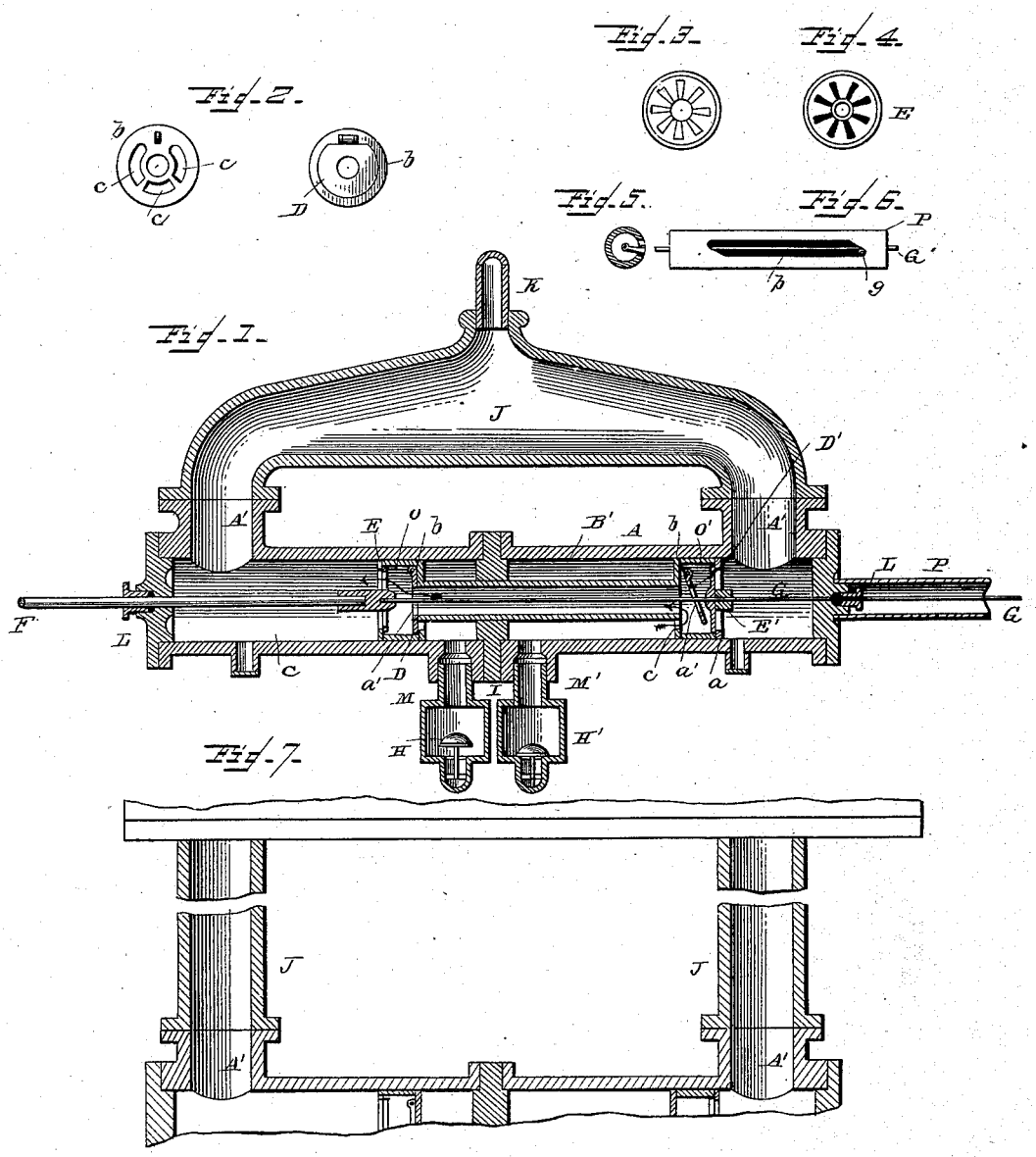
(No Model.)

H. M. CLOSE.

PUMP.

No. 384,679. Patented June 19, 1888.



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PUMP.

SPECIFICATION forming part of Letters Patent No. 384,679, dated June 19, 1888.

Original application filed April 13, 1887, Serial No. 234,679. Divided and this application filed November 5, 1887. Serial No. 254,380. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. CLOSE, a citizen of the United States of America, residing at Beaver Falls, in the county of Beaver and State of Pennsylvania, have invented certain new and useful Improvements in Pumps, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to a new and useful pump, of which the following is a specification.

