Jan. 5, 1932. W. H. GREEN 1,840,031

WATER SOFTENING APPARATUS

Filed Aug. 21, 1926

Fig. 1.

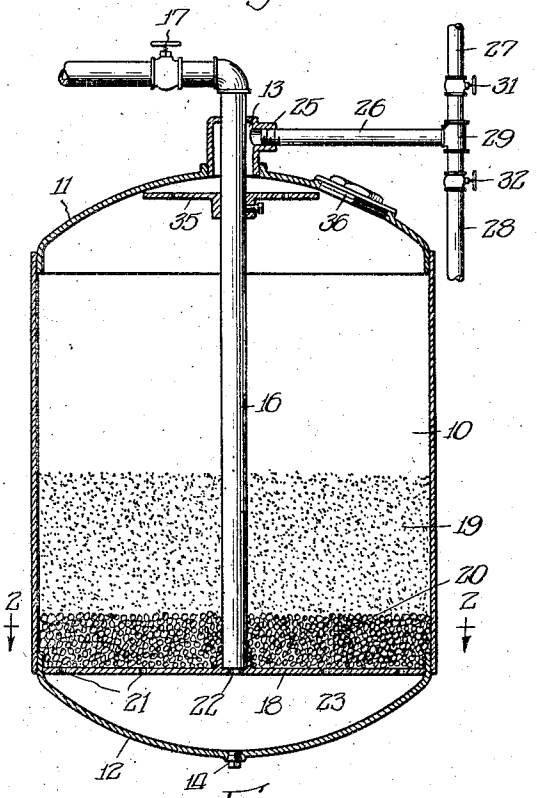


Fig. 2.

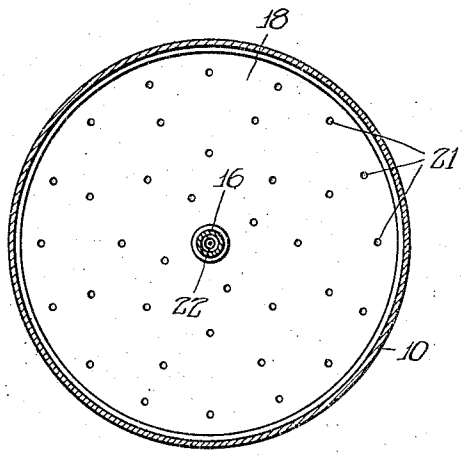


Fig. 3.

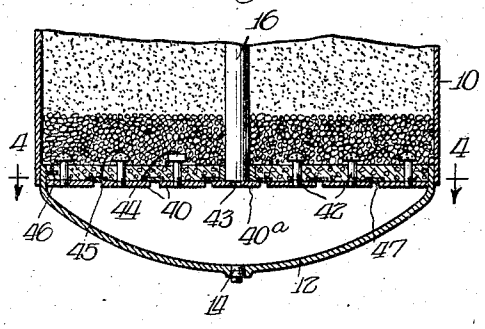
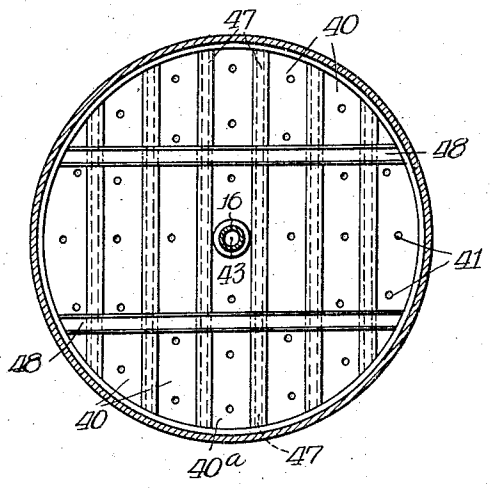


Fig. 4.



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UNITED STATES PATENT OFFICE

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WATER SOFTENING APPARATUS

Application filed August 21, 1926. Serial No. 130,753.

This invention relates to apparatus useful in connection with processes of softening water, particularly those employing zeolites or base exchange silicates. An object of the invention is to provide apparatus of simple construction and operation.

Other objects and advantages of the invention will be better understood upon consideration of the following specification and the accompanying drawings wherein are depicted an apparatus of preferred form embodying the essential features of the invention.

In the drawings—

Fig. 1 represents a vertical sectional view of the casing of the apparatus and the related piping and valves which control the flow into and from the casing, the structure herein shown being designed for new installation;

Fig. 2 is a cross-sectional view taken through the line 2—2 of Fig. 1 and showing in detail the perforated zeolite supporting plate and fluid distributor;

Fig. 3 is a vertical sectional view through the lower part of an old casing which has been redesigned for operation in accordance with the present invention; and

Fig. 4 is a cross-sectional view illustrative of the built-up zeolite support and distributor.

With special reference to Figs. 1 and 2 it will be observed that the casing 10 which I provide is in many respects similar to those which have been in general use heretofore, that is to say, the casing is cylindrical in section and has rounded top and bottom closure members 11 and 12 respectively. The cover member 11 has an opening in the center thereof into which is screwed a hollow cap member 13. The bottom member 12 is provided with a screw plug 14 which may be removed to permit complete drainage of the casing if that is at any time desired.

