No. 846,640. PATENTED MAR. 12, 1907.

C. WOLF.

FORCE PUMP.

APPLICATION FILED OCT. 15, 1906.

2 SHEETS—SHEET 1.

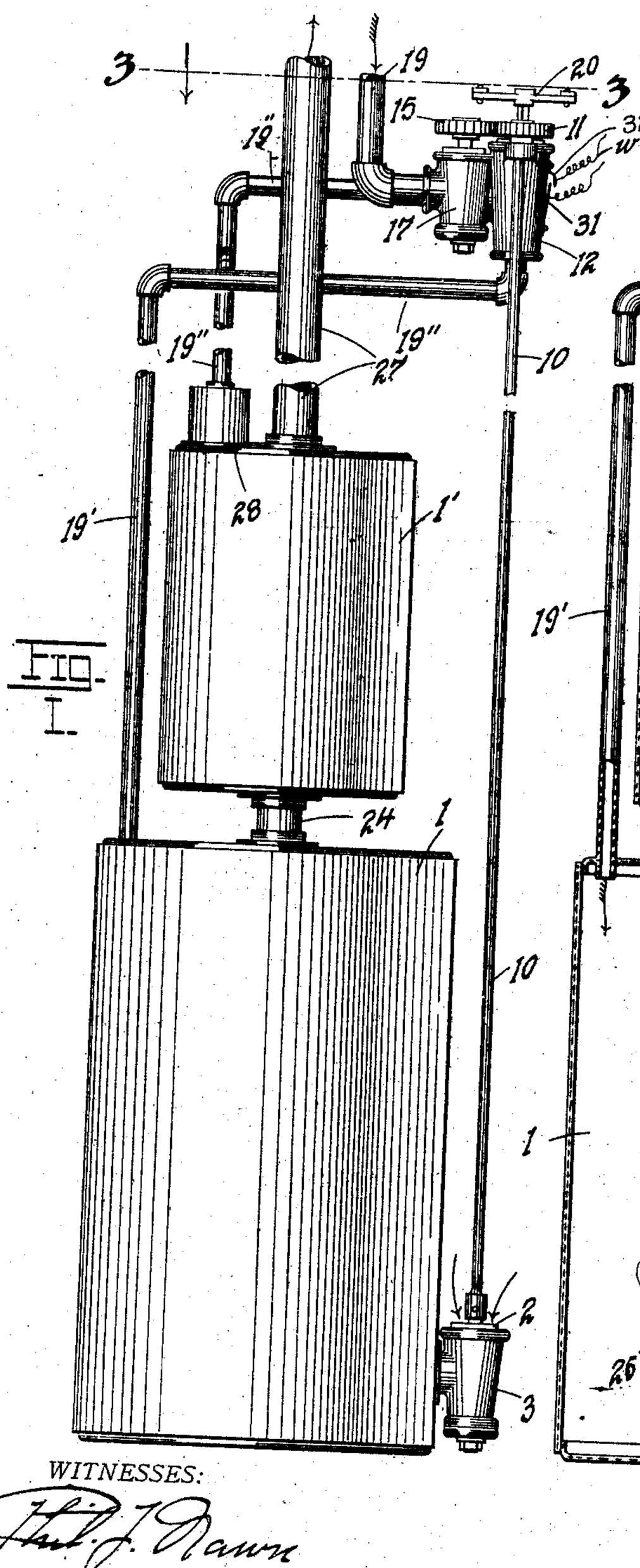

FIG. 1.

