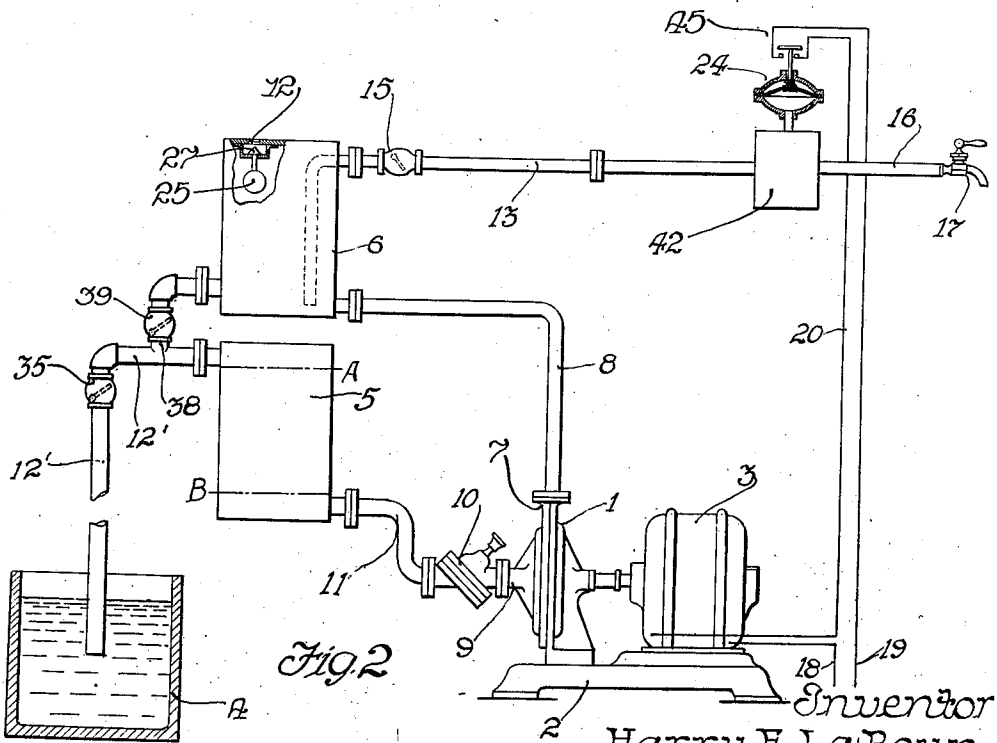
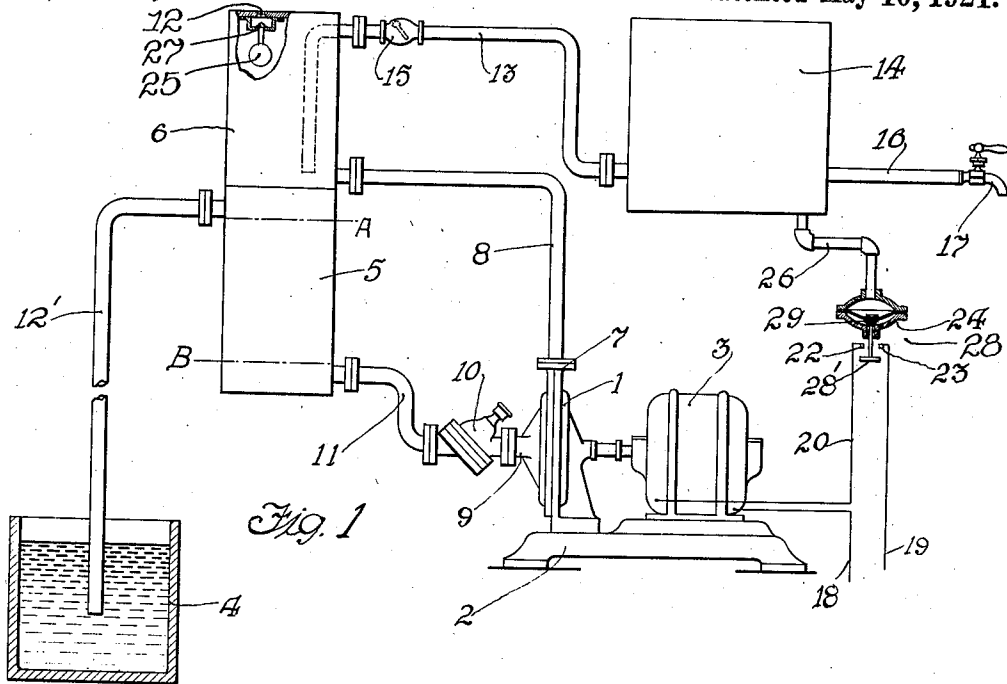


H. E. LA BOUR.
PUMPING SYSTEM.
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UNITED STATES PATENT OFFICE.

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PUMPING SYSTEM.

