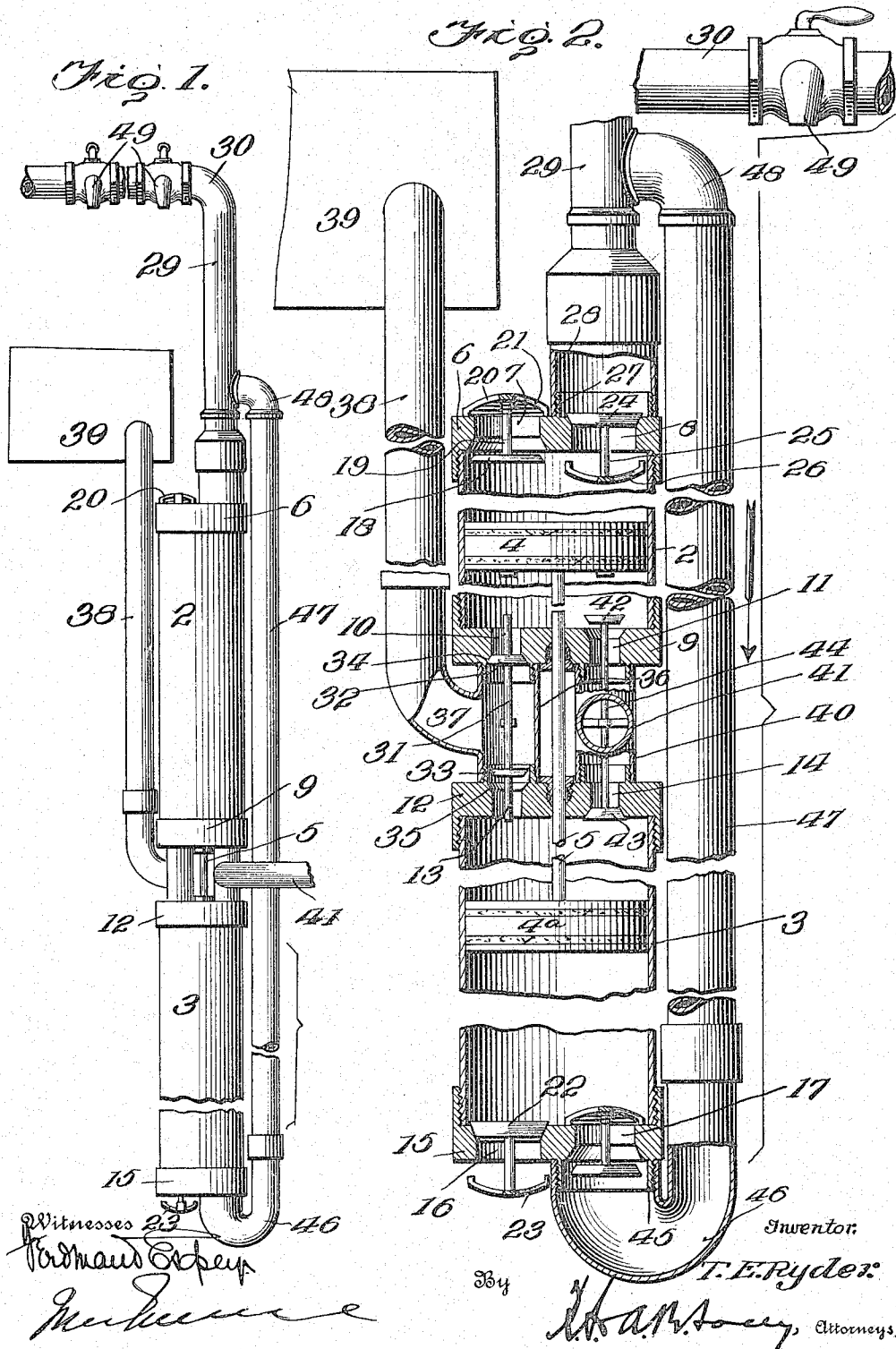


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UNITED STATES PATENT OFFICE.

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AUTOMATIC PNEUMATIC PUMP.

1,129,362.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, THOMAS E. RYDER, a subject of the King of Great Britain, residing at St. John, Province of New Brunswick, Dominion of Canada, have invented certain new and useful Improvements in Automatic Pneumatic Pumps, of which the following is a specification.

My invention relates to pumps and particularly to pumps designed to be operated by compressed air.

The primary object of my invention is the provision of a pump which is operated by compressed air, or like compressed fluid, but which is automatic in its action so that immediately upon water being withdrawn from the service main or pipe, the pump will automatically start to acting and this pumping action will continue until the discharge of water be cut off.

Another object of the invention is to provide a pump of the character above referred to which shall be simple in construction, have few parts and in which the parts may be readily assembled to form a complete pump.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a side elevation of my improved compressed air water elevator. Fig. 2 is an enlarged vertical section of the elevator.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawing by the same reference characters.

