No. 742,799. PATENTED OCT. 27, 1903.

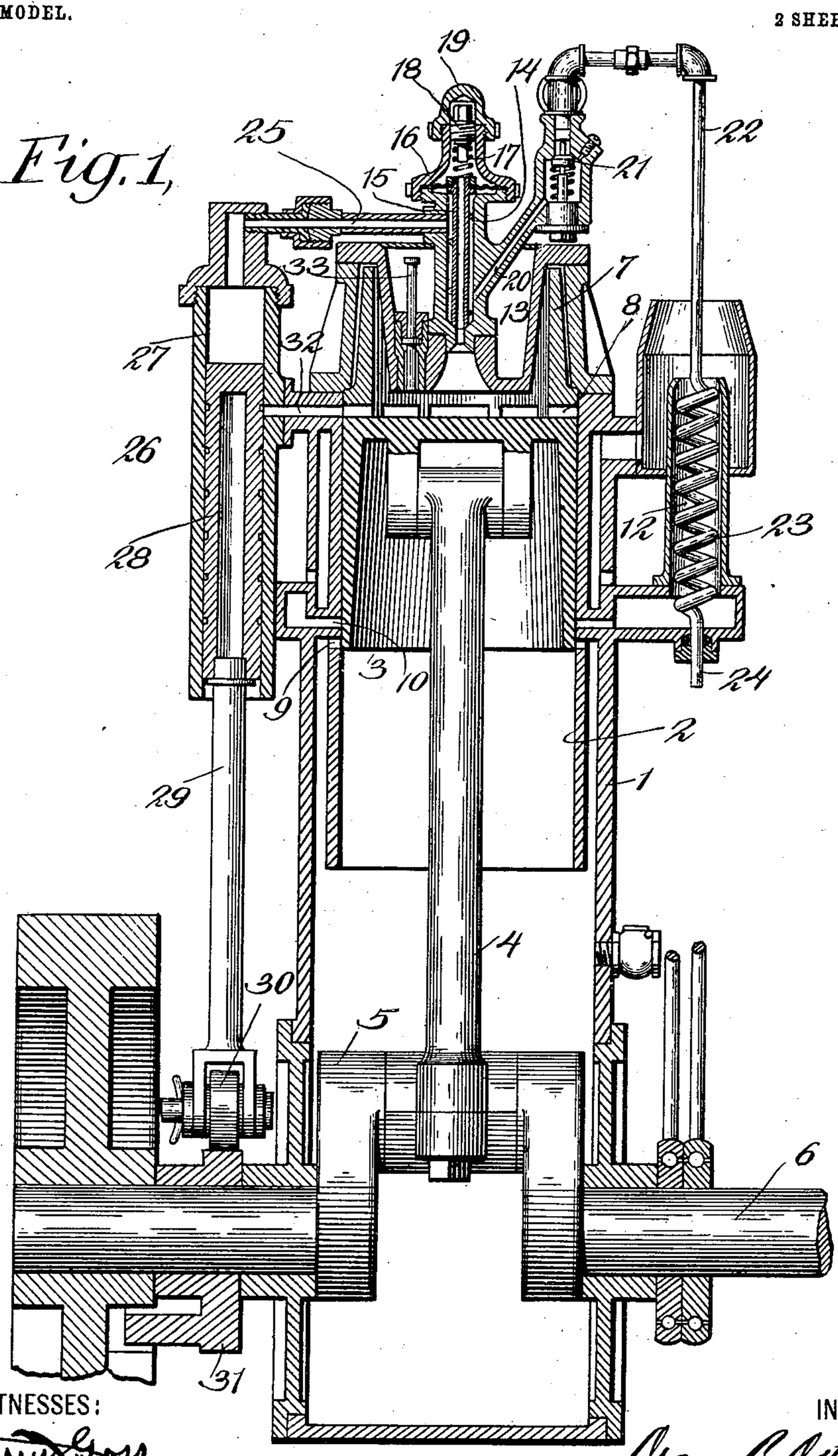
O. P. OSTERGREN.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED NOV. 4, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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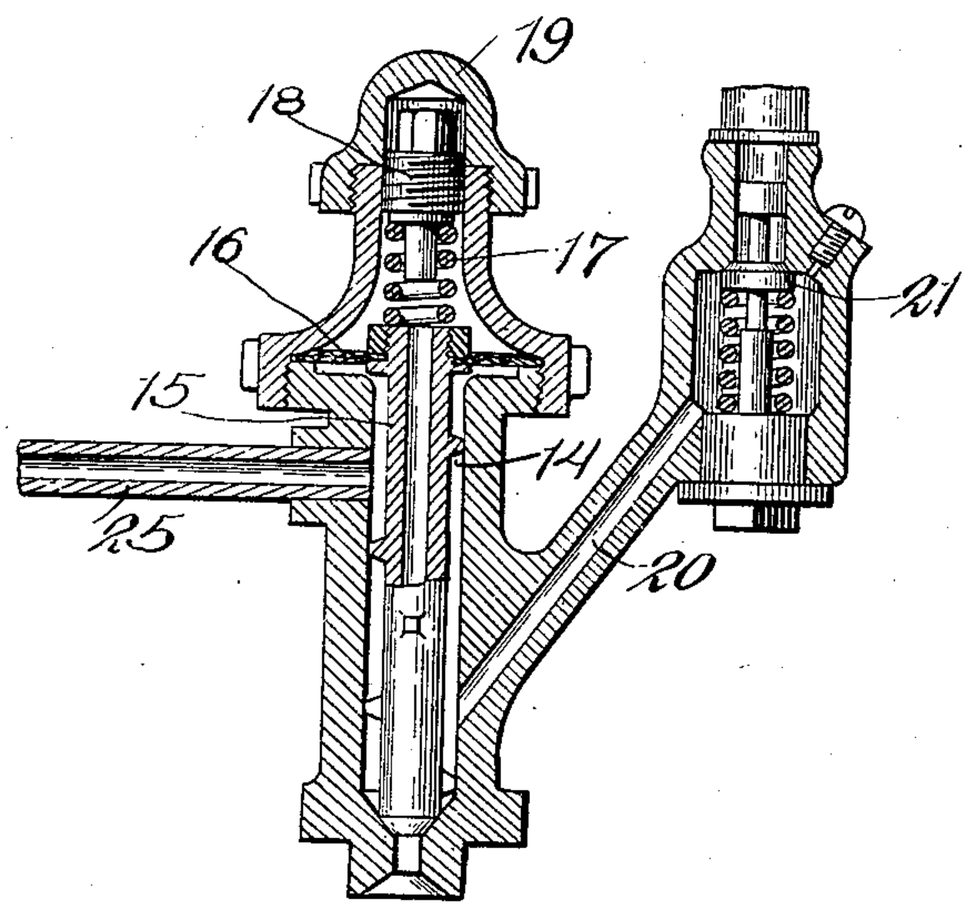
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.



