W. B. MOORE.

LIQUID IMPELLING APPARATUS.

APPLICATION FILED NOV. 4, 1907.

925,012.

Patented June 15, 1909.

2 SHEETS—SHEET 1.

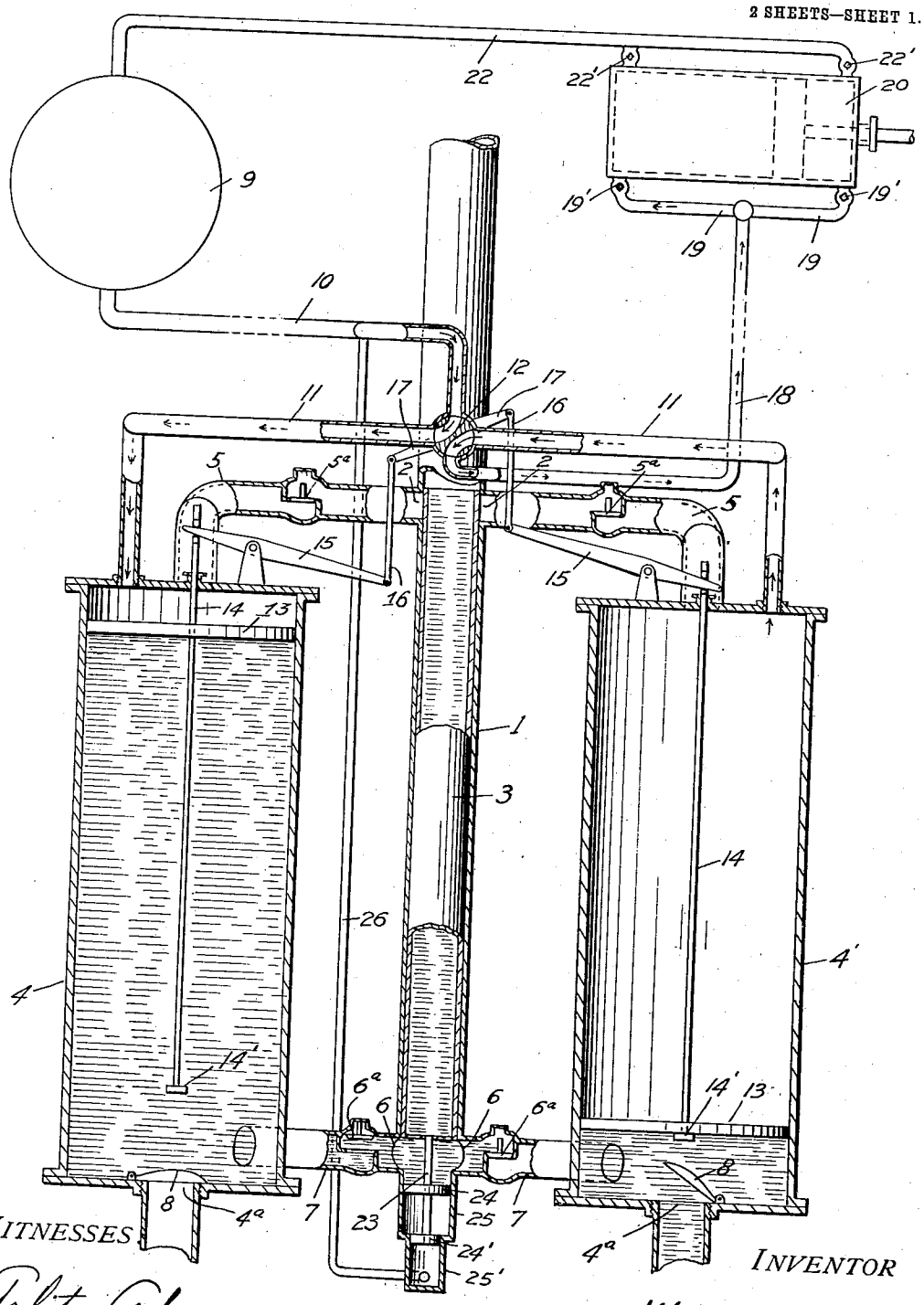

Fig. 1

WITNESSES

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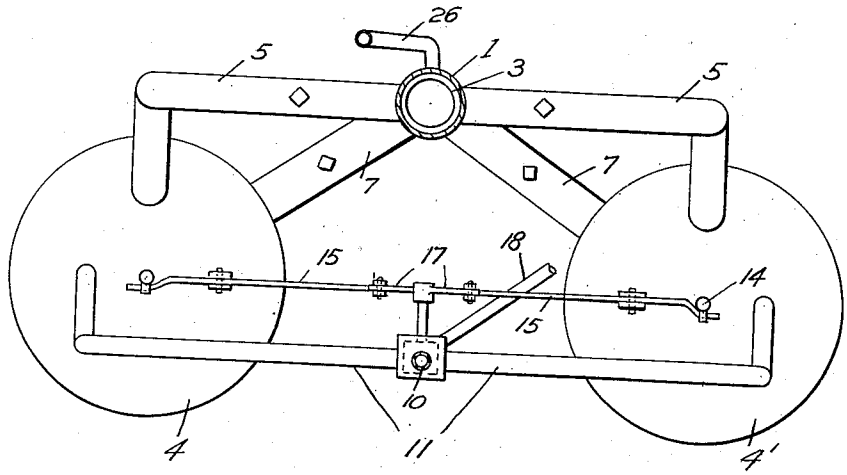
2 SHEETS—SHEET 2.

Fig. 2.



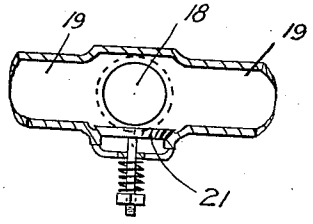


Fig. 3.

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UNITED STATES PATENT OFFICE.

WALTER B. MOORE, OF WALLA WALLA, WASHINGTON.

LIQUID-IMPELLING APPARATUS.

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Application filed November 4, 1907. Serial No. 400,674.

To all whom it may concern:

Be it known that I, WALTER B. MOORE, a citizen of the United States of America, and a resident of the city of Walla Walla, in the county of Walla Walla and State of Washington, have invented certain new and useful Improvements in Liquid-Impelling Apparatus, of which the following is a specification.

My invention relates to improvements in liquid impelling apparatus and aims primarily to provide an improved apparatus of the above character which can be operated in an efficient manner.

A further object resides in the provision of means for normally preventing the ingress of air into the liquid discharge pipe.

With the above and other objects in view to be set forth, as the description progresses, the invention resides in the structural features, arrangements and combinations of parts hereinafter described and succinctly defined in the annexed claims.

Referring now to the accompanying drawings in which like numerals of reference indicate like parts throughout: Figure 1 is a side view of an apparatus embodying my invention, parts being shown in section. Fig. 2 is a top plan view, and Fig. 3 is a detail view in section, on enlarged scale.

