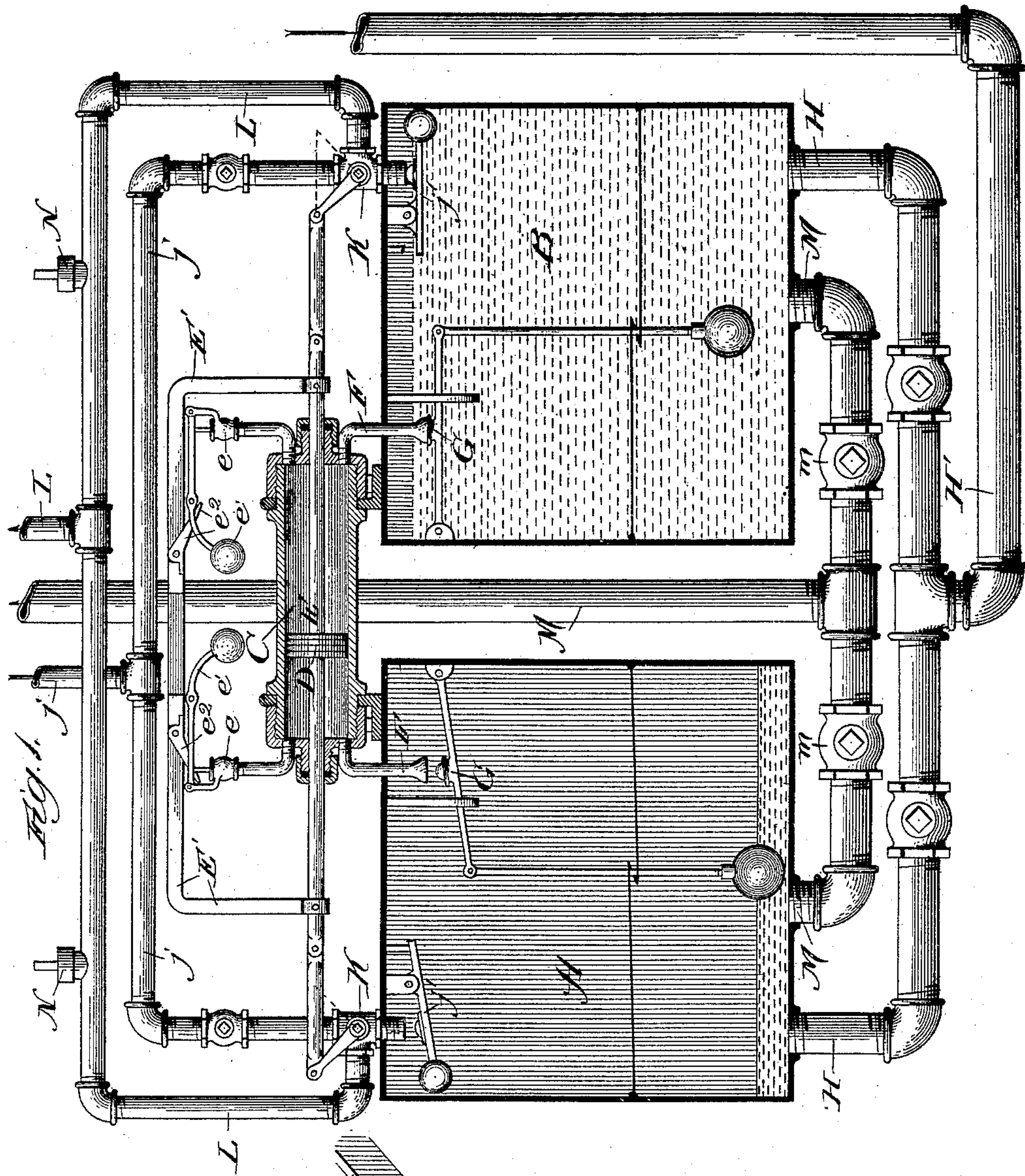


(No Model.)

I. T. DYER.
AUTOMATIC WATER LIFTING APPARATUS.

No. 474,338.

