No. 664,200. Patented Dec. 18, 1900.

C. O. WHITE.

GASOLENE ENGINE.

(Application filed Feb. 11, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

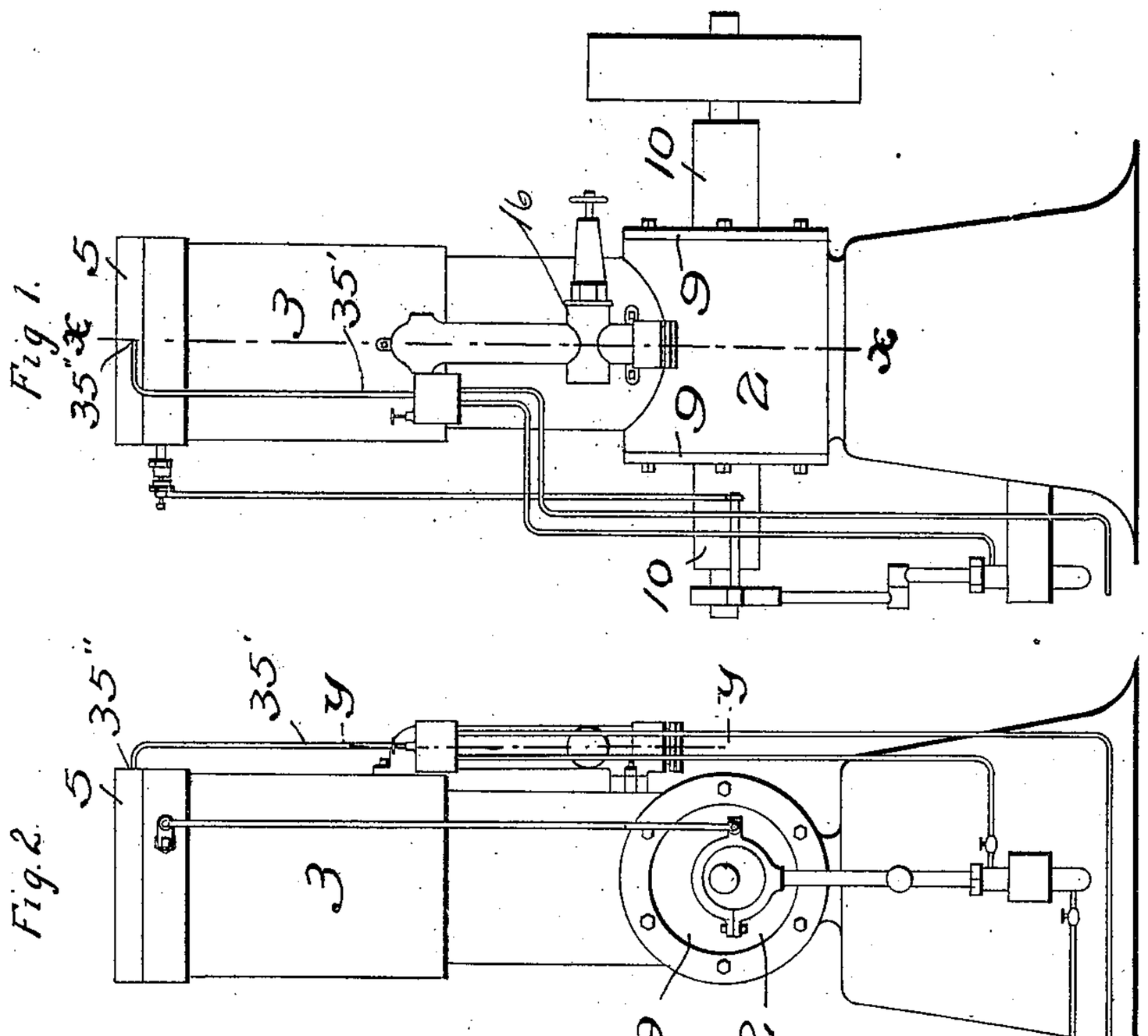


Fig. 2.