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To all whom it may concern:

Be it known that I, HARRY E. LA BOUR, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Pumping Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to pumping systems of the faucet controlled type employing a centrifugal or valveless pump as the liquid moving means, and contemplates an improved system embodying the principles and advantageous features disclosed in my Patent No. 1,314,875, granted September 2, 1919. By "faucet controlled" I mean that the pump and the flow of water are controlled by the acts of opening and closing a faucet or other suitable outlet, the system being normally closed on the discharge side and subjected to sufficient pressure to cause delivery upon the opening of a faucet.

In systems of the class to which my invention relates it has been found that a centrifugal pump is subject to the difficulty that it must be primed each time for starting, i. e., each time that water is to be delivered from the well or other source of supply.

Heretofore a foot valve has been placed in the suction main and this valve has been depended upon to retain sufficient liquid in the system to permit priming of the pump. So long as the foot valve is absolutely tight or the time between periods of starting is relatively short the use of the foot valve in the system is satisfactory. But in the case of the usual house system the periods of non-activity are often quite prolonged and any leakage of the foot valve will empty the suction line and render the system inoperative.

Furthermore the location of the foot valve in the well is disadvantageous because it is subject to leakage caused by sand, etc., and if anything becomes lodged in it, it necessitates the raising of the suction line.

My invention aims to provide an improved pumping system of the faucet controlled type in which a non-self-primed centrifugal or other valveless pump is employed as a motive element by providing

automatic priming means not dependent upon the use of a check valve on the intake side.

It is known that after a centrifugal pump is once primed so that the intake is full of liquid, the pump will exert a suction and continue to raise the liquid. I employ the self-priming feature disclosed in my above referred to patent in connection with the centrifugal pump of the present system. This self-priming feature includes means for filling a part of the intake preliminary to starting so that the pump may exert a suction through the rest of the intake. In fact, one embodiment of the invention provides means whereby upon stopping the pump, sufficient liquid is automatically trapped on the intake side of the pump to prime the pump upon the next starting operation so that thereafter no delay in the delivery occurs.

The present invention is not concerned with the details of the system; for example, as to whether or not a storage tank or reservoir is employed. I provide in either case for automatically loading the supply pump upon opening a faucet or other outlet, or in the event a storage reservoir is employed the pump is automatically loaded when a predetermined minimum level or pressure is reached in the reservoir. The supply pump of the system is automatically unloaded upon closing the faucet, or when a predetermined maximum level or pressure is reached in the storage reservoir in the event that such a reservoir is employed.

In order that those skilled in the art may be fully acquainted with the nature and scope of the present invention I shall describe a specific embodiment of the invention in connection with the accompanying drawings, which form a part of the present specification. In the accompanying drawings:

Figure 1 is a diagrammatic view of the preferred form of the invention, employing a relatively large closed tank, and

Fig. 2 is a similar view of a so-called tankless system.

Referring to Fig. 1, the centrifugal pump 1, which is preferably, although not necessarily, of the type disclosed in my application Serial No. 221,644 filed March 11, 1918;

is mounted on a base 2 and driven by a motor 3 directly connected to the pump. The base 2 serves as a common mounting for the pump 1 and the motor 3.

5 The well or other source of supply is shown diagrammatically at 4 and it is from this well or source that it is desired to raise and discharge liquid by means of the centrifugal pump 1 into a consumption system such as the pipes and faucets of a dwelling or the like.

As in my Patent No. 1,314,875, granted September 2, 1919, I provide a pair of closed tanks 5 and 6 which may be made integral as shown in Fig. 1, or separately, as shown in Fig. 2. It is not essential that these tanks be exactly superimposed, but it is essential that the tank 6 be so located with respect to the tank 5, that liquid may flow from the tank 6 to the tank 5, as will be described later.

