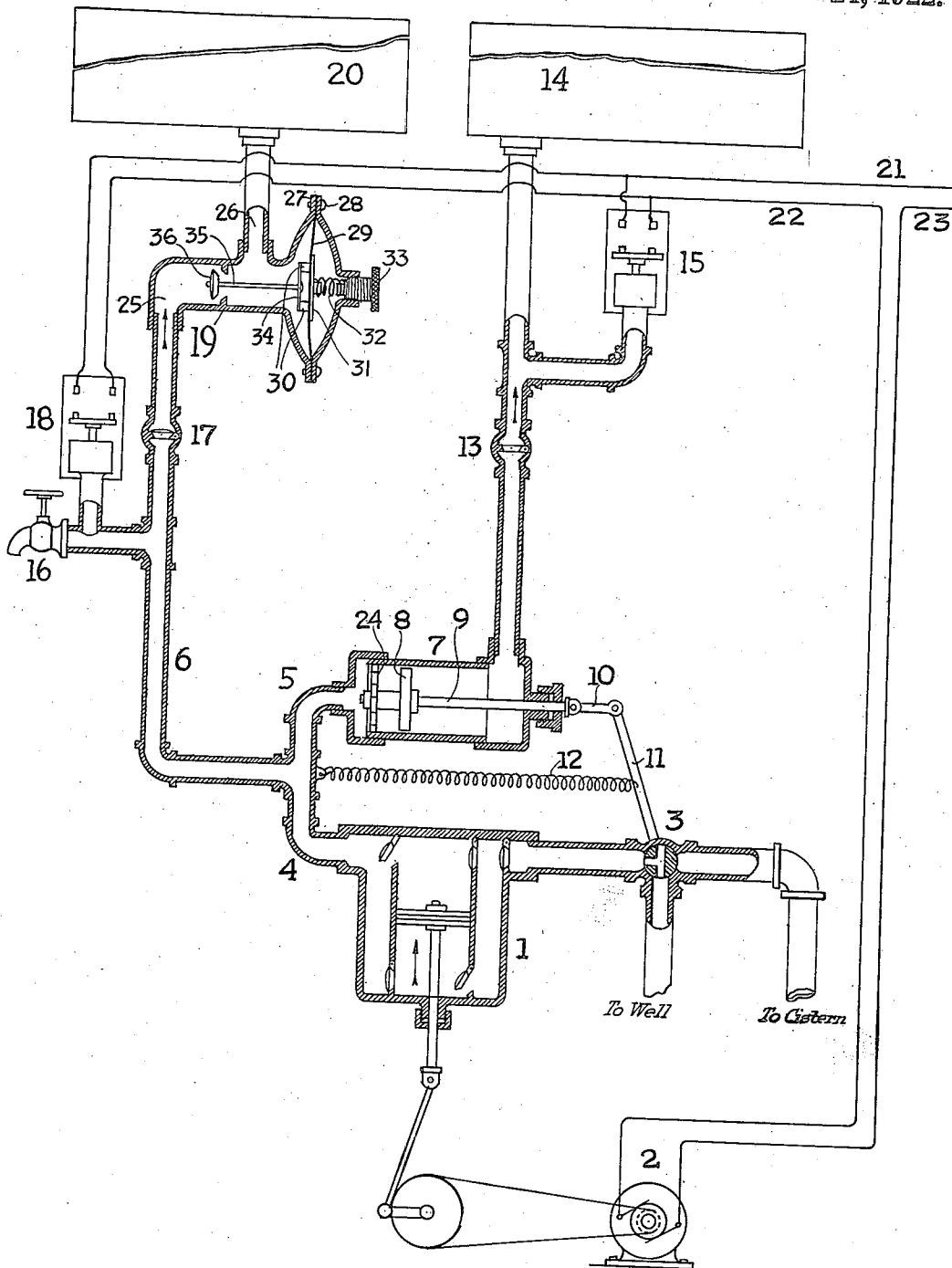


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 AUTOMATIC HARD AND SOFT WATER SUPPLY PLANT.
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AUTOMATIC HARD AND SOFT WATER SUPPLY PLANT.

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To all whom it may concern:

Be it known that I, THADDEUS S. HARRIS, a citizen of the United States, and a resident of Waverly, in the county of Morgan and State of Illinois, have invented a new and useful Improvement in Automatic Hard and Soft Water Supply Plants, of which the following is a full, clear, and exact description.

My invention relates to an automatic pumping plant in which one pump is utilized to automatically draw two kinds of water from two separate sources and deliver it to corresponding pipes or storage systems.

The automatic control of the intake to and the discharge from the pump is based upon the maintenance of a different range of pressures in the two discharge systems, the maximum limit of one, being approximately the minimum limit of the other.

