No. 777,632. PATENTED DEC. 13, 1904.

R. P. HENRY.

WATER SUPPLY SYSTEM.

APPLICATION FILED FEB. 23, 1904.

NO MODEL.

Fig. 2.

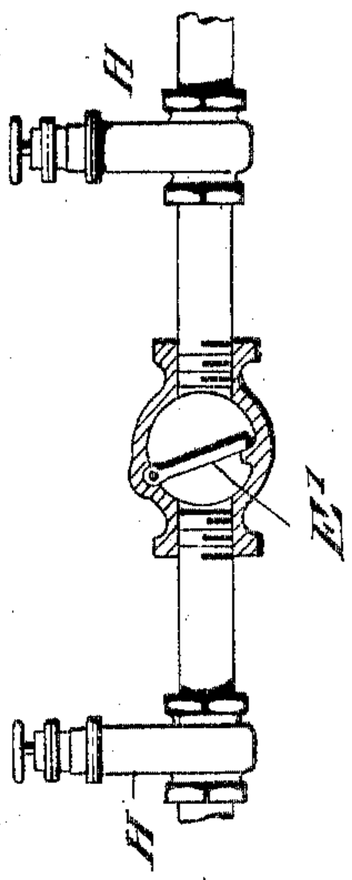

Fig. 1.

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UNITED STATES PATENT OFFICE.

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WATER-SUPPLY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 777,632, dated December 13, 1904.

Application filed February 23, 1904. Serial No. 194,873. (No model.)

To all whom it may concern:

Be it known that I, ROBERT P. HENRY, a citizen of the United States, residing at Winston Salem, in the county of Forsyth and State of North Carolina, have invented certain new and useful Improvements in Water-Supply Systems, of which the following is a specification.

My invention relates to water-supply systems of the class in which the water-mains and service-pipes are supplied by pumps from a stand-pipe or reservoir, or from both combined; and the object of my invention is to provide improved means for regulating the flow of water through the mains from the pumps and from the stand-pipe or reservoir.

The particular object of my invention is to provide means for producing any desired pressure in the mains and service-pipes at any time.

In carrying out my invention I connect the water-main with the stand-pipe or reservoir by two branches containing valves opening in opposite directions in such manner that the flow of water from the main to the stand-pipe or reservoir is prevented through one of the branches, but permitted under certain conditions through the other branch, and the flow of water from the stand-pipe through the last-mentioned pipe is prevented, while the flow of water from the stand-pipe through the other branch to the main and service-pipes is permitted under certain conditions. The valve in the branch pipe through which the water flows from the main to the stand-pipe is preferably weighted or so constructed that it may be held closed until a certain predetermined pressure has arisen in the service-pipes, by which means I am enabled to cause the pumps to produce any desired pressure in the system before delivering to the stand-pipe, and the arrangement is also such that whenever the pressure in the mains and service-pipes exceeds a predetermined pressure the excessive pressure may be expended in supplying water to the stand-pipe, thus preventing the water-hammer. I also contemplate supplying two stand-pipes or reservoirs at different levels from the same main, and in such case the valve through which water flows from the stand-pipe or stand-pipes to the main is weighted so that it will be held close until a predetermined pressure in excess of the pressure of the pumps has been attained.

In the accompanying drawings, Figure 1 is a diagram illustrating the preferred form of apparatus employed for carrying out my invention. Fig. 2 is a detail view of a modification.

The main A is connected as usual with pumps of the ordinary construction, the water flowing from the pumps in the direction indicated by the arrow *x*. There are of course a number of branch pipes or service-pipes connected with the main, one of these being indicated at B.

At the point X, which is preferably at the end of the service-pipe system and near the stand-pipe or reservoir G, the main is divided into two branches C and D, both of which connect with the stand-pipe G. The portion C′ of the pipe C might of course have a separate connection with the stand-pipe G, but preferably it is joined at *c* to the portion D′ of the branch pipe D. It is immaterial which form of connection is employed. In effect, both pipes C and D are connected with the reservoir G.

