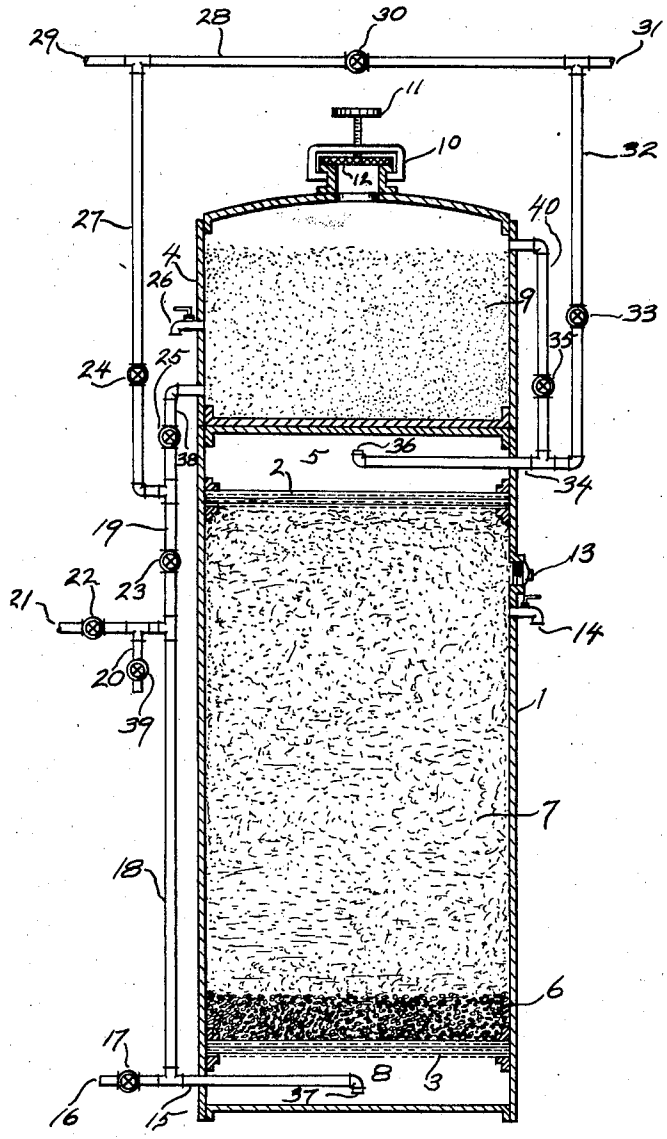
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WATER SOFTENER

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WATER SOFTENER

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4 Claims. (Cl. 210—24)

This invention relates to a new and improved apparatus for softening water, and the principal object of the present invention is to simplify and improve prior apparatus designed for this purpose, whereby the removal of solids from the water is greatly facilitated with uniform efficiency by means of relatively inexpensive equipment requiring a minimum of skilled attention.

In prior apparatuses water is softened by passing it through a chemical such as zeolite and either pumped or otherwise forced out, by means unlike that incorporated herein, of the treating tank back to the mains supplying the softened water for various purposes. The results of prior equipment has been more or less unsatisfactory in that they require considerable attention and are limited to use where the waste or regenerative solution can only pass by gravity or pumped to the sewer.

Generally speaking the present invention contemplates the removal of ingredients such as calcium carbonate which causes the water to be hard. This invention relies upon the regenerative qualities of salt the same as other systems but I am able to rinse the zeolite with the salt solution much quicker and with a minimum of labor.

Other objects and features of the invention will be readily understood from the following description in connection with the drawing.

The apparatus, as shown by the one figure of the drawing, includes an upright tank containing a lower compartment 1 and an upper compartment 4, separated by a partition constituting the bottom of the upper compartment.

The lower compartment has upper and lower baffle-plates 2 and 3, respectively, between which the compartment is charged, through a port normally closed by a plug 13, with gravel 6 on the bottom and with zeolite or other suitable softening material 7 thereabove, the gravel being to diffuse into the softening material water forced upwardly through the lower baffle-plate.

The upper compartment is charged with pure salt 9, as the regenerating material, through a port at the top normally closed by a cap 12 held in place by a clamp 10 and screw 11.

The general construction of the tank is such that it is impossible for dust or other foreign matter to get into the salt and zeolite compartments. Due to the fluid-tight construction, there is prevened entrance into the compartments of air, which ordinarily causes corrosion of parts and contamination of water.

The apparatus is full of water under main pressure while in use, and it is supplied with water from a main 28 entering through pipe 27 from near a place designated by 29, and it reenters the main through a pipe 32 connected near the place designated by 31. A normally closed valve 30 in the main between pipes 27 and 32 may be opened to permit water to continue in the main to the place of use without passing through the apparatus.

The supply-pipe 27 has a valve 24, therebeyond it is T-coupled with a pipe 18 having a valve 23 below the coupling, and thence pipe 18 continues downwardly to a pipe 15 extending into a chamber 8 below the baffle-plate 3. The pipe 15 has an exit-orifice 37 directed downwardly toward the bottom of the tank.

The pipe 18, below the valve 23, has a branch pipe 21 fitted with a valve 22; and, between that valve and the pipe 18, the pipe 21 has a branch 20 controlled by a valve 39. The pipe 18 has an upper extension 38 entering the salt-compartment 9 near its bottom, and the extension is fitted with a valve 25.