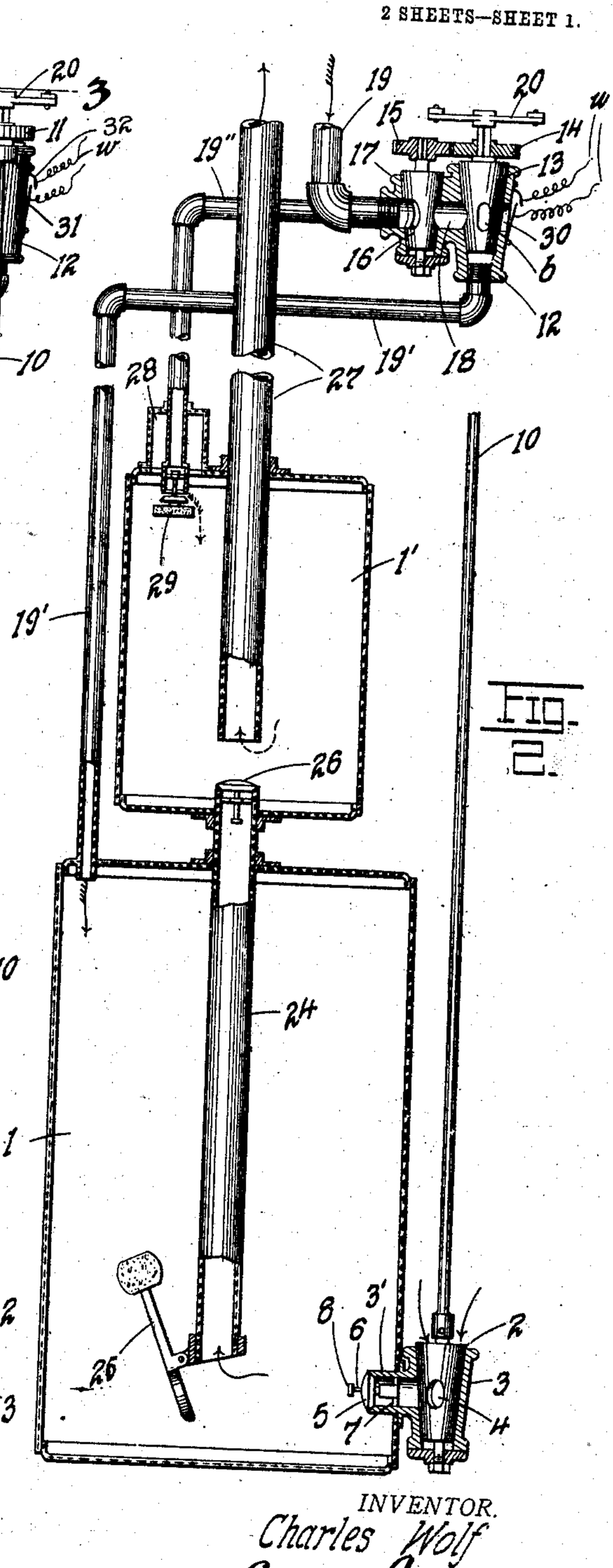

FIG. 2.

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2 SHEETS—SHEET 2.

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FORCE-PUMP.

No. 846,640. Specification of Letters Patent. Patented March 12, 1907.

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To all whom it may concern:

Be it known that I, CHARLES WOLF, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Force-Pumps, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in force-pumps, and consists in the novel details of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is an elevation of the pump. Fig. 2 is a combined vertical section and elevation showing the main cylinder in the act of discharging. Fig. 3 is a horizontal section on line 3 3 of Fig. 1. Fig. 4 is a vertical section on line 4 4 of Fig. 5, taken through the air-controlling valves. Fig. 5 is a horizontal section on line 5 5 of Fig. 4, the valves being positioned to allow for the discharge of the contents of the main cylinder. Fig. 6 is a section similar to Fig. 5 with valves turned to cut off the main cylinder from the compressed-air supply and allow the air to enter the supplemental cylinder for expelling the contents thereof. Fig. 7 is a transverse vertical section on line 7 7 of Fig. 5. Fig. 8 is a sectional view of the closed position of the water-inlet valve corresponding to the positions of the air-controlling valves in Fig. 5, and Fig. 9 is a sectional view of the open position of the water-inlet valve corresponding to the positions of the air-controlling valves shown in Fig. 6.

The object of my invention is to construct a force-pump provided with two intercommunicating cylinders from one of which the water may be expelled while the companion cylinder is filling with water from the well or other source of supply, this arrangement permitting an available volume of water to be drawn upon without the necessity of waiting the full time required to fill the main cylinder. The capacity of the main cylinder or tank is several times greater than the supplemental cylinder, so that in drawing water from the main cylinder the supplemental tank is almost instantly filled therefrom by the water in its passage to the point of consumption, reducing the time for the final delivery of water in proportion to the ratio subsisting between the cubic capacities of the respective cylinders. The valves by which the compressed air is alternately admitted first to one cylinder and then the other for expelling the water therefrom may be actuated at a distance from the well or source of supply, all as will hereinafter more fully appear from a detailed description of the invention, which is as follows.

