No. 648,614. Patented May 1, 1900.

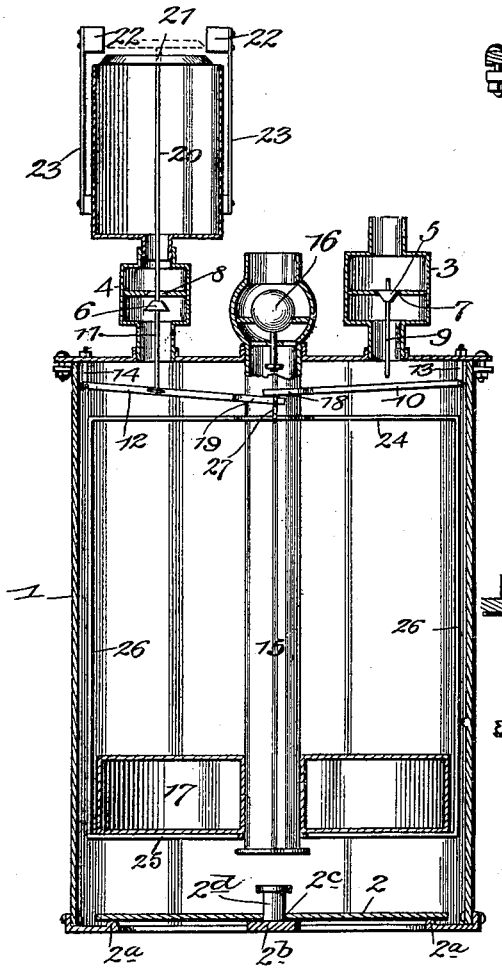
M. M. GROVE.

PUMP.

(Application filed May 1, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



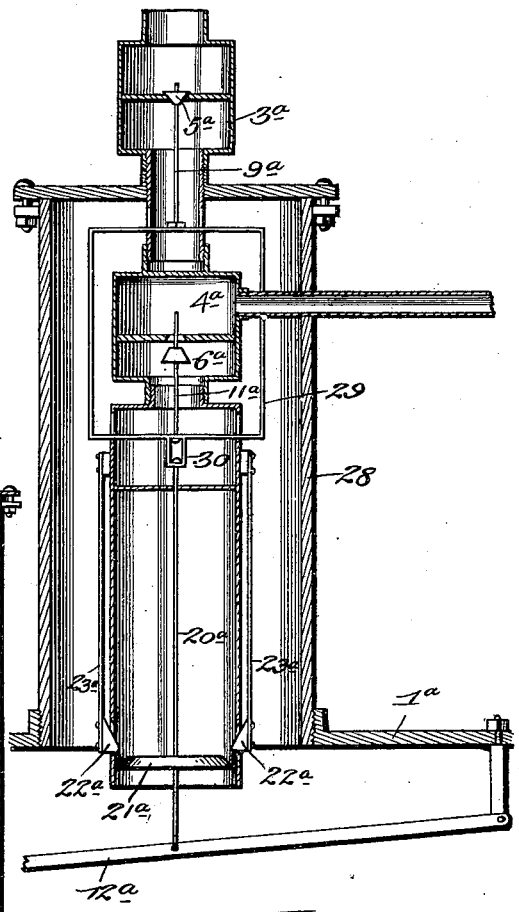


Fig. 2.

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Fig. 3.

