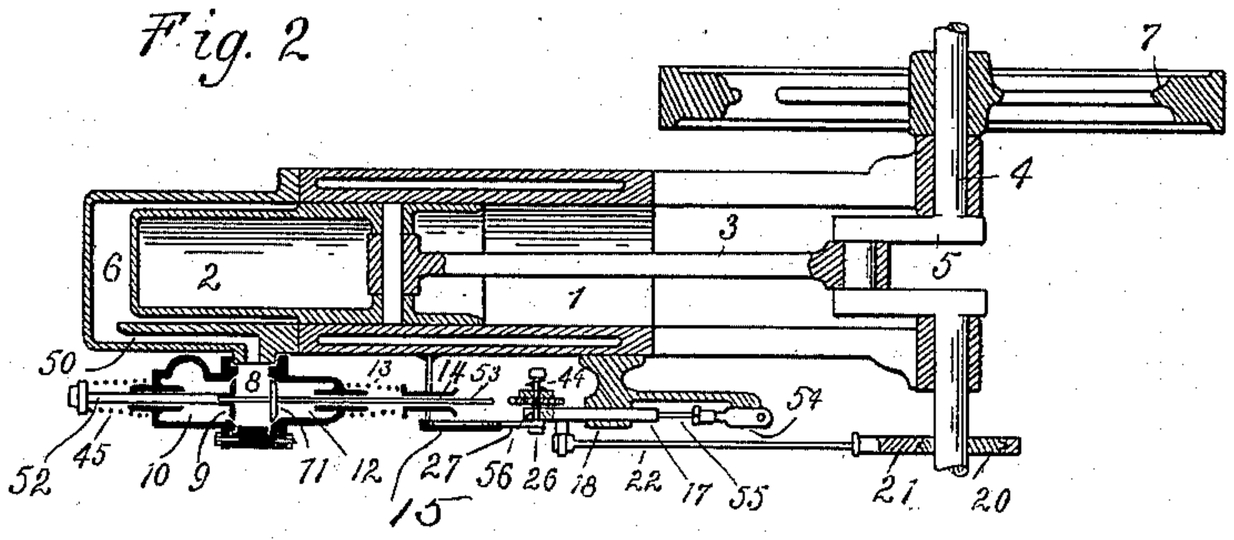
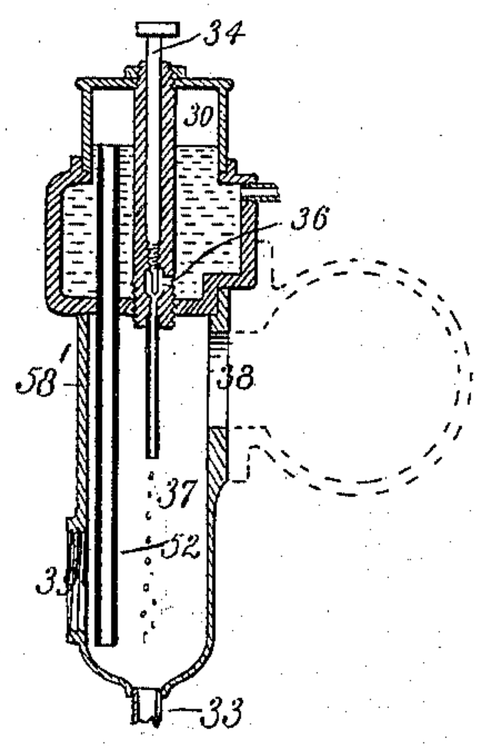


Fig. 4



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(No Model.) 2 Sheets—Sheet 2.

