L. K. PULLIAM.

PUMP.

APPLICATION FILED APR. 3, 1908.

912,888.

Patented Feb. 16, 1909.

3 SHEETS—SHEET 1

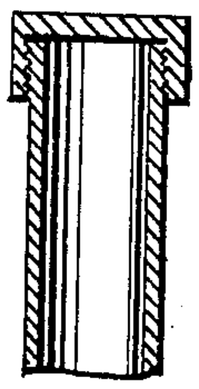
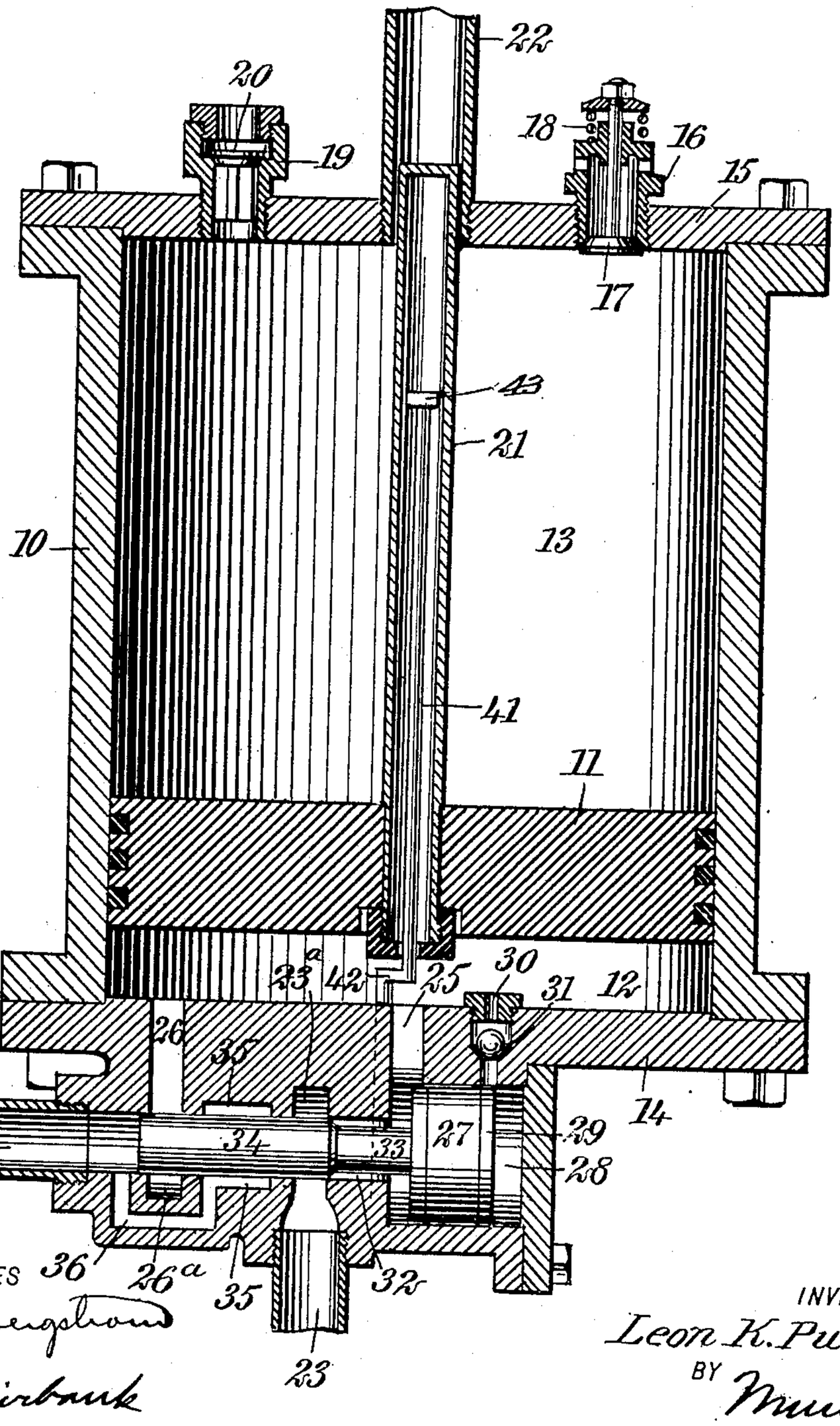