The discharge nozzle or outlet 7 of the pump is connected by means of the pipe or conduit 8 to the bottom of the upper tank 6. The inlet 9 of the pump is connected through the valve 10 and the pipe or conduit 11 to the bottom of the lower tank 5. The valve 10 is provided in order to permit the operator to shut off the pipe 11 should it be desired to disconnect the pump from the tank 5. The valve 10 is otherwise not necessary in the system and is not employed in the normal operation thereof. The suction pipe 12' leading from the well shown diagrammatically at 4 is connected to the top of the trap 5 to discharge into said trap at substantially its highest point.

The top of the tank 6 is provided with an air vent 12 which is adapted to be controlled by the valve 27 which is operated by the float 25. A pipe 13 communicates with the tank 6, preferably extending down there-within to a point adjacent the bottom thereof, as shown in dotted lines and leads off from this tank to a reservoir 14 which reservoir 14 serves in this particular instance in the capacity of a storage tank. The tank or reservoir is of the closed pressure type. A check valve 15 is provided in the pipe line 13 adjacent its point of communication or entrance into the tank 6 to prevent water in the storage tank 14 from backing into the tank 6.

A delivery main 16 leads from the tank 14 to a water outlet faucet 17 through which water may be drawn as desired. In this system the motor 3 is connected by the feed wires 18, 19 and 20 through the switch 28. The free ends of the leads 20 and 19 terminate at any convenient point near the tank 14 and are terminated at suitable contact points 22 and 23 of a controlling switch 28. A regulator or controller 24 is provided in connection with the tank 14. This regulator, which is shown more or less diagram-

matically, will not be described in detail except where it is necessary to set out its function in the present system as any form of regulator which is capable of closing the main switch 28 when the level of the water in the tank 14 has dropped to a predetermined level and which will operate to open the main switch when the level of the water has risen to a predetermined level might be used.

The regulator comprises a diaphragm chamber, the pressure of the water in the tank 14 being exerted upon one side of the diaphragm therein through a pipe line 26. A stem carried by the diaphragm and extending from the diaphragm chamber is provided with a connecting member or bridge piece 28', adapted for coöperation with the contact points 22 and 23, as will be hereinafter described. A spring 29 acts upon the opposite side of the diaphragm and in opposition to the pressure of the water in the tank 14. This spring being adjustable as that it will move the diaphragm and thereby cause the connecting member to bridge the contacts 22 and 23 when a predetermined minimum water level is reached in the tank 14. Instead of a pressure controlled switch 28 a float controlled switch might be employed to secure the desired operation.

The operation of the system as shown in Fig. 1 is as follows:

Liquid is first charged into the tank 6, or into the tank 5 for the initial operation of the system and thereafter a supply is always trapped automatically for priming the pump and starting the system. Assume that the liquid in the tank 5, which is herein termed the trap, stands at substantially the level indicated by the broken line A. The current is turned on as by closing a line switch not shown to start the motor and pump. As the speed of the motor picks up the pump 1 will begin to discharge liquid from the trap 5 into the tank 6.

The contents of the trap between the levels A and B is slightly greater than the volume of air contained in the suction pipe 12' and in the trap 5 above the level A when said volume of air is expanded by the necessary reduction in pressure required to raise a column of liquid from the well 4 to the top of the suction pipe 12'. The capacity of the tank 6 is substantially equal to the capacity of the tank 5.

As the pump 1 lowers the liquid in the trap 5 the air within the top of the trap and the suction pipe 12' expands to fill the space and in so doing drops in pressure. As the liquid in the tank 6 rises the body of air in this tank will be forced out through the vent opening 12 and the float 25, carrying the valve member 27 will rise until the valve member engages the valve seat with which the vent opening 12 is provided, whereupon

this opening is closed against further discharge therethrough. Before the intake pipe 11 of the pump is uncovered, the pressure of the atmosphere will force the liquid 5 from the well 4 through the suction pipe 12' and into the top of the trap 5, from where the liquid will fall through the body of air which is contained in the upper portion of the trap 5 and will then be drawn out by 10 the pump 1 and discharged by way of the pipe 8, tank 6 and pipe 13 to the storage reservoir 14.