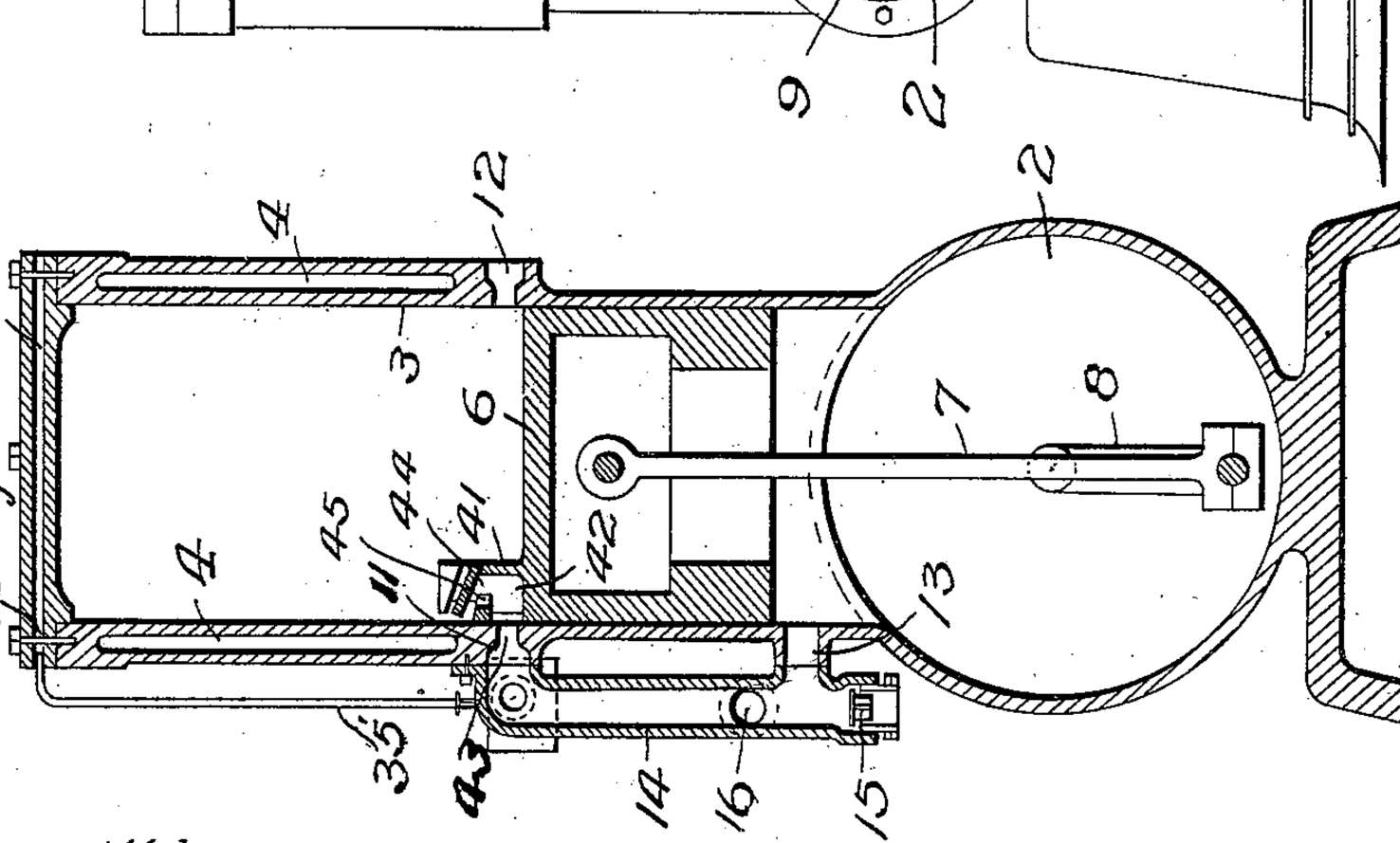
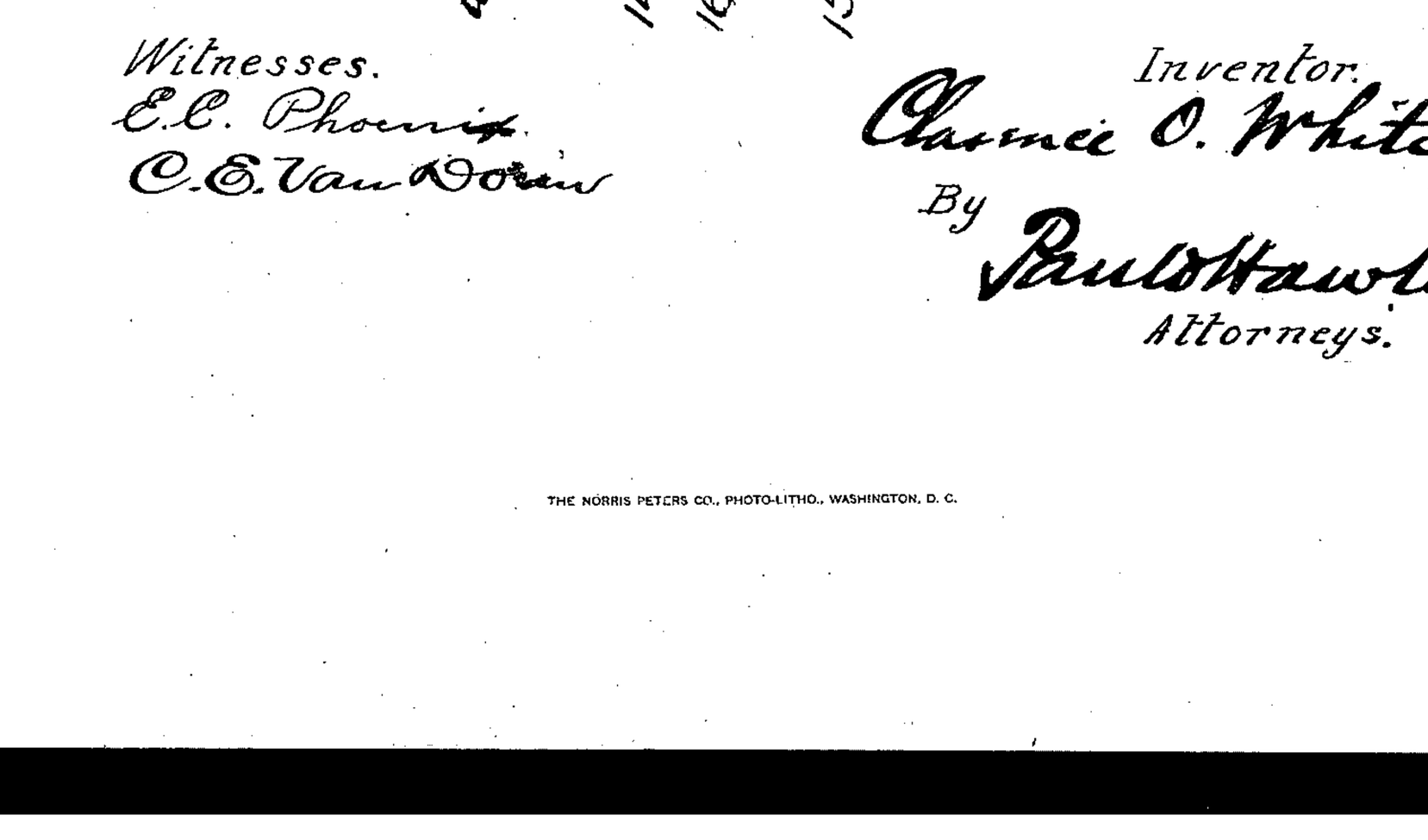