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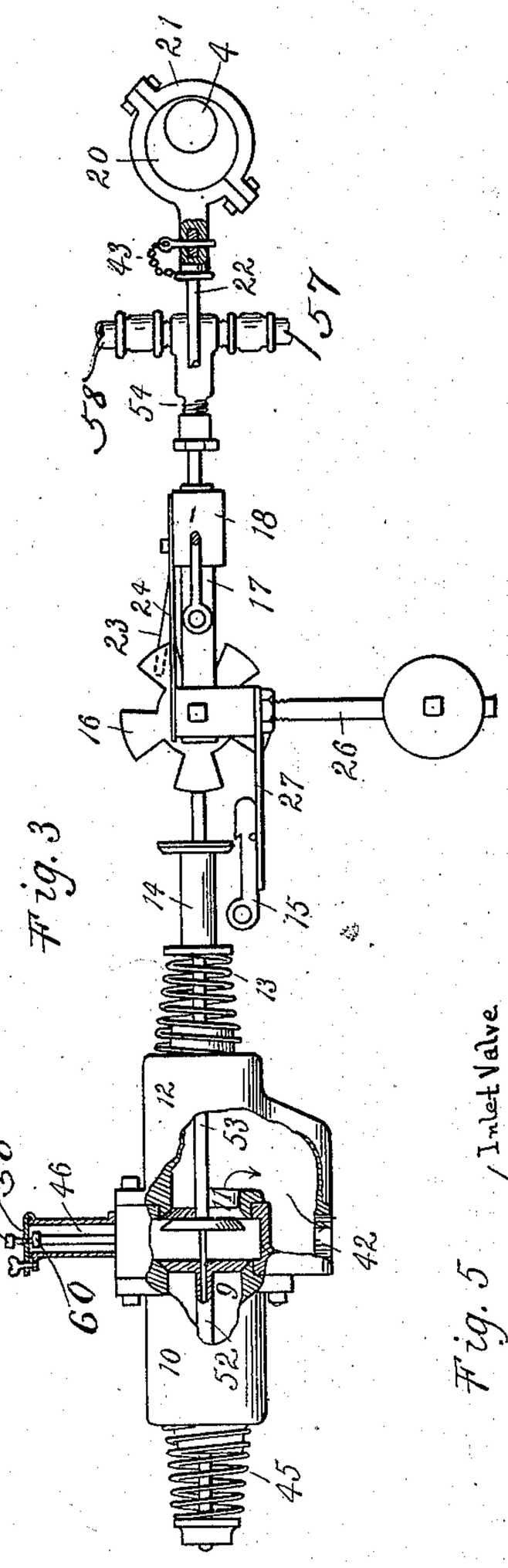

Fig. 3.

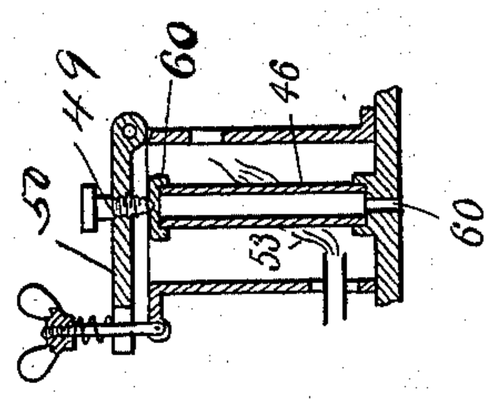

Fig. 7.

