

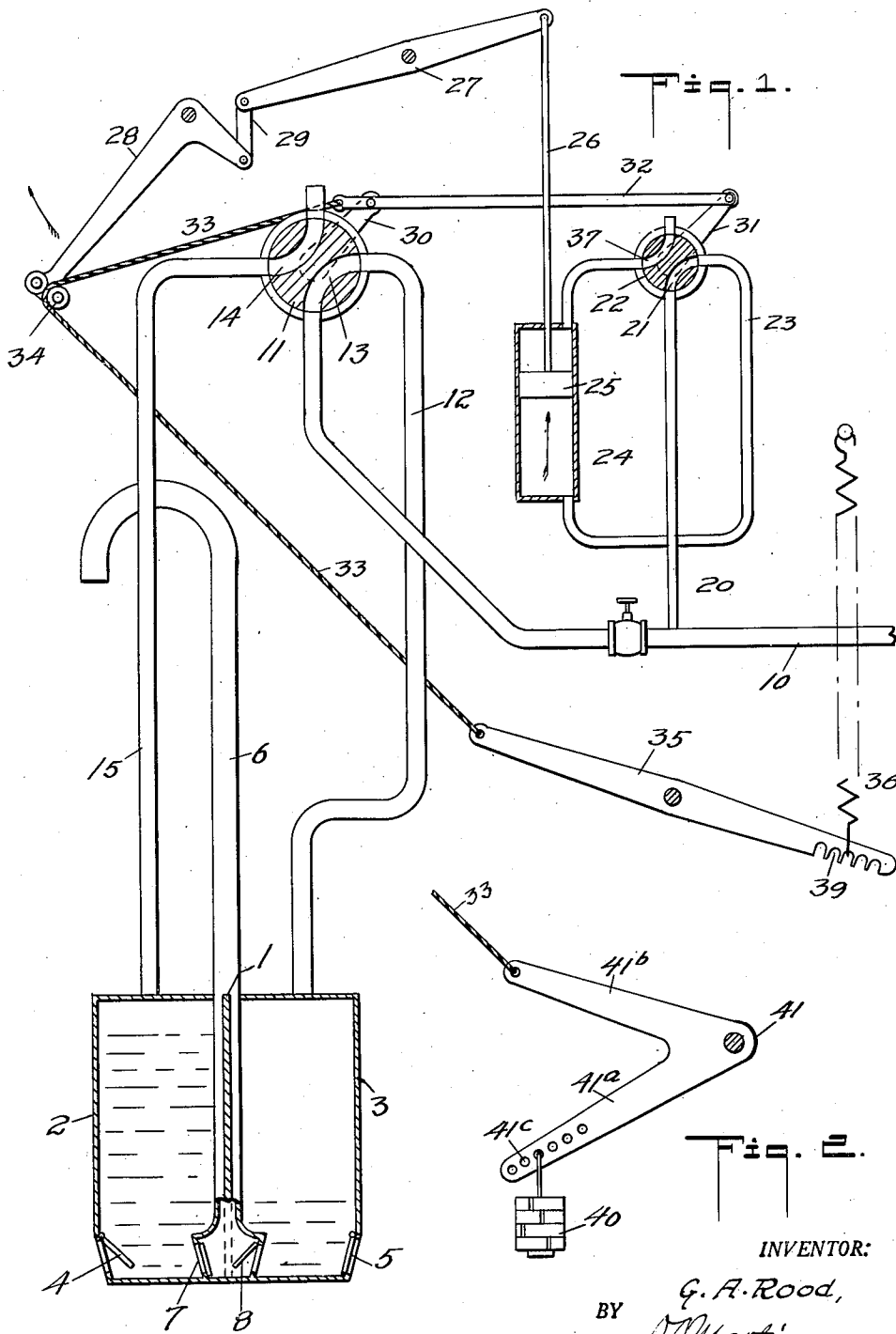
May 31, 1949.