Fig. 3.



Witnesses.
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Fig. 4.

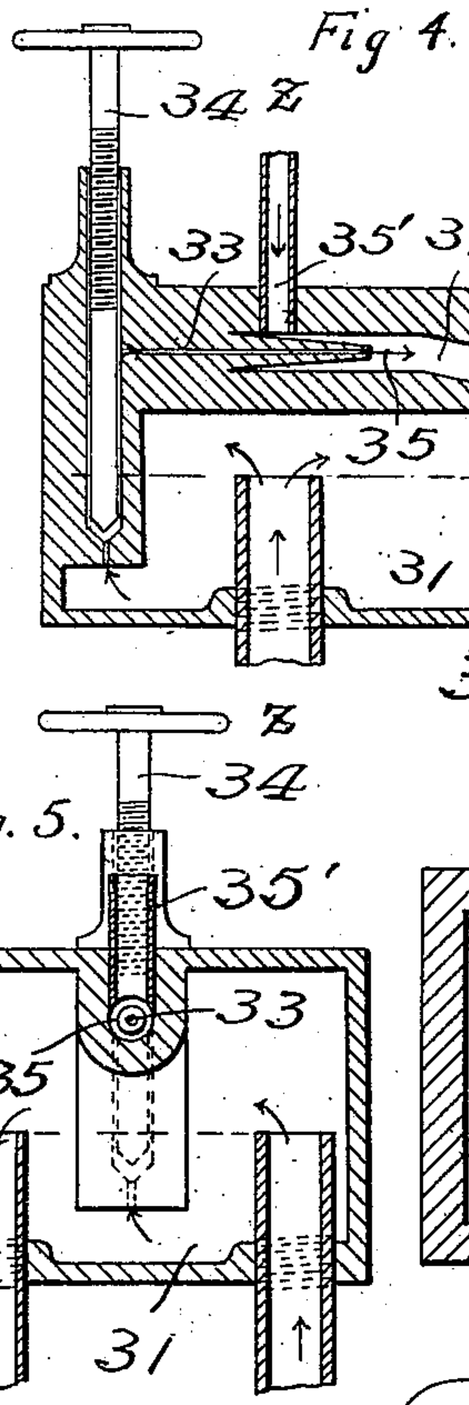

Fig. 5.