The preferable form of my invention is described in the following specification, but I claim the right without departing from the spirit of the invention to reverse the connections to the sources of water so that the pump is normally connected to the cistern instead of the well as described herein.

As illustrated in the accompanying drawing, which is a top plan view, and horizontal section of the complete plant, 1 is a pump of the usual type, driven by an electric motor 2. 3 is a three-way valve placed in the intake to the pump so that the pump is connected to the well when the valve 3 is shifted in one direction, and to the cistern or other source of water when the valve 3 is shifted in the opposite direction. Valve 3 is of the type which does not at any time entirely cut off both the cistern and the well. In its normal position as shown the pump is connected to the well. The valve 3 is provided with a lever 11 by which it is operated as described herein.

The discharge line from the pump divides into two pipe lines 5 and 6. Discharge line 5 connects to the intake end of a valve shifter which comprises a central tube or barrel 7, a piston 8, and a piston rod 9, which is operably connected by link 10 to the lever 11 of three way valve 3.

An opening adjacent to the discharge end of cylinder 7 is connected by a pipe line with a storage tank 14. A check valve 13 in this pipe line prevents a flow of the water from

the tank when the pressure in pipe line 5 falls below the pressure within the tank.

The piston in cylinder 7 is preferably composed of two parts, a diaphragm member 8 which is as nearly water tight in cylinder 7 as it is practical to make a freely movable disc, and a guide member 24 which is perforated to allow a free flow of water when the diaphragm member is moved beyond the end of the cylinder 7.

A spring member 12 holds the piston normally in the position shown, where the three-way valve connects the pump to the well. The three-way valve is shifted to connect the pump to the cistern only at such times as the discharge from the pump is caused to pass through the cylinder 9.

Discharge line 6 is connected by a branch pipe line with a faucet 16, and then is connected to an automatic pressure controlled valve 19, a check valve 17 being placed in the line between valve 19 and the line leading to the faucet.

Automatic pressure valve 19 is also connected to tank 20 by discharge opening 26. This valve causes the flow of water to tank 20 to be cut off when the pressure on diaphragm 29 reaches a predetermined maximum for this discharge line, which maximum constitutes approximately the minimum pressure that is maintained in tank 14.

Valve 19 consists of an inlet chamber 25, a discharge opening 26, diaphragm supporting flanges 27 and 28, and a diaphragm 29 which is clamped between the flanges 27 and 28. The valve proper 36 is attached by means of a rod 35, blocks 30 and a flexible support 34 to the diaphragm 29.

A disc 31 communicates the pressure of spring 32 to the diaphragm and adjusting screw 33 affords means for determining the degree of pressure required to close valve 36. When valve 36 is brought within a short distance of its seat the increase of pressure due to the obstructed passage causes the flexible support 34 to become deflected and the valve closes sharply and without any pulsating action. When valve 36 is completely closed the increase of pressure in line 6 causes it to remain closed until a considerable decrease in pressure in tank 20 causes diaphragm 29 to be moved by spring 32 to engage the base of valve rod 35 and lift valve 36. The flexible support 34 then regains its normal position which throws the

valve wide open, reducing the pressure in pipe 6 to that existing in tank 20.

An automatic electric pressure switch 18, of any suitable type is connected to the discharge arm 6 its contacts being open except when the pressure in line 6 has fallen to a predetermined minimum, which causes the circuit to be closed through the motor 2 and the pump to be put in operation.

Switch 18 is preferably set to break the circuit when the pressure in line 6 has reached a point somewhat in excess of the pressure at which valve 19 closes, but not in excess of the minimum pressure in tank 14.

A second automatic electric pressure switch 15 is connected to the discharge line passing to tank 14 and between valve 13 and tank 14. This switch is set to close the circuit when the pressure in tank 14 falls to a predetermined minimum which is somewhat above the pressure at which valve 19 closes. The switch 15 breaks the circuit to motor when the pressure has reached a predetermined maximum, which is considerably above the maximum pressure in tank 20.

One terminal of each of switches 15 and 18 is connected to a main source of current 21. The remaining terminal of each switch is connected by wire 22 to one terminal of the motor. The other motor terminal is connected to main 23.

The operation of this pumping plant is as follows:

Supposing the pressure in tank 20 falls below the predetermined minimum causing valve 19 to open and switch 18 to close. The circuit is completed through motor 2 and the pump put in operation, drawing water from the well. Since the pressure in tank 14 is considerably in excess of that in tank 20, the pump discharges into tank 20 until its pressure rises to a point where valve 19 closes and switch 18 quickly after, opens and stops the pump.

