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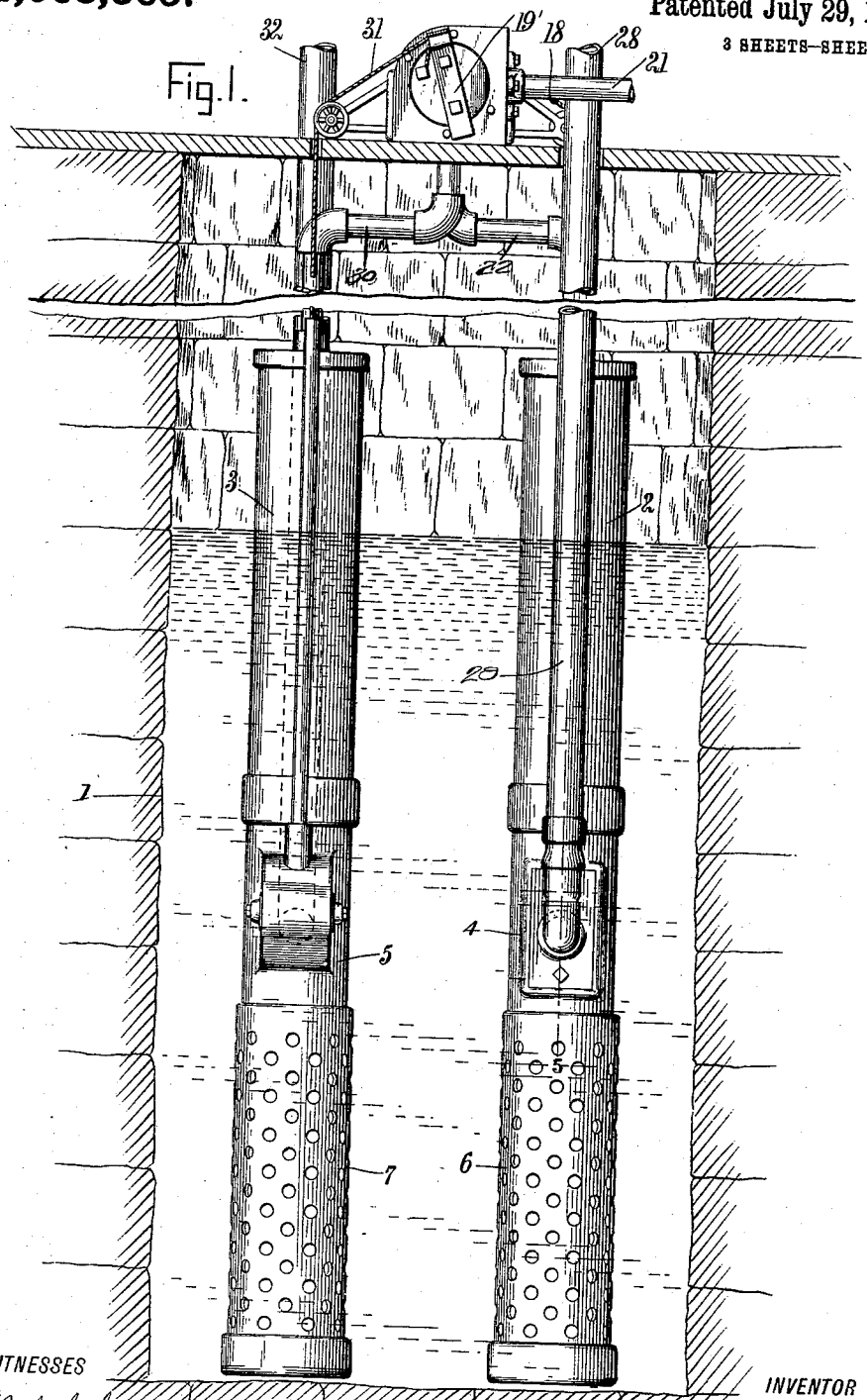
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1,068,865.