Upon creating a proper supply in the reservoir 14 the automatic switch 28 will 15 open and stop the motor and pump. As soon as the pump ceases to force the liquid forward toward the reservoir 14 the liquid will tend to drop back by gravity from the tank 6 to the tank 5, but the check valve 15 20 will close and prevent the reflux of any liquid from the reservoir and also will tend to hold up its column of liquid in the tank 6. This downward pressure of the liquid tends to draw a partial vacuum in the top of 25 the tank 6, which is released by opening of the float controlled valve 27 admitting air through the port 12. The liquid which is then contained in the tank 6 will flow back through the pipes 8 and 11 through the 30 pump 1 into the bottom of the trap 5 until the level of liquid stands at substantially the line A.

Upon opening the outlet 17, water will flow therefrom and the level of the water in 35 the tank 14 will drop. Upon reaching the level or pressure at which the regulator 24 is adjusted to close the switch, the spring 29 being adjusted to overcome the pressure of the water at such points, will move the 40 bridge member 28 into engagement with the contacts 22 and 23, closing the circuit and starting the motor, whereupon the operation of the system will be as previously described.

45 The tank 14 may be made relatively small if desired. This will result in more frequent operations of the pump.

Fig. 2 illustrates a system in which the reservoir 14 is dispensed with. This system 50 is known as the tankless system as the opening of a faucet results in the immediate starting of the pump to supply water directly from the well or other source of supply. In order to accomplish this it is 55 desirable that the suction main be maintained full so that immediately upon starting the motor pressure is developed in the system. This obviates any delay in delivery which would be caused by scavenging air from 60 tank 6.

However the means which I provide prevents the pump from losing its suction under any conditions.

A branch pipe 38 communicates with the 65 suction pipe 12' and with the tank 6. A

check valve 39 controls the communication between the tank 6 and the trap 5 by way of the branch pipe 38. The pipe 13 leads off from the tank 6 through a check valve 15 to a cushion tank 42, from where the delivery 70 main 16 leads to an outlet faucet 17. The cushion tank 42 is provided to provide a small supply so that in the event of a small leak such as a drip at its faucet the pump will not be needlessly started. Otherwise 75 this system is the same as that shown in Fig. 1. The operation of this form of invention is as follows:

Upon opening the faucet 17 the pressure is relieved and the air in the chamber 42 80 expands, causing a flow of water from the faucet 17 by way of the delivery main 16. This drop in pressure will cause immediate operation of the regulator 24, thereby, starting the entire system into operation. Thus 85 the complete system is automatically started by the opening of the faucet 17.

When the pump 1 is first started to maintain the operation of the system, the level of the liquid in the trap 5 which was previously 90 charged by hand will be lowered, which lowering of the liquid will create a drop in pressure of the air contained in the top of the trap 5 and in the suction pipe 12' 95 to raise the liquid from the well 4 to the top of the suction pipe.

The operation of the pump in lowering the level in the tank 5 to prime the suction has forced the liquid from the tank 5 into 100 the tank 6 which has automatically been relieved of air by the action of the port 12 and float valve 27. The pump is now shut down. The liquid in the tank 6 flows back into tank 5, displacing the air in said latter 105 tank 5. This air is preferably discharged through check valve 39 into tank 6, so as to maintain a liquid seal on valve 39, but it is possible to operate it by permitting check valve 39 to discharge to the atmosphere 110 directly in which latter case it is essential that air be admitted to the tank 6 through the vent 12.

On the next or second operation of the pump the suction main 12' is full of liquid. The discharge from the pump 1 to tank 6 115 scavenges the air in this tank out by way of vent 12 filling the tank 6 with liquid and discharging into the pipe 13, tank 42 and distribution system 16 until the system is brought under the proper pressure to open 120 the control switch 45. Thereafter opening of any of the outlets of the distributor system will result in a prompt flow of liquid from the well 4 to said outlet and valve 27 will only open to discharge small amounts 125 of air due to leakage or entrainment.

Leakage of the valve 35 will not disable the system. It can only interpose a slight delay between the starting of the pump and the discharge of liquid from the tank 6. 130

I do not intend to be limited to the details of construction shown and described.