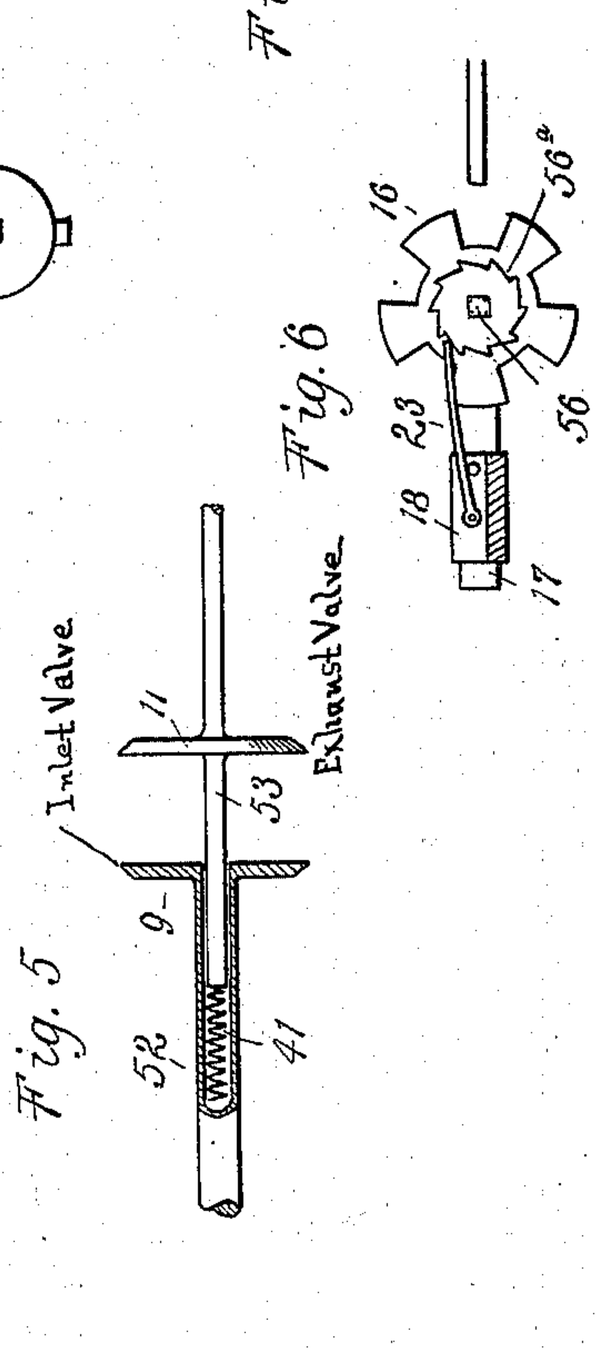

Fig. 6.

Fig. 5.

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UNITED STATES PATENT OFFICE.

RANSOM E. OLDS AND MADISON F. BATES, OF LANSING, MICHIGAN; SAID BATES ASSIGNOR TO THE P. F. OLDS & SON, OF SAME PLACE.

GAS OR VAPOR ENGINE.

SPECIFICATION forming part of Letters Patent No. 565,786, dated August 11, 1896.

Application filed August 24, 1895. Serial No. 560,381. (No model.)

To all whom it may concern:

Be it known that we, RANSOM E. OLDS and MADISON F. BATES, citizens of the United States, residing at Lansing, in the county of Ingham and State of Michigan, have invented certain new and useful Improvements in Gas or Vapor Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates more particularly to that type of gas-engines in which the motive power is derived from the combustion of carbureted air in the engine-cylinder; and the invention particularly relates to the improved construction, arrangement, and operation of different parts, notably of the valve mechanism, the regulator which controls the supply of vapor and the carbureting devices, which in our construction form an organic part of the engine and make it self-contained, all as more fully hereinafter described, and shown in the drawings, in which—

Figure 1 shows our improved gas-engine in elevation. Fig. 2 is a horizontal section thereof. Fig. 3 is an enlarged detached elevation of the valve mechanism and of the regulator. Fig. 4 is a vertical central section through the carbureter substantially on line *x x*, Fig. 1. Fig. 5 shows the inlet and exhaust valves detached. Fig. 6 is a rear elevation of the notched wheel in the valve mechanism, and Fig. 7 is a vertical section showing the construction of the igniter in detail.

The construction of the engine will be readily seen from the drawings, in which the different numbers indicate the following parts:

1 is the engine-cylinder open at one end.

2 is the piston, which is hollow, open at one end and greatly elongated. It has a suitable packing about midway of its length, and the space 6 in which it moves in the cylinder constitutes the combustion-chamber.

3 is the piston-rod, pivotally secured to the piston. 4 is the main shaft, provided with the fly-wheel 7 and crank 5, with which the piston engages.

8 is a valve-chamber connected by a passage 50 with the combustion-chamber 6.

9 and 11 are the inlet and exhaust valves, respectively, which control inlet and exhaust ports formed upon opposite sides of the valve-chamber. 52 and 53 are the stems to which these valves are respectively secured, and 41 is a spring interposed between them.

10 is the inlet, and 12 is the exhaust-chamber, with which the valve-chamber 8 communicates under control of the valves 9 and 11, respectively.

42 is an exhaust-port into the atmosphere from the chamber 12.

45 is a spring secured upon the valve-stem 52 to normally hold the inlet-valve 9 closed.

13 is the closing-spring of the valve 11.

14 is a collar secured upon the valve-stem 53.

20 is a valve-operating eccentric on the engine-shaft.

21 is the eccentric-strap.