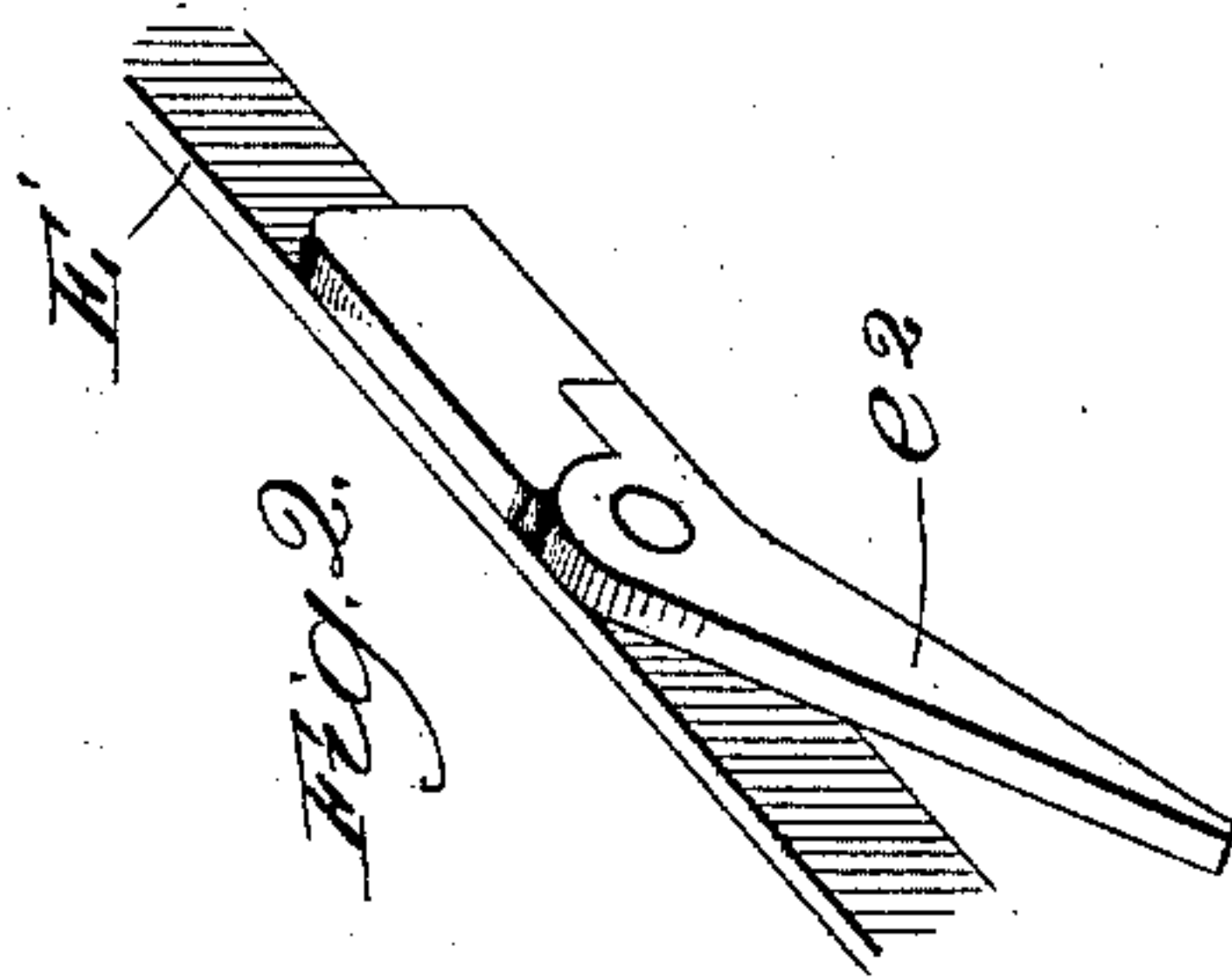
Patented May 3, 1892.



Witnesses:

Ed. Payford,
Efford N. White.

Fig. 2.



Inventor:

Isaac T. Dyer,
Ranning & Ranning Payson,
Attys.

UNITED STATES PATENT OFFICE.

ISAAC T. DYER, OF CHICAGO, ILLINOIS, ASSIGNOR OF TWO-THIRDS TO
RICARD O'S. BURKE AND JOHN R. COFFEY, OF SAME PLACE.

AUTOMATIC WATER-LIFTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 474,338, dated May 3, 1892.

Application filed November 25, 1890. Renewed October 16, 1891. Serial No. 408,878. (No model.)

To all whom it may concern:

Be it known that I, ISAAC T. DYER, a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful
5 Improvements in Automatic Water-Lifting Apparatus, of which the following is a specification.

The object of my invention is to make an apparatus in which water is lifted and conveyed to the place of use by means of air-pressure, and it is intended as an improvement upon the apparatus shown and described in an application filed by me August 25, 1890, Serial No. 363,039.