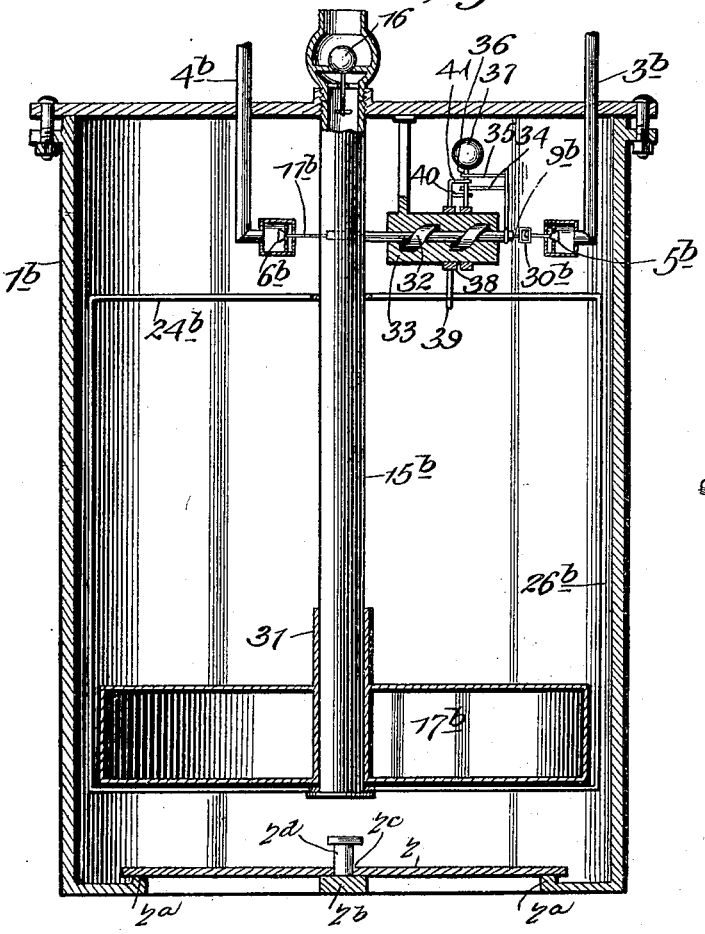
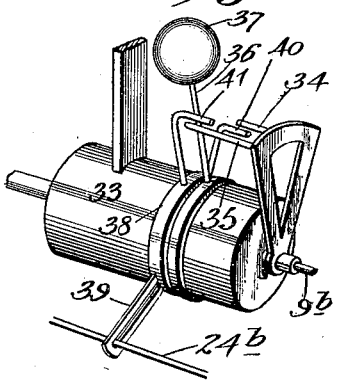


Fig. 4.



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MELCHI M. GROVE, OF GARFIELD, WASHINGTON.

PUMP.

SPECIFICATION forming part of Letters Patent No. 648,614, dated May 1, 1900.

Application filed May 1, 1899. Serial No. 715,161. (No model.)

To all whom it may concern:

Be it known that I, MELCHI M. GROVE, a citizen of the United States, residing at Garfield, in the county of Whitman and State of Washington, have invented a new and useful Pump, of which the following is a specification.

My invention relates to pumps, and has for its object to provide a simple, inexpensive, and efficient construction and arrangement of parts whereby pneumatic pressure may be utilized economically in the elevation of liquids.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a vertical central sectional view of a pump mechanism constructed in accordance with my invention. Fig. 2 is a similar view of a modified construction of valve mechanism. Fig. 3 is a similar view of another modified construction of valve mechanism. Fig. 4 is a detail view in perspective of the valve-operating mechanism.

Similar reference characters indicate corresponding parts in all the figures of the drawings.