In carrying out my invention, I provide a suitable liquid discharge pipe, as 1, to which the fluid under pressure is supplied, and at a suitable distance from its lower end, said discharge pipe 1 is provided with an air inlet means 2.

A valve 3 normally prevents the ingress of air into pipe 1, so that column of water from which the strata are to be obtained, as will later be more fully described, will not be charged with air and filled with bubbles as would be the case were the air permitted to enter in a continuous manner into the liquid discharge pipe. Valve 3, as now considered, is in the form of a hollow tube or cylinder, being open at both ends and being of such length as to, upon being operated, alternately close the air and water inlet ports.

Water or other liquid to be impelled is supplied to pipe 1 from suitable receivers 4, 4′ there being two shown in order that the operation can be a continuous one. Two receivers are however, not absolutely necessary, as will be readily understood.

The air inlet means 2 consists of a pair of ports, clearly shown in Fig. 1, which are connected by pipes 5, each with a respective receiver at the upper portion thereof. The water inlet ports 6 are formed in pipe 1 below ports 2 and are connected by pipes 7 to the lower portions of the receivers.

Receivers 4, 4′ are provided in their bottom walls with inlet ports 4ª through which fluid enters to fill said receivers, said ports being provided with suitable valves, as 8.

Reference numeral 9 indicates a suitable storage tank, supplied with air under pressure, from which a supply pipe 10 leads. Pipe 10 is connected to branch pipes 11, leading each to a respective receiver, and communicating therewith preferably at the upper portions thereof, as illustrated.