Referring to these drawings, 2 and 3 designate the pumping cylinders which are illustrated in alinement with each other but the adjacent ends of which are spaced from each other. These cylinders may be supported in any suitable manner. Disposed within each cylinder is a piston, these pistons being designated, respectively, 4 and 4^a, the piston 4 being located in the cylinder 2 and the piston 4^a in the cylinder 3. These pistons are connected by means of a piston-rod 5 so that the pistons will move downward or upward together.

The upper cylinder 2, or pumping chamber is closed by a head 6 at its upper end, this head having an inlet port 7 and an outlet port 8. The lower end of the cylinder 2 is closed by means of a head 9 having a

compressed air inlet port 10 and a compressed air outlet or exhaust port 11. The upper end of the cylinder 3 is closed by a head 12 having the compressed air inlet port 13 which is disposed opposite to the compressed air inlet port 10 and having the compressed air outlet or exhaust port 14, disposed opposite the exhaust port 11. The lower end of the cylinder 3 is closed by means of a head 15 having an inlet port 16 and an outlet port 17.

Disposed in the inlet port 7 of the cylinder 2 is the water inlet valve 18. This valve has a beveled edge face adapted to seat against a beveled seat formed in the wall of the port and this valve has a stem 19 and a cross-bar 20 arranged upon the exterior face of the head within which the valve is mounted and disposed between the exterior face of the head and the cross-bar is a spring which acts to force the valve to its seat, the cross-bar or equivalent element 20 acting to limit the inward movement of the valve. The inlet port 16 of the cylinder 3 is likewise controlled by means of a valve 22 which has the same form as the valve 18 and also provided with a spindle which extends through the port and which carries at its outer end the cross-bar 23. This valve is closed by gravity and pressure. No spring is necessary to close the valve but one may be used, if desired. The water outlet port 8 of the cylinder 2 is controlled by a valve of the same character as that used for the port 16. This valve is designated 24 and is provided with a stem 25 and a cross-bar 26. The valve opens outward instead of inward as is the case with the valve 22.

The head 6 surrounding the port 8 is formed with an upwardly extending nipple 27 to which is connected a chamber 28 opening into a discharge T 29 in turn connected with a discharge pipe 30 forming part of a water system.

Passing through the ports 10 and 13 is a spindle 31 carrying upon it the valves 32 and 33. These valves co-act with seats 34 and 35 formed in the heads 9 and 12. The valves are so spaced apart that when the valve 32 is raised against its seat 34 the valve 33 is lifted from its seat 35 and vice versa.

It will be particularly noted that the spindle 31 extends beyond the valves a distance greater than the thickness of the heads 9 or 12, for a purpose to be later

stated. Extending between the ports 10 and 13 and supported on the heads 9 and 12, in any suitable manner is the T 36 having the branch 37 which is connected by an elbow or other suitable means to a vertical pipe 38 which in turn is connected to a compressed air tank 39. This compressed air tank may be located in any suitable position and is designed to be charged with compressed air or other compressed fluid in any suitable manner.

The ports 11 and 14 are connected to each other by means of a T 40 having the discharge branch 41. The ports 11 and 14 are controlled respectively, by means of valves 42 and 43 which seat against the inside faces of the heads 9 and 12. These valves are connected by means of a spindle 44 of such length that when one of the valves are open the other will be closed, the spindle being long enough so that when for instance, the valve 43 is closed the valve 42 is raised above the inner face of the head 9.

The under face of the head 15 is provided with the nipple 45 to which is connected the elbow 46 from which extends a vertical discharge pipe 47 which at its upper end connects with the elbow 48 forming part of the T 29.

The parts being in the position shown in Fig. 2 the operation is as follows:—The pistons 4 and 4^a are supposed to move downward in the direction of the arrow in Fig. 2. The valve 18 will therefore be open and water will be entering into the space between the upper face of the piston 4 and head 6. Exhausted compressed air will fill the space below the piston 4 and this compressed air will be passed out through the port 11 into the exhaust pipe 41. The valve 32 will be closed and the valve 33 will be open, and as a consequence compressed air will pass downward through the pipe 38 and into the cylinder 3 above the piston 4^a and drive this piston downward. Water will fill the space below the piston 4^a and after this piston is forced downward the pressure of the water will hold the valve 22 closed and will open the valve controlling the port 17 and the water beneath the piston 4^a will pass up into the pipe 47. When the pistons arrive at the lower end of the stroke the piston 4 will engage with the valve stem 31 and with the face of the valve 42 and this will act to open the valve 32 and close the valve 33 and also act to close the valve 42 and open the valve 43. This directs the compressed air into the cylinder 2 beneath the piston 4. This compressed air cannot escape through the closed valve 42 so that it will act to force the piston 4 and the piston 4^a upward. The valve 33 being closed and the valve 43 being open the exhausted compressed air will pass through the exhaust port 14 into the T 41. As the

