Dec. 27, 1927.

1,654,172

O. W. JOHNSON

WATER SOFTENER

Filed July 27, 1925

Fig. 1.

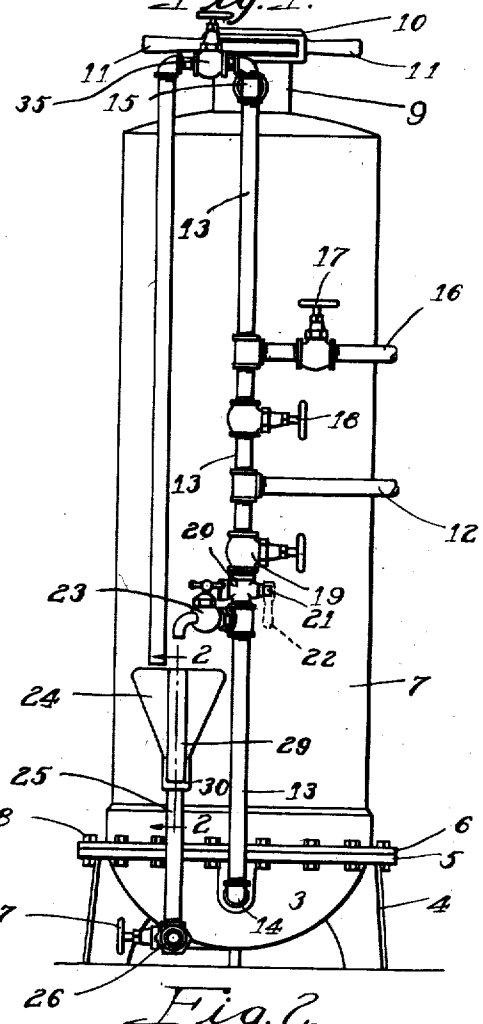
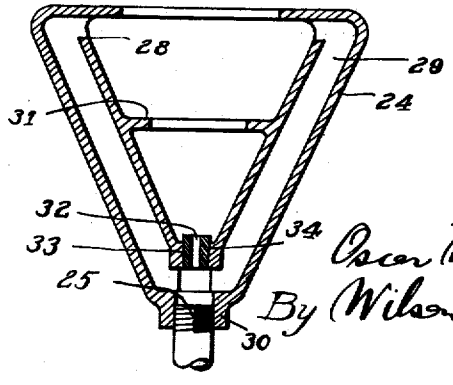


Fig. 2.



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UNITED STATES PATENT OFFICE.

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WATER SOFTENER.

Application filed July 27, 1925. Serial No. 46,198.

My invention relates to water softeners and has for its principal object, first, the provision of means for regulating the flow of water through the system during softening, so as not to exceed a pre-determined rate beyond the capacity of the softener to soften water, regardless of the available water pressure in different installations; and, secondly, the provision of a novel means to regulate the flow of regenerating fluid through the softening material in the system during regeneration or reconditioning so as not to exceed a pre-determined rate at which the fluid will be used to regenerate, it being understood that the chemical exchange always involves a certain definite time factor and it is wasteful, therefore, to pass regenerating fluid through the system faster than an exchange can occur between it and the softening material.

A further object of the invention relates to the provision of improved means for securing the desired results above mentioned, which is practically fool-proof in that it leaves nothing to the personal judgment of the user of the softener in controlling the operation thereof, both in the normal softening operation and in regenerating or reconditioning.

The invention embraces other objects and advantages which will be brought out more clearly in the course of the following detailed description. The latter refers to the drawing in which Fig. 1 is a front view of a softener embodying the improvements of my invention, and

Fig. 2 is an enlarged vertical section through the atmospheric measuring or timing funnel, forming a part of my present invention. Fig. 2 is taken on the line 2—2 of Fig. 1, looking in the direction of the arrows.