15 My invention consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a vertical longitudinal section of my improved water-lifting apparatus; and Fig. 2 is a perspective
20 view of a trip for opening certain vent-valves, as hereinafter described.

In making my improved water-lifting apparatus I make two tanks A and B of a size to receive the desired quantity of water and air under pressure. These tanks may be arranged side by side, as shown in Fig. 1, or in such other convenient position with reference to each other as may be desired. The two
25 tanks are connected together and a communication from the one to the other afforded by means of a cylinder C, in which are arranged two piston-heads D and E. These piston-heads are provided with piston-rods
30 extending out through the respective ends of the cylinder, where they pass through proper stuffing-boxes to secure a close and perfect connection, while permitting the rods to be moved back and forth. I have shown the
35 cylinder arranged outside of the tanks and immediately above them, as I consider this to be the most desirable arrangement of the cylinder; but it may be located otherwise, if desired, by the constructor of the apparatus.
40 The cylinder is provided with a valve *e*, connected by pipes to the cylinder to permit air to escape at the proper moment as the piston-heads move backward and forward, so as to prevent back-pressure from the air. I have
45 not shown the details of construction of these valves, as they may be of any of the well-

known constructions adapted to be opened and closed automatically. To effect their automatic opening and closing I have shown a carriage E' mounted on the piston-rods and
55 adapted to be moved back and forth with them. The valves are held closed by pivoted weighted bars *e'*, and the carriage is provided with trips *e''*, mounted thereon and carried back and forth with it. These trips engage
60 with the weighted bars *e'* and lift the one or the other, as the movement of the carriage is in the one direction or the other. As the weighted bars are lifted alternately, the valves
65 *e* are opened. While one is opened the other is closed, and the movement of the piston-heads back and forth, moving the carriage E' back and forth with them, alternately opens
70 and closes the valves *e*, so that each time one of the piston-heads moves back the appropriate valve will be opened to permit air to escape. The engagement of the weighted bar
75 *e'* and the trip *e''* is intended to continue only long enough to open the valve a sufficient time to permit enough air to escape to prevent the pressure and not interfere with the movement
80 of the piston-head, when the weighted bar is again disengaged and allowed to fall into position to close the valve. In each of the tanks is arranged a pipe F, with its lower end preferably near the top and its upper end entering the cylinder in the rear of its appropriate
85 piston-head. A float-valve G, having a float-ball arranged on a depending rod so as to be near the bottom of the tank, is pivotally arranged in each of the tanks, so that as the
90 float-ball is lifted or forced up by the inflowing of the water the valve will be forced against its seat and so close the lower ends. Pipes H are arranged to enter the bottoms of
95 the tanks to admit an inflow of water. These pipes are provided with valves which open inwardly to the pressure of the water from the outside of the tanks. As these valves may be of any of the ordinary and well-known
100 constructions, operating in the usual way, I have not deemed it necessary to illustrate them in the drawings. Each of the pipes H preferably communicates with a pipe H', which may be carried to any proper source of water-supply from which it is desired to procure water to be lifted and carried to the place of use.

In proper proximity to the tanks an air-pump is arranged, provided with an air-reservoir, so that the same may be charged or filled with air under pressure. The air-reservoir should be of sufficient capacity to supply both of the tanks with compressed air. I have not shown this air pump or reservoir, as they may be like those shown in the application on which this is an improvement or like any of the well-known constructions. A pipe j leads from the air-reservoir to a point near the top of the tanks, when it branches into two parts, one branch entering each of the tanks. The lower ends of the branches are carried down into the tanks any desired distance, and are provided near their lower ends with two-way cocks or valves K . Leading from the joint or place where the two-way valves are arranged are pipes L , which preferably are united into one and carried back to the pump. The "two-way valves," as they are termed, open the pipes j and close the pipes L , so that air may be drawn by the pump from the tank through such pipes and conveyed on into the reservoir. The valve-stems of these valves are connected to the piston-rods by suitable links, so that as the pistons are moved back and forth the valves will be correspondingly turned.

