Sept. 15, 1931. H. D. WINTON 1,823,308

METER SYSTEM

Filed Aug. 20, 1929

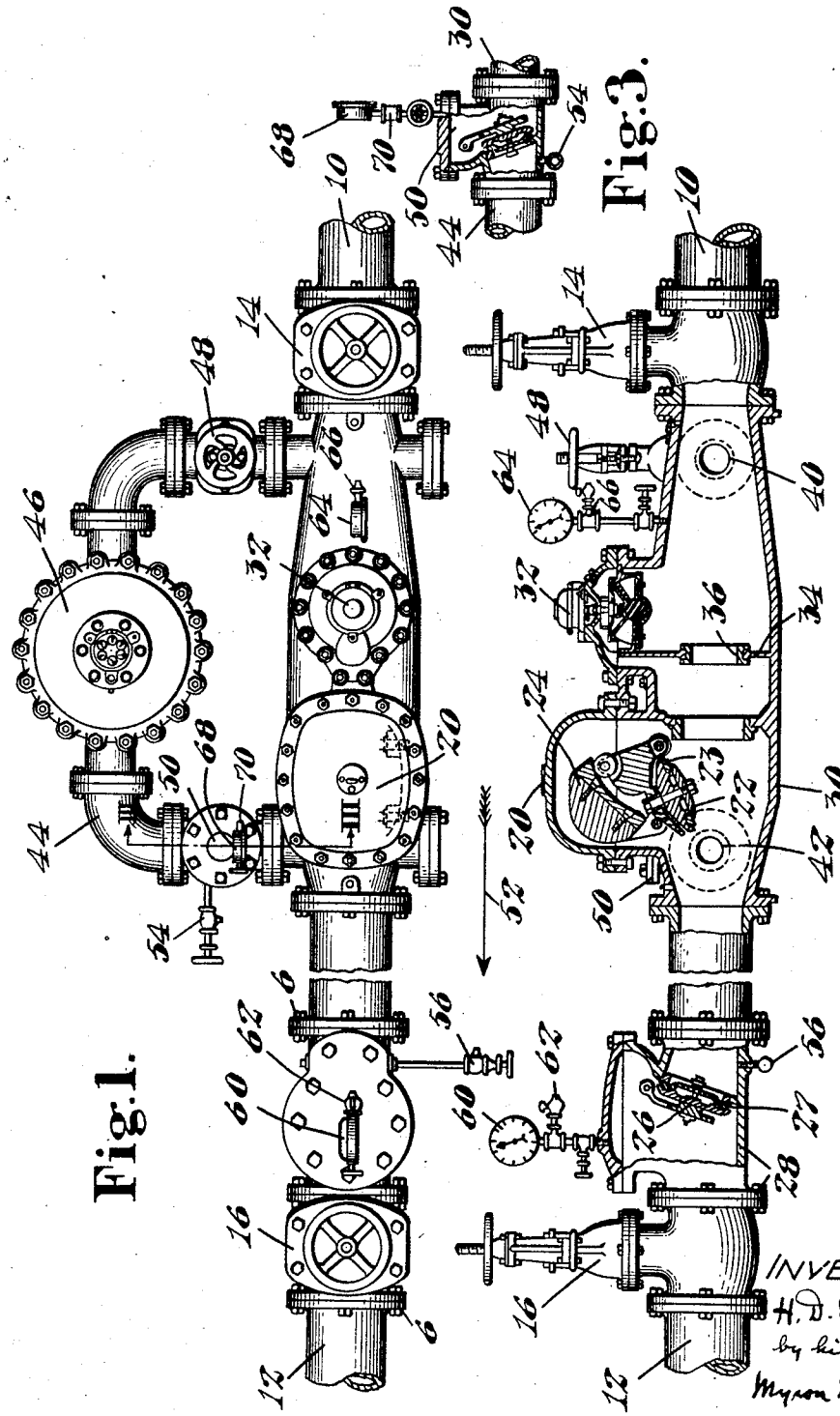


Fig. 1.

Fig. 2.

Fig. 3.

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Patented Sept. 15, 1931

1,823,308

UNITED STATES PATENT OFFICE

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METER SYSTEM

Application filed August 20, 1929. Serial No. 387,142.

This invention relates to meter systems and is herein illustrated as embodied in a cross-connection between a potable and a non-potable supply system.

A demand for two sources of water supply is found in many factories either in order to insure continuous operation where large quantities of water are used for boiler feed, for cooling, or for various other industrial purposes. In other cases the demand for two supplies arises from the requirements of the insurance underwriters. With the advent of automatic sprinkler systems, large amounts of property are gathered together in one building, but it is very evident that the protection afforded by automatic sprinklers is of little value unless an immediate and adequate supply of water is assured under all emergency conditions. In order to provide two such sources of supply for any one of a number of reasons such as those mentioned, recourse is frequently had to the utilization of the public drinking-water supply as one source and to the utilization of another private source which very frequently is not potable and, even if it is, is not sufficiently protected to be safe for utilization as drinking water.