Referring to the drawing, in which the same reference numerals are applied to corresponding parts, a base 3, having supporting legs 4 and a bolting flange 5, has the flange 6 of the tank 7 secured thereon by a plurality of bolts 8. The tank contains the material for softening hard water and usually has provision for filtering the water as well. The softening material in the present case extends from within a short distance of the top of the tank to the bottom thereof, and provision is made at the bottom for filtering and evenly distributing the passage of water by means of a metal filter cloth of very fine mesh. The head space gives the softening material that is agitated and raised in the rising column of water an opportunity to settle so as not to be carried off through the outlet. It also furnishes a chamber into which the regenerating or reconditioning material, such as common salt or salt brine, may be poured or injected when the system is to be reconditioned. The neck portion 9 of the tank is fitted with a salt cap 10, which is applied and removed from the tank by the handles 11. Hard water is received through an inlet pipe 12 leading in from the city mains at the user's disposal. The pipe 12 taps into a pipe 13, extending vertically outside the tank 7. The pipe 12 leads into the base 3, as indicated at 14, and into the neck 9 at the top of the tank, as indicated at 15. The soft water leaves the tank through an outlet pipe 16 tapped into the pipe 13 above the inlet 12. A valve 17 is interposed in the outlet pipe and another valve 18 is interposed in the pipe 13, between the inlet and outlet pipes 12 and 16 respectively. From the description thus far advanced it will appear that water entering the inlet 12 and flowing down through the pipe 13, the valve 17 being open, flows upwardly through the tank and is discharged through pipe 16. This corresponds to the normal flow through the system in softening.

A valve 19 is provided below the inlet 12 to shut off the normal flow through the system and to enable reversing the direction of flow by opening the valve 18 when regenerating or reconditioning the softener. A valve 20 is interposed in the pipe 13 below the valve 19 to serve as a flow regulator for the system. This valve has a cap 21, screw-threading on the body thereof, to cover the stem of the valve to prevent tampering therewith once the valve has been set. A key, indicated in dotted lines at 22, fits the valve 20 and is used by the plumber who makes the installation. After the valve is set, the key is removed and the cap 21 securely threaded in place. A faucet or bibb 23 is tapped into the pipe 13 below the valve 20 and discharges into a flow-measuring or timing funnel 24. The funnel 24 is mounted on a stand-pipe 25

tapped into a waste-pipe 26 on the discharge side of a valve 27, which controls the discharge of water from the tank through the waste-pipe in draining.

It may be stated at this point that, with the valve 18 closed and valves 19 and 23 fully opened, water entering through the pipe 12 will be discharged through the faucet into the funnel 24 at a rate depending upon the available city water pressure. This pressure varies in different localities from as low as 20 to 30 pounds to as high as from 100 to 150 pounds. Obviously, a softener designed for installation in a locality having a lower water pressure would not be suited for use in a locality having a much higher water pressure, due to the fact that with inlet and outlet openings designed for a certain rate of flow at one pressure the material in the tank might, in certain cases, be completely carried off if water were admitted at a much higher pressure. For this reason I provide a main restriction valve, such as the valve 20, which may be set to allow only a certain pre-determined flow through the system within the capacity of the softener to soften water. Thus, regardless of what demand is made on the softener due to the number of taps being opened throughout a given system, no more water will be allowed to pass than can reasonably be accommodated for softening by the softener. The valve 20 is regulated until the discharge from the faucet is just sufficient to maintain a level of water in the funnel up to the openings 28 therein. These openings lead into by-passes provided in hollow ribs 29 cast on the sides of the funnel 24 and extending down to the hollow neck 30, which threads on the end of the stand-pipe 25 as above indicated. When valve 20 is set according to the level maintained in the funnel, the opening 34 in the funnel is not fitted with the bushing 33 hereinafter described.

The measuring or timing funnel 24 also serves in the regulating of the reverse flow through the system in regenerating or reconditioning. A reverse flow for salt-washing is established when the valve 18 is opened and the valve 19 closed, it being understood that the valve 17 for the outlet will be closed during the reconditioning process. The water will flow downwardly through the softening material in the tank to carry with it the salt, which has been poured in on top of the softening material, and is dissolved by the water as it descends. In large machines, salt brine is injected directly into the top of the tank. The salt brine coming in contact with the material in the tank produces a chemical exchange to replace with sodium the calcium and magnesium that has been assimilated by the material. This exchange can be carried on only at a certain pre-determined rate and it is therefore wasteful to pass the regenerating brine through the tank any faster than it will be used. By regulating or timing the flow of brine through the tank to the proper extent, knowing what time element is involved, I avoid a wasting of brine. In this connection, I provide means for regulating the rate at which the water is discharged from the tank during reconditioning and, consequently, the rate of flow of the reconditioning or regenerating fluid through the material is thereby governed. The reconditioning fluid is discharged through the faucet 23 into the funnel 24 and the faucet is opened only to such an extent as to maintain a level in the funnel up to the rim or flange 31 inside the funnel. The discharge from the funnel is restricted by the opening 32 provided in a tapered bushing 33 having a drive fit in an opening 34 in the bottom of the funnel over the neck 30. Due to the restricted size of the opening 32, a reduction in pressure would occur in the stand-pipe 25 were it not for the by-passes 29, which serve to relieve any suction that would otherwise be created. The process of regenerating or reconditioning is carried on for thirty minutes or thereabouts. The valve 18 is then closed to prevent the admission of any more water through the inlet 23. It may be pointed out here that the salt-washing may be carried on in the same direction as the normal flow in softening, that is, in an upward direction. In this case salt or salt brine would be injected in the base instead of in the top of the tank. In this way there would be no necessity for providing valves to reverse the flow through the tank.

