

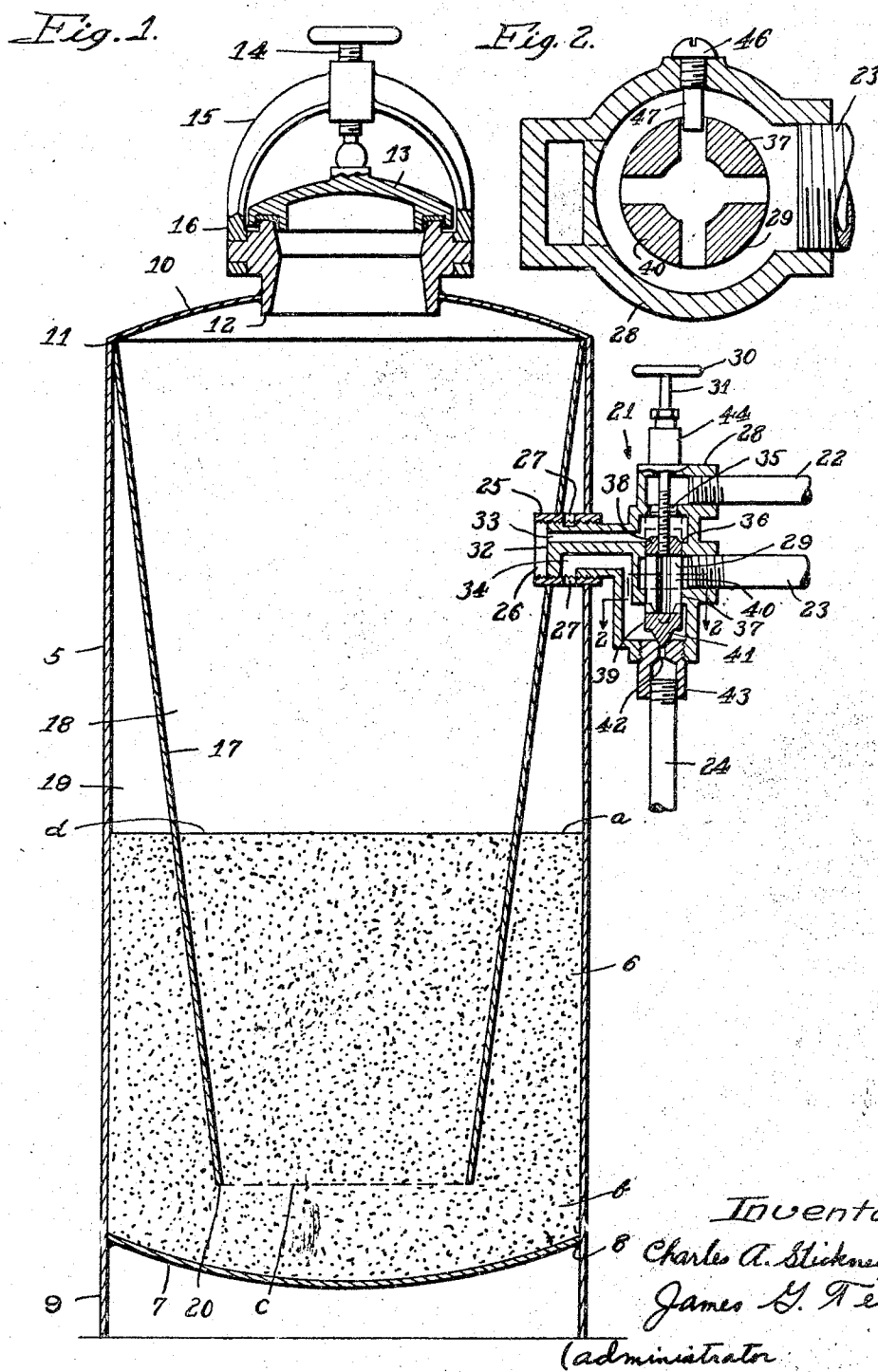
Sept. 20, 1932.