I claim:

1. In combination, a valveless pump, a trap, and a connection therefrom to the intake of the pump, discharge means having a relatively large capacity and a connection therethrough from the discharge of the pump, an air vent in said discharge system, a suction pipe connected to said trap above the level of the pump connection and a check valve in said suction pipe.
2. In combination, a closed liquid and gas trap, a pump connected on its intake side to the bottom of said trap, and arranged with respect to the trap so that liquid in the trap can flow freely into the pump to prime the same each time that the pump stops, a source of liquid supply below the pump, a discharge system for the pump, a check valve between the pump and the system for retaining the system under pressure, means subject to lowering of the pressure in said discharge system for starting, and subject to raising of the pressure in the system for stopping the pump.
3. In combination, a centrifugal pump and a prime mover suitable for automatic control, a suction pipe extending to a source of liquid supply below the pump, automatic means comprising a liquid trap for priming said pump, a normally closed water discharge system maintained under pressure and having a controllable outlet, and means subject to the pressure in said system for starting and stopping said prime mover.
4. In combination, a closed liquid and gas trap, a source of power, a pump connected on its intake side to the bottom of said trap, and adapted to be primed by the liquid in the trap, a suction pipe connected to the top of said trap, a source of liquid below the pump, a discharge system for the pressure side of the pump, a check valve between the discharge system and the pump and means subject to the pressure in said discharge system for connecting the source of power to the pump.
5. In combination, a closed liquid and gas trap, a motor, a pump connected on its intake side to the bottom of said trap and adapted to be primed by the liquid in the trap, a suction pipe connected to the top of said trap, a source of liquid supply below the pump, a discharge system for the pressure side of the pump, a check valve between the discharge system and the pump, a reservoir in said discharge system and means subject to the level of the liquid in said reservoir for controlling the motor.
6. In a faucet controlled pumping system, a valveless pump, an intake tank, a discharge tank, said pump having its intake connected to the bottom of the intake tank and its discharge connected to the bottom of the discharge tank, said connections being open for liquid flow in either direction, a suction pipe connected to the top of the intake tank, a closed delivery system normally under pressure, said delivery system communicating with the lower portion of the discharge tank so that discharge of liquid from the pump into said delivery tank will seal the opening to the delivery system, a check valve between the delivery tank and the delivery system and means controlled by the pressure in the delivery system for governing the starting and stopping of said pump.
7. In a pumping system of the class described, a pair of chambers arranged at different levels, a pump having a valveless intake communication with the lower chamber, a source of liquid below said pump, a pump discharge system communicating through the upper chamber with a delivery system which is maintained under pressure, a normally closed manually controllable outlet in said delivery system, a check valve between the delivery system and said upper chamber, a release valve in the top of the upper chamber for permitting liquid to flow from the upper chamber into the lower chamber when the pump is stopped to prime the pump for the next operation of pumping.
8. In combination, a trap, a tank above the trap, a valveless pump having its inlet connected to the bottom of the trap and its outlet connected to the bottom of the tank, a delivery main extending from the tank, said delivery main having a check valve and a controllable outlet, said tank having a level controlled air vent, communication between the tank and the delivery main being established when the liquid level in said tank has risen to close said air vent.
9. In combination, a trap, an intake pipe communicating with the trap, a valveless pump connecting with the bottom of the trap, a closed delivery system normally under pressure, a connection between the delivery system and the discharge side of the pump, a check valve in said connection and an air valve between the check valve and the pump.
10. In combination, a pump, a trap for priming the pump, a closed discharge system, a conduit connecting the pump and the discharge system, a check valve in said conduit for preventing reflux from closed discharge system, said conduit having a relatively large capacity to insure priming of the pump and an air port in said conduit for permitting the inlet of air when the pump stops and for permitting the scavenging of air when the pump starts.
11. In combination, a suction pipe, a trap, a pump below the trap having its intake connected to the trap, a discharge conduit for the pump having a relatively large ca-

capacity, an air port in said discharge conduit, a branch connection connecting said suction pipe to said trap and to said discharge conduit, the portion of said branch connection
5 leading to said conduit having a check valve for permitting the discharge of air from the trap when the pump stops, and a check valve in said suction pipe.

12. In a system of the class described, a
10 normally closed delivery system maintained under pressure, a centrifugal pump, a source of liquid supply below the pump, a

check valve between the delivery system and the pump, a driving motor for the pump, means controlled by the pressure in the de- 15
livery system for stopping and starting the motor, and means for automatically trapping sufficient liquid to prime the pump when the motor stops.

In witness whereof, I hereunto subscribe 20
my name this 7th day of January, A. D. 1920.

HARRY E. LA BOUR.