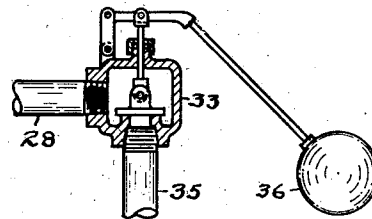
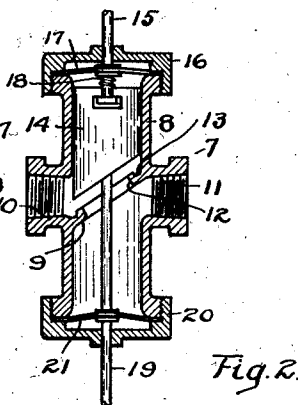
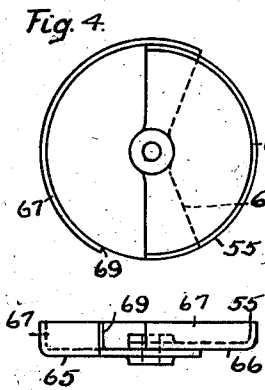
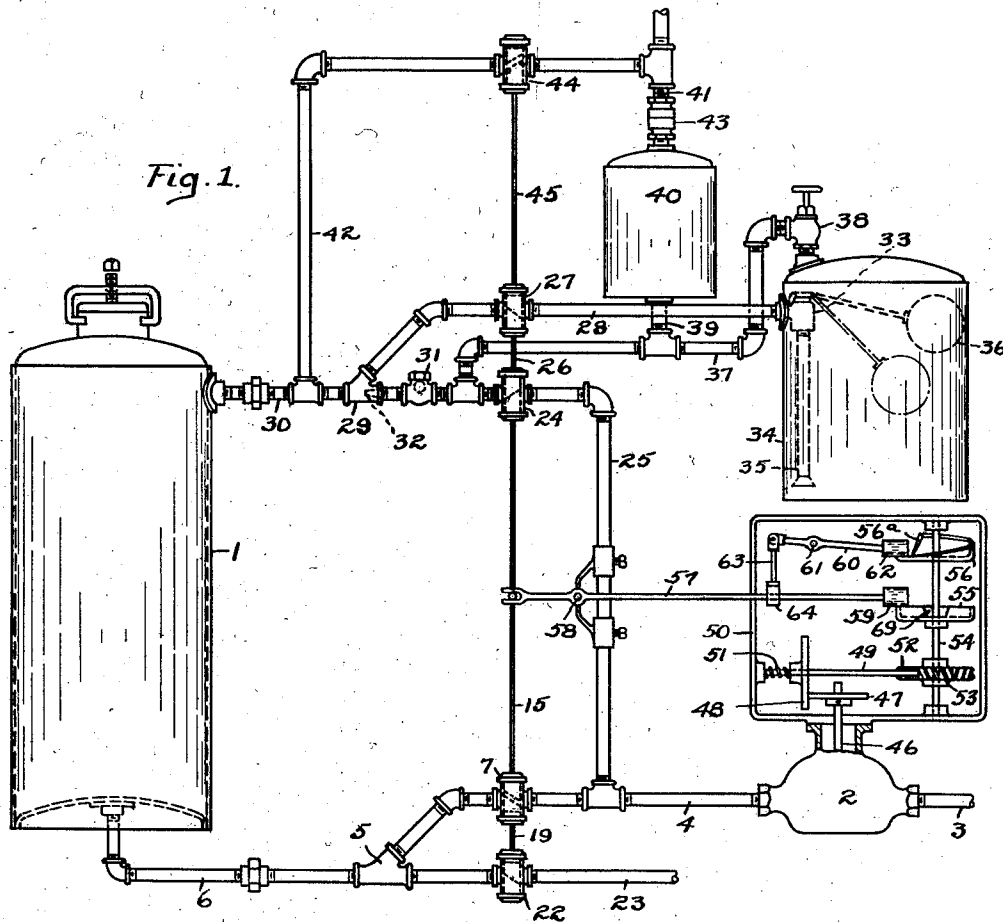


Oct. 23, 1928.

1,688,366

J. J. TOMKINSON
WATER SOFTENING DEVICE

Filed Sept. 30, 1926



INVENTOR.
J. J. Tomkinson
BY Elwin M. Hulbe
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOSEPH J. TOMKINSON, OF FORT WAYNE, INDIANA.

WATER-SOFTENING DEVICE.

Application filed September 30, 1926. Serial No. 138,668.

The invention relates to water softening devices and it is directed particularly to devices thereon for automatically regenerating the water softening material.

Water softening devices are commonly in use in which the hard water is led through a tank containing gravel and a material to soften the water such as zeolites or hydrated alumino silicates. When the latter material has exhausted itself in softening the hard water it is necessary to recondition it by passing salt brine through the mass. The general practice followed is to recondition the material at stated periods of time, the operations being carried on manually.

The object of the present invention is to provide the device with simple means by which to automatically admit the salt brine into the tank upon the consumption of a predetermined quantity of the softened water.