C. A. STICKNEY

1,878,019

WATER SOFTENER VALVE

Original Filed May 28, 1928



UNITED STATES PATENT OFFICE

CHARLES A. STICKNEY, DECEASED, LATE OF ROCKFORD, ILLINOIS, BY JAMES G. TETLOW,
OF ROCKFORD, ILLINOIS, ADMINISTRATOR, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
THE PERMUTIT COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

WATER SOFTENER VALVE

Original application filed May 28, 1928, Serial No. 281,008. Divided and this application filed March 1, 1929. Serial No. 343,766.

This invention relates to water softeners of the base exchange type and constitutes a division of application Serial No. 281,008 filed May 28, 1928. The principal object of this invention is to provide a single control valve for water softeners which makes the operation of a softener much easier and, furthermore, keeps the cost of the unit to a minimum, the single valve replacing as many as four valves or even more, which, in addition to being costly, made the operation of a softener more or less of a perplexing proposition to the average mechanically unskilled person. The valve is herein disclosed as applied to a double or plural flow softener, which is covered in the parent application, above referred to, but it will be understood that the same is not limited to use with this or any other particular type or kind of softener.

The invention is hereinafter fully described with reference to the accompanying drawing, in which—

Figure 1 is a central vertical section through a softener equipped with a valve made in accordance with this invention, and

Fig. 2 is an enlarged sectional detail through the valve taken on the line 2—2 of Fig. 1.

The invention is herein shown as embodied in a hand operated softener, but it should be understood that it is not limited to such application inasmuch as suitable mechanism might be employed in connection with the valve for the operation thereof to be automatically or semi-automatically controlled, as desired.

The softener, the details of which are covered in the parent application, comprises a tank 5 of any ordinary or preferred construction containing a bed 6 of zeolite mineral or other base-exchange water softening material, the present invention as will presently appear permitting the use of mineral of a very fine texture because of the elimination of all screens, etc., for distributing purposes, thus making for much greater capacity in a unit of a given size. The tank, as shown, has a dish bottom 7 welded or otherwise suitably secured to the side walls of the tank

as represented at 8, the bottom being set-in so that the side walls provide an enclosed base 9. The top 10 is suitably dome-shaped, welded or otherwise suitably secured to the side walls of the tank at 11, and has a neck 12 welded in place at the center thereof. This neck provides a filler opening for the introduction of the mineral at the time of assembling, it being possible with a softener of the present improved construction to ship the softener with the mineral therein ready for use. The neck 12 is closed by a cap 13 clamped in place by the tightening of the screw 14 in the yoke 15 swingably mounted on the neck at 16. The cap 13 is quickly removable for the purpose of dumping in the salt or brine when the softener is to be regenerated.

In accordance with the parent application, the tank 5 is provided with a partition 17 of frusto-conical form. This wall is fastened inside the tank at its large end as by welding at the point 11. The small end penetrates the bed 6 to a point slightly above the bottom thereof, as shown, thus providing a central chamber 18 separated from an annular or circumferential chamber 19 except for the communication afforded between the chambers through the opening 20 defined by the lower end of the partition wall 17. A valve mechanism designated generally by the reference numeral 21 is arranged to control communication between the chambers 18 and 19 and service pipe 22, supply pipe 23, and waste pipe 24, the communication being established at a single point on the tank through a nipple 25. The nipple has the open inner end 26 thereof in communication with the chamber 18 and has openings 27 in the wall thereof establishing communication with the chamber 19. In normal softening operation, hard water supplied through the pipe 23 is directed by the valve mechanism 21 through the ports 27 into the chamber 19 above the bed of water softening material. This hard water passes downwardly through the depth of material in the chamber 19 and at the lower end thereof reverses in direction and passes upwardly through the opening 20 through the depth of material in the cham-