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3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

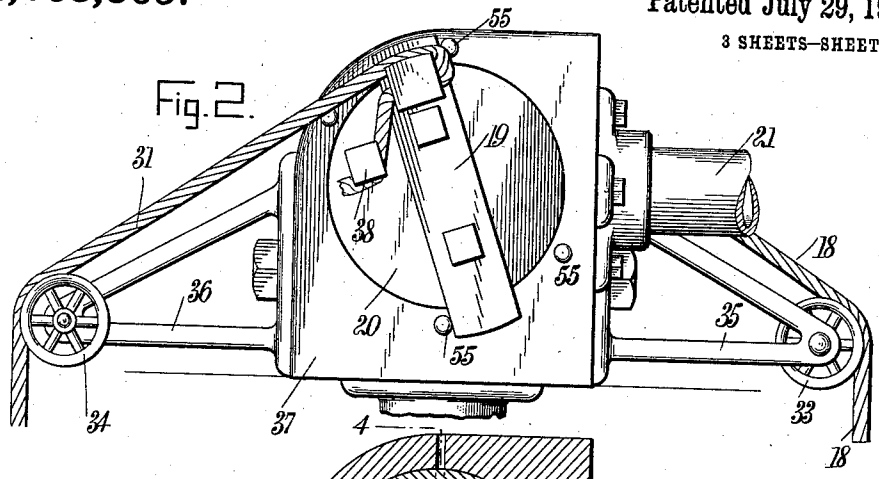


Fig. 3.

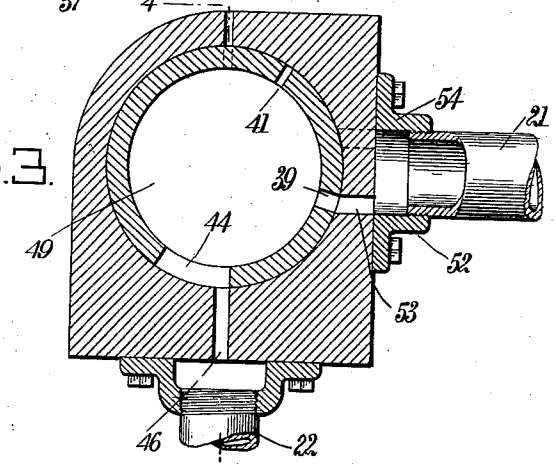
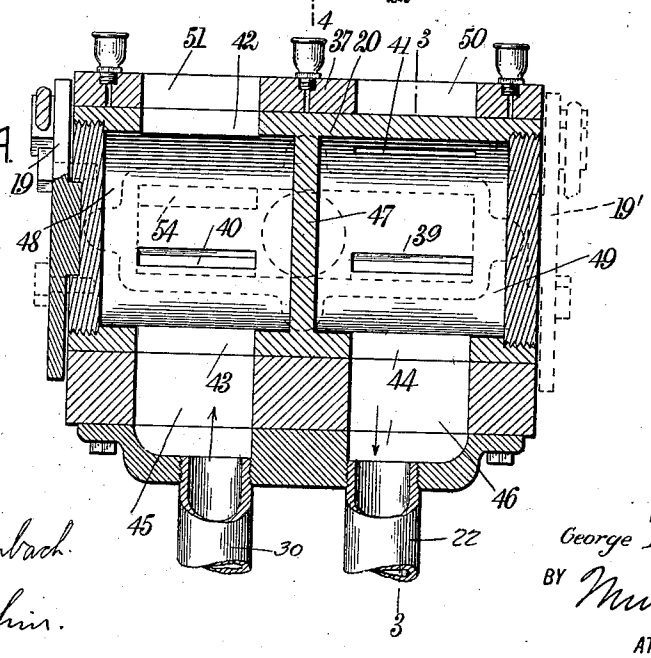


Fig. 4.



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3 SHEETS—SHEET 3.