1 designates a cylinder provided in its lower end with an inwardly-opening supply-valve 2, approximately coextensive with the bottom of the cylinder and adapted when depressed to rest near its periphery upon a seating-rib 2^a and at its center upon a support 2^b. This valve is designed to open inwardly by the exterior pressure of the liquid which is to be elevated, and a guide-opening 2^c at the center thereof is mounted upon a vertical guide-stud 2^d, headed at its upper end to limit the upward movement of the valve. At its upper end the cylinder is provided with inlet and outlet conveyers 3 and 4, respectively, having an outwardly-opening inlet-valve 5 and an inwardly-opening outlet-valve 6, arranged in operative relation with seats 7 and 8. These valves are adapted for approximately simultaneous operation, but are so related that when one is seated the other is unseated, the inlet-valve 5 having a stem 9, which is arranged in the path of an inlet-valve-operating lever 10, and the outlet-valve 6 having a stem 11, which is connected for movement with an outlet-valve-operating lever 12, said levers being fulcrumed upon hangers 13 and 14, depending from the top of the cylinder. Also communicating with the cylinder near its lower end and preferably extending axially therethrough is the delivery-pipe 15, having a suitable check-valve 16 to prevent back pressure of liquid elevated therein, and mounted upon this delivery-pipe, which constitutes a guide therefor, is a float 17, designed for reciprocation in the cylinder and approximately equal in area with the cross-section of the cylinder. This float may be constructed of any suitable buoyant material. The inner ends of the valve-operating levers 10 and 12 are bifurcated or are provided with yokes 18 and 19, and the extremities of the arms of these yokes slightly overlap, the arms of the yoke 18, which is carried by the inlet-valve-operating lever 10, being uppermost, or, in other words, being supported by the arms of the yoke 19, which is carried by the lever 12, whereby motion communicated by the float 17 to the yoke 19 is imparted by the latter to the yoke 18 to cause the upward swinging movement of the lever 10 for contact with the stem 9 of the inlet-valve.

The stem of the outlet-valve 6 is extended, as shown at 20, and is provided with a motion-resisting disk 21, in the path of the beveled periphery of which are arranged yielding stops 22, carried by spring-arms 23, or any equivalent yielding supports. The function of the stops is to temporarily check the upward movement of the disk 21 before the outlet-valve reaches its seat, when the valve-operating lever 12 receives pressure from the float; but owing to the beveled periphery of said disk 21, the yielding supports or stops 22, and the continued rise of the liquid in the cylinder, thus causing the increased upward pressure upon the float, this resistance offered by the stop is overcome and the disk spreads the stops and passes therebetween to a point indicated by dotted lines in Fig. 1. The initial movement of the disk 21 is slow; but af-

ter its beveled edge has cleared the lower corners of the stops 22 and the periphery of the disk comes in contact with the vertical inner edges of said stops the movement of the disk will be abrupt, or, in other words, that while the upward movement of the disk is temporarily checked by the stops to allow an accumulation of force as applied to the lever 12 when the accumulated force is sufficient to overcome the resistance of the stops the upward movement of the disk is rapid, thus causing the prompt or sudden seating of the outlet-valve 6. As the resistance offered to the disk 21 is overcome and the outlet-valve is seated the valve-operating lever 10 comes into contact with the extremity of the stem of the inlet-valve 5, and thus suddenly unseats the latter to admit fluid-pressure (preferably air-pressure) into the cylinder to force the liquid contents of the cylinder into the delivery-pipe.

As a means of communicating motion from the float to the valve-operating levers, and particularly as a means of unseating the outlet-valve, to allow the seating of the inlet-valve I employ a cage connected with the valve-operating lever 12 and having members arranged, respectively, in the paths of the upward and downward movements of the float. In the construction illustrated said cage consists of an upper member or bar 24 and a lower member or bar 25, both of which are arranged, respectively, in the paths of the upward and downward movements of the float 17 and are terminally connected by side bars 26, the upper bar being connected by links 27 with the arms of the yoke 19. Thus as the float rises it comes in contact with the upper member 24 of the cage, communicating motion to the lever 12, and forces the disk 21 into contact with the stops 22. The water then rises around the float until sufficient force is accumulated to overcome the resistance of the stops 22, whereupon the disk 21 spreads the stops away from each other and slips between them, and at the same time the arm 10 is brought abruptly into contact with the stem 9, thus unseating the inlet-valve 5 as the outlet-valve 6 is seated. The pneumatic pressure communicated to the interior of the cylinder through the inlet-conveyer expels the liquid contents of the cylinder through the delivery-pipe 15, and the float 17 descends until it comes in contact with the lower member 25 of the cage, thus bearing downwardly upon the free end of the lever 12 and releasing the lever 10, whereby the pneumatic pressure in the conveyer 3 may seat the valve 5. Said downward movement of the lever 12 in addition to unseating the outlet-valve 6 returns the resistance-disk 21 to its normal position, as indicated in full lines in Fig. 1.