The devices herein shown, and to be hereinafter more fully described, are shown in an application filed by me April 13, 1887, Serial No. 234,679. In the application above referred to the method of transferring liquids from a lower to a higher level by utilizing the weight of the column or columns of water to neutralize the resistance which the column of liquid opposes to the action of the piston is claimed, and this application is designed as a division of said application, the particular devices only being claimed herein.

Referring to the drawings, Figure 1 is a vertical longitudinal sectional view of my pump. Fig. 2 is a front view of one of the inside suction-heads of the piston and the valves which cover the same. Fig. 3 is a front view of one of the oscillating neutral valves at the outer ends of the piston-heads or neutral cylinder, showing the valve open. Fig. 4 is a similar view showing the valve closed. Fig. 5 is an end view of the device which I employ for operating the oscillating or neutral valve. Fig. 6 is a side view of the devices shown in Fig. 5. Fig. 7 is a longitudinal sectional view of a portion of the pump, showing two exit-pipes.

A indicates the main cylinder or casing of the pump, in which are located the neutral cylinder or piston, valves, and other working parts of the pump, said cylinder being divided into two chambers by the transverse partition or diaphragm I. The partition I is provided with an opening through which a hollow neutral cylinder, B, is adapted to work back and forth in the cylinder A.

B is a hollow neutral cylinder or piston adapted to work back and forth through the partition I and in the chambers of the cylinder A, as already indicated, said neutral cylinder being somewhat smaller in diameter throughout the greater part of its length than the internal diameter of the outside cylinder or casing, A, so as to leave suction-chambers B′ on each side of the partition between the outer wall of the neutral cylinder and the inner walls of the cylinder or casing A. Both ends of the neutral cylinder or piston B are enlarged so as to fill or snugly fit within the cylinder A, and are so constructed as to form hollow piston-heads or chambers O O′. The piston-heads or chambers O O′ communicate with the hollow neutral cylinder B, and are bounded by the front and rear walls, *a* and *b*, respectively.

The rear walls, *b*, are provided with ports *c*, so as to form a communication between the chambers B′, which surround the neutral cylinder, and the chambers O and O′, said ports or openings *c* being controlled by suitable valves, D and D′.

The valves D and D′ are hinged at their upper ends to the walls *b* and adapted to move back and forth to open and close the ports *c*, said valves being provided with a central opening, *a*′, which registers with the ends of the neutral cylinder B and leaves the ends of said neutral cylinder always open.

The front walls or ends *a* of the chambers or piston-heads O O′ are perforated, and are covered by the oscillating or register valves E and E′, said valves being operated by suitable devices to open and close the perforations in the front walls *a*, as will now more fully appear.

The valves E and E′ are connected by a rod, G, which extends outside of the cylinder A into the tube P, said tube being provided with a longitudinal peripheral slot, *p*, which is beveled or inclined at both ends in opposite directions, as shown in Fig. 6.

g is a pin or stud secured to the rod G, and projects into the slot *p*, so that when the piston B is moved in one direction and nearly reaches the end of its stroke the pin *g* comes in contact with the beveled or inclined end of the slot, when the rod G and valves E and E′ will be turned to open and close the ports in the heads *a*.

The valves E and E′ are arranged on a rod, G, in such manner that when said rod is partially rotated, by the means already described,

the valves E and E′ will be alternately opened and closed, and one valve is opened and the other closed at the end of each stroke of the neutral cylinder or piston.

L L are glands or stuffing-boxes through which the piston-rod F and the valve-rod G are free to work back and forth in the usual manner.

The outer end of each chamber of the cylinder or casing A is provided with openings A′, to which is connected the dome J of the pump, and K is the discharge-pipe leading therefrom.

Instead of using the dome J, with its two branches connecting with openings in the ends of the chambers of the cylinder or casing A, I may continue the pipes to any desired height, and have two discharge-pipes K, instead of one, and these pipes may be placed at any desired angle.

M M′ are pipes connecting the inner ends of the two chambers B′ with the water or other liquid to be raised, said pipes being provided with suitable valves, H and H′.

I will now proceed to describe the operation of the pump.