The branch pipe D, between the points X and *c*, or, in other words, between the point X and the stand-pipe G, contains a valve E, opening and closing in such manner that it is closed by pressure from the main when the pressure in the main exceeds the pressure in the stand-pipe; but when the pressure in the stand-pipe exceeds that in the main the valve E automatically opens and permits water to pass from the stand-pipe into the main and service-pipes. The branch C of the main contains a valve F, which opens and shuts in the direction shown, permitting water to pass from the main to the stand-pipe or reservoir G and preventing water from passing by it in the opposite direction.

Gates H and I are arranged in the branches C and D on opposite sides of the valves E and F. They are not essential, but are employed mainly for the purpose of disconnecting the valves E and F from the system when it is desired to inspect or repair them. The valves E and F, as shown in Fig. 1, may be assumed

to be ordinary check-valves. In fact, an ordinary check-valve E′, such as shown in Fig. 2, may be employed, and when this is the case the system will operate as follows: The pressure from the pumps in the main will hold the valve E closed as long as the pressure in the main exceeds the pressure from the stand-pipe G, and when the pressure from the main exceeds the pressure in the stand-pipe water may flow past the valve F into the stand-pipe. If, however, there is unusual demand on the service-pipes and the pressure in the main is reduced or if the pumps be stopped for any reason, the pressure in the main on top of the valve E will be reduced, and at this time water may flow from the stand-pipe G into the main and supply the service-pipes.

I have shown in Fig. 1 a second stand-pipe G′, which may be assumed to be at a lower level than the stand-pipe G. When it is desired to fill two or more stand-pipes, the connections are preferably as shown in Fig. 1, a branch pipe J being employed to connect the stand-pipe G′ with the branch C between the stand-pipe G and the valve F. The branch J contains a gate-valve J′, by means of which connection between the stand-pipe G′ and the branch C may be cut off. When a second stand-pipe is thus connected to the system, the valve E is weighted, as shown in Fig. 1, or is provided with some variable means for keeping it closed or producing a pressure on it opposed to the pressure of the water from the stand-pipe G. Preferably, as shown, the valve-stem *e* is prolonged and carries on its upper end a cup *e′*, carrying balls or weights *e²*. By adding to or subtracting from the weights in the cup *e′* the pressure of the valve E on its seat may be varied. When the connections are as shown in Fig. 1 and a second stand-pipe is employed, an ordinary check-valve K is interposed between the stand-pipe G and the pipe J. As thus organized the system will operate as follows: It is first necessary to properly weight the valve E in the manner above specified, so that when pressure is relieved on its upper side while filling the stand-pipe G′ the pressure of water from the stand-pipe G may not cause it to open. It will be assumed that the stand-pipe G is filled to the desired level and the gate J′ is opened. Flow from the stand-pipe G is prevented past the valve E in the manner above specified, and the flow is prevented toward the pipe J from the stand-pipe G by the check-valve K. Water therefore flows from the main past the valve F and through the pipe J to the stand-pipe G′ and will continue thus to flow until the pressure of the stand-pipe is equal to the pressure in the main, when the valve F will close. After this the valve J′ is closed and the stand-pipe G′ may be used to supply its own system of service-pipes. Then the weights may be removed from the valve E and the stand-pipe G used to supply the service-pipes B in the manner before explained, or if the stand-pipe G is empty the valve J′ may be left open and the service-pipes B may be supplied from the stand-pipe G′. The weight on the valve E may be adjusted at any time to withstand any amount of pressure from the stand-pipe or stand-pipes.

I do not contemplate usually supplying the service-pipes B from both stand-pipes at the same time; but in an emergency where the pumps are stopped or where there is unusual demand on the service-pipes the valve E may have the weights so adjusted or so reduced that water may freely flow from both stand-pipes at the same time. Ordinarily, however, I contemplate weighting the valve to counterbalance the pressure in the stand-pipe G only when filling the stand-pipe G′, after which, as before stated, the additional weight is removed from the valve E and the valve J′ is closed.