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No. 742,799. Patented October 27, 1903.

UNITED STATES PATENT OFFICE.

OSCAR P. OSTERGREN, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO FUEL OIL POWER COMPANY, A CORPORATION OF THE DISTRICT OF COLUMBIA.

INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 742,799, dated October 27, 1903.

Original application filed September 11, 1902, Serial No. 122,911. Divided and this application filed November 4, 1902. Serial No. 130,028. (No model.)

To all whom it may concern:

Be it known that I, OSCAR PATRIC OSTERGREN, a subject of the King of Sweden and Norway, and a resident of New York city, county and State of New York, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in internal-combustion engines, and particularly to that class of internal-combustion engines employing a heavy oil, such as petroleum or kerosene, as fuel.

My invention relates specifically to an improved fuel-admission valve and means for operating same.

My present invention is an improvement on the fuel-admission and correlated parts disclosed and claimed in my copending application, Serial No. 122,911, filed September 11, 1902.

In my present invention I provide a fluid connection or passage between the discharge side of the fuel-admission valve and the rear of the pressure-operating means therefor, so as to maintain a balance of pressures thereat, or, in other words, when pressure accumulates upon the discharge side of the valve there will be no tendency thereby to open the valve. The valve is designed to be operated by an independent pressure-actuated means upon accumulation of pressure in an independent chamber.

My invention further consists in certain novel details of construction and combination of parts, as will hereinafter be more fully set forth, and other advantages will appear hereinafter.

In the drawings, Figure 1 represents a central sectional elevation through an internal-combustion engine and fuel-admission valve therefor embodying my invention. Fig. 2 is a detail sectional view, on a larger scale, of the fuel-admission valve and certain correlated parts.