Fig. 1



WITNESSES

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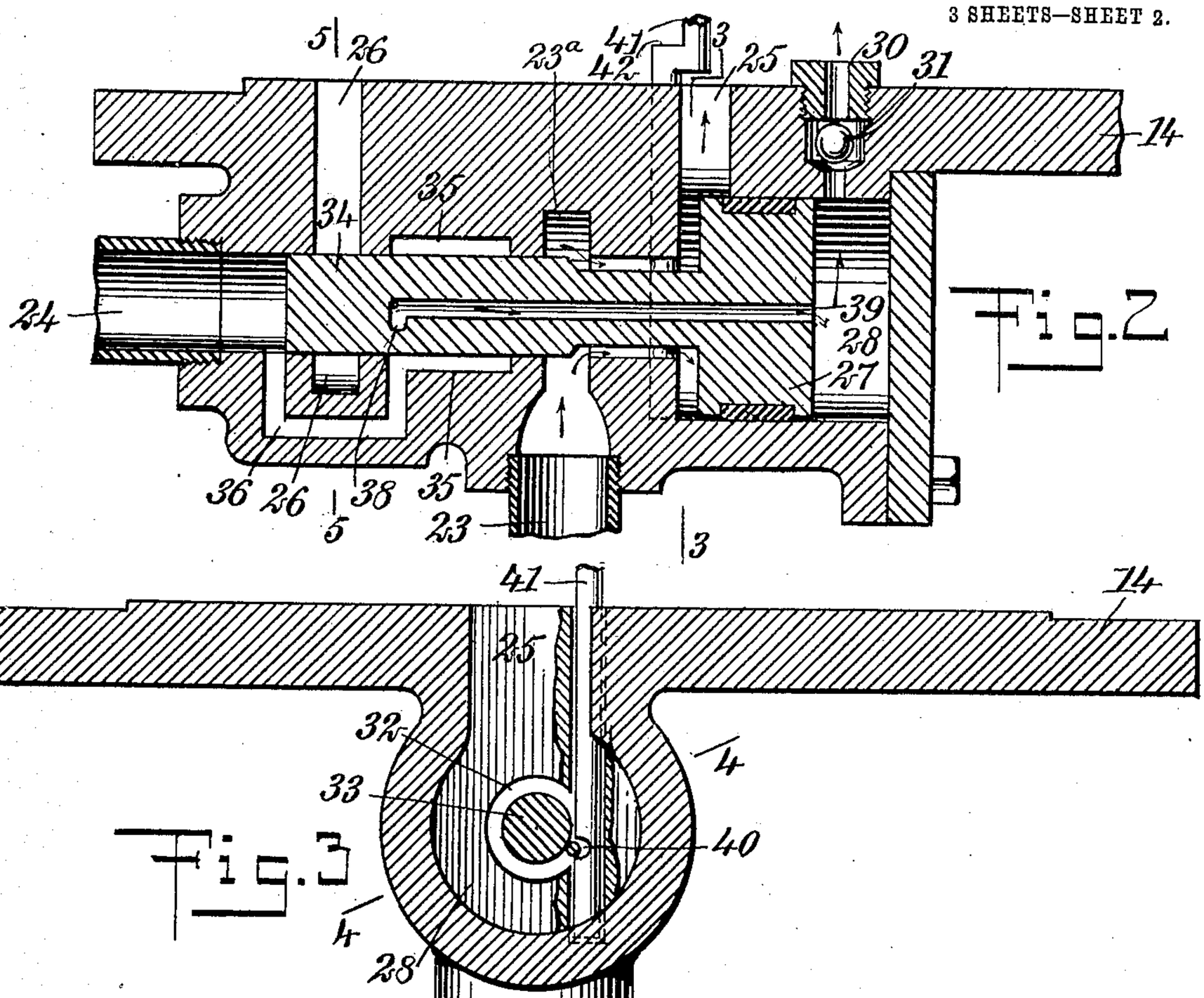

