Aug. 29, 1939. E. PICK 2,170,975

WATER-TREATING APPARATUS

Filed Nov. 11, 1937

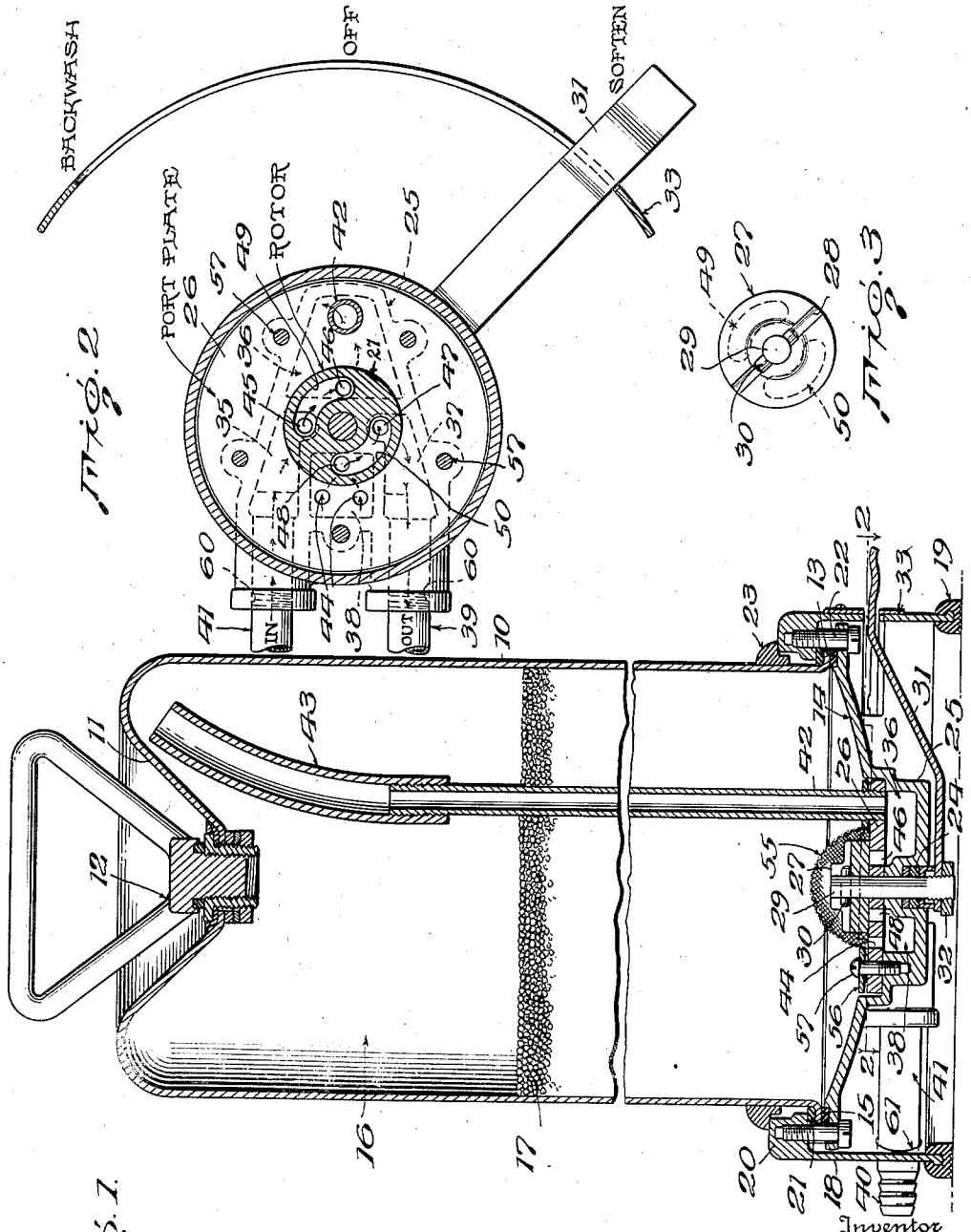


Fig. 2

Fig. 3

Fig. 1.

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Patented Aug. 29, 1939 2,170,975

UNITED STATES PATENT OFFICE

2,170,975

WATER-TREATING APPARATUS

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Application November 11, 1937, Serial No. 174,104

11 Claims. (Cl. 210—24)

This invention relates to water treating apparatus; and it comprises apparatus for softening or filtering water including a container shell adapted to hold a charge of water treating granules and having a flanged opening at the bottom, a basal closure for the shell comprising a flanged annulus adapted to engage the upper face of the shell flange, a discoid cover member adapted to engage the lower face of the flange, and screw means for drawing the cover member toward the annulus flange whereby to tightly close the lower end of the container, and a screened multiport valve in the discoid cover, means for actuating said valve extending outside the annulus, and liquid connections for the valve; all as more fully hereinafter set forth and as claimed.