It is customary to provide a physical connection between the two sources of supply including control valves, meters and the like, and check valves, so that the auxiliary source will be instantly and automatically available in case an emergency arises without permitting the flow of impure, non-potable water into the public supply system. There can be no delay in case of fire, for example, as one of the tremendous advantages of automatic sprinklers lies in their ability to extinguish fires at the start, and these cross-connections must permit an immediate inflow of water from the emergency supply, frequently the public water supply.

It should be borne in mind, however, that no matter how imperative the demand and need may be, it is still more imperative that the health of the public shall not be imperilled by the introduction of unclean, non-potable water into the public supply system. A great many instances of outbreaks of typhoid fever and other water-borne diseases have convinced public health authorities of the necessity of carefully guarding against the accidental introduction of non-potable water into the public supply system. This has led to the requirement for the use of more than one automatic check valve in such a cross-connection, in order that the public may not be imperilled by the breakdown or leakage of one of these valves, and to the added requirement that such valves, if inserted in an underground connection, shall be placed in a suitable brick or concrete pit easily accessible for tests of the valves at regular intervals to see that they are continuing to function properly. Such installations, however, are expensive and useful only for protection purposes.

It frequently happens that the stand-by or emergency source of supply is from a system such as a public supply system requiring the metering of any water taken from this emergency source either in small or large quantities and without interfering with the free flow of water when the emergency demand arises.

In view of the above, this invention provides a novel meter system by which the means provided for measuring of the water used may serve at the same time to help in protecting the potable supply.

A feature of the invention relates to the utilization of a check valve, herein shown as of a type which can only be opened by substantially maximum demand but which when opened will impose substantially no frictional loss upon the flow of water, which will serve to cause small quantities of water to be by-passed through a meter of small capacity adequate for such quantities, and which will also serve as a check valve to prevent the back flow of non-potable water into the system supplying potable water.

In the accompanying drawings,

Fig. 1 is a plan view of a meter system arranged in accordance with my invention;

Fig. 2 is a vertical elevation of the same, parts being broken away and in section; and

Fig. 3 is a fragmentary section on the line

III—III of Fig. 1 showing a check valve in the by-pass.

In the arrangement herein illustrated, it is assumed that the pipe 10 is connected to a supply of potable water and that the main 12 is connected to a non-potable supply. Interposed between these two sources, capable of being shut off manually by means of gate valves 14 and 16 in order to provide for repairs or tests, is a meter system operating also to protect the potable supply from the introduction of unclean water. Such protection is afforded partly by a one-way check valve 20 embodying a swinging flap 22 having a rubber facing 23 and having associated therewith an auxiliary weight 24. This in the closed position of the valve requires a severe unbalancing of the pressures on opposite sides of the valve such as would be occasioned by an unusual demand arising from an emergency, before the valve can be opened. At the same time the valve is very readily held in open position by the passage of the water without setting up frictional losses and loss of head such as would result if the weight of the valve flap 22 and the auxiliary weighted lever 24 were combined to act constantly upon the flap in all positions. For a more complete description of the construction of such a valve reference may be had to the application of James A. Tilden, Serial No. 119,657, filed June 30, 1926. Another check valve 26 having a flap with a rubber facing 27 is disposed within a casing 28 and arranged to swing in the same direction as the valve 20 so that if, by reason of wear or inattention, one of these valves does not prevent the back flow of water from the source 12, the other valve can be depended upon so to prevent it.

The check valve 20 is embodied in a casing 30 containing a proportional meter 32 of the type disclosed in Letters Patent of the United States No. 797,027, granted upon the application of James A. Tilden, and having a diaphragm or wall 34 with a large axial opening 36 which does not interfere with the proper flow of water through the cross-connection and at the same time diverts a proportional part of the water through the meter 32 so that all but flows of very small volume will be accurately measured by said meter.

It may at times be desired to utilize small quantities of water from the potable supply 10 for drinking or washing, for example, which would not cause the check valve 20 to open and which could not accurately be measured by means of the proportional meter 32. Accordingly, the casing 30 has an outlet opening 40 and a return opening 42 between which there is connected a by-pass 44 containing a meter 46 of small but adequate capacity for such flows as may be permitted through the by-pass 44. For emergency or testing purposes the by-pass is provided with a manually operable gate valve 48 and, in order to aid in protecting the potable supply 10, a check valve 50 is also introduced in said by-pass 44 swinging in such a direction that flows are permitted in the direction of the arrow 52 from the potable supply toward the nonpotable supply but reverse flows are prevented.