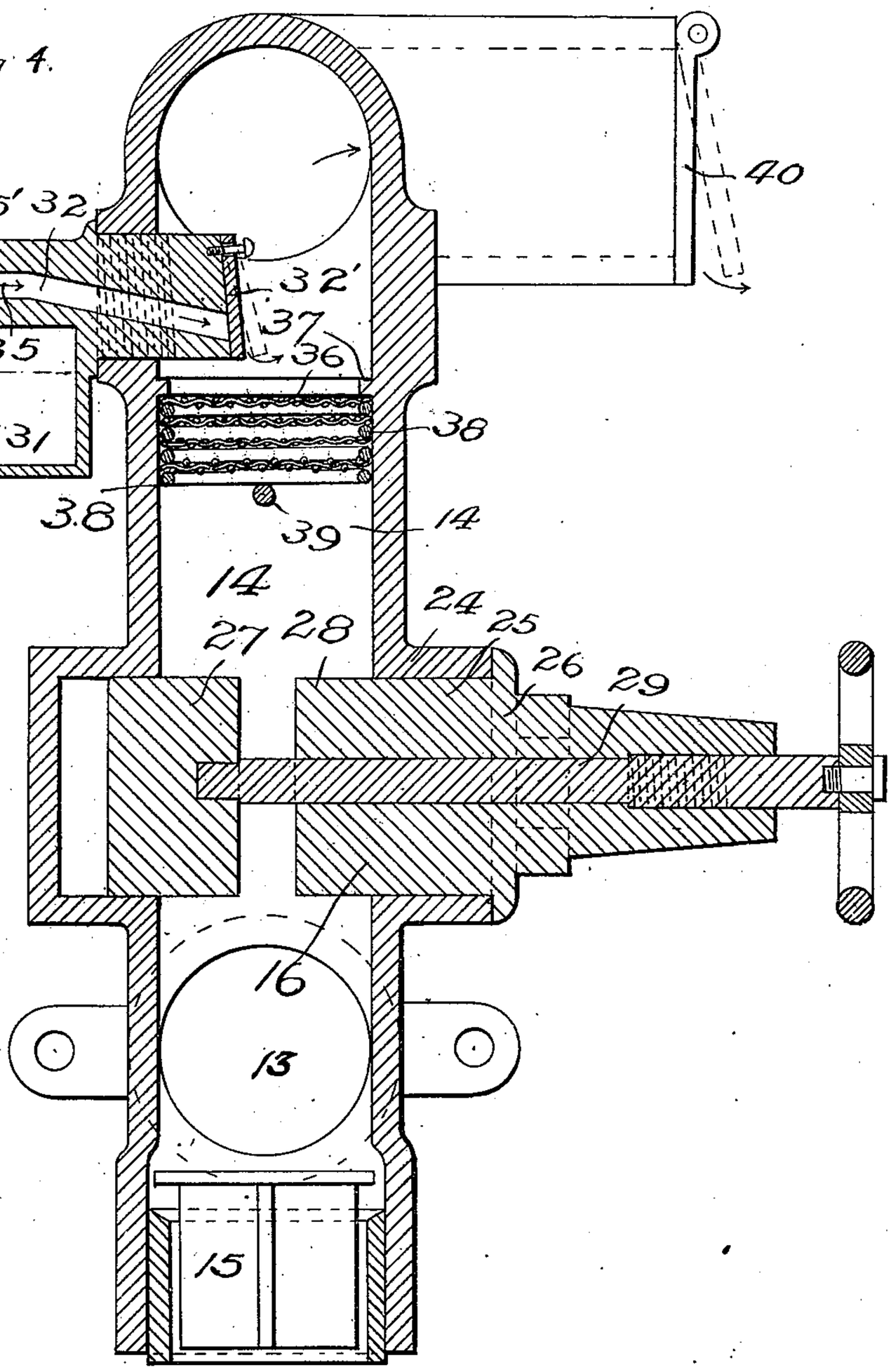

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Fig. 7.