The tank is provided with an air vent valve 35 tapping into the inlet 15 of the tank. The valve 35 also provides an overflow in a manner presently to appear, there being a pipe 36 extending therefrom to the funnel 24 to conduct the overflow to the funnel to be discharged through the waste-pipe 26. Assuming that the regenerating process has been completed, the brine in the softener is drained by opening the valve 35 to allow air to replace the water as it drains out through the faucet 23. The faucet 23 is, as indicated, at a level near the bottom of the softening material. This location of the faucet is made with a view to eliminating as much of the regenerating brine as possible so that on the reflush, which occurs in an upward direction through the material in the tank, the water discharged may soon be tested for its softness. The reflush flow occurs with the valve 18 closed, valve 19 opened, faucet 23 closed, and valve 35 opened. The valve 19 is opened gradually so that the water in filling the softener tank does not enter at too rapid a rate

and will not agitate the material therein too seriously. The air valve 35 may be regulated so that the water will flow into the funnel 24 at a fair velocity. The reflushing will at first carry off what regenerating brine still remains in the tank but within a few minutes a test for softness may be made. As soon as the water tests soft, the air vent is immediately closed and the valve 17 is opened again to allow the soft water to go into the system served by the softener.

I claim:

1. A flow measuring device for the purposes described comprising a funnel having a discharge opening, a level indicating means at a predetermined height on said funnel above said opening to determine a rate of flow for brine in regenerating a water softener, and a second level indicating means at another predetermined height on said funnel above the other means to determine a faster rate of flow for water in the softening operation of the water softener.

2. A flow measuring device for the purposes described comprising a funnel cast to provide an annular rim inside the same between the top and bottom of the funnel, and an annular rim at the top thereof, said funnel having a discharge opening at the bottom thereof, and said first mentioned rim serving to determine a relatively low rate of flow for brine in the regenerating operation of a water softener while the other rim serves in determining a relatively high rate of flow for water in the normal softening operation of the water softener.

3. A flow measuring device of the character described comprising a funnel terminating in a hollow neck portion at the bottom thereof, said hollow neck portion providing a discharge opening for the funnel, said funnel being cast to provide a by-pass passageway extending from the upper portion thereof to the bottom of said funnel and communicating with said discharge opening, and a plug having a restricted opening disposed in the bottom of the funnel proper and establishing restricted communication between the funnel proper and the discharge opening.

4. In a flow measuring device as set forth in claim 5, the provision of an annular rim cast on the inside wall of said funnel intermediate the top and bottom thereof, and another rim cast on the inside wall of said funnel at the top thereof above the intake end of the by-pass passageway.

5. A flow measuring device of the character described comprising a funnel having a main relatively restricted discharge opening at the bottom thereof, a neck portion at the bottom of said funnel providing a relatively less restricted discharge opening, and means providing a by-pass passageway extending from the upper portion of said funnel to the bottom thereof outside the funnel proper and communicating at the lower end thereof with the last mentioned discharge opening.

6. A device as set forth in claim 5 wherein the main relatively restricted discharge opening is provided in a replaceable or interchangeable plug whereby a certain desired restriction is afforded.

7. In a device as set forth in claim 5, the provision in said funnel of a level indicating mark intermediate the top and bottom of said funnel to determine, for example, a rate of flow for brine in regenerating a water softener, and another level indicating mark at the upper end of said funnel at the inlet end of the by-pass passageway and serving to determine, for example, a faster rate of flow for water in the normal softening operation of the water softener.

In witness of the foregoing I affix my signature.

OSCAR W. JOHNSON.

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In witness of the foregoing I affix my signature.

OSCAR W. JOHNSON.

CERTIFICATE OF CORRECTION.

Patent No. 1,654,172. **Granted December 27, 1927, to**

OSCAR W. JOHNSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 52, claim 4, for the numeral "5" read "3"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of January, A. D. 1928.

M. J. Moore,
Acting Commissioner of Patents.

Seal.

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