Thus it results that at least two check valves are interposed in any path between the two supplies, which check valves are arranged to prevent the back flow of water. At the same time my novel meter system will not interfere with the passage of small quantities of water that may be taken from the supply 10 for any desired purpose and the check valve 20 will serve to deflect such small quantities through the by-pass meter 46. These flows of water will at the same time be measured without either introducing an error because of the use of a meter suitable for large flows of water or, conversely, without introducing an undue loss of head because of the utilization of a meter which is arranged to measure any quantity of water from small to large which may be passed through it.

The experience of many years in the inspection of cross-connections and the check valves embodied therein shows that a failure of one of these valves is not infrequent. Such a failure might be caused by the lodging of some foreign substance, such as a stone or a stick, on the valve seat so as to prevent the complete closing of the valve, or it might be caused by the wearing out of the valve itself as check valves for protective purposes are usually required to be provided with rubber facings, such as those shown at 23 and 27, which after long usage are liable to disintegrate. In order that complete information concerning the effectiveness of the various valves may be obtained without breaking open the pipe connections, the check valve 50 has been provided with a drain valve 54 while the check valve 26 has a drain valve 56. Additional information regarding the conditions obtaining is permitted by the provision of a pressure gage 60 combined with an air cock 62 upon the casing 28 of the valve 26 and of a similar gage 64 and air cock 66 upon the casing 30 at one side of and in front of the proportional meter 32, considered with regard to the direction of flow indicated by the arrow 52. Still another gage 68 with an air cock 70 is provided upon the outlet side of the check valve 50.

The use of such testing devices will be understood by those skilled in the art but if, for example, it is desired to test the check valve 50, the gate valves 14 and 48 may be closed and the drain valve 54 opened. If the gages 68 and 64 do not show any drop in pressure the valve 48 is tight. If, however, a con-

tinued leakage through the drain valve 54 occurs and the by-pass meter 46 registers a flow, the leakage is in the gate valve 48. If the by-pass meter 46 does not register, then the leakage is in the check valve 50.

If it is desired to test the check valve 26, the gate valves 14 and 16 are closed and the drain valve 56 opened. If the gage 60 shows no drop in pressure, then the check valve 26 is tight. Having found that the check valves 50 and 26 are tight, then the check valve 20 may be tested by closing the gate valve 14, opening the gate valve 48 and the drain valve 54, and by observing the gages 68, 64 and 60. If the gage 64 drops to zero while the gage 68 remains as high as the gage 60, then the check valve 20 is tight.

It will be understood that in the ordinary use of the system the gate valves 14, 16 and 48 are open so that the supply 10 is immediately available for use to assist the supply 12. At the same time, any back flow from the source 12 toward the source 10 is absolutely prevented.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination in a water main, a plurality of check valves in series in said main and each opening in the same direction, one of said check valves being a maximum demand valve constructed and arranged to open only upon substantially maximum demand through said main, a proportional meter in front of said latter check valve, a by-pass around said proportional meter and said maximum demand check valve, said by-pass providing for the flow of moderate quantities of water without opening the latter check valve, a meter of moderate capacity in said by-pass, and a check valve in said by-pass allowing the flow of water only in the direction of flow permitted by said other check valves.

2. In combination, a water main provided with a one-way check valve held in closed position by its own weight to allow a flow of water only in one direction, a by-pass of small capacity connected to said water main and having its inlet and outlet openings into the water main both positioned at one side of said check valve, with reference to the direction of flow through said main, means for permitting the flow of water in one direction only through said by-pass, a small meter for measuring said flow of water through the by-pass, a large meter located in the main between the inlet and outlet openings of the by-pass and having a capacity to measure the full flow of water permitted by said main, another check valve located in said main between said inlet and outlet openings of the by-pass and constructed and arranged to be opened automatically by the flow of water only when the demand for water through the main is large, said check valve being arranged not to impede the flow of water when in its open position.

3. In combination, a water main having a pair of gate valves, a by-pass leading out of and into said main between said valves and having a shut-off valve, a meter and a check valve in said by-pass, a meter of large capacity located in said main between the inlet and outlet openings of the by-pass, a check valve in said main also located between said openings, another check valve in said main between one of said gate valves and said by-pass, all of said check valves opening in the same direction, and drain valves associated with said check valves to enable tests for leakage through said valves to be readily made by manipulation of said gate valves.

4. In combination, a water main having a protective one-way check valve, means forming parallel paths in series with said check valve, a meter and check valve in each of said paths, the check valves in said parallel paths opening in the same direction as said first-named valve and cooperating therewith to protect said main against back flows, one of said latter valves serving to hold one of said parallel paths closed until the demand reaches a predetermined amount and then to open automatically whereby the total flow may be accurately measured by said meters irrespective of the volume at any one time.

In testimony whereof I have signed my name to this specification.

HENRY D. WINTON.