In case the pressure in tank 14 falls below its predetermined minimum the switch 15 closes and puts the pump in operation. Water is, at first, drawn from the well as before. If the pressure in tank 20 is near its maximum, valve 19 is closed and the discharge from pump must go through discharge line 5 to the valve shifter, driving piston 8 before it until the opening to tank 14 is uncovered and the valve 3 shifted to connect the cistern to the pump. Cistern water is then delivered to tank 14 until the pressure rises to the point at which switch 15 opens and stops the motor and pump. When the flow of water through cylinder 9 ceases the leakage past piston 8 allows the piston and arm 11 to be moved to their normal position by the tension of spring 12.

If, when switch 15 closes and puts the pump in operation, the pressure in tank 20 is considerably below its maximum, valve 19

is open and well water is discharged into tank 20 until the increased pressure causes valve 19 to close. The discharge is then forced to tank 14 through valve shifter cylinder 7 forcing piston 8 to move valve 3 to connect the pump with the cistern as previously described.

A check valve 17 prevents the discharge of water from the tank 20 in case the pressure in line 6 falls below the pressure in tank 20. So, if faucet 16 is opened the pressure in discharge line 6 immediately falls until switch 18 closes, putting the pump in operation, drawing well water and discharging it through the faucet 16. When faucet 16 is closed the pressure immediately rises causing switch 18 to open, unless valve 19 is open, in which case, well water is discharged into tank 20 until the increased pressure causes valve 19 to close and switch 18 to open stopping the motor and pump.

If, when the pump is already in operation discharging into tank 14, the faucet 16 is opened or valve 19 opens, then the pressure in discharge line 5 immediately drops allowing piston 8 to be moved by spring 12 to shift the valve 3 to connect the well to the pump, and the discharge is through faucet 16 or valve 19, until they close when the discharge is again forced through cylinder 9, to shift the valve 3 to again connect the well to the pump.

The system is of course operable with switch 15 eliminated, but the fresh water faucet 16 is thereby rendered almost useless.

If switch 15 is eliminated, then every time faucet 16 is opened to operate the pump to draw fresh well water, it is necessary to clear the pump and adjacent pipes of cistern water before obtaining pure well water.

In case switch 15 is not used, upon closing the faucet the pump continues to pump until the pressure in tank 14 is brought to its maximum pressure, which is the cutting out point of switch 18, which is materially above that pressure which is the closing point of valve 19. This causes the pump to always become filled with cistern water before it ceases to operate.

By using switch 15 and setting its point of closing at or above the point at which switch 18 opens, a pressure is constantly maintained in tank 14 which is in excess of the cutting out point of switch 18. Then it is only necessary to clear the pump and pipes of cistern water once after each time that tank 14 has been filled, for on closing the faucet the pressure rises only sufficiently to open switch 18 which stops the pump while still drawing well water. Consequently the next time the faucet is opened pure well water is obtained at once.

I claim:

1. In an automatic hard water and soft water supply plant the combination of

three-way valve, a valve shifter which comprises a cylinder with an intake port at one end, and a discharge port at the opposite end, a sliding plunger valve in said cylinder, a plunger rod which is operably connected with said three-way valve, a spring that normally holds said sliding plunger valve in such position that the passage between said intake port and said discharge port is closed, a passage from said intake port to the intake chamber of a pressure actuated valve, said valve comprising an intake chamber, a discharge chamber, an opening between said chambers, a valve in said opening, a diaphragm chamber, which communicates with said discharge chamber, a diaphragm across said diaphragm chamber, a spring which engages that side of diaphragm which is not subject to the pressure of the discharge chamber of said valve and a flexible connection between said valve and said diaphragm.

2. In an automatic hard and soft water supply plant, the combination of a valve shifter comprising a cylinder, a sliding plunger valve in said cylinder, an intake port at one end of said cylinder, a discharge port at

the other end of said cylinder, a plunger rod, a three-way valve which is operably connected to said plunger rod, a spring disposed to normally hold said plunger valve in such position that the passage between said intake port and said discharge port is closed, a second discharge port which is connected by a passage with said intake port of the valve shifter, a valve in said second discharge port, a movable member, which is subject to the approximate discharge pressure on one side and to the pressure of a spring on the opposite side, and which is operably connected to said discharge valve.

3. The combination of a three-way valve and a valve shifter which comprises a cylinder adapted to be connected in a discharge line from a pump, an intake opening and a discharge opening in said cylinder, a sliding plunger valve in said cylinder, said sliding plunger valve being operably connected to said three-way valve and being so disposed that it is adapted to move in either direction under the influence of the differing pressures in the immediately adjoining external portions of the discharge line.

THADDEUS S. HARRIS.