Fig. 2

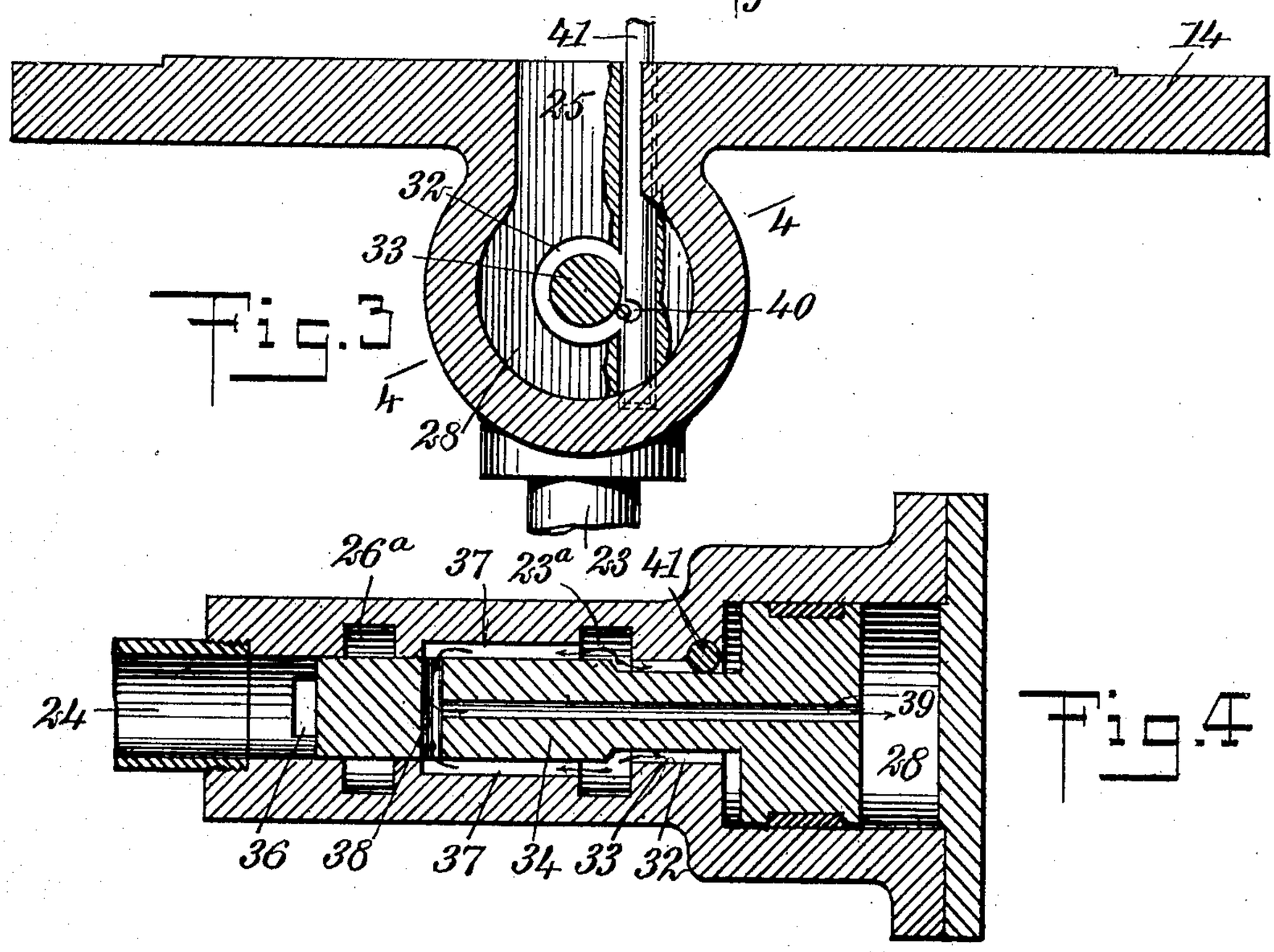

Fig. 3

Fig. 4

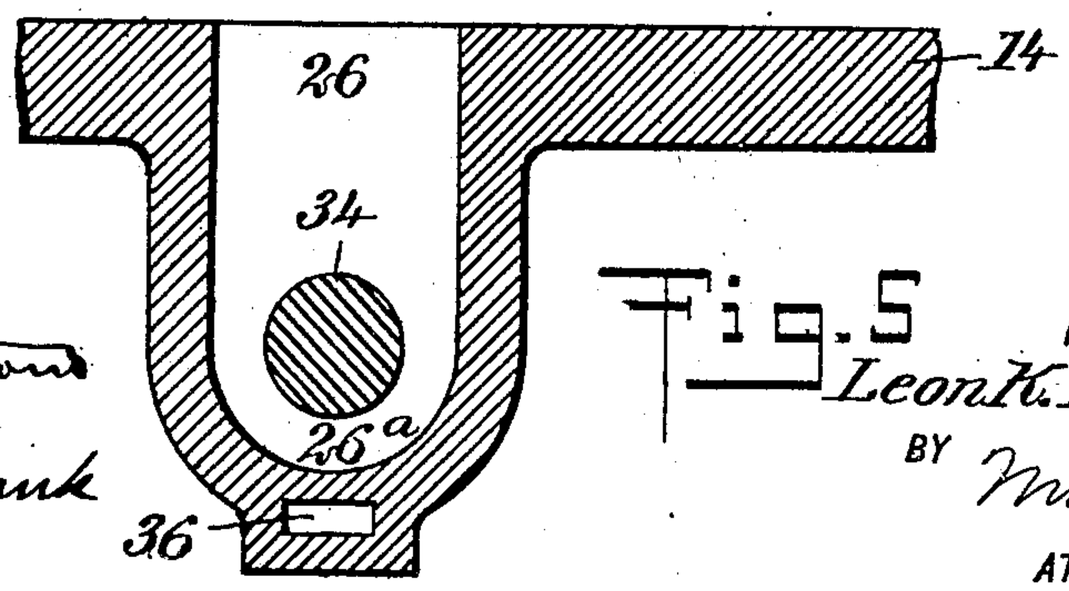

Fig. 5

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3 SHEETS—SHEET 3.