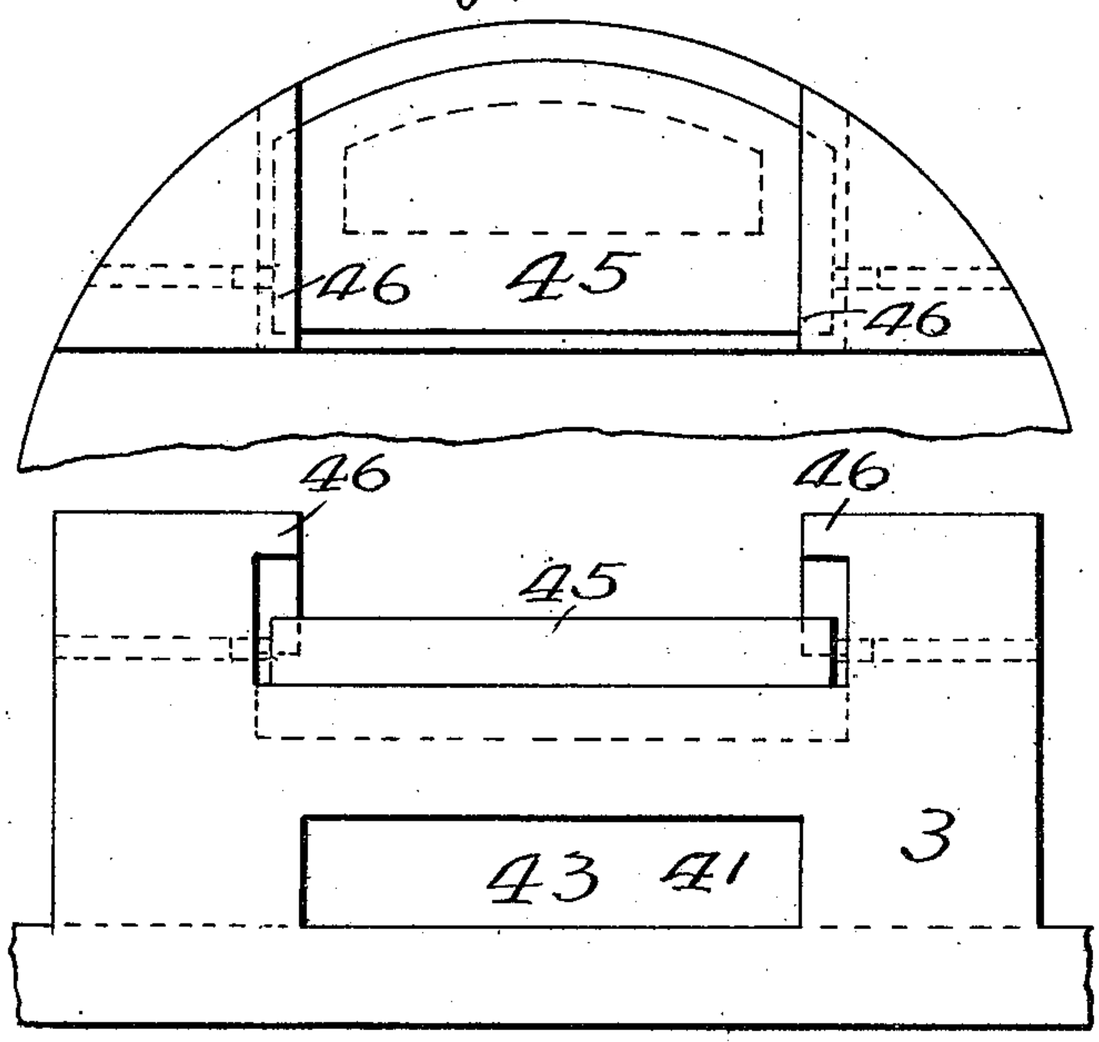

Fig. 6.

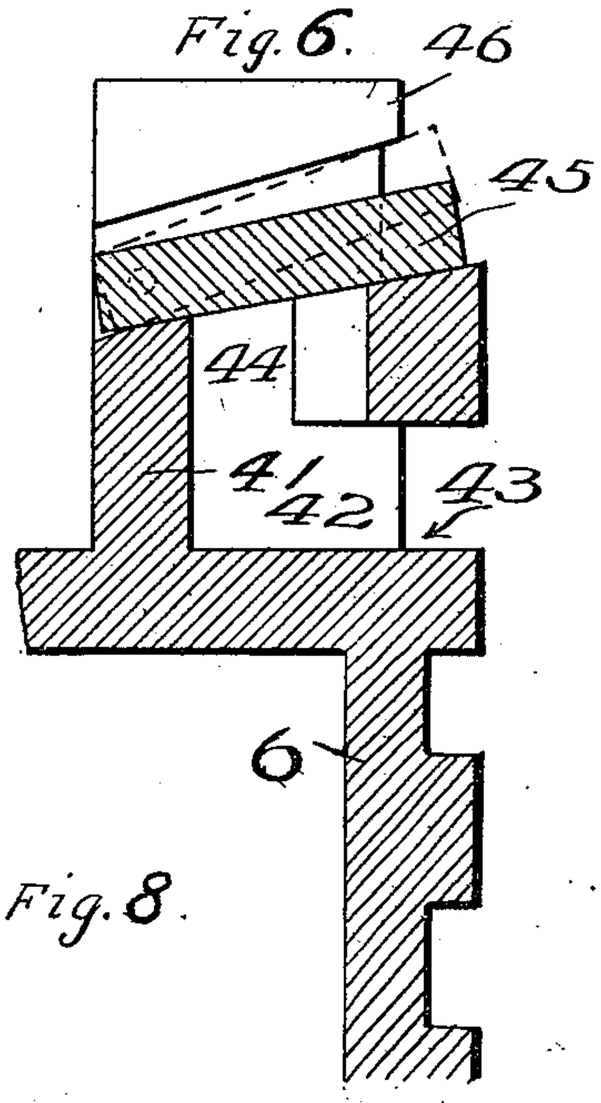

Fig. 8.