ber 18 and out through the open end 26 of the nipple 25 to the service pipe 22. The double flow through the bed insures perfect softening so long as the mineral of the bed is not exhausted. The disposition of the inlet and outlet for the water above the mineral bed makes it unnecessary to provide the water distributing and straining means used in all other softeners so far as I am aware. It will be observed that the cross section of the passageway afforded in the two chambers by reason of the form of the partition wall 17 is of gradually increasing area from the point where the water first enters the bed to the point where it emerges therefrom. Thus the passageway widens from the point *a* to the point *b* and from the point *c* to the point *d*, the opening 20 being preferably of such a size that its area is approximately equal to the area of the annular opening defined between the lower end of the partition wall 17 and the wall of the tank. That is, the area of the passageway at the point *b*, for all practical purposes, may be regarded as about equal to that at the point *c*, the thought being to provide a passageway of gradually increasing area from the point *a* to the point *d*. This widening of the passageway more definitely insures the spreading out of the water in passing through the bed and the water is thereby prevented from channelling through the bed and is caused to come into intimate contact with the mineral at all points. Perfect softening of the water is therefore insured.

The valve mechanism 21, constituting the subject matter of this application, is so designed that the operations thereof in regenerating the softener are rendered extremely simple and will not necessitate extensive directions for the guidance of the user. It comprises a single casing 28 having a single shiftable valve element 29 therein operable by a handle 30 on the stem 31. The casing 28 has integral therewith a portion 32 arranged to thread in the nipple 25 and provided with two passages 33 and 34, the former of which is normally the outlet for softened water and the latter of which is normally the inlet for hard water, the one being in communication with the chamber 18 and the other with the chamber 19 by way of the opening 26 and ports 27, respectively. Three valve ports 35, 36 and 37 are provided in coaxially spaced relation in the casing 28, the port 35 serving normally to establish communication between the service pipe 22 and the outlet passage 33, while the port 37 serves normally to establish communication between the supply pipe 23 and the inlet passage 34. The valve element 29 is cast and provides two valve discs 38 and 39 in coaxial spaced relation joined by integrally cast ribs 40. The disc 38 normally closes the port 36, as shown, while the disc 39 leaves the port 37 uncovered.

The latter disc has a tapered tip 41 arranged to close a waste opening 42 of restricted size provided in a plug 43, into which the waste pipe 24, above referred to, is threaded. The valve stem 31 is held against endwise movement in a stuffing box 44 provided on the casing 28 and has the inner end thereof threaded, as shown, to cooperate with a threaded opening in the valve disc 38, to the end that when the handle 30 is turned, suitably as directed by means of arrows or the like on the upper face thereof, the valve element 29 will be moved up and down in the valve casing from the full line position shown to the dotted line position indicated. A screw 46 has a plain tip 47 entering between two of the ribs 40 to hold the valve element 29 against turning so that the valve stem 31 may thread therein properly.

In the softening operation, the valve 21 has the shiftable valve element 29 thereof disposed in the full line position illustrated. Hard water supplied through the pipe 23 passes the valve element at the port 37 and flows through the passageway 34 and ports 27 into the chamber 19. After passing downwardly and upwardly through the bed for softening, the water leaves the chamber 18 through the passage 33 and is discharged through the port 35, into the service pipe 22. The waste pipe 24 meanwhile is out of communication with the tank by reason of the closing of the waste opening 42 by the tapered tip 41 of the lower valve disc 39. After a capacity run of softening when the mineral requires regeneration, the valve is operated by turning the handle 30 to raise the valve element 29 to an intermediate position where the disc 38 still closes the port 36 and the disc 39 closes the port 37. It will be evident that the supply pipe 23 is thereby thrown out of communication with the tank and the waste pipe 24 is at the same time placed in communication with the passage 34. Now, when the cap 13 is removed for the dumping in of salt or brine, there will be drainage of water from the tank through the waste pipe until the level in the tank is as low as the upper end of the passage 34, the waste pipe 24 being so arranged (not shown in the drawing) that any siphoning action is prevented. After the salt or brine is in the tank, the latter is sealed by replacement of the cap 13. Then, if it should be desired to draw water while the regeneration is carried on, the valve element 29 may be shifted slightly higher to a still further intermediate position where the port 37 is still closed but the port 36 is opened, thus placing the supply pipe 23 in communication with the service pipe 22. In that way hard water may be drawn. However, this method of operation must not be practiced as a general rule but the valve may be shifted to the dotted line position indicated so as to close the port 35 along with the port 37 and open the port 36