Another object is to provide the device with means by which a supply of softened water is furnished while the reconditioning process is in operation.

Other objects will appear hereinafter.

The invention is illustrated in the accompanying drawings, in which

Figure 1 is an elevational view of a device embodying the invention; Fig. 2 a vertical cross-section of one of the controlling valves; Fig. 3 a cross-section of the controlling valve of the brine tank; Fig. 4 a plan view of the valve operating cam and Fig. 5 an elevational view of said cam.

In the illustrative embodiment of the invention, in which the parts are in the position for the softening operation to be carried on, 1 represents a tank in which the water softening materials are suitably supported. 2 represents a water meter to which the water service line 3 communicates. A conduit 4 also communicates with the meter and is connected to a Y fitting 5. A pipe 6 is connected to the fitting 5 and to the bottom of the tank. A valve 7 is interposed in the pipe 4 and consists of a casing 8 (Fig. 2) having an oblique partition 9 therein that extends from the lower side of the discharge opening 10 to the upper side of the intake opening 11. This partition is apertured at 12 and about said port 12 is a seat 13 upon which the hollow valve 14 is adapted to engage. A rod 15 is connected to the valve 14 and projects upwardly through a stuffing box formed on the cap 16, a diaphragm gasket 17 being engaged

on the rod and secured at its periphery between the cap 16 and the casing 8. A spring 18 may be supported on the rod between the valve body 14 and the member 17. Another rod 19 is connected to the valve and projects through the port 12 and through a stuffing box formed on the cap 20, a diaphragm gasket 17^a similar to the gasket 17 being similarly secured to the rod 19 and to the casing.

The rod 19, at its lower end, is connected to a valve mounted in the casing 22 that is interposed in the drain pipe 23 that is connected to the fitting 5, and leads to a convenient point. This valve is constructed so that it is closed when the valve 7 is open.

The upper end of the rod 15 is connected to a valve 24 that is interposed in a conduit 25 which is connected at its lower end to the hard water inlet pipe 4. This valve is arranged to be closed when the valve 7 is open, and it is similar to the valve 7 except that it is inverted. The rod 26 that is connected to the valve 24, is also connected to a valve 27 that is interposed in a conduit 28. This valve 27 is adapted to be closed when the valve 7 is open and it is also similar to valve 7 but inverted.

Conduit 28 is connected to a Y fitting 29 that is connected to a conduit 30, the latter conduit being connected to the upper portion of the tank 1.

A check valve 31 is interposed in the conduit 25 and the adjacent end of the conduit carries a nozzle 32 that is connected to the fitting 29 and projects into it a selected distance so as to form an injector that will, when the valve 24 is open and hard water flows from the pipe 4 through the conduit 25, produce a vacuum in the conduit 28, which conduit is connected to a valve 33 suitably supported in the upper portion of the brine tank 34, an intake pipe 35 leading from the valve casing toward the bottom of the brine tank. A float 36 is operatively connected to the valve 33 and closes the valve at a predetermined level of the brine.

A conduit 37 has communication with the conduit 25 between the valve 24 and the tank 1 and it also communicates with the top of the brine tank, a valve 38 controlling the latter communication. When the valve 24 is open water from the main 3 passes through this conduit 37 into the brine tank to replenish the same.

The conduit 37 also has a communication with an auxiliary tank 40 containing water

softening materials, the outlet 41 from this tank being united to the discharge conduit 42 that leads from the upper portion of the main tank 1, a check valve 43 in the outlet 41 preventing the discharge of softened water into the tank 40. A valve 44, similar to the valve 22, controls the conduit 42 and it is operated by the rod 45 that is connected to the valve 27, or it may be a further extension of the rod 15. This valve is open only when the valve 7 is open.

Since the controlling valve 7, 22, 24, 27 and 44 are tied together they are operated in unison and that operation is effected automatically by the following mechanism:

A shaft 46 is suitably connected to the meter 2 to be driven thereby. A disk 47 is adjustably secured to the shaft 46 and its peripheral edge frictionally engages a disk 48 slidably secured to a shaft 49 that is rotatably mounted in a frame or case 50. A spring 51 tends to retain the disk in engagement with the disk 47. A worm 52 is secured to the shaft 49 and meshes with a worm wheel 53 secured to a shaft 54 that is removably supported in the frame or case 50. Two cams 55 and 56 are secured one above the other to the shaft 54. A lever 57, pivoted at 58 and having one end loosely engaged to the rod 15, carries a roller 59 at its opposite end that rides on the cam 55. A lever 60 pivoted at 61 carries a roller 62 at one end that rides on the upper cam 56. A link 63 is pivoted at its upper end to the lever 60 and a slotted collar 64 is secured to the lower end of the link through which the lever 57 loosely extends.

Cam 55 consists of two overlapped segments 65 and 66 that are relatively movable, each segment having an upstanding wall or flange 67 about its peripheral edge upon which the roller 59 rides. The wall or flange on the lower segment is terminated at one end back of the open side 68 of the segment to provide an opening 69 in the wall of the cam into which the roller 59 may descend when said opening is moved under the roller. Since the two segments are relatively movable the width of the opening 69 may be adjusted as desired.