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UNITED STATES PATENT OFFICE.

CLARENCE O. WHITE, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF TO EDWARD J. KIMBALL, OF SAME PLACE.

GASOLENE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 664,200, dated December 18, 1900.

Application filed February 11, 1898. Serial No. 669,913. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE O. WHITE, of the city of Minneapolis, county of Hennepin, State of Minnesota, have invented certain new and useful Improvements in Gasolene-Engines, of which the following is a specification.

This invention relates to explosion-engines, and particularly to gasolene-engines.

One object of the invention is to improve the construction of gasolene-engines and to make the same more reliable.

A particular object of the invention is to improve the bearings of the engine-shaft, whereby leakage of compressed air from the engine-base may be prevented.

Another object of the invention is to provide an engine wherein air only is compressed in the base of the engine and the vapor is supplied to the air charge at a point near the cylinder.

Another object is to simplify the connection between the base and the cylinder and the means for controlling the flow of air upward from the base.

Another object is to provide a simple and effective back-check valve in connection with the piston in the cylinder, whereby the vapor is prevented from entering the cylinder until the dead-gases have been practically exhausted therefrom.

The invention consists generally in an explosion-engine of the construction and combination of parts all as hereinafter described, and particularly pointed out in the claims.

The invention will be more readily understood by reference to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a side elevation of an engine embodying my invention. Fig. 2 is an end elevation of the same. Fig. 3 is an enlarged vertical section substantially on the line *x x* of Fig. 1. Fig. 4 is an enlarged detail section of the vaporizer substantially on the line *y y* of Fig. 2. Fig. 5 is a sectional view on the line *z z* of Fig. 4. Fig. 6 is an enlarged sectional view of the plate-valve employed on the piston. Fig. 7 is a top view taken from Fig. 8. Fig. 8 is a front view thereof.

As shown in the drawings, 2 represents the engine-base; 3, the cylinder; 4, the water-jacket; 5, the cylinder-head; 6, the piston; 7, the connecting-rod, and 8 the crank-shaft. The base is closed by ends or heads 9, on which bearings 10 are provided for the crank-shaft. The piston has a suitable packing to prevent leakage around the same. The cylinder is provided with an inlet-port 11 and with an exhaust-port 12, and these ports are preferably at the same height to be simultaneously opened upon the downward stroke of the piston, which piston closes said port in all other positions of the piston. The base of the engine is provided with a port or opening 13, and this is connected with the inlet-port 11 by an independent or removable duct or chest 14. The lower end of this chest or duct is open except for a gravity-valve 15, which possesses sufficient weight to somewhat oppose the passage of air into the duct or chest 14. 16 represents a controlling-valve, the construction of which will be hereinafter explained. Upon the upward stroke of the piston the ports 11 and 12 are closed and the gas or vapor that is within the cylinder is compressed. At the same time a partial vacuum is created in the base of the engine and air will be drawn through the valve 15 and into the base through the opening 13. Upon the downward stroke of the piston the air that is held in the base will be compressed up to the moment that the piston falls below the port 11, when the compressed air from the base will pass through the duct 14 and the port 11 into the cylinder.

The entrance of air to the cylinder from the base is controlled by means of a sliding piston-valve 16. (Shown in detail in Fig. 4.) As there shown, this valve comprises a transverse cylinder 24 in the duct or chest 14, the cylinder being partly closed by the head 25 of the cap 26, which closes the end of the cylinder. The movable part of the valve comprises a piston or cylindrical disk 27, adjustable toward and from the end or face 28 of the part 25 by means of the stem or rod 29, which may be operated with a thread and a hand-wheel or by a lever. When the part 27 is closed upon the part 25, the passage through the duct 14 is completely closed. The valve is simple in construction and may be easily

and accurately set to admit just the required quantity of air. Upon stationary engines the end 29 is preferably made to slide in the head 25 and is connected with a suitable governor, which thus controls the amount of air permitted to enter the cylinder.