In the water treating arts, and particularly in base exchange softening and in filtering, there is a demand for portable apparatus which is readily set up where needed, and which has convenient controls for the various steps of water treating processes carried out therein; process steps which are sometimes complex. It is also desired to have such apparatus capable of being readily dismantled for inspection or repair, this being particularly true in experimental or research work.

According to the present invention there is provided apparatus which meets these requirements to a remarkably successful degree. The new apparatus includes a vertical tubular container shell, having an openable orifice at the top, and a base for the shell clamped thereto in a way allowing ready detachability but insuring complete tightness. The clamping arrangement is such that great freedom is left in the choice of materials for the container shell. It can be of enameled steel, for example, or glass; materials with which it is ordinarily difficult to make tight joints. Concealed in the base is a rotary multiport slide valve, protected by a screen.

In the accompanying drawing there is shown, more or less diagrammatically, one example of a specific embodiment of apparatus within the purview of the invention, the apparatus being particularly adapted for base exchange softening. In the drawing,

Fig. 1 is a view in vertical section of the complete apparatus,

Fig. 2 is a fragmental sectional view taken along line 2—2 of Fig. 1, and

Fig. 3 is a plan view of the valve rotor.

Referring to the drawing, there is provided a container shell 10 of any suitable height, having a funnel-like top portion 11 with a detachable handled plug 12. The shell can be of any suitable material, metallic or non-metallic, and is conveniently enameled steel. The bottom of the shell is flanged as shown at 13, and a concave or dished discoid cover plate 14 is provided, opposed to flange 13 with an interposed gasket 15. The shell and cover plate define an enclosed chamber 16 as shown, containing a charge of zeolite granules 17 partly filling the chamber. A base for the apparatus is provided, in the form of an annulus 18 having a rubber protecting ring 19 around its bottom and an upper flange 20 extending over flange 13. A gasket 21 is interposed between flanges 13 and 20 and the two flanges are clamped together by a plurality of screws 22, conveniently sixteen in number, only two of which show in Fig. 1. A soft rubber annulus 23 prevents access of water etc. to the space between flange 20 and container 10.

Flows of fluids are controlled by a multiport valve, including a chambered housing or body 25 formed integrally with cover plate 14, a port plate 26, of Formica or the like, covering the housing, and a channeled rotor 27 within the container shell and resting on the port plate. The rotor is slotted at 28 and is keyed to a shaft 29 by a pin 30 resting in the slot and extending through the shaft as shown. The shaft is turned from outside base 18, by means of a valve lever 31 adjustably fastened to the shaft by a nut 32. Sealing rings are provided at 24. The valve lever moves in a slotted member 33 attached to base 18 as shown. The rotor and port plate arrangement, and fluid passages, are similar to the structure disclosed in my prior Patent 2,061,715.

Fig. 2 is a view to illustrate the valve structure and operation. As shown, housing 25 has four separate chambers or passages therein, 35, 36, 37 and 38. Chamber 37 communicates with a liquid fitting 39 to which a hose (not shown) may be attached leading to the point of use. Chamber 35 has a similar fitting 41, adapted to be connected at 40 through a hose (not shown) with a source of raw water. Fittings 39 and 41 are screwed into the housing 25 as indicated at 60 and extend through openings in the base annulus 18; one such opening being indicated at 61. Chamber 36 communicates directly with a conduit 42 extending upwardly in the shell, having a hose extension 43 reaching nearly to the top of the shell. Lastly, chamber 38 communicates with a pair of ports 44 in the port plate arranged as shown. The port plate has four additional ports, 45, 46, 47 and 48 communicating

with chambers 35, 36, 37 and 38 respectively. The rotor 27 has two arcuate channels, 49 and 50, arranged as shown, the channels registering with ports 45, 46, 47 and 48. A dome-like screen 55 covers the rotor and ports, to keep out zeolite granules, and the screen and port plate are retained to member 25 by a ring 56 and screws 57.

Fig. 2 shows the valve in softening position; Fig. 1 in "off" position.

In the softening position, raw water flows in through conduit 41 and chamber 35, port 45, rotor channel 49 and port 46, chamber 36, and conduits 42 and 43, to the top of the shell. The water flows downwardly through the zeolite, becoming softened therein, and leaves the shell through the screen 55, ports 44, chamber 38, port 48, rotor channel 50, port 47, chamber 37 and outlet conduit 39.