Referring to the drawings, 1 represents the main cylinder or tank, adapted to be submerged below the surface of the water in the well and adapted to be filled from the bottom through a rotatable supply or inlet valve 2, mounted in a valve-casing 3, communicating through the wall of the cylinder, the water flowing into the valve from the top and through the port 4 past the reciprocating check-valve 5, mounted in a lateral extension or inlet 3′ of the valve-casing. The check-valve 5 slides loosely on the stem 6, secured to a transverse rib 7 of the extension 3′, its inward movement being limited by the terminal head 8 of the stem 6. The top cross bar or rib 9 of the inlet-valve 2 is connected to a rod 10, extending above the surface of the well, the upper end of the rod being provided with a pinion 11 and having a bearing in the valve-casing 12 of the primary air-valve 13, whose stem is provided with a pinion 14, meshing with the pinion or gear-wheel 11 aforesaid. The pinion 14 meshes in turn with a similar pinion or gear-wheel 15 of the secondary air-valve 16, mounted in the valve-casing 17, the casings 17 and 12 being preferably in the form of a single casting and communicating with each other by a passage or port 18. Leading to the valve-casing 17 of the secondary air-valve is the compressed-air-supply pipe 19. The valve-stem carrying the pinion 14 is provided with a terminal lever 20, to whose arms are coupled the wire or rope connections or links 21, whose opposite ends are in turn connected to an oscillating lever 22, mounted about a pivot 23 and located at any convenient point for the operator or person desiring to turn on the water.

Mounted above the cylinder 1 is a supplemental cylinder 1′, whose bottom communicates with the main cylinder through a pipe 24, leading to a point lying in a plane slightly above the extension 3′ of the valve-casing 3 and adapted when the cylinder 1 is empty above said plane to be closed by a float-valve 25, hinged at the bottom of said connecting-pipe 24. The top of the pipe 24 is provided with gravity check-valve 26.

Leading through the top of the supplemental cylinder 1′ is the main delivery-pipe 27, which terminates at the bottom a short distance above the pipe 24, the opposite end of said pipe 27 terminating at any convenient point of consumption. Leading from the bottom of the valve-casing 12 of the primary air-valve is a branch air-pipe 19′, which communicates with the top of the main cylinder 1, and leading from a convenient point of the valve-casing 17 of the secondary air-valve is a branch air-pipe 19″, which communicates through an air-chamber 28 at the corner of the top of the cylinder 1′, the lower end of the pipe 19″ being provided with a conventional float check-valve 29 of ordinary and well-known construction.

The valve-casing 12 has an exhaust-port 30, in whose path is a yielding vibrating metallic membrane or diaphragm 31, adapted to engage a contact arm or plate 32, and thereby close an electric current traversing the wires *w w*, leading to an annunciator. (Not shown.)

The operation of the pump may be best described by a reference to Figs. 4, 5, and 6. The valve 13 is open at the bottom and communicates with the pipe 19′. It is provided, moreover, with a peripheral inlet-port *a* and an exhaust-port *b*, adapted (when turned to exhaust position) to register with port 30. The valve 16 is closed at top and bottom, but has an elongated inlet-port *c* and outlet-port *d* and an exhaust-passage *e*. When the lever 22 has been oscillated to turn the valves to the positions shown in Fig. 4 and 5, the compressed air passes through the port *c* into valve 16, through port *d*, passage 18, port *a* into valve 13, and pipe 19′, expelling the contents of cylinder 1 into cylinder 1′, filling the latter, the water or liquid thence passing through the pipe 27 to the point of consumption. At the same time the valve 2 is turned to closed position, Figs. 2 and 8, this being desirable, as in the event of the failure of the check-valve 5 seating the escaping air-pressure would be apt to churn up the water in the well by escaping through the top of the valve 2 into the well. The expulsion of the water from the cylinder 1 continues until the water-lever drops to a plane slightly above the top of the inlet-port or extension 3′, when the float-valve 25 will no longer be supported by the water, and thus close the inlet to the pipe 24. The water in filling the cylinder 1′ displaces all the air with the exception of the small amount accumulating in the chamber 28, the air thus displaced exhausting through the pipe 19″ and out through the passage *e* of the valve 16. The tank or cylinder 1 being thus practically empty, the operator now swings the lever 22 to turn the valve 2 to filling or open position, Fig. 9, allowing the tank 1 to refill, the air displaced by the inrushing water now escaping through the pipe 19′, valve 13, ports *b*, 30, as seen in Fig. 6, it being understood that a turning of the valve 2 to filling position, Fig. 9, brings the valves 13 16 (through the medium of the gears 11 14 15) to the positions shown in said Fig. 6. The cylinder 1, therefore, will refill, and during such refilling operation of said primary cylinderthe valve 16, which is now turned to the second position, Fig. 6, will permit the compressed air to flow past the port *c* into the valve, thence through the same port (which is of sufficient length to reach in front of the open end of the pipe 19″ for the second position of said valve) into pipe 19″, thereby expelling the contents of the supplemental cylinder 1′ out through the pipe 27, the air-pressure opening the float-valve 29, and the check-valve 26 remaining closed by gravity and by the air-pressure within the tank, so that while the cylinder 1′ is being drained of its contents the large cylinder 1 is filling for a subsequent operation. Of course the cylinder 1 will become full when all the air has been displaced therein, a fact which is indicated by the electric annunciator. The exhaust-current of displaced air in impinging against the sensitive diaphragm 31 will force it against the contact arm or post 32, closing the circuit and sounding the signal; but when the air-current ceases the alarm will cease, so that the operator will know that the tank is full, when he may again turn the valve 2 to closing position and begin the expulsion of the contents of said main cylinder. This expulsion may take place before the cylinder 1′ has been emptied, (since the latter must first fill from the cylinder 1,) and the purpose of the smaller cylinder is to furnish an immediate supply of water while the large cylinder is filling, so that the consumer need not be obliged to wait unduly for the water once he has manipulated the valves to proper position. Of course the wait during the interval that the small cylinder 1′ is filling from the contents of the main cylinder is a comparatively short one on account of the relatively small capacity of the smaller cylinder. To shut the flow of water off completely, that may be done by an ordinary cock or faucet at the point of consumption—that is to say, at the point of discharge of the main (not shown) with which the pipe 27 communicates. It may also be accomplished by turning the valve 16 to such a position as to intercept the air coming through the pipe 19 and prevent its passage into the valve 16, a fact obvious by an inspection of Fig. 5.

