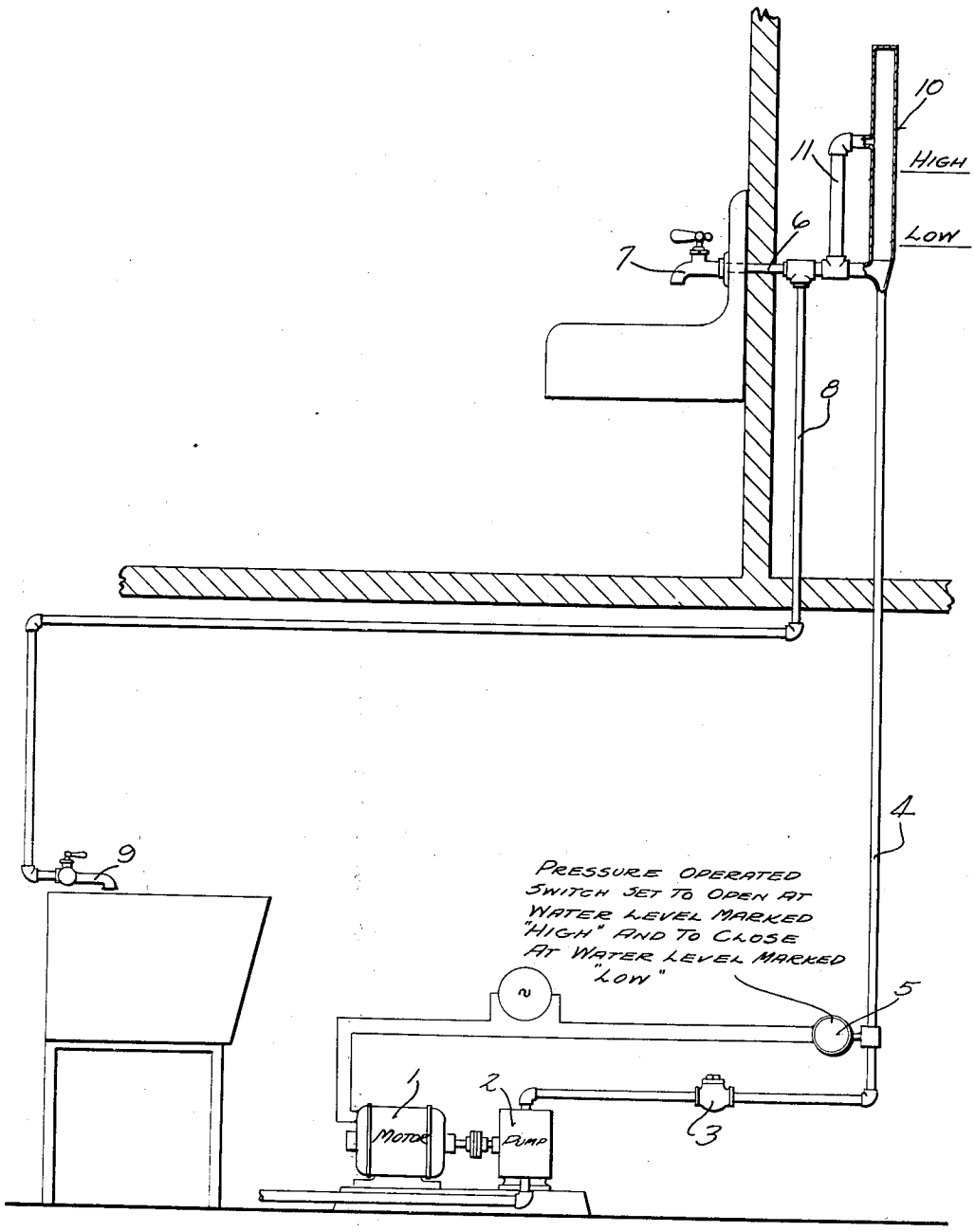
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WATER SYSTEM

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WATER SYSTEM

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This invention relates to improvements in water systems.