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2,471,498

PNEUMATICALLY OPERATED PUMP

Filed Jan. 12, 1946



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UNITED STATES PATENT OFFICE

2,471,498

PNEUMATICALLY OPERATED PUMP

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Application January 12, 1946, Serial No. 640,872

4 Claims. (Cl. 103-238)

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This invention relates to a device actuated and controlled by compressed air to force water from submerged tanks and discharging the water in a substantially continuous stream at a higher elevation.

It is the general object of my invention to provide a pumping device of the class referred to of simple and economical construction and entirely automatic in its operation. To this end, the invention resides in the combinations hereinafter described in detail and illustrated in the accompanying drawings of which:

Fig. 1 shows diagrammatically the devices which combine to form the invention; and

Fig. 2 is a detail view showing a modification of some parts of the device and the way in which they may be arranged in relation to each other so as to form an operative combination.

A submerged tank is by a partition 1 divided into two compartments, 2, 3. At the bottom of each compartment is an inlet valve 4, 5 and a discharge pipe 6 rises through the two compartments to the position at which it is required to discharge the water from the tank. The pipe 6 is at the bottom thereof made with an inlet from each compartment and check valves 7, 8 are seated in these inlets to prevent return flow into the two compartments.

Air under pressure from any convenient source flows through a conduit 10, a valve 11, and a conduit 12 to the top of the compartment 3, thereby to force water from the compartment through the discharge pipe 6. It is to be noted that the pressure forces the valves 5 and 7 to close.

The valve 11 is of the four-way type having in addition to the passage 13, through which the air flows to the compartment 3, a second passage 14. The compartment 2 communicates through an opening at the top thereof, a conduit 15 and the passage 14 with the atmosphere. The mechanism which will now be described is designed to turn the stem of this valve counterclockwise to connect the compartment 3 with the atmosphere and the compartment 2 with the compressed air conduit at the time the descending water level within the compartment 3 approaches the valves 5 and 8. When so connected, it is found that the air pressure against the water within compartment 2 instantly closes valves 4 and 8 and causes the water therein to rise through the discharge pipe 6. And, as the compartment 3 now is in communication with the atmosphere, it is seen that water is free to enter through the valve 5 to

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refill the compartment, while the pressure within chamber 2 maintains valve 7 closed.

A pipe 20 carries air under pressure through a passage 21 of a smaller four-way valve 22 and a pipe 23 to the bottom of an air cylinder 24, causing the piston 25 thereof to rise and, by means of the piston rod 26, to swing a lever 27 on its fulcrum. Adjacent this lever is hung a bellcrank 28, one end of which by a link 29 is operatively connected with the lever 27. On the stems of the two four-way valves are secured arms 30, 31 and a link 32 interconnects these arms for simultaneous movement. A cable or chain 33 extends from this link over a pulley 34 of the bellcrank to one end of a lever 35 and the latter is by a suitable means, such as a spring 36, urging the lever to swing on its fulcrum in counterclockwise direction.

Upon careful examination of the connections just described it is seen that the upward movement of the piston 25 imparts clockwise rotation of the bellcrank 28 on its fulcrum to draw the cable 33 upward, thereby gradually to increase the tension of the spring 36. This movement continues until the piston approaches the upper end of the cylinder 24, at which time the tension of the spring 36 becomes sufficient to overcome the inertia and frictional resistance of the valve stems and to swing the lever 35 on its pivot, thereby to turn the stems counterclockwise. In doing this, it is seen that the valve passage 37 is moved to connect the air pipe 20 with the upper end of the cylinder and that at the same time communication is established from the bottom of the cylinder, through the pipe 23 and passage 21, to the atmosphere.

The piston now commences to move downward, thereby to return the bellcrank to its initial position, with the result that the spring 36 again is put under sufficient tension to snap the valve stems back to their former position and so again to reverse the valves.

It is most important so to adjust the tension of the spring 36 that it will quickly reverse the valves at the proper time, and this may be done by providing a series of notches 39 in the end of the lever 35 and by moving the spring from notch to notch until the desired result is obtained.