The engine herein illustrated in all parts except those relating to the fuel-admission valve is similar to the engine shown in the before-mentioned copending application and claimed therein. Hence I will give but a brief description of the same herein as forming no part of this invention and will then describe in detail the novel features embodied in the fuel-admission valve.

The engine comprises a closed casing 1, a cylinder 2, a piston 3, a connecting-rod 4, a crank 5, and an engine-shaft 6. The connecting-rod 4 is connected to the crank 5 and to the piston 3 and operates within the closed casing 1. Piston 3 is provided at its upper or rear end with an annular deflector 7 and has ports 8 therein for admitting compressed air to within the deflector 7. The cylinder 2 is provided circumferentially with inlet-ports 9 and exhaust-ports 10. The inlet-ports 9 connect with the interior of the closed casing 1. The exhaust-ports 10 connect with an annular chamber 11, arranged around the casing 1, and from thence pass through a nozzle 12, forming part of an ejector. The rear end of the cylinder is provided with a head 13, which supports a fuel-admission valve comprising a casing 14, a valve-plug 15, a pressure-operated diaphragm 16, a spring 17, a regulating-screw 18, and an inclosing cap or cover 19. The valve-casing 14 is in communication, through a channel 20, check-valve 21, pipe 22, heating-coil 23, arranged within the nozzle 12 of the ejector, and pipe 24, with a source of fuel-supply. The valve-casing 14 is further in communication, through a pipe 25, with the upper end of an auxiliary compressor 26. The compressor 26 comprises a compression chamber or cylinder 27 and a compression-piston 28, connected by a piston-rod 29 and a cam-follower 30 with an operating-cam 31, mounted upon the main shaft 6. The auxiliary compressor has also a connection 32 with the upper end of the cylinder 2. A suitable electric starting-plug 33 is mounted in the end or head of the cylinder or may be located elsewhere in any convenient position.

The engine is designed to operate upon a two-cycle plane. Each downward stroke is a working stroke. At practically the com-

pletion of each downward stroke piston-ports 8 are brought opposite the cylinder inlet-ports 9, while the exhaust-ports 10 are uncovered. Atmospheric air, which has been drawn into the closed casing 1 during a previous downward stroke of the piston and which has been slightly compressed by the last downward stroke of the piston, will be admitted to within the deflector 7 of the piston and in rushing in will drive out the dead products of combustion from the previous stroke. Each downward movement of the piston will compress a charge of air thus admitted, at the same time driving in a new charge into the casing. Just about the moment the piston reaches the top of its stroke the auxiliary compressor-piston 28, which is reciprocated by the cam 31, will have been moved upwardly to a point sufficient to open the fuel-admission valve 15, so as to admit fuel into the compressed-air charge within the cylinder-head. The cylinder-head 13 being unjacketed will during the running of the engine be extremely hot, and such heat will be sufficient to ignite the next charge of compressed air and oil to form a motive fluid under great pressure for the succeeding downward working stroke of the piston prior to the heating up of the head 13. The electric starting-plug 33 may be employed to ignite the charge; but after the engine is once started such ignition-plug will not be necessary.

A constant supply of liquid fuel, such as a heavy oil, is supplied through pipe 24, heater 23, pipe 22, and check-valve 21 to the fuel-admission valve 15. When the auxiliary compressor-piston 28 is below the level of the port 32, as it will be during a portion of the stroke of the engine, the cam 31, being so formed and constructed as to produce such movement, will be equalized through the rear end of the cylinder, port 32, auxiliary compressor-cylinder 27, and pipe 25 upon both sides of the face of the fuel-admission valve 15 and the action of the spring 17 will be such as to hold the valve at its seat. When the auxiliary piston 28 is raised by the action of the cam 31 to a point above the port 32, the said port will be closed and the fluid above the moving piston 28 will be compressed until finally the pressure thereof rising to a point sufficient to overcome the pressure in the opposite direction will slightly lift the diaphragm 16, and with it the valve 15, into the rear end of the cylinder 2 behind the piston. Such admission will continue to take place for so long a time as the valve 15 is left open. It will be remembered, however, that at the time piston 28 is rising to compress the fluid above it and has cut off circulation through the port or passage 32 the piston 3 will also be rising and creating a greater pressure in the rear end of the cylinder 2. To prevent this pressure acting against the opening of the valve 15, I have provided a passage clear through the said plug to the opposite side of the diaphragm 16, so that such pressure will never act to oppose the closing of the said valve. By reason of this substantially balanced condition of the valve I am enabled to employ a very light spring 17 and to very delicately adjust the spring by means of the screw 18. The valve will then be opened at exactly the right moment by the compression of the fluid by the auxiliary compressor-piston 28, and I am certain to obtain admission, and hence ignition, at the correct predetermined point in the cycle or operation of the engine.