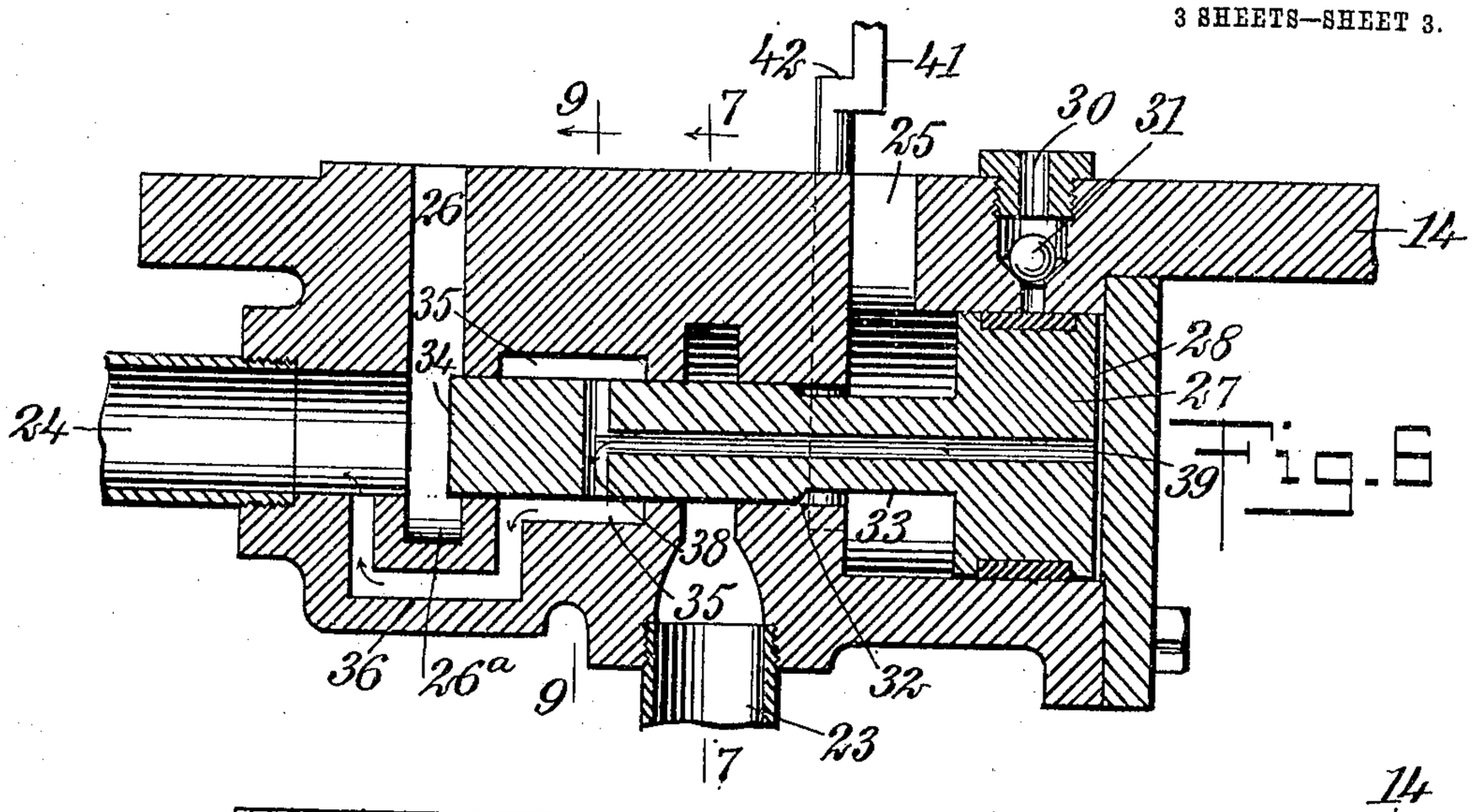

Fig. 6

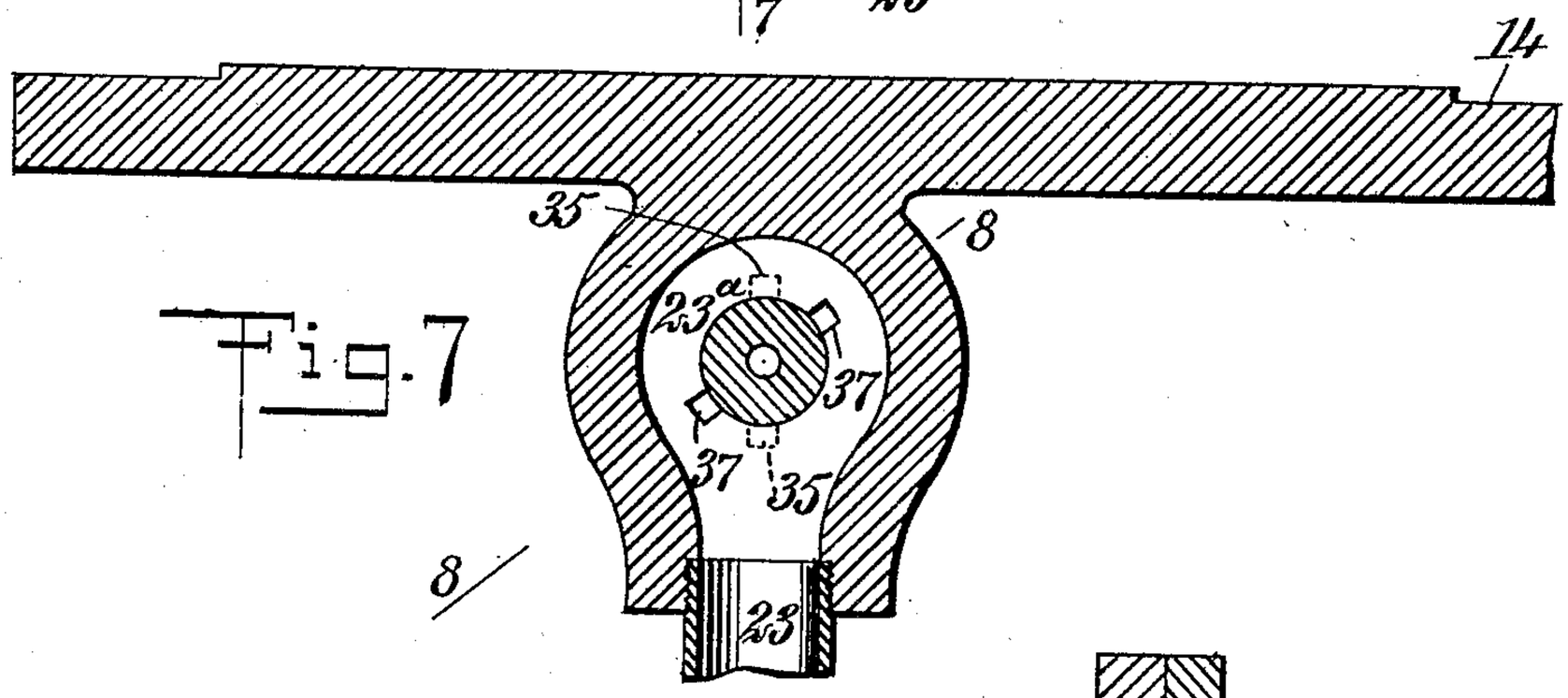

Fig. 7

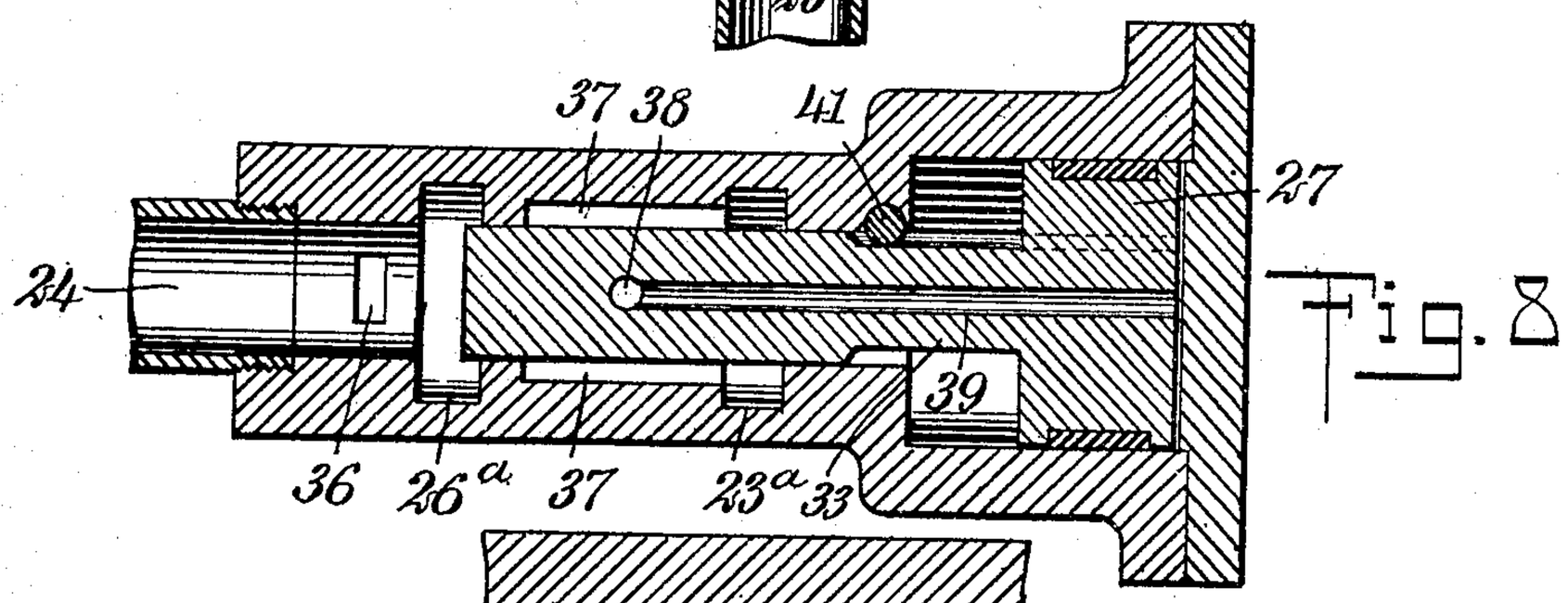

Fig. 8

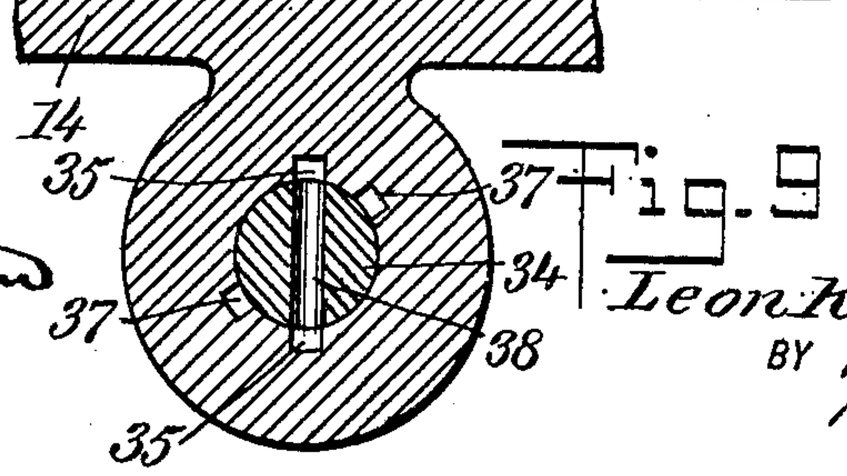

Fig. 9

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UNITED STATES PATENT OFFICE.

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No. 912,888. Specification of Letters Patent. Patented Feb. 16, 1909.

Application filed April 3, 1908. Serial No. 424,941.

To all whom it may concern:

Be it known that I, LEON K. PULLIAM, a citizen of the United States, and a resident of Pensacola, in the county of Escambia and State of Florida, have invented a new and Improved Pump, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in pumps, and more particularly to that type of combined engine and pump in which there is employed a single cylinder having a piston therein, the space at one side of said piston serving as a power chamber and the space at the opposite side of said piston serving as a compression chamber.

In my invention I provide supply and exhaust ports, both controlled by a single valve, and provide means whereby this valve is operated automatically by the piston in its movement and by the pressure of the steam or other motive fluid.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is a central longitudinal section through a pump constructed in accordance with my invention and showing the inlet valve in the neutral position; Fig. 2 is a section through the valve mechanism, said section being similar to a portion of Fig. 1, but showing the inlet port open; Fig. 3 is a transverse section on the line 3—3 of Fig. 2; Fig. 4 is a longitudinal section on the line 4—4 of Fig. 3; Fig. 5 is a transverse section on the line 5—5 of Fig. 2; Fig. 6 is a section similar to Fig. 2, but showing the exhaust port open; Fig. 7 is a transverse section on the line 7—7 of Fig. 6; Fig. 8 is a longitudinal section on the line 8—8 of Fig. 7; and Fig. 9 is a transverse section on the line 9—9 of Fig. 6.