From the foregoing description it will be seen that the resistance devices which impede the movement of the valve-adjusting float operate simply to cause an accumulation of pressure or force, whereby the complete adjustment of the valves may be accomplished abruptly; but the mechanism described is susceptible of various modifications, of which I have deemed it advisable to illustrate one form in Fig. 2, and, referring thereto, it will be seen that 1^a designates the top of the cylinder, 3^a the inlet-conveyer, and 4^a the outlet-conveyer; 5^a, the inlet-valve having a stem 9^a, and 6^a the outlet-valve having a stem 11^a. In this modified construction, however, the inlet and outlet conveyers are arranged coaxially, with the latter arranged in a housing 28, which is in communication with the inlet-conveyer. Connecting the stems 9^a and 11^a of the inlet and outlet valves is a yoke 29, and with this yoke the stem 20^a of the resistance-disk 21^a has a loose or sliding connection by means of a guide 30, in which the headed extremity of said stem 20^a operates, to allow a limited movement of the resistance-disk independently of the connected valve-stems. In the path of the resistance-disk are arranged yielding stops 22^a, supported by springs or other yielding supports 23^a, and connected with an extension of the stem 20^a is a valve-operating lever 12^a, constructed substantially as described in connection with the valve-operating lever 12 of the apparatus illustrated in Fig. 1, for direct actuation by a float. (Not shown in Fig. 2.) As the valve-operating lever 12^a is elevated by the float the resistance-disk 21^a is brought into contact with the stops 22^a and the motion of said disk is impeded by the stops until there is an accumulation of force due to the rise of water around the float. When this resistance is overcome and the resistance-disk spreads and slips past the stops 22^a, the head at the upper end of the stem 20^a comes into contact with the upper end of the guide 30, and thus suddenly seats the outlet-valve 6^a and unseats the inlet-valve 5^a. The unseating of the outlet-valve and the seating of the inlet-valve upon the fall of the water in the cylinder may be accomplished by means substantially identical with those described in connection with the form of my invention which is illustrated in Fig. 1.

I desire it to be understood that various means may be employed for supporting the essential parts of the valve mechanism and that the inlet and outlet conveyers may be arranged either separately, as in Fig. 1, or coaxially, as in Fig. 2, provided the relation between the parts of the valve mechanism is such that the adjustment of the valves to open the inlet and close the outlet is resisted to insure an accumulation of force sufficient to accomplish the said adjustment abruptly, and thus completely, and while in the drawings I have illustrated only two forms of the apparatus embodying my invention it will be understood that the relation between the parts may be otherwise varied and that numerous