In some cases, it may be found more convenient to substitute a counter weight 40 for the spring 36, as indicated in Fig. 2. The lever 41 may be similar to the lever 35, except that the end 41a thereof on which the weight 40 is hung extends downward on the same side of the lever fulcrum that the upper end 41b is placed. In this manner, it is seen

that the force exerted by the weight increases as the lever is caused to swing clockwise until sufficient to reverse the position of the valves. Instead of a single weight, it may be preferable to provide a series of weights, as shown, and the lever is made with a number of perforations 41c for additional adjustment of the parts.

From the foregoing description it should be apparent to anyone conversant with the art that I have provided a very simple and economical pneumatically operated device for delivering water from a submerged basin to a higher elevation in a substantially continuous stream.

I claim:

1. In a fluid pressure operated pump, the combination with a tank vertically divided into two chambers and having a water inlet passage to each chamber, a discharge pipe, an outlet passage from each chamber to said pipe, check valves in all of said passages preventing return flow therethrough and a conduit for pressure fluid, of a main valve having two positions, one for carrying pressure fluid to one chamber and the other for admitting pressure fluid to the other chamber, means alternately moving the valve back and forth to the two positions, a control valve having two positions, means interconnecting the two valves for simultaneous movement, a closed cylinder, pipes leading from the ends thereof to the said control valve, a power-controlled connection to said main valve, a piston within said cylinder extending to said connection, and a pipe from said pressure fluid conduit to carry pressure fluid from said control valve to one end of said cylinder or the other, thereby to move said piston gradually to increase the power of said connection until sufficient to throw said valves from one position into the other.

2. In a fluid pressure operated pump, the combination with a tank vertically divided into two chambers and having a water inlet passage to each chamber, a discharge pipe, an outlet passage from each chamber to said pipe, check valves in all of said passages preventing return flow therethrough, of a main valve, a conduit for pressure fluid from said valve to one chamber or the other, means alternately moving the valve back and forth to open a passage through one conduit or the other, said means comprising, a control valve, an adjustable power-controlled connection to said two valves, and fluid pressure actuated means for gradually increasing the force exerted against said connection as pressure fluid displaces the water within one chamber until sufficient power is generated to move the valves from one position into the other.

3. In a fluid pressure operated pump, the combination with a tank vertically divided into two

chambers and having a water inlet passage to each chamber, a discharge pipe, an outlet passage from each chamber to said pipe, check valves in all of said passages preventing return flow therethrough, a conduit for pressure fluid, of a main valve having two positions, one for carrying pressure fluid to one chamber and the other for admitting pressure fluid to the other chamber, means alternately moving the valve back and forth to the two positions, a control valve having two positions, means interconnecting the two valves for simultaneous movement, a closed cylinder, pipes leading from the ends thereof to the said control valve, an adjustable power-controlled connection to both of said valves, a piston within said cylinder extending to said connection, and a pipe from said pressure fluid conduit to carry pressure fluid from said control valve to one end of said cylinder or the other, thereby to move said piston gradually to increase the power of said connection until sufficient to throw said valves from one position into the other.

4. In a fluid pressure operated pump, the combination with a tank vertically divided into two chambers, and having a water inlet passage to each chamber, a discharge pipe, an outlet passage from each chamber to said pipe, check valves in all of said passages preventing return flow therethrough and a conduit for pressure fluid, of a main valve having one position for carrying pressure fluid through said conduit to one chamber and another position for admitting pressure fluid to the other chamber, a control valve, means interconnecting the two valves for simultaneous movement, a lever, a flexible connection from said lever to the said valve interconnecting means, a power means urging movement of said lever in one direction, a closed cylinder, pipes from the end of said cylinder to said control valve, a piston in said cylinder extending to said lever, and a pipe from said pressure fluid conduit to carry fluid from said control valve to one end of said cylinder or the other thereby to move said piston gradually to increase the force exerted by said power means sufficiently to move the said lever to throw the valves from one position to the other.

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