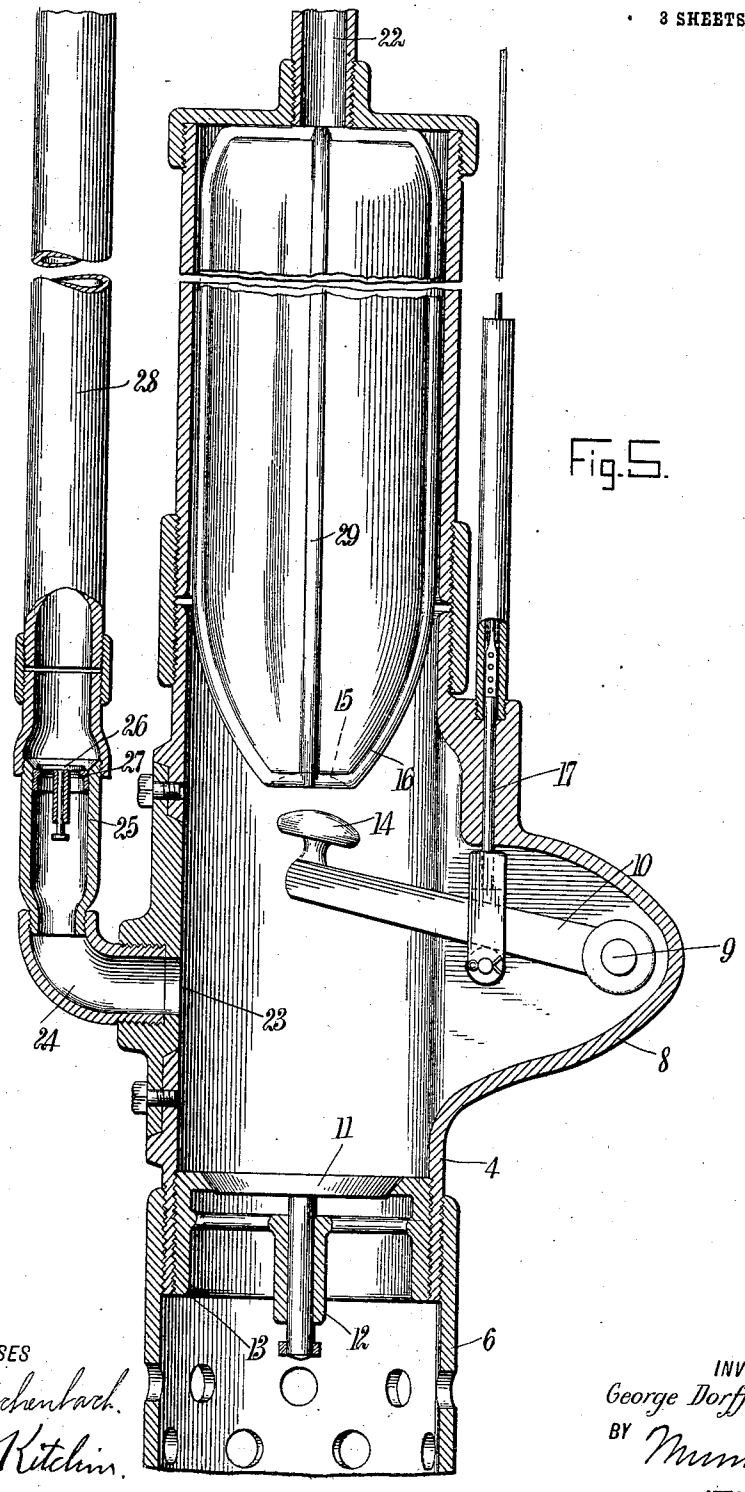


Fig. 5.

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1,068,865. Specification of Letters Patent. Patented July 29, 1913.

Application filed December 30, 1911. Serial No. 668,653.

To all whom it may concern:

Be it known that I, GEORGE DORFFEL, a citizen of the United States, and a resident of Oakland, in the county of Alameda and State of California, have invented a new and Improved Pump, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved pump structure designed to utilize air as the motive power, and to be automatically operated thereby continuously as long as the water is permitted to flow.

Another object of the invention is the arrangement of improved means for pumping from shallow wells, rivers, and the like, the structure being such as to properly operate as long as there is a supply of water.

A still further object of the invention is an arrangement in a water pump of means for utilizing air for propelling the various moving parts of the pump with the expenditure of a minimum amount of power and with a loss of a minimum amount of air.