along with the waste opening 42. In either of the last mentioned two positions of the valve the supply pipe 23 is of course in communication with the passage 33 through the port 36, hence the salt or brine in the chamber 18 will be washed down through the bed and upwardly therethrough and the waste water will be exhausted through the ports 27, the passage 34 and the waste opening 42 into the waste pipe 24. The waste opening 42, it will be observed, is of a sufficiently restricted size to confine the salt wash to such a rate of flow that the brine will have ample opportunity to make a complete chemical exchange with the mineral of the bed thoroughly to revive the latter. Following the regeneration the valve 21 will be shifted again back to its normal softening position. If desired the hard water contained in the chamber 18 above the bed of zeolite at the end of the regeneration may then be flushed out by simply opening a faucet in the service line near the softener, as for example in a laundry tub. Flushing in this way for a few minutes will eliminate any foreign matter from the softener and keep it out of the service system.

What is claimed is:

1. A water softener valve mechanism comprising a casing having two passages provided therein, one of which serves normally as an inlet for a softener tank, and the other of which serves normally as an outlet therefor said casing also having a waste opening, there being supply and service pipes arranged to communicate with the inlet and outlet passages, and a waste pipe communicating with the waste opening, and a single shiftable valve element in said casing normally occupying one extreme position wherein the waste opening is closed thereby and wherein the supply pipe communicates with the inlet passage and the service pipe communicates with the outlet passage, said valve element being arranged to be shifted to the opposite extreme position wherein the supply pipe is placed in communication with the erstwhile outlet passage and the erstwhile inlet passage is placed in communication with the waste opening, whereby to reverse the direction of flow through the softener tank and to discharge into the waste pipe, and the service pipe is at the same time isolated from communication with both passages, and the said valve element being arranged to occupy an intermediate position wherein the supply pipe is placed directly in communication with the service pipe and at the same time with the one passage, the other passage being in communication with the waste opening.

2. A water softener valve mechanism comprising a casing having two passages provided therein, one of which serves normally as an inlet for a softener tank, and the other of which serves normally as an outlet therefor, said casing also having a waste open-

ing, there being supply and service pipes arranged to communicate with the inlet and outlet passages, and a waste pipe communicating with the waste opening, and a single shiftable valve element in said casing normally occupying one extreme position wherein the waste opening is closed thereby and wherein the supply pipe communicates with the inlet passage and the service pipe communicates with the outlet passage, said valve element being arranged to be shifted to the opposite extreme position wherein the supply pipe is placed in communication with the erstwhile outlet passage and the erstwhile inlet passage is placed in communication with the waste opening, whereby to reverse the direction of flow through the softener tank and to discharge into the waste pipe, and the service pipe is at the same time isolated from communication with both passages, and the said valve element being arranged to occupy either one of two intermediate positions: one wherein the supply pipe is isolated from communication with both passages, and the other wherein the supply pipe is placed directly in communication with the service pipe and at the same time with the second named passage, the first named passage being in communication with the waste opening.

3. A water softener valve comprising a casing having two passages provided therein, one of which serves normally as an inlet for a softener tank and the other as an outlet therefor, there being a supply pipe and a service pipe arranged to communicate with said passages, said casing having three valve ports therein disposed in coaxial alignment, and a single shiftable valve element in said casing having two valve disks in coaxial alignment and arranged to be shifted together in relation to the three valve ports, the same being arranged in one position of the valve element to close the middle port and leave the two end ports open, one end port of the three serving then to establish communication normally between the supply pipe and the inlet passage and the other end port of the three serving then to establish communication between the service pipe and the outlet passage, the disks of said valve element being arranged in another position to close the two end ports and leave the middle port open, the middle port then serving to establish communication between the supply pipe and the erstwhile outlet passage, there being a waste pipe communicating with said casing, and the other passage in the latter position of the valve element being arranged to communicate with and discharge into the waste pipe.