In the backwash position, the valve lever 31 is turned to the position labeled "backwash" in Fig. 2, and the rotor establishes connections for a flow through the apparatus exactly reversing that in the softening position. Raw water, entering at 41, flows into the bottom of the shell at 44, at a rapid rate, and issues through conduits 42 and 39.

In the off position (Fig. 1) the valve rotor cuts off all communication between ports 45, 46, 47 and 48, and no flows take place through the apparatus.

The operating procedure in regenerating, that is, the manipulation of the valve, addition of salt etc., can conveniently be that disclosed in my acknowledged patent, and needs no description.

The apparatus can be used as a filter by simply substituting sand, activated carbon or the like for the zeolites.

The apparatus comprises remarkably few parts, and can be completely dismantled or assembled in short order. To take the apparatus apart, fittings 39 and 41 are unscrewed, screws 22 are removed and the shell, bottom plate 14 and base annulus 18 separated. The valve can then be completely taken apart simply by removing screws 57 and nut 32.

The apparatus can be embodied in any suitable material. Conveniently the shell is made of enameled steel, the base 18 of chromium plated zinc or cast iron, the port plate of Formica and the valve rotor and shaft of brass.

For permanent installation of the apparatus, pipe fittings 39 and 41 can be run directly to a point of use and to a source of supply, respectively.

What I claim is:

1. Water treating apparatus comprising a tubular container shell for holding water treating granules, open at one end and outwardly flanged at that end, a discoid closure plate opposed to said flange, an annulus surrounding the closure plate and having a flange extending over the container shell flange, sealing means between the container shell flange and the closure plate, screw means for pressing the container shell flange, closure plate and annulus flange together, a multiport valve in the closure plate, said valve comprising a ported stator and a rotor cooperating with the stator, a conduit for water to be treated and a conduit for treated water communicating with said ported stator, passages from the ported stator to each end of the container shell, and foraminous means at the end of the one of said passages terminating at the lower end of the container shell, the ported stator being so constructed and arranged as to make connections between said conduits and said passages.

2. Water treating apparatus comprising a tubular container shell for holding water treating granules, open at one end and outwardly flanged at that end, a discoid closure plate opposed to said flange, an annulus surrounding the cover plate and having a flange extending over the container shell flange, means for retaining said closure plate and flanges together so as to form a tight seal, a port plate attached to the discoid plate, a valve body integrally formed with the discoid plate outside thereof and having liquid chambers opposed to ports in the port plate, a valve rotor opposed to the port plate within the shell, a passage extending from one of the chambers through the port plate to the interior of the container shell, a domed screen within the shell covering said rotor and said passage, and means for retaining the screen to the port plate.

3. Water treating apparatus comprising a tubular container shell open at the bottom and outwardly flanged at the bottom, a discoid closure plate covering said opening, foraminous means adjacent said closure plate, a flanged annulus engaging said container shell flange, means for pressing the closure plate, annulus flange and container shell flange together, the closure plate having a chambered valve body integrally formed therewith, the body having four separate, upwardly presented chambers, a detachable port plate covering said four chambers and having four ports in communication respectively with the four chambers, and two ports communicating with the lower part of the container shell through said foraminous means and the upper part of the container shell respectively, a rotor covering said first four ports and having two channels arranged to put adjacent pairs of ports into communication at different angular positions of the rotor, and conduit connections for inflowing raw water and outflowing water in communication with two of said chambers.

4. Water treating apparatus comprising a vertical container shell, said shell having an open lower end surrounded by an outwardly extending flange, a closure plate for said open end, a gasket, a base having a substantially cylindrical portion for the apparatus to stand on and an inwardly extending flange, screw means for pressing the closure plate and gasket against the base flange with the shell flange arranged between the gasket and the base flange, inlet and outlet connections on the closure plate, said connections extending through openings in the cylindrcal portion of the base, a conduit eccentrically attached to the closure plate and extending to the top of the shell on the inside thereof, a strainer attached to the center of the base and communicating with the inside of the container, valve means for placing said inlet and outlet connections in communication with said conduit and said strainer, and operating means for said valve means, said operating means extending through an opening in the cylindrical portion of the base.