Having described my invention, what I claim is—

1. A force-pump comprising two intercommunicating cylinders or tanks, means for filling one of said cylinders from a suitable source of liquid-supply, means for permitting the escape of air during the filling of the

cylinders, a vibrating diaphragm in the path of said air-escape, an electric circuit of which said diaphragm forms one of the terminals, a contact member forming the opposite terminal of said circuit, the latter closing by the impact of the escaping air-current against the diaphragm and the forcing of the diaphragm against said contact member, and means for permitting the pneumatic expulsion of the liquid from the second cylinder during the filling of the first cylinder, substantially as set forth.

2. A force-pump comprising two intercommunicating cylinders or tanks, means for filling one of said cylinders from a suitable source of liquid-supply, a compressed-air-supply pipe, a double valve-casing coupled to said air-pipe, branches leading from the valve-casing to the respective cylinders, valves in said casings adapted to be relatively positioned to permit the air to flow into one or the other of said cylinders, and an inlet-valve for the liquid-supply adapted to be operated in conjunction with the operation of the air-controlling valves, substantially as set forth.

3. A force-pump comprising two intercommunicating cylinders or tanks, means for filling one of said cylinders from a suitable source of liquid-supply, a compressed-air-supply pipe, a double valve-casing coupled to said air-pipe, branches leading from the valve-casing to the respective cylinders, valves in said casings adapted to be relatively positioned to permit the air to flow into one or the other of said cylinders, an inlet-valve for the liquid-supply to the first cylinder adapted to be operated in conjunction with the air-controlling valves, and relatively positioned to admit the liquid to the first cylinder while the contents of the second cylinder is being pneumatically expelled, and to cut off the liquid-supply while the contents of the first cylinder is being expelled, substantially as set forth.

4. A force-pump comprising a main and a supplemental superposed cylinder of smaller capacity, a pipe connecting the cylinders, a check-valve at the upper end of said pipe, a float-valve at the lower end of said pipe, a hollow rotatable liquid-supply valve adapted to admit liquid to the main cylinder, a double valve-casing located above the supplemental cylinder, a compressed-air pipe leading to said casing, valves in said casing, branches leading from the casing in operative connection with said valves for conveying the compressed air alternately to the respective cylinders, a check-valve in the supplemental cylinder for closing the inlet to the air-pipe leading therefrom, a rod or staff leading upward from the liquid-supply valve, suitable gearing between the said rod and the valve-stems of the air-controlling valves, a delivery-pipe leading from the bottom of the supplemental cylinder, and means for actuating said gearing to effect alternate expulsion of the liquid from the respective cylinders, for closing the liquid-supply valve during the expulsion of the contents from the main cylinder, and opening the same during the filling thereof, and the expulsion of the contents of the supplemental cylinder, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES WOLF.

Witnesses:
EMIL STAREK,
JOS. A. MICHEL.