Any suitable vaporizer may be employed in connection with the engine; but I prefer the device shown in detail in Figs. 4 and 5. It comprises a small reservoir 31, wherein the gasolene is kept at a given height at all times, being supplied with a greater amount of gasolene than is used by the vaporizer and the surplus being carried off by an overflow-pipe. The oil is exhausted or drawn from this reservoir by the suction in the duct 14, which creates a partial vacuum in the vapor-duct 32, into which the oil is discharged from a small duct 33, which communicates with the lower part of the reservoir 31. The flow of oil through the duct is controlled by a pin-valve 34, and the suction upon the oil is increased by a stream of air admitted through the opening 35, opposite the opening of the duct 33. I may employ a heater to heat the air flowing into the mixing-duct 32. For this purpose a hole 35″ is made in the cylinder-head, (see Fig. 3,) and the hot air therefrom is conducted to the opening 35 by a small pipe 35′. The mixing or siphon duct 32 is normally closed by a small gravity-valve 32′. The valve 32′ is closed by pressure from within the duct due to the air rushing upward from the base. The vapor is made and drawn into the duct 14 upon the upward stroke of the piston, the duct thus holding a charge of heavy vapor in readiness for the opening of the cylinder-port. Any free gasolene which may be drawn through the duct 32 and into the duct or chest 14 will be caught by the series of screens 36, beneath the opening of the duct 32. These screens are of coarse mesh and do not materially interfere with the flow of air through the duct. They are held in place by the shoulder 37 within the part 14 and by interposed rings 38, all of which are kept in place by one or more pins 39 in the chest 14. The air, therefore, which is admitted through the valve 15 and passes into the base through the opening 13 is afterward forced upward through the open valve 16, and taking up the strong vapor that is present in the upper part of the duct or mixing-chamber 14 is discharged into the cylinder through the port 11. I may employ a simple check-valve 40 at the cylinder port or opening to prevent back pressure from the cylinder. Such back pressure would render the operation of the vaporizer uncertain and mix impure gases with the carbureted air from the chest 14.

In vertical engines or single-cycle engines of the type shown in Figs. 1 and 2 I prefer to arrange the back check-valve upon the piston, several advantages being gained thereby. As shown in Figs. 3, 8, 9, and 10, the piston is provided with a raised part 41, having a cavity 42, which in its side is provided with an opening 43, adapted to register with the port 11 in the wall of the cylinder. The top of the cavity is provided with an opening 44, that is normally closed by a gravity valve or plate 45. This plate is preferably pivoted in the part 41, as indicated in Figs. 8, 9, and 10, and its upward movement is limited by one or more lugs 46 on the part 41. When a charge has been exploded in the cylinder and the piston has been driven down, the exhaust-port 12 will be opened, but until the pressure of the dead gases is reduced the valve or plate 45 will be held upon its seat above the cavity 42 to prevent the driving of the dead gases into the duct 14. Upon the equalization of the pressure between the exhaust and the air in the engine-base the valve 45 will be lifted and the fresh charge will rush upward along the side of the cylinder to the top thereof and thence down to displace the remaining exhaust-gases. The moment that the piston closes the port 11 the valve 45 will drop upon its seat, and it is not affected by the explosion in the cylinder.

The particular construction and arrangement of the pump and the igniter belonging to the engine do not require explanation.

As various modifications may be made in my invention without departing from the spirit thereof, I do not confine the same to the constructions herein shown and described.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a gasolene-engine, the combination, of the cylinder, with the closed base, said cylinder provided with inlet and outlet ports, and said base provided with an inlet-opening, the independent duct connecting said opening with the inlet-port of the cylinder, an automatic air-valve provided in said duct, a controlling-valve also provided therein, a suction-vaporizer discharging into said duct between the cylinder and the controlling-valve and an automatic valve preventing the entrance of gas or vapor to the cylinder until the dead gases have been exhausted therefrom, substantially as described.

2. In a gasolene-engine, the combination, with the cylinder, and base, of a gasolene-engine, said cylinder provided with an inlet-port, of a free duct connecting said base with said inlet-port, a controlling governing-valve interposed between the base and said port, and an air-inlet valve provided in said duct beyond the opening therefrom into the said base, and means for supplying oil or vapor to said duct between said controlling-valve and said inlet-port by the suction created in the engine-base, substantially as described.

3. In a gasolene-engine, the combination, of the cylinder and base, said cylinder provided with an inlet-port, of a duct connecting said base with said inlet-port, a controlling-valve interposed between the base and said port, and an air-inlet valve provided in said

duct beyond the opening therefrom into the said base, and means for supplying oil or vapor to said duct between said controlling-valve and said inlet-port by the suction created in said base, and the baffles or screens provided in said duct, as and for the purpose specified.

4. In a gasolene-engine, the combination, with the cylinder provided with the inlet and exhaust ports, of the base and the piston, with the duct 14 connecting the base and said inlet-port, the suction-vaporizer connected with the upper part of said duct, the automatic valve 32′ in connection therewith, a controlling-valve in said duct between said inlet-port and the base, and the air-inlet valve 15 provided in said duct 14 beyond the opening therefrom into said base, substantially as described.