In my improved pump, I provide a cylinder 10 having a piston 11 disposed therein and subdividing the cylinder into two compartments or chambers 12 and 13. One of these chambers, 12, is adapted to serve as a power chamber while the other chamber, 13, is adapted to serve as a compression chamber. The cylinder is provided with two cylinder heads 14 and 15, each of which is provided with inlet and exhaust ports for the respective chambers. If the compression chamber 13 be employed for the compression of air or other gas, the inlet ports may be closed by suitable check valves. As shown, the cylinder head 15 carries a bushing 16 having a passage therethrough communicating with the outside atmosphere and controlled at its inner end by a suitable valve 17. The valve opens inwardly and is normally held closed by a coil spring 18. The cylinder head 15 also carries a bushing 19 having a valve seat therein for the outwardly-opening check valve 20. The bushing 19 may be connected to any suitable conduit or receiver, into which the compressed air or other gas may be delivered.

In my improved construction no piston rod or crank shaft is employed, the piston being forced in one direction by the admission of motive fluid under pressure, and returned in the opposite direction by the action of gravity. In order to guide the piston and prevent any tilting or twisting movement thereof, the piston is preferably provided with a tube 21 extending therethrough and leading through the cylinder head 15. The outer end of the tube is closed, and in order to avoid the necessity for packing in the cylinder head 15 and around the tube 21, I preferably provide a second tube 22, carried by the cylinder head and receiving the tube 21. The latter may freely slide within the former, and as the outer ends of both tubes are closed, no gas can escape.

The cylinder head 14 is provided with my improved form of automatic valve and has attached thereto a supply conduit 23 for the motive fluid under pressure, and an exhaust conduit 24 through which the motive fluid may escape after having operated against the under side of the piston 11. The cylinder head 14 has a main inlet port 25 and a main exhaust port 26, and has a valve seat for a valve 27, which controls the flow of fluid through both of these ports. At one end and communicating with the inlet port 25, the cylinder head is provided with a secondary cylinder 28, within which is disposed a piston portion 29 of the valve 27. One end of the cylinder 28 communicates with the main cylinder through the inlet port 25, while adjacent the opposite end of the cylinder 28, a secondary inlet port 30 is provided leading to the main cylinder and normally controlled by a check valve 31. At the end of the cylinder 28 having communication with the inlet port 25, I provide a pas-

sage 32 coaxial with said cylinder and slightly larger than the reduced portion 33 of the valve which extends therethrough. The passage 32 leads to an annular passage 23[a] in open communication at its lower side with the supply conduit 23. The reduced portion 33 of the valve serves to connect the piston portion 29 with a cylindrical portion 34, somewhat larger than said reduced portion, and this cylindrical portion extends through to control the exhaust port 26. The exhaust port communicates with an annular passage 26[a], encircling the end of the cylindrical portion 34 of the valve, and the only outlet from said annular passage is an opening communicating with the exhaust conduit 24, and of a size substantially equal to the portion 34 of the valve. By withdrawing the valve portion 34 into the annular passage 26[a], the motive fluid may escape from the cylinder through the exhaust port 26, as shown in Fig. 6, but when the valve portion 34 extends through the annular passage 26[a], the escape of fluid is prevented, as shown in Figs. 2 and 4.

Intermediate the annular passage 23[a] and the annular passage 26[a], I provide a pair of longitudinally-disposed passages 35, one of which communicates by a passage 36 with the exhaust conduit 24, as is indicated in Figs. 1, 2 and 6. Intermediate the two passages 35, I provide two longitudinally-disposed and diametrically-opposed longitudinally-extending passages 37, both of which communicate with the annular chamber 23[a], as indicated in Figs. 4 and 8. The valve 27 is provided with a transverse passage 38, which upon the rotation of the valve may connect the two passages 37, 37, or may connect the two passages 35, 35. The passage 38 at its center communicates with a passage 39 extending longitudinally of the valve and communicating with the cylinder 28 at the further side of the piston portion 29.

At the reduced portion 33 of the valve, the latter carries a longitudinally-extending projection, lug, or pin 40, rigid in respect thereto and serving as means whereby the valve may be rotated. Intersecting the passage 32, substantially tangentially thereof, I mount a valve rod 41 having an aperture in the side thereof to receive the pin 40, and extending into the cylinder, so as to be operated by the piston. Within the piston the valve rod extends at right angles a short distance to form a shoulder 42, and then extends vertically into the tube 21. At the end of the valve rod, there is provided a head 43 which engages with a collar or projection adjacent the opposite end of the tube, when the piston is raised to the maximum extent.