The inlet pipe 16 projects through the top of the cap 13 into the interior of the casing, terminating somewhat short of the bottom of the casing. This inlet is provided with and controlled by the valve 17. Connected to the lower end of the inlet 16 and supported thereby is a rigid circular plate or diaphragm 18, the outer edge of which is joined to the bottom member 12 and which provides a support for the zeolites 19. A layer of gravel 20 may be interposed between the zeolites and the plate 18.

The diaphragm is provided with a plurality of perforations 21 which are fairly evenly distributed. The central opening 22 underlies the lower end of the inlet pipe 16 and permits the entrance of liquid into the distribution chamber 23.

The cap 13 is provided with a radially extending lug 25 which latter is screw-threaded to receive the inner end of the outlet pipe 26. Branch pipes 27 and 28, connected to the T 29 and controlled respectively by the valves 31 and 32 direct the liquid leaving the casing either to the place of use or to waste.

The inlet 16 is connected with the water supply line and also with a supply of regenerating solution, not shown. In operation, hard water to be softened enters through the inlet 16 into the distribution chamber 23 at the bottom of the casing, then passes up through the perforations 21 and up through the zeolites 19 where it is softened, and leaves the casing through the cap 13, the outlet 26 and one of the branch pipes, for instance, the branch 27. In the water softening operation the valve 32 would be closed. In order to prevent the formation of direct currents to the outlet, a circular baffle plate 35 is fastened to the inlet pipe 16 near the top of the casing. As is customary in large sized casings, the cover member 11 is provided with a man-hole and cover 36.

After the zeolites have become exhausted of their capacity for softening water, the valve 31 is closed and the valve 32 opened, and a regenerating solution such as sodium chloride brine is introduced through the inlet 16. In accordance with well known practice the regenerating solution is passed through the casing at a lower rate of flow than the water to be treated or the wash-out water. The rates of flow may be controlled by manipulation of the valve 17, and/or either valve 31 or 32.

After the zeolites have been regenerated, wash water is introduced through the inlet

16 and displaces the regenerating solution, the wash water also escaping through the branch pipe 28. In order to start the next cycle of operation it is only necessary to close valve 32 and open valve 31, so far as the casing is concerned.

It will thus be seen that the apparatus of this invention is composed of a minimum of parts and that the operation thereof is extremely simple.

The equivalent of the diaphragm 18 may be built into the casing in the following manner: A series of iron strips 40, having their lengths and ends fashioned to rest upon the bottom member 12 and to lie substantially in the same plane are let in through the manhole 36 and arranged as shown in Figs. 3 and 4. These strips contain a plurality of screw-threaded perforations 41 into which are screwed short upstanding pipe sections 42. Because of the difficulty of handling within the interior of the casing, the strips 40 are not designed to fit together, and it is contemplated that there will be spaces between adjacent strips. Cover strips or battens 47 are placed over the spaces in order to provide an unbroken floor. The middle strip 40^a will have a central opening 43 arranged to align with the open end of the inlet pipe 16. As thus arranged, the pipes 42 are closed with wooden plugs 44. Concrete is now poured over the floor formed by the strips 40 and the battens 47 to a depth just below the tops of the stub pipes 42. After the concrete is set the wooden plugs 44 are removed and replaced by perforated metal caps 45. The object of the wooden plugs is to prevent the concrete from filling the stub pipes 42.

A plurality of anchor brackets 46 may be riveted or welded to the interior of the casing, the horizontally projecting portions being embedded in the concrete and serving as an additional support for the diaphragm.

In some cases it may be desirable to place, crosswise on top of the strips prior to the pouring of the concrete, channel members 48 which may be fastened to the plates by set-screws or otherwise.

I claim:

1. Water softening apparatus comprising a casing having a top closure member surmounted by a hollow cap, an inlet projecting through the cap and terminating short of the bottom of the casing, an outlet connected to the cap, a perforated diaphragm associated with the lower end of the inlet for directing liquid upwardly through the casing, zeolites supported above the diaphragm and a circular baffle between the zeolites and the cap.

2. Water softening apparatus comprising a casing, an inlet projecting into the upper portion of the casing and terminating short of the bottom, an outlet from the upper portion of the casing, a diaphragm having a central opening connected to the lower end of the inlet, and zeolites supported above the diaphragm, said diaphragm comprising a floor of strips, supported at their ends by a wall of the casing and having perforations therethrough, upstanding open ended pipes extending from the perforations, and a layer of concrete on the floor.

3. Water softening apparatus comprising a casing, an inlet projecting into the upper portion of the casing and terminating short of the bottom, an outlet from the upper portion of the casing, a diaphragm having a central opening connected to the lower end of the inlet, and zeolites supported above the diaphragm, said diaphragm comprising a floor of strips, supported at their ends by a wall of the casing and having perforations therethrough, upstanding open ended pipes extending from the perforations, perforated caps upon the upper ends of said pipes, and a layer of concrete on the floor.

In testimony whereof I have hereunto subscribed my name.

WALTER H. GREEN.