In carrying out the objects of the invention a pair of tubular members are provided formed with apertures in the lower part thereof for the admission of water. These tubes are arranged to be entirely submerged or almost entirely submerged, so that a float positioned in each of the tubes will be raised by the water entering therein under certain circumstances. These floats are arranged to co-act with a valve operating mechanism for turning on and off power in order that the water may be pumped or forced from the pipes alternately, and that the operation may be automatic. The pumping mechanism is adapted to be operated by air pressure which is alternately turned on to the pipes for forcing the water therein outward through suitable discharge members, one pipe and associated devices operating for discharging water during the time that the other pipe and associated devices are operating for taking in a new supply of water.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a front elevation of a pump embodying my invention, the same being shown in position in a well; Fig. 2 is an enlarged side view of the air-controlled mechanism; Fig. 3 is a section through Fig. 4 on the line 3—3 thereof; Fig. 4 is a longitudinal vertical section through the air controlled mechanism, the same being taken approximately on the line 4—4 of Fig. 3; and Fig. 5 is an enlarged fragmentary vertical section through the center of one of the water receiving pipes, together with associated devices, the same being taken approximately on the line 5—5 of Fig. 1.

In using or applying a pump formed according to my invention, the same may be supported in any desired manner, as for instance, by having the pump rest on the bottom of a well, the bottom of a river, lake, or other place containing water which is desired to be removed. In the accompanying drawings, Fig. 1 shows the pump arranged in a well 1, having a sufficient quantity of water for almost submerging the pipes 2 and 3. The pipes 2 and 3 have connected therewith auxiliary pipes 4 and 5 which carry perforated water receiving pipes 6 and 7, all of these pipes being approximately of the same size. Each of the intermediate pipes 4 and 5 is provided with an enlargement or bulged portion 8 for accommodating a bolt 9 and operating lever 10, which is pivotally mounted on the bolt 9. The ends of the bolt 9 may be held in place by nuts or other suitable means, and any desired packing may be used for preventing the escape of air or water around the bolt.

Referring more particularly to Fig. 5, it will be seen that arranged in the intermediate pipe 4 is a valve 11 which is designed to seat itself by gravity and to be guided by a spider 12 formed integral with a sleeve 13 threaded into the lower end of the intermediate pipe or section 4. The lever 10 is also located in the pipe 4 and carries at its front end a bearing knob 14 designed to fit into a depression 15 in the float 16. By this means whenever the float 16 moves downward under the action of gravity the same will engage the knob 14 and depress the lever 10. This will cause a downward movement of a rod 17 and a cable 18, which is connected with a valve controlling lever 19. The movement of the cable 18 and the lever 19 will cause a partial rotation of the valve 20 as the lever 19 is permanently rigidly bolted to the valve. When this occurs the air will pass from the air supply pipe 21 into the valve 20 and thence to pipe 22. The pipe 22 is connected to the upper part of the

pipe 2 so that the air will pass on downward and press against the water in the pipe 2 and also the water in the intermediate pipe 4, until practically all of the same escapes out through an opening 23 into a pipe 24. From the pipe 24 the water passes upward into a valve casing 25 and raises a valve member 26. The valve member 26 normally rests on a spider 27 for preventing any water in the discharge pipe 28 from escaping. When the water is forced upwardly through the casing 25 the same may freely raise the valve member 26 and pass upward into the discharge pipe 28 and from thence outward to any desired point. In case the float 16 is pressing tightly against the top of the pipe 2, the air will move the same downward slightly until it can escape around the float. In order to facilitate this action by the air, the float is formed with beads or fins 29 for providing a space between the body of the float and the walls of the pipe 2. It should be understood that there is a float 16 arranged in each of the intermediate sections 4 and 5, and that when the float 16 is lowered by air forcing water out of the intermediate pipe 4 the lever 10 will be operated for shifting the arm 19 in order that the air may be turned off from the pipe 2 and turned on the pipe 3. The air controlled mechanism shown in Figs. 2 to 4, inclusive, is constructed and arranged as hereinafter fully described, for opening pipe 22 to the atmosphere at substantially the same time that a pipe 30 connected with pipe 3, is connected with the air supply pipe 21. Immediately upon connecting the pipe 22 with the exhaust or with the atmosphere, water will rush through the openings in pipe 6 and pass upward into the intermediate section 4 and also into section 2, lifting valve 11. The water will continue to pass into the pipe 2 until the float 16 has moved upward and engaged the top of pipe 2, or until the water has raised to its own level. If the pipe 2 is submerged then the water will pass upward to the top of pipe 2, and if the float 16 is not tightly engaging the top of the pipe the water will continue to move upward through pipe 22 until it has reached its normal level. Of course when the air is turned into pipe 22 the same will force the water therefrom downwardly through pipe 22, and finally out pipe 24. The float in the intermediate section 4 is designed to operate the cable 18 and the float in the intermediate section 5 is designed to operate a cable 31, these floats acting alternately for shifting the valve 20 from one position to another in order that water may be forced alternately out of discharge pipes 28 and 32. The discharge pipes 28 and 32, if desired, may be joined or united in order to provide a discharge having a continuous stream. The cables 18 and 31 are guided by suitable pulleys 33 and 34 mounted in brackets 35 and 36 bolted or otherwise rigidly secured to the cylinder 37 in which the valve 20 moves.