In the operation of my improved mechanism, a motive fluid under pressure is delivered through the supply conduit 23 while the parts are in the position indicated in Figs. 2 to 5, inclusive. The motive fluid flows from the annular passage 23[a] through the passage 32 into the cylinder 28, and thence through the port 25 into the main cylinder, a further portion of the motive fluid flows through the passages 37 to the passage 38, and thence through the passage 39 to the cylinder 28, where it exerts a pressure against the cylinder head to force the valve in substantially the position indicated in Figs. 2 to 5, inclusive, and with the auxiliary inlet port 30 open. When the piston 11 reaches its uppermost position and has expelled the compressed gas from the chamber 13, the collar at the lower end of the tube 21 engages with the head 43 of the rod 41 and raises the latter so as to rotate the controlling valve. The rotation of the valve causes the passage 38 therein to communicate with the passages 35, 35, as indicated in Fig. 6, and the motive fluid which was under pressure at the end of the cylinder 28, immediately escapes through the passages 39, 38, 35 and 36, so that the pressure of the motive fluid within the main cylinder forces the piston portion of the valve longitudinally to close the passage 32 and open communication between the exhaust port 26, and the exhaust conduit 24. The motive fluid then flows from the cylinder until the piston under the action of gravity reaches its lowermost position. It then rotates the valve in the reverse direction, so that the motive fluid may flow from the conduit 23 through the passages 37, 38 and 39 to the end of the cylinder 28 and return the valve to its former position and establish direct communication from the supply conduit 23 to the inlet port 25. It will thus be noted that the valve 27 controls not only the inlet port but also the exhaust port, and that it not only rotates but moves longitudinally. The rotation of the valve serves to admit motive fluid to one side or the other of the valve piston 27, so that the actual reciprocation of the valve is caused by the pressure of the motive fluid.

The entire mechanism is automatic in its operation, very compact, and devoid of any shafts, wheels, or finely adjusted bearings. Should a slight amount of steam escape past the piston 10, no particular danger would be done, as the steam would readily condense in the compressed air.

Various changes may be made in the construction of the device and within the terms of the appended claims without departing from the spirit of my invention. For instance, if the device be used with the cylinder extending in a horizontal direction or if the entire device be reversed, it would be necessary to provide suitable springs or other mechanism for returning the piston after the power stroke and during the exhaust stroke.

If desired, the specific construction illustrated may be employed in connection with

compound, triple, or quadruple expansion engines, by the use of two or more cylinders either of equal or different sizes and lengths, and the opposite ends of the cylinders may also be used for multistage compression.

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

1. In combination, a cylinder having one end thereof adapted to serve as a compression chamber and the other end thereof adapted to serve as a power chamber, a valve for controlling the admission of fluid to one end of said cylinder, a tube carried by the opposite end of the cylinder, a piston within said cylinder, a tube carried by said piston and telescoping with the first-mentioned tube, and a valve rod for operating said valve and telescoping with said last-mentioned tube.

2. In combination, a cylinder, a piston mounted therein, said cylinder having an inlet port and an exhaust port, a valve for controlling both of said ports, means whereby said valve is rotated upon the reciprocation of said piston, and means whereby said valve is reciprocated by the motive fluid to control said ports upon being rotated.

3. A cylinder having an inlet port and an exhaust port, a valve for controlling both of said ports, said valve having a piston portion subjected to the action of the motive fluid for reciprocating said valve, and means for rotating said valve to control the action of the motive fluid upon said piston portion.

4. In combination, a cylinder having an inlet port and an exhaust port, a valve member for controlling both of said ports, said valve member having a piston portion, opposite sides of which may be subjected to the action of the motive fluid to cause the reciprocation of said valve, a piston within said cylinder, and means whereby said valve member is rotated by said piston to control the flow of motive fluid into engagement with said piston portion.

5. In combination, a cylinder having an inlet port and an exhaust port, and a valve member for controlling both of said ports, said valve member being movable longitudinally by the action of the motive fluid and controlling by its longitudinal movement, the admission and exhaust of fluid to said cylinder, and said valve member being also rotatable to control the action of the motive fluid upon said valve member.

In testimony where I have signed my name to this specification in the presence of two subscribing witnesses.

LEON K. PULLIAM.

Witnesses:
NELLIE G. ANDREWS,
J. N. ANDREWS.