piston 4^a moves upward the outlet valve of the water end of the cylinder 3 will have been closed and the inlet valve 22 will open, allowing water to enter into the cylinder 3 beneath the piston 4^a. When the pistons have reached the upward limit of their movement the inner face of the piston 4^a will strike the valve-stem 31 and the valve 43, thereby opening the valve 33 and closing the valve 43, whereupon compressed air will again enter into the cylinder 3 and cause another stroke of the pump pistons. A constant reciprocation of the pump pistons will thus occur just so long as water is free to pass off by means of the discharge pipe 29 and just so long as the pressure of air within the compressed air tank is sufficient to lift the water. If now a faucet 49 be closed so as to prevent the discharge of water the compressed air pressure and the water pressure will be balanced and the compressed air can no longer force the piston upward and the pump will stop. Immediately, however, upon the opening of the faucet 49 the pressure acting against the compressed air in the tank 39 will be relieved and the compressed air will again start the pump to working.

It will be seen that my invention is very simple, that it is positive in its operation and that it may be easily repaired or replaced when any of the parts become worn.

While I have illustrated what I believe to be the best form of my invention and the one which is particularly compact, I do not wish to be limited thereto as many modifications may be made in the mechanism as illustrated. It will be noted, however, that the pipes and cylinders forming the pump body are connected to each other and that therefore the pumping apparatus with the exception of the compressed air tank may be supported from the main delivery pipe 29 and may be readily inserted into a well or withdrawn therefrom.

Having thus described the invention what is claimed as new is:—

1. In a pumping apparatus, upper and lower pumping cylinders, pistons operating therein, a common piston rod connecting two pistons, a water inlet port at the outer end of each cylinder, an inwardly opening valve controlling each of said ports, a water outlet port at the outer end of each cylinder, an outwardly opening valve controlling each of said outlet ports, discharge pipes connected to said outlet ports, a common delivery pipe to which both of said discharge pipes are connected, compressed air inlet ports disposed opposite to each other and at the adjacent ends of the cylinders, a pipe connecting said ports and communicating with the source of compressed air, a valve-stem disposed within said ports, oppositely positioned valves mounted upon

said valve stem, one for each of said ports, said valves being spaced apart from the stem a distance sufficient to cause one valve to open when the other is closed, the stem being long enough to project beyond the inner face of the head of the cylinder when the corresponding valve is closed, a pipe connecting the compressed air outlet ports in the adjacent ends of the cylinders, a valve-stem passing longitudinally through said ports, and oppositely disposed valves upon said stem, the stem being of sufficient length that when one of said valves is closed the other of the valves will be open, the open outlet valve and the stem of the closed air inlet valve being adapted to be engaged by a corresponding piston thereby to reverse the position of the valves.

2. In a pumping apparatus, upper and lower pumping cylinders, pistons operated therein and having a common piston rod, a water inlet port at the outer end of each cylinder, a water discharge port at the outer end of each cylinder, valves controlling said ports, compressed air inlet ports disposed opposite to each other and at the adjacent ends of the cylinders, a pipe connecting said ports and communicating with a source of compressed air, a valve stem disposed within said ports, oppositely positioned valves mounted upon the valve stem, one for each of said ports, said valves being spaced apart on the stem a distance sufficient to cause one valve to open when the other is closed, the stem being long enough to project beyond the inner face of the head of the air cylinder when the corresponding valve is closed, a pipe connecting the compressed air outlet ports in the adjacent ends of the cylinders,

a valve-stem passing longitudinally through said ports, and oppositely disposed valves upon said stem, the stems being of such length that when one of said valves is closed the other valve will be open, an open outlet valve and the stem of the closed air inlet valve being adapted to be engaged by a corresponding piston thereby to reverse the position of the valves.

3. In a pumping apparatus, pumping cylinders disposed in line with each other, pistons operated therein and having a common piston rod, a water inlet port at the outer end of each cylinder, a water discharge port at the outer end of each cylinder, valves controlling said ports, compressed air inlet ports disposed opposite to each other and at the adjacent ends of the cylinders, a pipe connecting said ports and communicating with a source of compressed air, a valve-stem disposed within the ports, oppositely positioned valves mounted on said stem, one for each of the ports and spaced apart a distance sufficient to cause one valve to open when the other is closed, the stem being long enough to project beyond the inner face of the head of the cylinder when the corresponding valve is closed, and valve controlling means for permitting the escape of compressed air from said cylinder, said valve controlled means operating reversely from the valve controlling the inlet of compressed air to the cylinders.

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

THOMAS E. RYDER. [L. s.]

Witnesses:

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