22 is an eccentric-rod detachably secured to the strap by means of the key 43.

17 is a slide mounted in a fixed guide-bearing 18 and actuated by the eccentric-rod 22.

54 is a feed-pump having its actuating piston-rod 55 secured to and operated by the slide 17.

57 and 58 are the suction and delivery pipe of the pump, respectively.

16 is a notched wheel journaled upon a wrist-pin 56, secured in the slide and arranged to move in the path of the valve-stem 53.

44 is a spring, the tension of which prevents the notched wheel from revolving to freely.

26 is a pendulum-weight suspended from the slide 17.

24 is a spring pressing against a flat portion of the pendulum to interfere by its tension with the free swinging of the pendulum.

27 is a spring-arm secured to the pendulum and engaging at its free end a catch 15, pivotally supported on some stationary part of the engine.

56[a] is a ratchet-wheel on the notched wheel 16.

23 is a pawl pivoted on the arm 18 and adapted to operate the ratchet-wheel 56.

58′ is the carbureter containing the carbureting-chamber 37, which communicates through a drip-pipe with the gasolene-cup 30, which surmounts it.

39 is an air-inlet into the carbureting-cham-

ber, and 38 is the outlet from said chamber, which communicates into the chamber 10.

34 is a regulating needle-valve controlling the inlet-port 36 of the drip-pipe.

33 is a waste-pipe leading from the carbureting-chamber into the tank or reservoir 59 formed by the hollow base of the engine, and 52 is an overflow-pipe leading from the gasolene-cup 30 into the carbureting-chamber.

The construction of the igniter is shown in detail in Fig. 7.

53 is the flame fed from any suitable supply.

46 is the igniter-tube adapted to be heated to incandesence by the flame and communicating through a port 60 with the chamber 8.

As shaft 4 revolves it draws piston 2 forward in cylinder 1 and forms a partial vacuum in back end of cylinder 1 and combustion-chamber 6, which causes inlet-valve 9 to open in drawing the air through opening 39 in carbureter 58′. The momentum of the balance-wheel starts the piston back again and causes inlet-valve 9 to close instantly by the aid of spring 45, and the charge is then compressed into combustion-chamber 6, at the same time filling the igniter-tube 46 with the combustible charge. This being kept incandescent by the flame around the outside of tube ignites charge in combustion-chamber 6, thereby giving force to piston, imparting an impulse to crank, and storing energy in balance-wheel 7 to carry over idle points. As the piston starts to move toward the combustion-chamber 6 again, the eccentric 20 is so set on shaft 4 that it opens exhaust-valve 11 by means of the exhaust-valve stem 53 coming in contact with one of the points of the moving ratchet-wheel 16, which opens the exhaust-valve until the piston has reached its extreme backward stroke, when it closes. At the point where the exhaust-valve closes the pawl 23 comes in contact with ratchet-wheel 56 and moves the notched wheel, so that during the next compression the exhaust-valve remains closed by the stem passing into a notch between two high points on the notched wheel, the spring 44 being a friction to hold the wheel in position.

The speed of the engine is governed by the pendulum device, which is normally held in a vertical position by spring 24; but if the average speed of the engine is exceeded the weight 26 under the influence of its momentum will not start as quickly as the slide 17, when the eccentric changes its stroke to forward. This will throw catch 15 up in contact with sleeve 14 by means of spring 27 and thereby hold the exhaust-valve open and at the same time hold the inlet-valve closed by means of its stem compressing the spring 41.

While the speed of the engine is below the average, the weight 26 will not vibrate on account of the pressure brought to bear by spring 24 and the catch will not be thrown in contact with sleeve 14, allowing cylinder to draw in a new charge with every other revolution.

The pump 54 is to supply the carbureter-cup 30 with gasolene. It pumps more than is required and the surplus passes through overflow 32 and waste-pipe 33 into gasolene-reservoir in base of engine. The carbureter is so adjusted that a continuous stream or drip of gasolene passes through pipe 35 into the carbureter-chamber 37, and as the air-current created by the suction passes through said chamber on its way into the combustion-chamber it carburets the air and renders it combustible. During the idle strokes of the engine the gasolene passes directly down through overflow 33. The necessary quantity of gasolene is continuously supplied by the pump into the cup 30 through the feed-pipe 58, and the eccentric valve-rod 22 can be readily disconnected by means of the key 43, so that the pump can be operated by hand while engine is at rest, if necessary. The igniter-tube is firmly held in position by the pressure-bar 50 in a manner to permit its free expansion and contraction. It is made easily removable and can be reversed, and the set-screw 49 accommodates different lengths of tube.

