July 24, 1928. 1,677,891

W. H. GREEN

WATER SOFTENING APPARATUS

Filed Aug. 21, 1926

Fig. 1

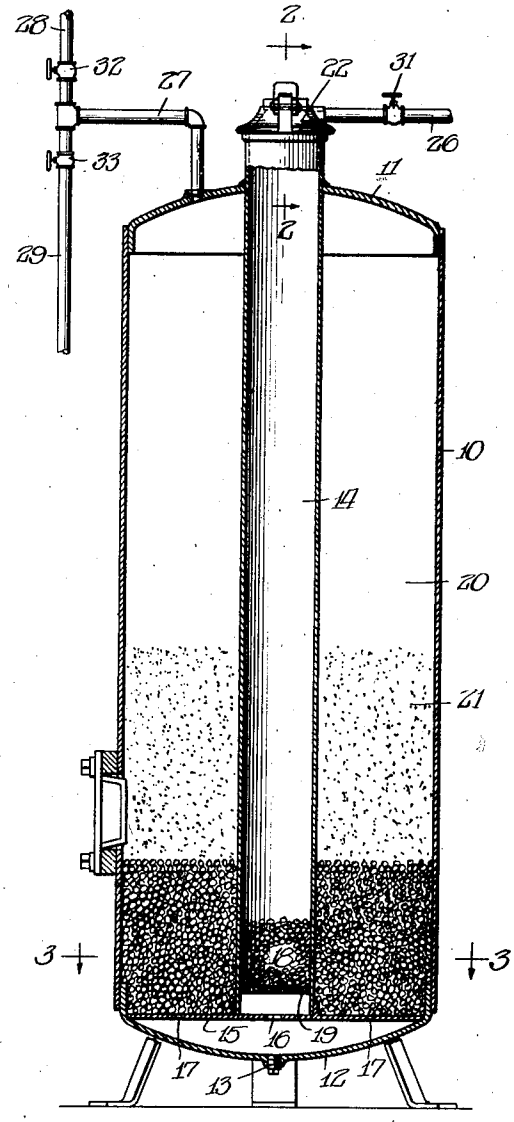


Fig. 2

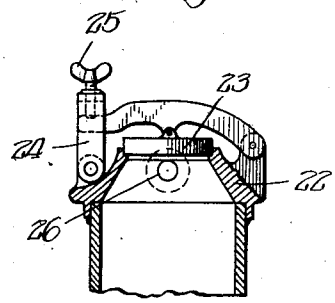
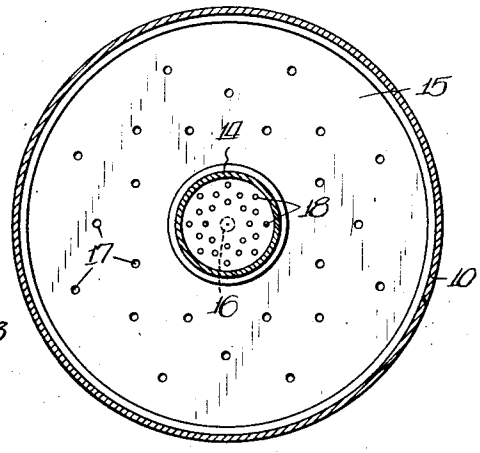


Fig. 3



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UNITED STATES PATENT OFFICE.

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WATER-SOFTENING APPARATUS.

Application filed August 21, 1926. Serial No. 130,755.

This invention relates to apparatus especially useful in processes involving zeolitic or base exchange action, the most notable example of which is water softening.

The object of the invention is to provide an apparatus having a minimum of parts, which shall occupy a minimum of space, and shall be extremely simple of installation and operation. The invention will probably find its greatest degree of usefulness in connection with water softeners designed for domestic use.

One of the noteworthy features of the invention is the provision of a novel arrangement of parts whereby the operation of brining or regeneration of the zeolites may be conducted in a simple fashion without any involved manipulation of valves without the necessity of exercising extraordinary care in the handling of the material and apparatus and without utilization of a separate regenerating solution preparation unit.

A preferred form of apparatus embodying the invention is illustrated in the accompanying drawings which are offered for the purpose of aiding in the explanation of the invention and are not to be construed in any sense as a limitation upon the scope of the protection which I seek through the subjoined claims.

In the drawings:

Fig. 1 represents a vertical sectional view through the center of an apparatus embodying the invention;

Fig. 2 is a detail of the cover cap; and

Fig. 3 is a cross-sectional view taken along the line 3—3 of Fig. 1.

The apparatus comprises a cylindrical casing 10 having rounded end members 11 and 12, the former having a central opening therein and the latter having a screw plug 13 at the bottom to permit of complete drainage of the casing.

