H. E. LA BOUR.

PUMPING SYSTEM.

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1,419,273. Patented June 13, 1922.

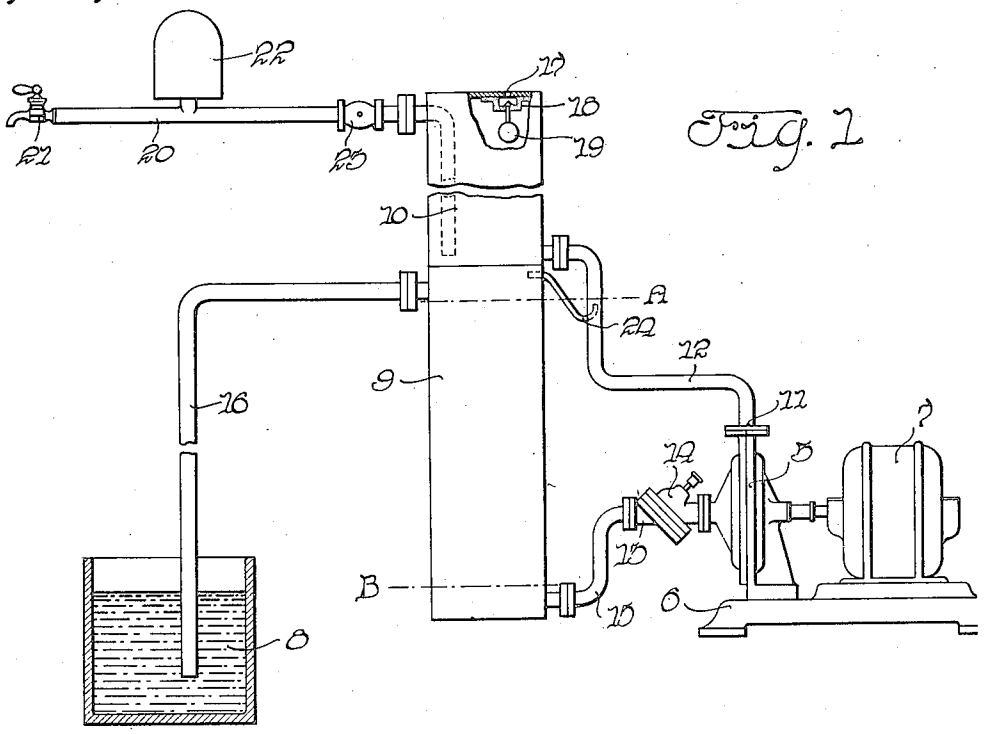


Fig. 1

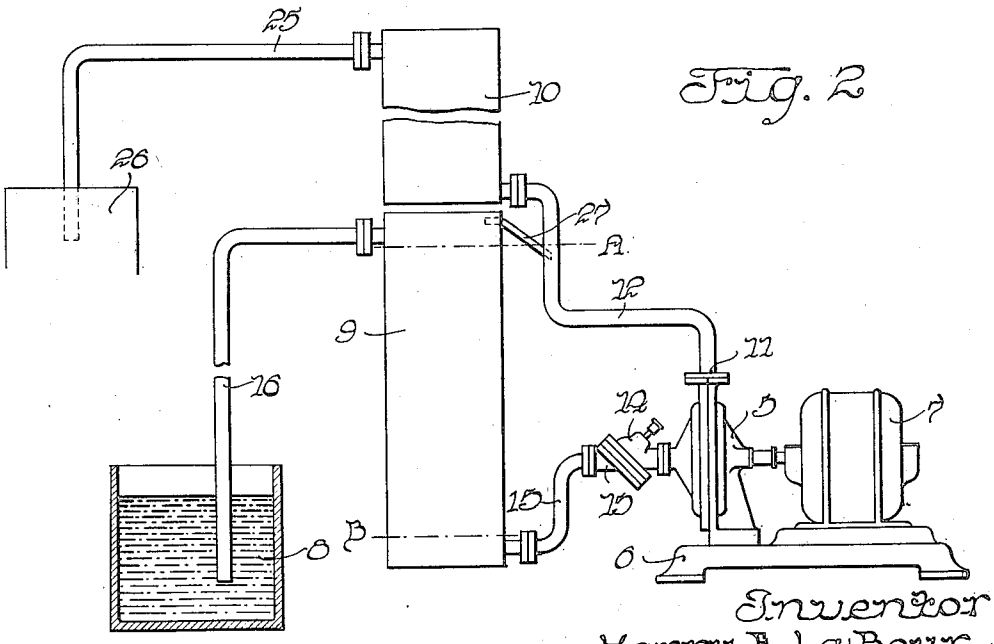


Fig. 2

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PUMPING SYSTEM.