At the juncture of pipes 10 and 11, I provide a valve 12 which is suitably ported to, upon being rocked, alternately establish communication between the respective branch pipes 11 and pipe 10, thereby enabling air from tank 9 being discharged first into one receiver and then into the other. Valve 12, as now considered, is controlled by floats 13, slidably mounted on rods 14, in receivers 4, 4′, said floats when having lowered a predetermined distance, engaging stops 14′, on said rods 14, and acting as weights lowering said rods. The movement of rods 14 is transmitted to valve 12 through levers 15 and links 16, the latter of which are connected to arms 17, fixed to said valve.

The ports of valve 12, there being two shown, are arranged to each alternately establish communication between pipe 10 and a respective pipe 11, and then each alternately establish communication between its respective pipe 11 and an exhaust pipe 18.

Pipe 18 is connected with a pair of branch pipes 19 having suitable check valves indicated at 19′, which communicate with a double acting air compressor 20, as shown. At the juncture of pipes 18 and 19, a valve 21, controlling a port communicating with the atmosphere is provided (see Fig. 3). By this construction after the water has been exhausted from a receiver, the air in said receiver is drawn into compressor 20, together with a certain amount of air from the atmosphere, admitted through port controlled by valve 21, and then forced through a pipe 22, provided at 22′ with suitable check valves to tank 9. As air is exhausted from the receivers, water will enter through the inlet ports 4ª thereof, as will be readily understood.

Connected to valve 3, by a stem 23 is a suitable controller comprising pistons 24, 24′ operating in cylinders 25, 25′ of relatively large and small cross sectional areas, the smaller or lower of said cylinders having the piston 24′ therein and being in communication with supply pipe 10 through the medium of a pipe 26 which communicates with cylinder 25′ at the lower portion thereof. Cylinder 25 is arranged beneath discharge pipe 1 and is in communication therewith so as to bear the weight of the water in pipe 1.

Now for example, assuming tank 9 to contain air at 20 pounds pressure, and the ports are arranged as shown, air entering receiver 4 forces the water therefrom into pipe 1 upwardly through valve 3 until the weight of column of water in said pipe is substantially equal to the air pressure, then by reason of the difference in the surface areas of pistons 24, 24′, the pressure of the column of water on the larger of said pistons will overcome the pressure of air exerted on piston 24′, and effect the lowering of valve 3. Valve 3 when lowered closes ports 6 and opens the air inlet ports 2, thereby permitting of the air cutting into the side of the column of water at a suitable distance above its lower end and forcing upwardly the superimposed portion of the column of water. When in pursuance of this operation water is discharged from pipe 1, and the weight of the column of water in pipe 1, thereby reduced, air in cylinder 25′ will again force piston 24′ and the valve 3 upwardly, thereby opening ports 6 and closing ports 2. Water entering again through one of the ports 6 fills the lower portion of pipe 1 to a point above ports 2, when the weight of the water in said pipe 1 will again effect the lowering of valve 3, as hereinbefore described. This operation being continued, pipe 1 will be filled with alternating strata of air and water, thereby enabling the lifting of water to great heights with a comparatively small amount of pressure.

I desire to call particular attention to the function of valve 3, the same preventing air entering discharge pipe 1, until the column of water in pipe 1 rises to a point above the inlet ports 2. By this construction, when air is admitted into pipe 1 it will cut into the side of the column of water and form a solid stratum or piston of air and lift the water lying thereabove for discharge. If valve 3 was omitted and air allowed to flow in a continuous manner into pipe 1, the water about the air inlets would be kept in a constant state of agitation, and a loss of efficiency by air passing through the strata of water, in the form of bubbles, would result.

It will be understood that by the construction described, the air first forces the water through one of the ports 6 into pipe 1 to as great a height as is possible. Then the air is admitted into pipe 1 through one of the ports 2, thereby cutting off the lower portion of the column of water from that to now be lifted for discharge.

Suitable check valves as 5ª, 6ª are provided in pipes 5 and 6 when two receivers for the liquid, are employed.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States of America, is:

1. An apparatus of the character described comprising a discharge pipe formed with an air inlet, means communicating with said pipe at one side of the air inlet thereof for supplying the same with a liquid, means for discharging air under pressure into said pipe through the air inlet thereof, and a valve in said pipe normally preventing ingress of air, said valve being formed to permit of the liquid passing through the same while preventing ingress of the air, for the purpose specified.