I have herein shown the passage leading from the discharge side of the valve 15 to the rear of the operating-diaphragm 16 as being formed through the valve-plug itself. It is of course obvious that this passage may be formed elsewhere, if desired, and that other modifications of the device herein shown and described are possible within the spirit and scope of my invention. It will also be understood that my improved admission fuel-valve may be employed with designs of different form and construction than that shown herein.

What I claim is—

1. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a fuel-admission valve controlling passage of fuel to the cylinder, and balanced as to pressure within the cylinder by admission of the fluid under pressure therein to both ends of said valve, pressure-operated means for operating said valve, and means for supplying pressure to said pressure-operated means at a predetermined point in the stroke of the engine.

2. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a fuel-admission valve controlling passage of fuel to within the cylinder, and having a balancing-passage affording communication at all times from within the cylinder at the front of said valve to the rear thereof, pressure-operated means for operating said valve, and means for supplying pressure to said pressure-operated means at a predetermined point in the stroke of the engine.

3. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a fuel-admission valve controlling passage of fuel to within the cylinder, pressure-operated means for operating the valve, said pressure-operated means being in constant communication, through a balancing-passage, with the interior of the cylinder, and means for supplying pressure to the opposite side of said pressure-operated means at a predetermined point in the stroke of the engine.

4. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a fuel-admission valve, comprising a hollow valve-plug, adapted to control passage of fuel to within the cylinder, but having an opening through its hollow portion

connecting the interior of the cylinder with the rear of the valve-plug, pressure-operated means for operating the valve, and means for supplying pressure to said pressure-operated means at a predetermined point in the stroke of the engine.

5. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a fuel-admission valve controlling passage of fuel to the cylinder, and balanced as to pressure within the cylinder by the fluid under pressure therein, a diaphragm connected to said valve, and means for supplying pressure beneath said diaphragm to operate said valve at a predetermined point in the stroke of the engine.

6. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a fuel-admission valve controlling passage of fuel to within the cylinder, a diaphragm connected to said valve, constituting pressure-operated means for operating said valve, said diaphragm being open upon one side, through a balancing-passage, with the interior of the cylinder, and means for supplying pressure to the opposite side of said diaphragm at a predetermined point in the stroke of the engine.

7. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a fuel-admission valve comprising a hollow valve-plug, adapted to control passage of fuel to within the cylinder, but having an opening through its hollow portion connecting the interior of the cylinder with the rear of the valve-plug and with the rear of a diaphragm connected thereto, a diaphragm connected to said valve, and means for supplying pressure upon the opposite side of said diaphragm to operate said valve at a predetermined point in the stroke of the engine.

8. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a fuel-admission valve communicating with the interior of the cylinder, a main passage leading from within the cylinder to behind the valve-face, pressure-operated means for operating the valve, said pressure-operated means connected upon one side thereof, through a balancing-passage, with the interior of the cylinder, and means operated by the engine in its movement for closing the said main passage, and for compressing fluid to operate the fluid-pressure-operating means.

9. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a fuel-admission valve communicating with the interior of the cylinder, a main passage leading from within the cylinder to the rear of the said valve-face, pressure-operated means for operating the valve, said pressure-operated means connected upon one side thereof, through a balancing-passage, with the interior of the cylinder, an auxiliary compressor adapted in its movement to close the main passage to compress fluid therein to actuate the pressure-operated means, and means in the engine for operating the auxiliary compressor.

10. In an internal-combustion engine, the combination with a cylinder and a piston therein, of a valve-casing 14, having a connection with the interior of the cylinder, a valve-plug 15 fitted thereto, a diaphragm 16 for operating the said valve, said diaphragm being open upon one side to the interior of the cylinder, a main passage 25 leading from the opposite side of the diaphragm 16 to within the cylinder, an auxiliary compressor for closing the said main passage upon the cylinder side, and compressing the fluid remaining therein beneath the diaphragm to operate the said valve, substantially as and for the purposes set forth.

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Witnesses:
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