1,419,273. Specification of Letters Patent. Patented June 13, 1922.

Application filed August 9, 1920. Serial No. 402,159.

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" and particularly to that type of system employing a centrifugal or valveless pump as a liquid moving means and constitutes an improvement over my Patent No. 1,314,875, granted Sept. 2, 1919.

It is known that after a centrifugal pump is once primed, so that the pump is full of liquid, it will exert a suction. The system, as disclosed in the above mentioned patent, is provided with means for priming the pump. The priming means is in form of a pair of tanks on different levels arranged as disclosed in said patent.

I have found that under certain operating conditions when the pump is stopped the falling liquid in the vertical section of the suction pipe produces a siphoning effect upon the lower or trap tank. This siphoning effect continues until all liquid is withdrawn from the upper tank, pump and pump connections, and in fact until air is admitted through the pump and its suction pipe into the lower part of the trap tank. The two liquid columns one being that in the trap tank and the other that in the vertical section of the suction pipe, finally attain a balance, but it is possible for this balance to occur in such a way that at least half of the pump may be empty of liquid and thus in an unprimed condition. Under this condition the pump if started will fail to pick up its suction.

The object of the present invention is to provide means for preventing the siphoning action to an extent which will permit the above mentioned conditions. Briefly stated I provide a small connection or vacuum break between the top of the lower tank and the connection between tanks to admit air from the connecting pipe directly to the trap tank without said air having to pass through the pump. During operation this connection is sealed by the liquid being handled.

In order to teach those skilled in the art, more particularly how to construct and practise my invention, I shall now describe in detail one particular embodiment of my invention.

Figure 1 is a diagrammatic view of one form of my invention; and

Figure 2 is a similar view of a modification.

As shown in the drawing, the pump 5, which is preferably of the type disclosed in my Patent No. 1,335,987 although any valveless pump may be employed in the present system, is mounted on the base 6 and driven by the motor 7 in this case directly connected with the pump.

The well or other source of liquid to be pumped is shown at 8 and it is from this source that it is desired to raise and discharge liquid by means of the centrifugal pump 5. The present invention may be employed in connection with water distributing systems, having faucets or the like as the discharge outlets.

I have provided a pair of suitable closed tanks 9 and 10 which may be made integral as shown in Figure 1, or separately, as shown in Figure 2. It is not essential that these tanks be exactly super-imposed, but it is essential that the tank 10 extend to a higher level than the tank 9 in order that liquid may flow from the tank 10 to the tank 9, as will later be described.

The discharge nozzle or outlet 11 of the pump is connected by means of the pipe or conduit 12 to the bottom of the upper tank 10. The inlet pipe 13 of the pump is connected through the valve 14 and the pipe or conduit 15 to the bottom of the lower tank 9. The valve 14 is provided in order to permit the operator to shut off the pipe 15, if it should be desired to disconnect the pump from said tank. The valve is otherwise not necessary in the system, and is not employed in the normal operation thereof. The suction pipe 16 is connected to the top of the trap 9.

The top of the tank 10 is provided with an air vent 17 which is adapted to be controlled by the valve 18 which is operated by the float 19. A pipe 20 communicates with the tank 10, preferably extending to a point adjacent the bottom thereof, as is shown in dotted lines. This pipe terminates with a

suitable outlet, such as the faucet 21 and has inserted therein a storage tank or reservoir 22. The tank 22 does not in any way concern the operation of the system, as it merely acts as a reservoir for the storage of pumped water, and hence reduces the frequency of operation of the motor and pump when water is desired. A check valve 23 is provided in the discharge pipe line 20 adjacent its point of communication or entrance to the tank 10 to prevent water in the storage tank 22 and pipe 20 from backing into the tank 10.

The upper part of the trap 9 has communication with one end of the air vent pipe 24 which projects from one side thereof, having its opposite and terminating preferably with an upwardly turned mouth within the pipe or conduit 12 and preferably below the line of level A—A in tank 9.

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

Liquid is first charged into the tank 9 or into the tank 10 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 9, which is herein termed the trap, stands at the level indicated by the dotted line A, the suction pipe extending into the liquid which it is desired to pump. When the motor is started, the pump 5 will begin to discharge liquid from the trap 9 into the tank 10 and from there into the discharge pipe 20.