2. An apparatus of the character described comprising a liquid discharge pipe provided with an air inlet and a liquid inlet, a valve arranged in said discharge pipe for normally closing the air inlet thereof, said valve being formed to allow liquid passing through the same, and controller means for said valve connected to be operated one way by air under pressure and operated the other way by the liquid in said discharge pipe.

3. An apparatus of the character described comprising a liquid discharge pipe provided with an air inlet and a liquid inlet, a valve means arranged for alternately opening one of the inlets of said discharge pipe and closing the other, and means for operating said valve means.

4. An apparatus of the character described comprising a liquid discharge pipe provided with an air inlet, a hollow valve open at both ends supported in said pipe for vertical movement, said pipe being provided at a point below the air inlet thereof with a liquid inlet, and means for raising and lowering said valve to open and close said air inlet.

5. An apparatus of the character described comprising a liquid discharge pipe formed with an inlet in communication with a source of liquid supply, said discharge pipe being formed with an air inlet above said first named inlet thereof, means for supplying air under pressure through the last named inlet of said discharge pipe, a valve means slidably arranged in said discharge pipe for alternately opening and closing the said inlets thereof, said valve means being formed to allow the liquid to pass above the same, a piston secured to said valve means and arranged to be acted upon

by the liquid in said discharge pipe for lowering said valve means, and means for elevating said valve means, for the purpose specified.

6. An apparatus of the character described comprising a liquid discharge pipe formed with an inlet, a receiver for the liquid in communication with the inlet of said discharge pipe, said discharge pipe being provided with another inlet at a point above the first named inlet thereof, a pipe leading from said receiver to the last named inlet of said discharge pipe, means for supplying said receiver with air under pressure, a valve means supported in said discharge pipe for sliding, whereby to alternately open and close the respective inlets of said discharge pipe, and means for operating said valve means.

7. An apparatus of the character described comprising a liquid discharge pipe provided with air and liquid inlets, the air inlet being disposed above said liquid inlet, a receiver for the liquid in communication with the liquid inlet of said discharge pipe, a pipe leading from said receiver to the air inlet of said discharge pipe, means for supplying air under pressure to said receiver, a vertically slidable valve means in said discharge pipe for alternately opening and closing the inlets thereof, being arranged to close one of said inlets while the other is left open, a casing in communication with said discharge pipe at the lower portion thereof, a piston in said casing connected to said valve means, a second casing, a piston in said last casing connected to said first named piston for movement therewith, and means for conveying air from said air supply means and directing the same for discharge in said last named casing, for the purpose specified.

8. An apparatus of the character described comprising a liquid discharge pipe provided with air and liquid inlets, the air inlet being disposed above said liquid inlet, means in communication with said liquid inlet for supplying said pipe with liquid, means for supplying air under pressure for discharge into said pipe through the air inlet thereof, a valve for normally preventing ingress of air into said pipe, a casing in communication with said liquid discharge pipe, a piston in said casing connected to said valve, a second casing, a piston in said last named casing connected to said first named piston for movement therewith, and a pipe leading from said supply means for conveying air and directing the same for discharge into said last named casing.

9. An apparatus of the character described comprising a discharge pipe formed with an air inlet, means communicating with said pipe at one side of the air inlet thereof for supplying the same with a liquid, means for discharging air under pressure into said pipe through the air inlet thereof, and a valve in said pipe seated against the wall thereof to normally close said air inlet while permitting of the liquid passing upwardly past the same.

10. An apparatus of the character described comprising a discharge pipe formed with an air inlet, a valve for normally closing said air inlet arranged to have said pipe constitute a casing therefor, means for directing air under pressure for discharge into said pipe through said air inlet thereof, and liquid supply means communicating with said pipe below the said air inlet thereof.

11. An apparatus of the character described comprising a discharge pipe formed with air and liquid inlets arranged one above the other, means for directing air under pressure for discharge through the air inlet of said pipe, a liquid supply means communicating with the liquid inlet of said pipe, a valve for controlling the discharge of air into said pipe, a casing in communication with the lower portion of said pipe to receive liquid therefrom, a piston slidably supported in said casing arranged to be lowered by the weight of the water in said pipe, means connecting said valve with said piston for operation thereby, and means for elevating said piston.

Signed at Seattle, Washington, this 19th day of October 1907.

WALTER B. MOORE.

Witnesses:
ARLITA ADAMS,
E. W. CRESSMAN.