5. Water treating apparatus comprising a vertical container shell, said shell having an open lower end surrounded by an outwardly extending flange, a closure plate for said open end, a gasket, a base having a substantially cylindrical portion for the apparatus to stand on and an inwardly extending flange, screw means for pressing the closure plate and gasket against the base flange with the shell flange arranged between the gasket and the base flange, inlet and outlet connections

on the closure plate, said connections extending through openings in the cylindrical portion of the base, a conduit eccentrically attached to the closure plate and extending to the top of the shell on the inside thereof, a strainer attached to the center of the base and communicating with the inside of the container, a multiport valve on the closure plate for placing said inlet and outlet connections in communication with said conduit and said strainer, said valve having a rotor located below said strainer, and operating means for said rotor extending through an opening in the cylindrical portion of the base.

6. Water treating apparatus comprising a container for water treating material, a bottom plate for said container, a dome shaped perforate distributor provided with a flange, a ring shaped plate fitting over said flange, screw means holding said plate and flange against the bottom plate, a multiway valve in the bottom plate of the container and comprising a stator and a rotor, the rotor and stator having cooperating faces, the rotor axis being substantially vertical and the rotor extending into the space within the dome shaped distributor, a conduit extending from the stator to the top of the container on the inside thereof, laterally extending inlet and outlet connections in the bottom plate communicating with the stator, the stator face having ports in communication with said connections and other ports in the stator face in communication with the conduit and the space within the dome shaped distributor, and a horizontally shiftable operating lever connected to the rotor and extended laterally beyond the side wall of the container.

7. Water treating apparatus comprising a container for water treating material, a bottom plate for said container, a recess in the upper face of the bottom plate and having a depressed portion, partitions subdividing the depressed portion into a plurality of open cavities, a port plate mounted in said recess separating said cavities from each other and provided with a set of ports arranged on a circle, each port of said set communicating with one of said cavities, a channeled valve rotor cooperating with said port plate and adapted in different angular positions to variously interconnect the ports of said set, a perforate distributor enclosing said valve rotor, said port plate further having a port establishing communication between the inside of said distributor and one of said cavities and another port communicating with a second of said cavities, a conduit connected to said other port and leading to the top of the container on the inside thereof, a laterally extending inlet connecton communicating with another of said cavities, a laterally extending outlet connection communicating with the remaining cavity, and laterally extending means for turning the valve rotor.

8. Water treating apparatus comprising a container for water treating material, a bottom plate for said container, a distributor, a ring shaped plate, screw means holding said ring shaped plate and distributor against the bottom plate, a multiway valve in the bottom plate and comprising a ported stator and a rotor, the rotor and stator having cooperating faces, the rotor axis being substantially vertical and the rotor extending into a space confined at its top by the distributor, a conduit inside the container extending from the stator to the top of the container, laterally extending inlet and outlet connections in the bottom plate communicating with the stator, some ports in the stator face being in communication with said connections and other ports in the stator face in communication with the conduit and said space confined at its top by the distributor, and a horizontally shiftable operating lever connected to the rotor and extending laterally beyond the side wall of the container.

9. In water treating apparatus of the type described, a container shell open at one end and a discoid closure member attached to said end, a foraminous distributor within the container shell adjacent its lower end, the closure member having partitions forming four cavities therein open toward the interior of the container shell and two conduit connections, for raw water and treated water, delivering into two of said cavities, a port plate resting on the closure and arranged to cover the cavities and having four ports one for each cavity and two additional ports communicating respectively with two of said cavities on the one hand and with the lower end of the container shell through the distributor and with the upper end of the container shell on the other hand, and a channeled rotor within the container registering with the four cavity ports of the port plate, the rotor having two channels adapted in one angular position of the rotor to direct a flow of raw water to one end of the container shell and withdraw water from the other end of the shell, and in another angular position to reverse said flow.

10. In water treating apparatus of the type described having a container shell, a closure attached to said shell, the closure having integral wall portions constructed and arranged to define a plurality of cavities therein opening toward the interior of the container shell, two conduits, for raw and treated water, communicating with two of said cavities, a port plate fastened to the closure and arranged to cover said cavities and having ports communicating with each cavity and with the interior of the container shell, a foraminous distributor, one of said ports communicating with the lower end of the shell through the distributor, a valve rotor engaging ports on the port plate and adapted in different angular positions to establish different fluid flows through the container shell, and means for turning the rotor.

11. A closure for valved water treating apparatus comprising a substantially centrally located dished member having a plurality of cavities and connections for raw water and treated water, a ported stationary top for the dished portion having openings to the said cavities, a foraminous distributing means for one of said cavities, a channeled rotor establishing communication between different openings of the stator and means substantially centrally disposed with respect to the dished portion extending beyond the rim of the dished portion, for rotating the rotor.

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