changes in the form, proportion, size, and minor details of construction within the scope of the appended claims may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In Figs. 3 and 4 I have illustrated still another modified construction of valve mechanism, wherein 1^b designates the illustrated portion of the cylinder; 3^b, the inlet-conveyer, and 4^b the outlet-conveyer; 5^b, the inlet-valve, having a stem 9^b, and 6^b the outlet-valve, having a stem 11^b; also, 15^b represents the delivery-pipe, which communicates with the interior of the cylinder; 17^b, a float, and 26^b the cage in which the float operates, said float being provided with a sleeve or extension 31 for contact with the upper bar 24^b of the cage. Connecting the valve-stems 9^b and 11^b is a feed-screw 32, operating in a fixed feed-nut 33, whereby when the feed-screw is turned it advances the valve-stems to unseat one of the valves and seat the other; also, a slip-joint or sliding connection 30^b is employed between the inlet-valve stem and the inlet-valve, whereby a limited movement of the exhaust-valve is allowed independently of the inlet-valve. Carried by the feed-screw is a rocker having arms 34 and 35, and swiveled upon the bearing formed by the exterior surface of the feed-nut 33 is a weighted trip-arm 36, having a terminal weight 37, said weighted arm being provided with a sleeve encircling the feed-nut. The arms of the rocker 34 35 are arranged in the paths of movement in opposite directions of the weighted arm. Also mounted for rocking movement upon the exterior surface of the feed-nut is a tilting lever 38, provided with a slotted arm 39, with which is engaged the cross-bar 24^b of the cage, whereby during the vertical movement of the cage said tilting lever is rocked. The tilting lever carries tappet-pins 40 and 41, arranged upon opposite sides of the plane of the weighted lever. Hence in operation as the float rises to cause the contact of the sleeve 31 with the cross-bar 24^b the latter is elevated to tilt the lever 38. This brings the tappet-pin 41 into contact with the weighted lever and raises the latter until it passes the center of its path of movement or, in other words, passes a vertical position, whereupon gravity swings the weighted arm downward in a continuation of its former movement to strike the arm 34 of the rocker. This reverses the position of the rocker and by turning the feed-screw causes the advance of the valve-stems in one direction to open the inlet-valve and close the exhaust-valve. When the float reaches an operative position in its downward movement, it depresses the cage, thereby drawing downward upon the tilting lever, causing the tappet 40 to raise the weighted arm to and slightly beyond a vertical position, whereupon said arm swings forward into contact with the rocker-arm 35, and thus communicates motion to the feed-screw to open the exhaust-valve and close the feed-valve. It will be seen that in this construction the springs used in connection with the forms of my invention illustrated in Figs. 1 and 2 are avoided and the prompt reversal of the valves is accomplished by gravity; but, as in said form shown in Figs. 1 and 2, the weighted arm constitutes a yielding resistance device which impedes the valve-adjusting movement of the operating means and then after reaching a certain point promptly and efficiently consummates the reversal of the valves.

Having described my invention, what I claim is—

1. In a pump, a cylinder having an inwardly-opening valve at its lower end, a delivery-pipe provided with an outwardly-opening valve, spaced air inlet and exhaust valves, oppositely-disposed levers pivoted at their outer ends and having their inner ends overlapping, the underlying lever having the stem of the exhaust-valve connected therewith, the stem of the inlet-valve being spaced from and lying in the path of the overlying lever, a resistance device connected with the stem of the exhaust-valve, a float, and a float-actuated device having loose connection with the said underlying lever and comprising portions lying in the path of the float to be positively actuated thereby at the limits of its movement in each direction.

2. In a pump, the combination with a cylinder and delivery-pipe, of air inlet and exhaust valves, float-actuated valve-operating means, and resistance devices consisting of a disk connected with said valve-operating means and having a beveled edge, oppositely-disposed spring-supported stops arranged in the path of movement of said disk, and substantially-straight parallel bearing-faces beyond the active portions of the stops, substantially as specified.

3. In a pump, the combination with a cylinder and delivery-pipe, of air inlet and exhaust valves, float-actuated valve-operating means, and resistance devices consisting of a casing, a resistance-disk mounted for movement in the said casing and connected with said valve-operating means, and having a beveled peripheral edge, and yieldingly-supported stops arranged in the path of said peripheral edge of the resistance-disk and attached to opposite sides of the said casing, substantially as specified.

4. In an apparatus for raising liquids, a cylinder provided at its lower end with an inwardly-opening valve, a delivery-pipe provided with an upwardly-opening valve, an inlet and an outlet port in the top of the cylinder, a valve for each port, the stem of one of which is extended and provided with a retarding device, two levers pivotally secured within the top of the casing, the free ends of which overlap each other around the deliv-

ery-pipe and the intermediate portion is in position to engage with the stems and operate the valves, one of the levers being secured to its stem, and a float upon the pipe in position to engage with and operate the levers, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

MELCHI M. GROVE.

Witnesses:
J. C. LAWRENCE,
P. H. SHERMAN.