It will be readily understood that by means of the elongated hollow piston the heat of combustion is kept away from the working part of the cylinder, so that no water will be needed to keep it cool.

The arrangement of the valve in a separate semidetached casing, which is connected to the side of the cylinder in a position where it is detached from the combustion-chamber, excludes any injurious effects from the heat and concussion, and the valves operating independently but coöperating in the manner described by means of their valve-stems and the interposed spring simplify the construction materially and insure their perfect working.

The mechanism for actuating the exhaust-valve is very simple and not liable to get out of order, and the regulator effectively controls the speed and can be easily set for any desired speed by simply adjusting the weight up or down.

The carbureter is organically combined with the engine in a manner to make a compact structure, and its operation is such as to insure a uniform quality of carbureted air capable of easy adjustment as to quantity of gas needed.

The construction of the igniter has the advantage that there is no special fitting of the tubes required. They need no threading, as by means of metal gaskets an air-tight joint can be readily made.

What we claim as our invention is—

1. In a gas-engine, the combination of two oppositely-moving disk-valves controlling the inlet and exhaust ports respectively and having their valve-stems arranged in line with each other, springs upon each valve-stem to close the valves independently of each other and a spring interposed between the valve-

stems of the two valves, substantially as described.

2. In a gas-engine, the combination of the valve-chamber 8 provided with inlet and exhaust ports upon opposite sides, the automatically-closing inlet and exhaust valves 9, 11, controlling said ports, the spring 41 interposed between the valve-stems of said valves, and a regulating device acting through a detent on the stem of the exhaust-valve to control its closing, substantially as described.

3. In a gas-engine, the combination of the automatically-closing exhaust-valve 11, carried by the valve-stem 53, the reciprocating slide 17, the bearing 18 in which it is guided, the eccentric on the main shaft detachably connected to and operating said slide, the pump having its piston connected to the slide, and the notched wheel 16 carried by the slide in the path of the valve-stem and adapted to intermittently engage and move the stem of the exhaust-valve to open said valve, substantially as described.

4. In a gas-engine, the combination of the automatically-operating inlet-valve 9, the automatically-closing exhaust-valve 11, the spring 41 interposed between the valve-stems of said valves, the slide 17 operated by the movement of the engine and provided with means for intermittently operating the exhaust-valve, the pendulous weight carried by the slide, the spring 24 arranged to hold the pendulous weight in position by frictional contact, and the arm 27 provided with the catch 15 adapted to detain the closing of the exhaust-valve by the movement of the pendulous weight, substantially as described.

5. In a gas-engine, the combination with the combustion-chamber and the inlet-valve, of the carbureter 58′, comprising the carbureting-chamber 37, having air-inlet 39 and outlet 38 communicating with the inlet-valve, the gasolene-cup 30, surmounting the carbureting-chamber and provided with the drip-pipe extending into said chamber, the needle-valve in said drip-pipe, a supply-pipe 37 into said gasolene-cup and connected to a source of continuous supply, an overflow-pipe from the gasolene-cup into the carbureting-chamber, and a waste-pipe from the latter to the source of supply, substantially as described.

6. In a gas-engine, the combination with the cylinder provided with a combustion-chamber in one end, of the piston provided with a suitable packing and a hollow closed extension projecting freely beyond said packing into the combustion-chamber of the engine, substantially as described.

7. In a gas-engine, the combination with the valve-casing, of an automatically-opening inlet-valve having a stem projecting without the casing, a spring on said stem for closing the valve, an oppositely-working exhaust-valve, means for opening said exhaust-valve, means for closing the exhaust-valve, and a spring between said valves for holding the inlet-valve closed while the exhaust-valve is open, substantially as described.

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

RANSOM E. OLDS.
MADISON F. BATES.

Witnesses:
CHAS. F. HAMMOND,
HARRIS E. THOMAS.