The liquid must be raised in the suction pipe 16 by the reduction of pressure in the trap 9, which is secured by the rarefaction of the air in the tank 9 and suction pipe 16 before the liquid starts to rise. In order to secure this proper rarefaction of the air, the contents of the tank between the levels A and B must be slightly greater than the volume of the air at the reduced pressure contained in the suction pipe and in the trap 9 above the level A. The capacity of the tank 10 is substantially equal to the contents of the tank or trap 9.

As the pump lowers the liquid in the trap 9, the air within the top of the trap and suction pipe 16 expands to fill the space, and in so doing, drops in pressure. Before the intake pipe 15 of the pump 5 is uncovered, the pressure of the atmosphere will force the liquid from the source 8 through the suction pipe 16 and into the top of the tank 9 from where the liquid will fall through the body of air which is contained in the upper portion of the trap 9 and will then be drawn out by the pump 5, and discharged by way of the pipe 12, tank 10 and discharge pipe 20.

As the water is drawn up through the suction pipe 16 into the upper portion of the trap 9 and falls through the air in the trap, it mixes with the air, and thereby entrains some of the air.

When the pump is stopped the water in the system which has not been discharged, will tend to flow back due to gravity, returning the water in the tank 10 to the trap 9. The check valve 23 immediately acts to prevent back flow of whatever liquid remains in the discharge line, which includes the discharge pipe 20 and storage tank 22. The valve 18 as before mentioned, is operated by the float 19, the valve governing the air vent 17. As the liquid falls in the suction pipe 16 the liquid in the tank 10, flows back to the tank 9 by gravity and in so doing, the valve 18 unseats and admits air into the tank 10. When the liquid reaches a level in the pipe 12 which corresponds to level A in the trap tank, the back flow should cease in order to retain liquid in the pump.

The suction in the upper part of trap 9 sometimes is too great to permit the liquid to stand at such a level, and then withdrawal of the liquid from the pump 5 occurs. The liquid rises in the trap 9 and stands at levels A, held by the suction from the falling liquid column in pipe 16. Liquid is also held in the suction pipe 16 to such a level as will balance the head of liquid in the trap 9.

The air vent pipe 24 is provided to relieve the partial vacuum in the upper part of the trap just as the level of the liquid reaches the mouth of the pipe. It is to be noted that a portion of the air vent pipe 24 is provided with the upwardly turned mouth which opens to the interior of the pipe 12 just below the liquid level A. Air passes into the pipe 12 from the super-imposed tank 10 by way of the valve 18 which opens when the level in the tank drops.

The purpose of the upturned mouth of tube 24 in pipe 12 is to permit the flow of liquid past the mouth to produce a suction effect on pipe 24 and thus reduce or prevent back-flow of liquid through pipe 24 from pipe 12 to trap 9 when the pump is in operation. This tends to improve the efficiency of the system.

In Figure 2, I have shown a modified embodiment of the invention. In this case, the discharge pipe 25 leads to an open receptacle 26. The vacuum break pipe 27 merely projects into the pump discharge pipe 12. No particular effect is produced by the flow of liquid past the mouth of the pipe 27 and consequently a small amount of liquid may return to the tank 9, but this is inconsequential. Otherwise the operation of the system shown in Figure 2 is like that described in connection with Figure 1.

It is essential that the tanks or discharged system or other parts of the apparatus be

fixed in position. It is essential to the invention that they occupy certain relations at certain times in order to secure the individual functions as above outlined.

I claim:

1. In combination, a valveless pump, intake and discharge lines therefor, said intake line extending above the level of the pump and having intake storage means between its point of highest level and the pump, said discharge line having storage means above the highest level of said intake line, and a vacuum break connection between the highest point of said intake line and said discharge line between its storage means and the pump.

2. In combination, a valveless pump, intake and discharge lines therefor, said intake line extending above the level of the pump and having intake storage means between its point of highest level and the pump, said discharge line having storage means above the highest level of the intake line, and a vacuum break connection between the highest point of said intake line and said discharge line between its storage means and the pump, the end of said vacuum break connection entering said discharge line forming an ejector therein, tending to prevent the flow of liquid from discharge to intake.

In witness whereof I hereunto subscribe my name this 6th day of August, 1920.

HARRY E. LA BOUR.