The cam 56 is similarly constructed in two overlapped segments, but the upstanding wall at the peripheral edge thereof slopes gradually from the surface of the segments to the highest point or end 56^a of the wall. The roller 62 rides on this cam and as the cam 56 is rotated under the roller the lever 60 is rocked on its pivot and the link 64 is moved downwardly. During this climbing movement or a portion thereof, the roller 59 is down in the aperture 69 in the cam 55, the regenerating process being then in effect. When the roller 62 drops to the segment at the end 56^a of the cam the lever 60 is rocked on its pivot and the link 64 rises and rocks the lever 57 to cause the roller 59 to ride on the wall of the cam 55.

In the drawings the mechanism is in a position where the valves 7 and 44 are open and the valves 22, 24 and 27 are closed. The hard water, therefore, is free to flow into the tank 1 and soft water is free to discharge through the conduit 42. Since the meter operates whenever soft water is drawn from the conduit 42, the operation of the meter drives the cams 55 and 56. The cams are properly adjusted relatively to the levers 57 and 60 so that as they rotate the roller 62 will have travelled up the cam 56 far enough to fully release the lever 57 so that the roller 59 will drop into the aperture 69 in the cam 55 when that aperture is moved beneath said roller. When this occurs the lever 57 rocks on its pivot and elevates the rod 15. This movement of the rod 15 causes the valves 7 and 44 to close and the valves 22, 24 and 27 to open. The hard water intake to the tank 1 and the soft water discharge 42 are thereby closed and the hard water conduit 25, the brine supply conduit 28 and the hard water conduit 37 are opened. The hard water flowing through the conduit 25 into the tank 1 operates the injector 28 to cause the brine to flow through the conduit 28 into the top of the tank 1, the water and brine flowing downwardly through the bed of water softening materials in the tank and discharge through the conduits 6 and 23.

At the same time the hard water flows through the conduit 37 into the brine tank and into the auxiliary tank 40, so that the brine tank is replenished with water. The float 36 will close the valve 33 should an excess of water flow into the tank 34 before the valve 27 closes again.

The cams are, of course, rotating continuously while the brine is flowing. Eventually cam 56 releases the lever 60 and it rocks on its pivot to cause the lever 57 to shift the rod 15 in the opposite direction and cause the valves 7 and 44 to open and the valves 22, 24 and 27 to close, thereby cutting off the flow of the brine and opening the apparatus for the softening of water.

If, while the reconditioning action is going on, the user should open a faucet the auxiliary tank 40 will supply the soft water desired. Occasionally the auxiliary softener will be reconditioned in suitable manner.

The opening 69 in the cam 55 is variable in width so that it may be adjusted in accordance with the water pressure in order that the cam may continue to rotate with the roller in the opening for the required time to fully recondition the water softening materials in the tank 1, it being apparent that the greater the pressure the less will be the time required to recondition the softener.

Any suitable mechanism for driving the cams will suffice. I prefer, however, to use a water meter or motor and drive it by the water that flows into the main tank.

What I claim is:

1. The combination of a main tank having water softening materials therein, a conduit adapted to admit water to be softened to the main tank, a conduit for the discharge of softened water from said tank, a conduit for the discharge of waste products from said tank, a branch conduit communicating with the first named conduit and with the main tank, a brine tank, a conduit leading from the brine tank and communicating with the branch conduit through which brine is adapted to flow under the influence of water flowing in the branch conduit, an auxiliary tank having water softening materials and a discharge conduit for softened water, a conduit communicating with the branch conduit and with both the auxiliary tank and the brine tank, valves to control the several conduits, pivoted means having connection to the valves for operating them simultaneously, and means to actuate the pivoted means comprising a revoluble cam engaging the pivoted means adapted to permit the same to rock in one direction to cause the valves to operate to close off the inlet of water to be softened and the soft water discharge and open the other conduits, means to rock the pivoted means in the opposite direction to reverse the movement of said valves and means driven by the water flowing into the main tank and

operatively connected to the cam and to the last mentioned means.

2. The combination of a main tank having water softening materials therein, a conduit adapted to admit hard water to the tank, a conduit for the discharge of softened water from the tank, a waste conduit having communication with the tank, a branch conduit having communication with the hard water conduit and with the main tank, an injector in the branch conduit, a brine tank, a conduit communicating with the brine tank and with the branch conduit, valves to control the several conduits respectively, a pivoted member having connection with all the valves, cam means to permit the pivoted member to rock in one direction for actuating the valves to close the hard water conduit and the softened water conduit and to open the other conduits, a cam to rock the pivoted member in the opposite direction and actuate the valves to open the hard water and softened water conduits respectively and means driven by the water that flows through the main tank and operatively connected to the cams for rotating the cams.

In witness whereof I have hereunto signed my name this 23rd day of September, 1926.

JOSEPH J. TOMKINSON.