So far as now explained an ordinary check-valve may be used at F; but in order to produce any desired pressure in the main and service-pipes the valve F is preferably weighted or provided with means for adjusting its pressure on its seat against the pressure of water from the pumps. A simple way of doing this is to extend the valve-stem *f* and provide it with a number of removable weights *f′*. By using the proper number of weights the desired pressure in the main and service-pipes can be obtained, it being necessary for the pressure in the main and in the branch C to rise to such an extent as to be able to lift the valve F against the pressure not only of the water in the stand-pipes G or G′, but also against the pressure of the weights *f′*.

In the use of such a system it is sometimes desirable after the valve F is weighted to produce a certain pressure in the main and service-pipes to relieve the valve F of this pressure in order that water may be allowed to flow into the stand-pipes without removing the weights. I therefore attach a piston L to the valve-stem *f* and arrange this piston in a cylinder M, connected by means of a pipe N with the branch pipe C between the valve F and the water-main. The pipe N is provided with a cock O, having a drain *o*. When the cock O is open, water may pass beneath the piston L and raise the valve F against the force of the weights *f′*, and thus permit water to flow to the stand-pipes. When it is desired to again put the valve F under pressure, the cock O may be turned in the proper direction to open the drain *o*, and thus allow the valve to close. It will therefore be understood that by my apparatus the service-pipes may be normally supplied by the pumps, and at the same time the stand-pipe or reservoir may be thus supplied; that if the demand on the service-pipes is excessive the deficiency may be supplied from the stand-pipe automatically by the valve E; that any desired pressure may

be produced in the main and service-pipes by the valve F, such valve being so adjusted that it is held closed until a predetermined pressure is exerted on it, when it opens to relieve excessive pressure and allow surplus water to pass to the stand-pipe or reservoir.

The apparatus shown is the best now known to me for carrying out my invention, but obviously the organization and the details of construction may be somewhat varied.

I claim as my invention—

1. A water-supply system comprising a stand-pipe or reservoir, a main connected with the stand-pipe by two branches, valves in said branch pipes controlling the flow of water in opposite directions toward and from the stand-pipe, and means for adjusting the pressure of one of said valves on its seat whereby the flow of water from the main to the stand-pipe is prevented until the pressure in the main is excessive.

2. A water-supply system comprising a stand-pipe or reservoir, a main connected with the stand-pipe by two branches, valves in the branches controlling the flow of water in opposite directions toward and from the stand-pipe, a valve in one of said branches controlling the flow of water from the stand-pipe to the main, and means for varying the pressure of said valve on its seat whereby the flow of water from the stand-pipe into the main is prevented until the pressure in the main has fallen below a predetermined amount.

3. A water-supply system comprising a stand-pipe or reservoir, a main connected with the stand-pipe by two branches, a valve in one of said branches preventing the flow of water from the main to the stand-pipe, a valve in the other branch permitting the flow of water from the main to the stand-pipe when the pressure in the main is sufficient, means for producing a pressure on said valve in addition to the pressure from the stand-pipe, and means for producing a pressure in addition to the pressure from the main on said valve to cause it to open.

4. A water-supply system comprising a stand-pipe or reservoir, a main connected to the stand-pipe by two branches, a valve for preventing the flow of water from the main through one of said branches to the stand-pipe, a valve in the other branch permitting the flow of water from the main to the stand-pipe when the pressure in the main is sufficient, a weighted valve-stem connected with said valve, a piston connected with said valve-stem, a cylinder in which the piston moves and a valved pipe connection between the cylinder and the branch pipe for the purpose specified.

5. A water-supply system comprising two stand-pipes or reservoirs, a water-main connected with said stand-pipes or reservoirs by two branches, valves in said branch pipes preventing the flow of water from the main through one branch to the stand-pipes, and permitting the flow of water from the main through the other of said branches to either or both stand-pipes when the pressure in the main is sufficient, means for adjusting the pressure of the valve past which water flows from the stand-pipes to the main, and a check-valve interposed between the two stand-pipes.

In testimony whereof I have hereunto subscribed my name.

ROBT. P. HENRY.

Witnesses:
W. E. FRANKLIN,
T. L. FARROW.