Projecting through and tightly fitting within the opening in the upper end member 11, is a cylinder 14 which terminates short of the bottom of the casing and which carries at its lower end a plate or diaphragm 15. The diaphragm has a central opening 16 therethrough and a plurality of smaller perforations 17, fairly evenly distributed over its surface. Within the cylinder and a short distance above the diaphragm a stiff screen or perforated plate 18 is mounted. A layer of gravel 19 is disposed on the screen. Gravel is similarly disposed on the upper surface of the diaphragm 15 and within the annular chamber 20 to provide a suitable supporting bed for the zeolites 21. The top of the cylinder is covered by a cap member 22, which is provided with a swinging lid 23 and a pivoted clamping member 24 which cooperate under the influence of the thumb screw 25 to provide a water-tight seal. The inlet pipe 26 conducts fresh water to the top of the cylinder. A discharge pipe 27, connected to the casing near the top thereof communicates with branch pipes 28 and 29, the latter of which lead to the place of use and to waste respectively.

The cylinder 14 is designed for the accommodation of dry salt to be used in connection with the regeneration of the zeolites, the diameter of the cylinder being determined by the quantity and character of zeolites in the casing. After the zeolites have become exhausted of their capacity for softening water, and in order to regenerate them, it is merely necessary to close the valve 31 in the inlet pipe 26, open the cap 23 and shovel or pour the required amount of dry salt into the mouth of the cylinder. This being done, the cap is again closed, valves 32 and 33 changed and valve 31 opened, whereupon the fresh water coming through pipe 26 will dissolve and carry the salt down through the screen 18, the openings 16 and 17 of the diaphragm, up through the zeolites and out through pipes 27 and 29 to waste. Without further manipulation of the valves the continuing flow of fresh water will wash the zeolites and dilute and remove the brine. After the washing has been completed it is merely necessary to reverse the valves 32 and 33 to procure a new supply of softened water.

It is to be observed that for the complete operation of the softener provided by this invention, only three valves are required to carry on the entire cycle of operations, that the extra salt pot or separate means for preparing a regenerating solution, with the consequent piping and valve arrangement necessary to introduce the prepared salt solution into the casing, which heretofore has

been a part of the standard equipment of zeolite water softeners are eliminated, and that it is possible to utilize the preferred upward flow through the zeolites of water to be treated and regenerating material.

Modification in structural elements and arrangement will doubtless occur to those familiar with the art, now that the invention has been disclosed. I shall not attempt to specify all of the equivalents that I conceive at this but as an example of an alternative arrangement I would suggest the possibility of eliminating the screen 18 and placing the gravel 19 directly on the perforated diaphragm, with due regard, however, to the size and positioning of the perforations immediately at the center of the diaphragm.

I claim:

1. Zeolite water softening apparatus comprising a casing having a central cylindrical member, said member having a perforated bottom and a removable cover and being adapted to hold salt for regenerative purposes, a fresh water inlet discharging into the cylindrical member, and zeolites disposed in the annular chamber between the walls of the casing and the member.

2. Zeolite water softening apparatus comprising a casing having a central cylindrical member extending through the top of the casing and resting upon a perforated diaphragm near the bottom, a pervious support for salt within the cylindrical member, zeolites in the casing and a fresh water inlet discharging into the member.

3. Zeolite water softening apparatus comprising a casing having a central cylindrical member extending through the top of the casing and connected at its lower end to a perforated diaphragm, zeolites disposed on the diaphragm, a fresh water inlet discharging into the central member, an outlet from the upper portion of the casing and a removable cover on the member, the latter being adapted to receive salt required for regenerative purposes.

4. Zeolite water softening apparatus comprising a casing, a salt receptacle within the casing, said receptacle comprising a cylinder having an exterior removable cover and a perforated lower portion terminating in the bottom of the casing, zeolites within the casing, a fresh water inlet discharging into the receptacle and an outlet from the top of the casing.

5. Zeolite water softening apparatus comprising a casing, a salt receptacle within the casing, said receptacle comprising a cylinder having an exterior removable cover and a perforated lower portion terminating in the bottom of the casing, zeolites within the casing, means for introducing water for treatment of, and by, the zeolites into the receptacle and an outlet at the top of the casing.

6. Zeolite water softening apparatus comprising a casing, a salt receptacle within the casing, said receptacle comprising a cylinder having an exterior removable cover and a perforated lower portion terminating in the bottom of the casing, zeolites within the casing, means for introducing into the receptacle fresh water to be softened, to dissolve the salt into a regenerative solution and to wash the zeolites, and a common outlet at the top of the casing.

7. Water softening apparatus comprising a casing, a tubular salt receptacle therein opening at one end adjacent to the bottom of the casing and at the other end exterior to the casing and having a closure member exterior to the casing, said receptacle serving as a conduit for water to be treated, and a bed of base exchange material within the casing and surrounding the receptacle.

8. Water softening apparatus comprising a casing, an elongated receptacle therein having its lower end adjacent to the bottom of the casing and its upper end without the casing, said receptacle serving as an inlet conduit for water to be treated, and a layer of base exchange material within the casing around the receptacle.

9. A zeolite water softening apparatus comprising a casing having a central chamber extending throughout the greater part of its height, said central chamber having a removable cover and being adapted to hold salt for regenerative purposes, a fresh water inlet discharging into the central chamber, and zeolites disposed in the annular chamber between the walls of the casing and the central chamber.

In testimony whereof I have hereunto subscribed my name.

WALTER H. GREEN.