In providing the levers 19 and 19′, the same are arranged to overlap the ends of the valve 20 so as to bear against the ends of the cylinder 37 and thus prevent a longitudinal movement of the cylinder, though permitting, and in fact causing a partial rotary movement thereof when the pump is operating. Each of the levers 19 and 19′ is provided with a pair of apertures through which the ends of the cables 18 and 31 are passed for anchoring the cables to the levers. The ends of the cables may, if desired, be clamped by suitable bolts 38 for insuring against accidental removal.

The valve 20 is provided with intake ports 39 and 40, and exhaust ports 41 and 42. The valve 20 is also provided with combination intake and exhaust ports 43 and 44 registering with ports 45 and 46, which in turn register with the pipes 22 and 30 respectively. By this construction the pipes 22 and 30 are in continuous communication with the interior of the valve 20 notwithstanding the fact that the valve 20 oscillates back and forth for part of a revolution. To accomplish this the ports 43 and 44 are made comparatively long and the valve 20 is limited in its rotation in order not to shut off either of the ports 45 or 46. In order to prevent confusion and to cause the proper operation of the valve, the same is divided by a partition 47 into chambers 48 and 49, as clearly shown in Fig. 4. In addition to the ports just mentioned, there are provided exhaust ports 50 and 51 in the cylinder 37. The same are designed to register alternately with the ports 41 and 42. As the valve is shown in Figs. 3 and 4, the pipe 22 is exhausting into the valve and then out at port 51, and the pipe 30 is receiving compressed air. The air supply pipe 21 is threaded into a fitting 52 which acts in the capacity of an air chest, and it supplies ports 53 and 54 with air under pressure. The port 53 is designed to register with the port 39 when the valve 20 is in one position, and the port 54 is designed to register with port 40 when the valve 20 is moved to another position, the movement of the valve 20 being limited by a plurality of stops or pins 55 secured to the cylinder 37 and arranged to engage the lever 19′.

After the pump has been placed in the well as shown in Fig. 1, and properly connected up, air under pressure is supplied to pipe 21 from any desired source. When the valve 20 is in the position shown in Figs. 3 and 4 the air will pass from pipe 21 into valve 20 and from thence through ports 44 and 46 into pipe 30. The air will move down through pipe 30 until the same engages the water in the pipe 3. If the pres-

sure of air is sufficiently strong, the water will be forced downward and out of the discharge pipe 32. As the water moves downward in the pipe 3 and intermediate pipe 5, the float arranged therein will be lowered by gravity until the same engages knob 14, whereupon it will act upon the lever 10 and pull in a downward direction on the cable 31. This will cause valve 20 to be shifted so that air will pass in from pipe 21 to chamber 48 through the intake port 54, and from thence downward through pipe 22 into pipe 2. The air will act on the water in the pipe 2 and force the same downward and finally out the discharge pipe 28. While this is taking place the air in pipe 3 and pipe 30 is being exhausted at ports 41 and 50, the motion of the valve 20 causing these ports to register at the same time that ports 54 and 40 register. When the float 16 in the air pipe 4 depresses the arm 10 therein, the air will be cut off from pipe 22 and switched on to pipe 30 and pipe 22 will be opened to the atmosphere for permitting the same to exhaust. By this construction and arrangement the device operates automatically and only a minimum amount of air is permitted to escape. It will also be observed that the device will operate equally well in deep water or shallow water, provided the water is sufficient to cover or almost cover the upper ends of pipes 2 and 3. The valve 26 arranged in pipes 28 and 32 prevents any back flow of water, while the intermediate sections 4 and 5 are taking in a new supply.