From at or near the bottom of the tank are arranged pipes M , opening at the ends into the tanks, and preferably uniting into one pipe outside of the tank and leading to the place where it may be desired to convey the water. Valves n are arranged in the respective parts of the pipes M that enter the tanks. These valves are arranged to alternately open and close by the pressure of the water, so that as the water is being carried from one tank its valve will be opened and the other closed and the water will pass up the main pipe to the place of use. When the operation is reversed, the other valve is opened by the pressure of the water, so as to permit the water to flow into the main pipe and the one first opened closed. In this way the water from the tank being emptied is prevented from flowing back into the other. Valves N are arranged in the pipes L , which are closed when there is an air-pressure in such pipes, but automatically opened whenever the pressure is released, so that whenever the pump has exhausted the air from the interior of the tanks air may be drawn in through the valves N and supplied from the atmosphere. The air-reservoir may be provided with a valve, so that when the pressure in the reservoir exceeds a predetermined amount the valve will be opened to permit the escape of air. This is a matter so well known in connection with air-reservoirs that it need not be explained in detail.

In order to prevent the water from entering the pipes j , through which the air is introduced, which it might do when the water-supply happened to be located at a greater height than the top of the tanks, I provide

valves j' , arranged on pivoted rods provided with float-balls that are carried up as the water approaches the top of the tanks and move the valves into their seats so as to securely close the pipes and prevent the water from entering them. As the air is forced in and the water is drawn from the tanks, the valves fall away from their seats and open the pipes again.

In operation the tanks are placed in any convenient position near to the water-supply from which it is desired to pump or procure water. If, for instance, the apparatus is arranged near a well, river, lake, or other water-supply, the pipe H' is conveyed into such water-supply, so as to permit of its being drawn through the pipe into the water-tanks. As the water fills the tanks, the float-balls are carried up and the float-valve G caused to close the bottoms of the pipes F . Air is pumped into the reservoir until the desired pressure has been obtained. It is then admitted through the pipe j into either one of the tanks, as may be desired, and permitted to pass into it until the pressure of the tank equalizes that in the reservoir or has become sufficient for the purpose. As the pressure of the air increases in the tank it forces the water down and out through the pipes M , whence it is carried to the place of use. As the water sinks in the tank it presently permits the float-valve G to fall and open the ends of the pipes F , one or the other, as the water may be drawn from one tank or the other. The air under pressure then rushes through such pipe and into the cylinder behind the piston-head. This causes the piston-head to move along the cylinder, forcing the opposite piston-head and piston-rod back. As the piston-rod moves forward with the piston-head it turns the two-way valve K , so that the pipes j become closed and prevent the admission of further air, while the pipes L , connected with it, become open and permit the air to be drawn out of the tank and again carried back through the pump into the reservoir; but while this operation has taken place the forcing of the opposite piston head and rod back has served to turn the valve K in the other tank, so as to open the pipe j and close the pipe L , leading to such tank. The air therefore from the reservoir is forced into this tank and carries the water down with it and out through the pipe M , communicating with the tank, as above explained with reference to the tank first emptied. As the air is drawn from the tank first emptied, the water again begins to flow into it through the pipe H , so that by the time the second tank is emptied the first tank is again filled. When, therefore, the float-valve G is opened in the second tank and the air admitted through the pipe F behind the piston-head that was first pushed back by the other, it in turn will be caused to advance and push the other piston head and rod back. In this way the valves of the two tanks will be constantly and auto-

5 matically opening and closing successively, and at the same time the water will be alternately forced from one tank and then the other. This operation of alternately filling
10 each tank with water and then air in constant succession will continue indefinitely as long as the air is forced by the pump into the reservoir, so that the flow of the water will be uninterrupted and continuous.

10 What I regard as new, and desire to secure by Letters Patent, is—

1. In a water-lifting apparatus, the combination of two tanks adapted to receive water, a cylinder connecting the tanks, piston heads
15 and rods movable back and forth in the cylinder, pipes through which air may be alternately forced into the one tank while it is drawn from the other, pipes through which water may be alternately admitted into the one tank
20 while it is drawn from the other, valves in the air-pipes, with stems connected to the rods of the piston-heads to be operated by the move-

ments of the piston-heads, and valves opening into the cylinder behind the piston-heads, automatically closing alternately as the tanks
25 fill with water and opening alternately as the tanks fill with air, substantially as described.

2. In a water-lifting apparatus, the combination of two tanks adapted to receive water, a cylinder connecting the tanks, piston heads
30 and rods moved back and forth in the cylinder as the air is forced into the one tank or the other, vents opening into the cylinder behind the piston-heads, valves for closing the vents, a carriage moved back and forth with
35 the piston-rods, and trips arranged on the carriage to engage with and lift the valves and open the vents at a certain point as the carriage is moved back and forth, substantially as described.

ISAAC T. DYER.

Witnesses:

THOMAS A. BANNING,
GEORGE S. PAYSON.