The pipe 34 has an upwardly-extending orifice 36 in the chamber 5 between the upper baffle-plate 2 and the bottom of the salt-chamber. The pipe 34 is connected with the reentrant or delivery pipe 32, which is fitted with a valve 33. A pipe 40, controlled by a valve 35, extends from pipe 34 to the upper part of the brine chamber.

When the apparatus is in normal operation for softening water, the valves 24, 23, and 33 are open, and all other valves are closed. Water passes from the main through pipes 27, 18, and 15 into the chamber 8, thence upwardly through the baffle-plate 3, gravel 6, zeolite 7, and baffle-plate 2 into chamber 5, and thence through pipes 34 and 32 back to the main. Water, during its flow upwardly through compartment 7, diffuses through the zeolite where the hard substances are removed.

When it is desired to regenerate the zeolite with brine from the upper compartment, valves 24, 25, 35, and 22 are open, and all other valves are closed. Water from pipe 27 passes through pipe 38 into the bottom of the brine compartment, upwardly through the salt, outwardly through pipes 40 and 34, upwardly from orifice 36 against the bottom of the brine-chamber, thence downwardly through baffle-plate 2, zeolite, gravel, and baffle-plate 3 to chamber 8, and thence through pipes 15, 18, and 21 to a sewer or other suitable place of disposal.

During the regenerating process, the speed of flow of water through the apparatus is controlled,

and its periodical stoppage effected, by manipulation of valve 24. Ordinarily, the regenerative solution is allowed to remain in contact with the zeolite for about 30 minutes.

Faucets 26 of the brine-compartment and 14 of the zeolite compartment, and valve 34, are provided for sampling fluids at intervals.

When the chamber 4 is to be refilled with salt, faucet 26 is opened to permit water to seek the level thereof, thereby providing space for the salt. Valve-controlled pipe 16 is provided to drain the apparatus of liquid when required.

During both the softening and regenerating action of the apparatus, the tank always is filled with water under the service pressure of the main; and, during the softening use, the valves having been set as hereinbefore described, no attention to the apparatus is required. The zeolite compartment is kept flooded with water as softened water is drawn off for use, and the complete apparatus operates successfully under service water pressure irrespective of the location of the apparatus.

Another important feature incorporated in this invention is the employment of baffle plates 2 and 3 which segregates the zeolite from the softened and unsoftened water and also serves as a diffuser for the water or brine when either is allowed to pass through the zeolite. Another important feature is the employment of an inverted coupling 37 which causes the entering water to break up against the bottom of compartment 1 thereby facilitating the diffusion of the water upwards through baffle plate 3 and gravel bed 6. In like manner orifice 36 is turned so as to cause the entering fluid to rush against the top of compartment 1 before diffusing through baffle plate 2 to the zeolite.

What I claim as new is:

1. Water-softening apparatus comprising a fluid-tight container of water-softening materail, a fluid-tight tank of regenerating material, a valve-controlled supply-pipe connectible with a main, a valve-controlled pipe-line extending from said supply-pipe to the bottom part of said container, a valve-controlled discharge-exit in said pipe-line between the valve thereof and said container, a valve-controlled delivery-pipe extending from the upper portion of said container, a valve-controlled pipe in communication with said supply-pipe beyond its valve and with the lower part of said tank, and a valve-controlled pipe extending from the upper part of said tank and connected with said delivery-pipe at a place between its inner end and its valve.

2. Water-softening apparatus comprising a fluid-tight container of water-softening material, a baffle near the bottom thereof on which said material rests and providing a chamber therebelow, a fluid-tight tank for regenerating material, a valve-controlled supply-pipe connectible with a main, a valve-controlled pipe-line extending from said supply-pipe to said chamber, a valve-controlled discharge-exit in said pipe-line between the valve thereof and said chamber, a valve-controlled delivery-pipe extending from the upper portion of said container, a valve-controlled pipe in communication with said supply-pipe beyond its valve and with the lower part of said tank, and a valve-controlled pipe extending from the upper part of said tank and connected with said delivery-pipe at a place between its inner end and its valve.

3. Water-softening apparatus comprising a fluid-tight casing containing a lower softening-chamber and an upper chamber for regenerating material, a valve-controlled supply-pipe connectible with a main, a valve-controlled pipe-line extending from said supply-pipe to the bottom of said lower chamber, a valve-controlled discharge-exit in said pipe-line between the valve thereof and said lower chamber, a valve-controlled delivery-pipe extending from the upper part of said lower chamber, a valve-controlled pipe in communication with said supply-pipe beyond its valve and with the lower part of said upper chamber, and a valve-controlled pipe extending from the upper part of said upper chamber and connected with said delivery-pipe at a place between its inner end and its valve.

4. The combination, with a main having a valve therein, of water-softening apparatus comprising a fluid-tight container of water-softening material, a fluid-tight tank of regenerating material, a valve-controlled supply-pipe connected with said main at one side of its valve, a valve-controlled pipe-line extending from said supply-pipe to the bottom part of said container, a valve-controlled discharge-exit in said pipe-line between the valve thereof and said container, a valve-controlled delivery-pipe extending from the upper part of said container and connected with said main at the other side of its valve, a valve-controlled pipe in communication with said supply pipe beyond its valve and with the lower part of said tank, and a valve-controlled pipe extending from the upper part of said tank and connected with said delivery-pipe between its inner end and its valve.

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