In Fig. 1 the double piston is shown as moving from right to left, with the valves H and E and D′ open and the valves H′, E′, and D closed. The movement of the piston-head O causes a current of water to pass through the pipe M into the cylinder back of the piston-head, and the movement of the piston-head O′ in the other division of the cylinder causes the water in advance of it to pass through the port *c* into the head O′, and thence through the hollow piston B and piston-head O into the space in advance of the latter piston-head, the water in advance of both piston-heads being forced into the dome J and pipe K, part, of course, flowing back to the space in the rear of the piston, and in this way the column of liquid being raised is caused to rest against the valves E and E′ at each alternate stroke of the piston and balance said piston or neutral cylinder at any point within the double-chambered cylinder-head O′. In this pumping action the piston is not subjected to the full hydrostatic resistance of the column of liquid in the pipe K, as in force-pumps now in general use, because this column of water presses not only on the forward side of the piston-head through one branch of the dome, but on the rear wall as well through the other branch of the dome, and in this way the piston is balanced or kept at an equilibrium of pressure on both sides, and can stand at any part of its stroke in a state of rest or balance. The movement of the pump-piston is therefore easy and its forcing power is very much increased. When the double piston reaches the end of its left stroke, the valve E is closed and the valve E′ opened, and when the piston begins its back-stroke the same movement of the water, but on opposite sides of the partition I, takes place, as described. In this way a continuous stream of water from the pipe K is maintained, for the pump is constantly receiving water at one side of the partition I and discharging it at the other.

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

1. In a device for transferring liquids from a lower to a higher level, a double-chambered cylinder having outlet-pipes in the outer ends and an inlet-pipe at the inner end of each of said chambers, and a hollow piston or neutral cylinder of smaller diameter, except at the ends, working within said cylinder, said piston being provided with automatically-operated valves to close the ends of the piston, as set forth, whereby the column of liquid being raised is caused to rest against the heads or valves of the piston at each alternate stroke of the same and balance the piston or neutral cylinder at any point within the double-chambered cylinder.

2. In a device for transferring liquids from a lower to a higher level, a main exit-pipe divided at its lower end into two branches, each communicating with the outer ends of a double-chambered cylinder, in combination with a piston or neutral cylinder having automatically-operated valves at each end thereof, whereby the column of liquid to be raised is divided into two columns, each of which rests against one or the other of the heads of the neutral cylinder or piston alternately, as set forth.

3. In a device for transferring liquids from a lower to a higher level, a double-chambered cylinder, the piston or neutral cylinder B, with heads which work snugly within the cylinder, and with the main body reduced, a partition through which the reduced portion of the piston works, forming with the heads a space between the outer walls of the piston and the inner walls of the chambered cylinder, supply-pipes communicating with the space in each chamber, and the check-valves and automatically-operated valves in the ends of said piston, as set forth, whereby a vacuum-chamber is formed for the inflow of water in one or the other chamber at each stroke of the piston, as set forth.

4. In a device for raising or transferring liquids from a lower to a higher level, a divided cylinder having an opening through its partition, a double hollow piston having a reduced portion connecting the heads fitting the opening in the partition to reciprocate therein, and with the heads fitting the cylinder to form chambers between the partition and heads, and the valves, ducts, or ports forming communicating passages between the chambers and the hollow piston, substantially as set forth.

5. In a device for raising liquids, a double-chambered cylinder, the inlet and outlet pipes communicating with each chamber, a double hollow piston or neutral cylinder working therein, and the valved ports in the ends of the piston acting to automatically and alter-

nately open and close to admit and discharge the liquids around the piston or neutral cylinder, substantially as set forth.

6. In a device for raising liquids, a divided cylinder having an opening through its partition, a double hollow piston having a reduced portion connecting the heads, fitting the opening in the partition to reciprocate therein, and the heads fitting the cylinder and forming chambers between the partition and heads, the ends of said piston made hollow, the inner and outer walls of both being provided with valved openings forming communications between the chambers and hollow piston and the hollow piston and outlet, and acting automatically and alternately to admit and discharge the water from the inlet to the outlet, substantially as set forth.

7. In a device for raising liquids, a double-chambered cylinder, A, a double hollow piston or neutral cylinder, B, having the chambers O O′, one at each end, and the inlet and outlet pipes, in combination with valves E E′, and the rod G for opening the valves automatically in the reciprocation of the piston or neutral cylinder, and the valves D and D′, substantially as set forth.

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

HENRY M. CLOSE.

Witnesses:
H. W. NAIR,
GEO. W. MORRISON.