5. In a gasolene-engine, the combination, of the cylinder, with the piston, said cylinder provided with inlet and outlet ports or openings, the vaporizer or mixer connected with said inlet-port, and said piston provided with an automatic valve to control the entrance of gas through said inlet-port in the cylinder, substantially as described.

6. In a gasolene-engine, the combination, with the piston, of the cylinder provided with inlet and outlet ports or openings, and said piston provided with a cavity having an opening adapted to register with said inlet-port, and an automatic valve controlling the escape of vapor or gas from said cavity, substantially as described.

7. In a gasolene-engine, the combination, of the cylinder provided with substantially opposite inlet and outlet ports, with the piston which acts as the controlling-valve for the inlet and outlet ports and is provided with an automatic valve for preventing the entrance of the fresh charge until the dead gases have been exhausted, substantially as described.

8. In a gasolene-engine, the combination, of the cylinder provided with substantially opposite inlet and outlet ports, with the piston which acts as the controlling-valve for the inlet and outlet ports and is provided with the structure 41, having a cavity and an opening adapted to register with the inlet-port, said cavity having an outlet-opening, and the valve normally closing said outlet-opening, substantially as described.

9. In a gasolene-engine, the combination, of the cylinder provided with substantially opposite inlet and outlet ports, with the piston that acts as the controlling-valve for said inlet and outlet-ports, the side valve provided upon said piston for preventing the entrance of the charge until the dead gases have been exhausted, substantially as described.

10. In a gasolene-engine, the combination, of the cylinder, with the closed base, the piston operating in said cylinder and adapted to compress air admitted to said closed base, an inlet-valve for said base, said cylinder provided with inlet and exhaust ports, an independent duct connecting said base with the inlet-port of said cylinder, and a suction-vaporizer having a back check-valve and connected with said independent duct and wherefrom oil is drawn into said duct by suction created in said base, substantially as described.

11. In a gasolene-engine, the combination, of the cylinder, with the closed base, the piston, the crank-shaft and connecting-rod, an air-inlet valve for said base, said cylinder provided with inlet and exhaust ports, a duct connecting said inlet-port with said base, a controlling-valve in said duct, a suction-vaporizer connected with said duct, and said piston having a cavity adapted to register with said inlet-port and provided with an automatic valve, substantially as described.

12. In a gasolene-engine, the combination, with the cylinder and closed base having respectively the ports 11 and 13, of the duct 14 connecting the ports of said cylinder and base, a suction-vaporizer communicating with said duct, a controlling-valve provided in said duct and comprising the head 25 having the face 28 and a disk 27 adapted to be moved toward or from said face to close or open the passage through said duct, and an air-inlet valve provided in said duct beyond the port leading to said base, substantially as described.

13. The combination, with the duct 14 connecting the ports of the cylinder and base and having an air-inlet valve 15, of a controlling-valve provided in said duct between the ports leading to said cylinder and said base, said valve comprising a cylinder 24, a head 25 having a face 28 provided in one end of said cylinder, and a disk 27 adapted to slide in the opposite end of said cylinder, and having a stem 29 to permit said disk to be moved toward or from said face 28, substantially as described.

14. In a gasolene-engine, the combination, with a cylinder having an inlet-port, of a closed base also having a port or opening, a duct 14 connecting the ports of said cylinder and base, a controlling-valve provided in said duct between said ports, an air-inlet valve provided in said duct beyond the port leading to said base, a suction-vaporizer communicating with said duct near the port leading to said cylinder, said vaporizer comprising a reservoir 31, the ducts 32 and 33 communicating therewith and with the duct 14, and the gravity-valve 32′ provided over the outlet of said duct 32 and adapted to be closed by pressure from within said duct 14, substantially as described.

15. In a gasolene-engine, the combination, with the cylinder having an inlet-port and its closed base also provided with a port, of a duct 14 connecting the ports of said cylinder and base, a controlling-valve provided in said duct between the ports of said cylinder and base, an air-inlet valve provided in said duct beyond the port leading to said base, and a

suction-vaporizer communicating with said duct near said cylinder-port, and adapted to supply oil or vapor to said duct through the suction created in said base, substantially as described.

16. In a gasolene-engine, the combination, with the cylinder having an inlet-port 11, of a closed base having a port or opening 13, the duct 14 connecting said parts, the gravity air-valve 15 provided in said duct below or beyond said port 13 in the base, means for closing and opening said port 11, and the suction-vaporizer comprising the overflow-reservoir, a throttle-valve and a siphon-duct leading into said duct 14 and provided with a back check-valve, whereby gasolene is drawn into said duct 14 only when said cylinder-port 11 is closed, substantially as described.

In testimony whereof I have hereunto set my hand, this 5th day of February, 1898, at Minneapolis, Minnesota.

CLARENCE O. WHITE.

In presence of—
C. G. HAWLEY,
M. E. GOOLEY.