It is one object of the invention to provide a standpipe of very limited capacity as a substitute for the storage tanks commonly used in pressure systems for distribution of water from a pump, and particularly to arrange for a reliable and frequently operable means for supplying air to the trap in the standpipe so that the flow of water through the system will not be interrupted for the lack of such air, and the water supplied will nevertheless be fresh to a degree which is impossible to achieve where a storage chamber of larger capacity is employed.

More specifically, it is proposed by means of the present invention to provide a system in which a pump is capable of acting directly to supply the ordinary needs of the system, the operation of the pump being controlled by a pressure switch so designed and coordinated with respect to the standpipe that the standpipe will invariably supply the requirements of the system pending the starting of the pump and will be regularly supplied with air under the control of the switch.

The drawing shows, in side elevation and partially in section, a water system installation including the invention.

The motor 1 operates any conventional form of pump at 2, which delivers water through the check valve 3 in a line 4. At any convenient point in the pipe line 4 is a pressure operated switch 5. The circuit connections of the switch with a suitable source of supply, and the motor 1, are diagrammatically illustrated.

The supply line 4 leads to a point immediately adjacent the horizontal connection 6 to the faucet 7, which is the highest faucet in the distributing system. The distribution pipe 8 leads from the pipe 6 downwardly to faucet 9 and such other faucets as may be included in the system.

Communicating with the pipe 6 and the supply pipe 4 is a short standpipe 10 which preferably has an air by-pass connection through pipe 11 with pipe 6.

It will be noted that the capacity of standpipe 10 is extremely limited. One of the objects of the invention is to provide for the direct delivery of fresh water to the system whenever any one of the faucets is opened. It is not desirable, therefore, to have any large amount of water remain in a pressure tank or standpipe. However, the limitation of the storage capacity of the standpipe also is effective to limit the amount of air which may be trapped therein. The presence of a certain amount of air is essential to the successful operation of the system in order that sufficient pressure range may be available to start the pump. The use of small quantities of air in such a system is open to the objection that the air is rapidly dissipated through absorption by the water and through other causes, and the means heretofore used for reestablishing the volume of air has been unreliable.

In the present device the pump 2 is capable of supplying all normal requirements of the system. Therefore, as soon as the pump is started, whether or not the faucet remains open, the water level in the system will ordinarily be restored almost to the high water level indicated by the line marked "High" next to the standpine 10. The high level will, of course, be reached when all faucets in the system are closed. The pressure operated switch 5 is so adjusted that when the water level reaches the approximate point represented by the line "High" the pump will stop, leaving a small body of highly compressed air in the top of the standpipe 10. When the faucet 7 is opened, the first small amount of water which runs from the system will reduce the level of the water in the standpipe down to the approximate location of the line marked "Low". Obviously, the pressure in the system at the level of faucet 7 will be negligible at this time and it will readily be possible for air to enter the system through faucet 7 to replace any air which has been absorbed from the standpipe. It is found desirable to by-pass such air through the pipe 11 in order to afford minimum interference with the flow of water from the bottom of the standpipe. When the low level mark is reached the adjustment of the pressure operated switch 5 is such that the pump will be set in operation and will immediately supply enough water to reestablish the pressure in the system and to discharge a full stream through any faucet that is open. The pump will not discontinue operation, however, until the faucet is closed and the water rises to its extreme high position.

If the pressure switch cut in the motor before the water had dropped to the low level indicated in the drawing, there would be no opportunity for air to enter the system through the faucet. On the other hand, if the air trapped in the top of the standpipe expands down to atmospheric pressure when the water reaches its low level as marked, there will be no occasion for air to enter the faucet. The air will only bubble in to the standpipe when a sufficient quantity of gas has been absorbed from the standpipe so that sub-atmos-

pheric pressures are created therein by the initial withdrawal of water.

Thus, the replenishment of the air supply does not depend upon any automatically operable check valve or the like but is, nevertheless, entirely automatic, being controlled by the pressure operated switch and the normal use of the faucet 7.