4. A valve as set forth in claim 3 wherein the valve element is shiftable to another position wherein the middle port and one end port are closed whereby to isolate the supply

pipe from communication with either of the passages in said casing.

5. A valve as set forth in claim 3 wherein the valve element is shiftable to another position wherein only one end port is closed whereby communication is established between the supply and service pipes and between the supply pipe and one of the passages in said casing, the other passage in said casing having communication with the waste pipe.

6. A water softener valve comprising a casing having coaxially aligned valve ports provided therein, a valve element slidably received in said casing for movement through and between said ports, said valve element comprising a plurality of valve disks disposed in axially spaced relation for cooperation with said ports and connected by ribs extending between the disks and parallel to the axis thereof, a rotatable valve stem mounted in said casing without freedom for endwise movement having a threaded inner end threading in at least one of the valve disks of the valve element, means on the casing projecting between said ribs for holding said valve element being against turning with reference to said casing, and means for turning the valve stem whereby to communicate endwise movement to the valve element.

7. A valve as set forth in claim 6 wherein pipes are arranged to communicate with the casing between and adjacent the valve ports, and including another pipe communicating with said casing at one end thereof in line with the valve ports, said valve element having the end disk thereof arranged to seal the opening for the last mentioned pipe in a certain position of the valve element.

8. A water softener valve comprising a casing having three coaxially aligned and spaced valve ports provided therein, a valve stem projecting through one end of said casing through one end port, a valve element connected therewith for operation thereby and having two coaxially aligned and spaced valve disks shiftable through and between the other two ports toward and away from the end port referred to, there being a pipe communicating with the casing between the middle port and the other end port and another pipe communicating with the casing above the first mentioned end port, said casing having two passages provided therein, one of which communicates with the space between the first mentioned end port and the middle port, and the other of which establishes communication with the space below the other end port, and there being a pipe communicating with the casing below the last mentioned end port.

9. A valve as set forth in claim 8 wherein the valve disks of the valve element are joined by longitudinally extending spaced ribs suitably cast integral therewith, and wherein the valve stem has threaded connection with the

upper valve disk, there being a pin or the equivalent mounted in said casing and extending between two of the ribs to hold the valve element against turning while permitting endwise movement thereof.

10. A valve of the character described comprising a casing having two passages provided therein, there being a supply pipe and a discharge pipe arranged to communicate with said passages, said casing having three valve ports therein in coaxial alignment and in vertically spaced relation, the supply pipe being connected with the casing above the bottom port and the discharge pipe being connected with the casing above the top port, one of the passages in the casing leading to a point below the bottom port and the other passage in the casing leading to a point below the top port, and a single shiftable valve element in said casing having two valve disks in coaxial alignment and arranged to be shifted together in relation to the three valve ports, the same being arranged in one position of the valve element to close the middle port and leave the top and bottom ports open, the bottom port serving then to establish communication between the supply pipe and the first named passage and the top port serving then to establish communication between the other passage and the discharge pipe, the disks of said valve element being arranged in another position to close the top and bottom ports and leave the middle port open, the middle port then serving to establish communication between the supply pipe and the last mentioned passage, there being a waste pipe communicating with said casing and the other passage in the latter position of the valve element being arranged to communicate with the waste pipe.

11. A valve as set forth in claim 10 wherein the valve element is shiftable to another position wherein the middle and bottom ports are closed whereby to isolate the supply pipe from communication with either of the passages in said casing.

12. A valve as set forth in claim 10 wherein the valve element is shiftable to another position wherein only the bottom port is closed whereby communication is established between the supply and discharge pipes and between the supply pipe and the last named passage in the casing, the other passage in the casing having communication with the waste pipe.

In witness of the foregoing I affix my signature.

JAMES G. TETLOW,
Administrator of the Estate of Charles A.
Stickney, Deceased.