In arranging the exhaust ports 41 and 42, 50 and 51, the same are arranged approximately twice the size needed, but are so set as to normally open only for half their distance. This construction and arrangement is provided so as to take up any loose motion or slackness in the cables or connected parts. In case there was some loose motion the exhaust ports would simply open a little wider rather than to close or partially close, as would be the case if the ports were not larger than absolutely necessary.

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

1. In an air operated pump, means for guiding air to the pump, an air valve formed with means for alternately switching on and off said air and connecting and disconnecting the pump with an exhaust, a pair of receptacles connected with said air valve for alternately receiving compressed air, a water intake valve for each of said receptacles, a discharge pipe connected with each of said receptacles, a float positioned in each of said receptacles above said intake valves, each of said floats being formed with ridges thereon for positively spacing the floats from the sides of the receptacles in order to permit water and air to freely circulate around the floats and allow a free action of the floats whereby the buoyancy of the floats and the action of gravity are utilized, and means operable by each of said floats for shifting the position of said air valve in order that when one of the floats is moved downwardly by reason of the discharge of water from the surrounding receptacle the air valve will be shifted for switching the compressed air to the other receptacle and open the first mentioned receptacle to the atmosphere for permitting the entrance of a new supply of water.

2. In a pump, a plurality of tubes for receiving water, discharge pipes extending therefrom and a valve for directing air under pressure alternately to said tubes and for alternately exhausting said tubes whereby the water in the tubes is alternately forced out of said discharge pipes, said valve comprising a rotating tubular member divided into a plurality of chambers, a plurality of intake and exhaust ports formed in said valve and a pair of continuously open ports, a housing for the tubular member formed with a pair of ports continuously open and registering with said tubes and with the continuously open ports of said rotating member and a pair of inlet ports alternately registering with the ports in said chambers whereby compressed air is alternately supplied to said chambers and said tubes, and said chambers and said tubes are alternately connected with an exhaust port.

3. In a pump, a pair of tubes formed with an opening in the lower ends thereof, an intake valve arranged in each of said tubes above said opening designed to permit the free entrance of water into the tubes, but prevent the escape of water from the tubes, a discharge pipe connected to each of said tubes above said intake valves, a pivotally mounted lever arranged in said tubes above said intake valve, a rod slidably connected with each of said levers and operated thereby, a float arranged in each of said tubes and engaging said levers for depressing the levers when the water is forced out of the tubes into said discharge pipes, an air valve for switching compressed air to said tubes, and means connecting said rods with said air valve whereby said rods alternately shift the position of said air valve for causing the alternate exhaust of said tubes and the supplying of the tubes with compressed air whereby the water in said tubes is alternately discharged out of said discharge pipes, said valves and said floats permitting a recharging of the tubes each time the tubes are exhausted.

4. In a pump, a pair of alternately operating pumping members, means for directing compressed air to said pumping members and a valve interposed in said means for controlling the action of said air, said valve

comprising a housing and a rotating valve member, said housing being formed with a pair of ports in continuous communication with said pumping members and with a pair of ports in continuous communication with the compressed air supply, said rotating valve member being formed with ports in continuous communication with said first mentioned ports in said housing and with ports alternately in communication with said second mentioned ports in said housing and with a pair of exhaust ports in alternate communication with the atmosphere whereby compressed air is alternately supplied to said pumping members and alternately connected with an exhaust.

5. In an air operated pump, means for guiding air to the pump, a valve formed with means for alternately switching on and off said air and connecting and disconnecting the pump with an exhaust, a pair of receptacles connected with said valve which are alternately supplied with air under pressure and alternately open to the atmosphere, a valve arranged near the bottom of each of said receptacles for permitting the free admission of water into the receptacles, but preventing the escape of water therefrom, a discharge pipe connected with each of said receptacles above said valves, a float positioned in each of said receptacles above said valves formed with ridges thereon for positively spacing the float from the sides of the receptacles in order to permit water and air to freely circulate around the floats, and means operable by each of the floats for shifting the position of said valve in order that when one of the floats is moved downwardly by reason of the discharge of water from the surrounding receptacle, the valve will be shifted for switching the compressed air to the other receptacles and opening the first mentioned receptacle to the atmosphere for permitting the entrance of a new supply of water.

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

GEORGE DORFFEL.

Witnesses:
BIRDIE P. ZOBEL,
E. M. SHAW.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."