The particular settings of the pressure operated switch will, of course, depend upon the vertical distance between the switch and the desired lowest water level. The weight of the vertical column of water between these levels will be the amount of pressure which will regulate the closing of the switch. The pressure at which the switch will re-open, on the other hand, will involve not merely the weight of the column of water, but also the substantial head of pressure represented by the air trapped in the standpipe. As above noted, this amount of pressure should be sufficient to deliver a full stream of water from the faucet 7 with the pump in operation.

Since the amount of air required for replacement is relatively small, it is not necessary that the replacement air be derived from every faucet in the system. It is sufficient that the standpipe be associated with one faucet which, even if used only occasionally, can serve to keep the supply of air in the system properly replenished.

Devices made in accordance with the foregoing disclosure have been found to be very reliable and to require no such attention as is demanded by spring controlled bleed valves. The amount of water stored in the standpipe 10 is so small that the pump will start and deliver a full flow in seven seconds after the faucet is opened. One of the advantages of the arrangement is that the pump starts virtually without load, thus greatly prolonging the life of the apparatus. Although a great fluctuation of pressure is inherently employed upon the opening of the faucet to permit replenishment of the air in the standpipe before the pump starts, the continued operation of the pump will maintain substantially constant pressure in the system thereafter until the faucet is again closed.

I claim:

1. In a water system, the combination with a pump and a withdrawal valve, of a small capacity standpipe providing an air trap and having an air receiving connection to said valve, a water system connecting said pump and valve, and pressure controlled means for operating said pump, said means being effective only when the pressure in said system has dropped to a value sufficiently low to permit the influx of air from said valve to said standpipe.

2. In a water system, the combination with a valve, a pump, and piping affording communication therebetween, of an air trap in said system above the level of said valve, said valve comprising means for the admission of air to said trap when the water in said system reaches a sufficiently low pressure level, and pressure controlled means for starting the operation of said pump at a pressure level below that at which air is admitted from said valve to said trap.

3. A water system comprising the combination with a pump and an air trap, of means comprising an air admission valve and a pressure operated control device operatively connected to regulate the operation of the pump and including means requiring the opening of said valve as a prerequisite to pump operation whereby to function for automatically controlling the admission of air to said trap to replace losses therefrom.

4. In a water system, the combination with a standpipe and a valve communicating therewith and adapted to admit air to the standpipe when the pressures therein reach a sufficiently low level, a motor pump operatively connected to deliver liquid to said standpipe, and means including said valve and a pressure switch connected with said pump and set to close below said level for controlling the admission of air to said standpipe.

5. A water system comprising the combination with a withdrawal valve and piping leading thereto, of a motor driven pump communicating with said piping and adapted to supply to said valve substantially the full capacity thereof, whereby to deliver water at uniform pressures through said valve while said valve is open, a standpipe of small capacity connected with said piping above the level of said valve, the piping between said standpipe and valve being adapted for the delivery of air from said valve to said standpipe, and a pressure operated switch controlling the actuation of said pump, said switch being set to stop the pump at a water level sufficiently high in said standpipe to trap air at a substantial pressure therein, and being set to start said pump when the pressure in said standpipe is sufficiently low for the admission of air thereto from said valve.

6. In a water system, the combination with a motor driven pump, of a discharge pipe from said pump equipped with a pressure operated switch controlling the functioning of said motor, a standpipe of low capacity connected with the highest point in said pipe, a water distributing system including a valve adjacent the bottom of said standpipe and a by-pass from the vicinity of said valve to a point intermediate the height of said standpipe.

7. A water system comprising the combination with distribution piping including valves, of a standpipe adjacent the upper of said valves and comprising an air trap, a supply pipe leading to the bottom of said air trap and communicating with said distribution piping, a motor operated pump arranged to deliver water through said supply pipe, and a pressure operated switch exposed to pressures in said supply pipe and set to start said pump only when pressures at the bottom of said standpipe are approximately atmospheric and to stop said pump only when pressures in said standpipe exceed those required for continuous delivery of a full stream from said valve, the fluctuation of pressures in said standpipe being sufficient to assure replenishment of air lost therefrom, and the capacity of said standpipe being sufficiently low so that such fluctuation would occur substantially immediately upon the opening of said valve.

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