

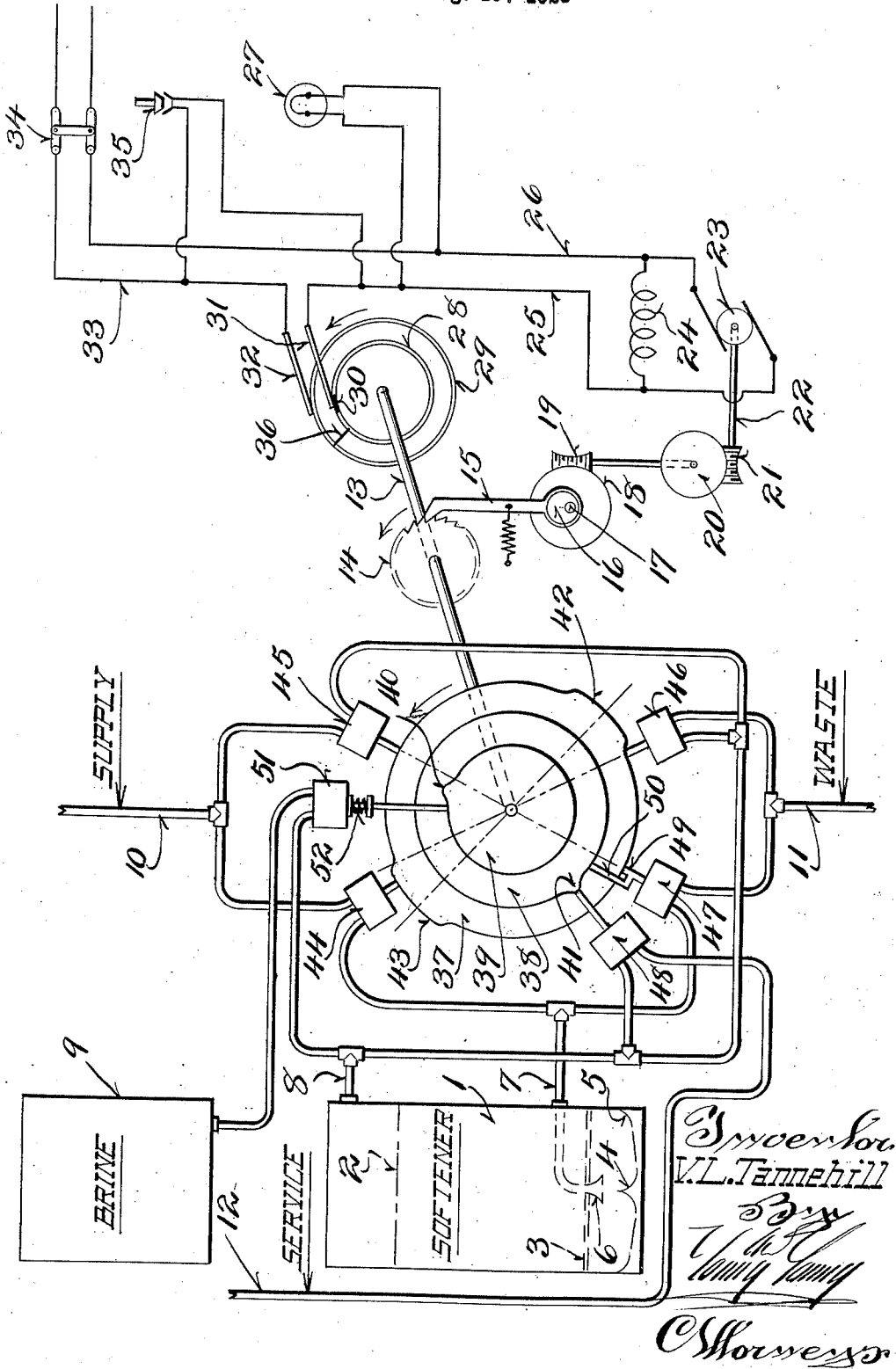
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VALVE CONTROL MECHANISM FOR WATER SOFTENERS

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VALVE-CONTROL MECHANISM FOR WATER SOFTENERS

Application filed August 13, 1926. Serial No. 128,958.

This invention relates to automatic water softeners and more particularly to valve control mechanism for water softeners.

Objects of this invention are to provide an automatic mechanism which may be initiated by manual means, as for example by means of a push button, and which will regenerate the softening material, such, for example, as zeolites, by the insertion of the proper quantity of salt solution and subsequent thorough washing of the excess salt from the zeolite.

The mechanism forming the subject matter of this invention may cooperate with a water softener of the type disclosed in my co-pending application for patent for Water softener, filed August 9, 1926, Serial No. 128,065.

Further objects are to provide a very compact and relatively simple mechanism, which is remote controlled, and which is substantially fool-proof so that an unskilled operator may easily manipulate the apparatus as it requires merely the pressing of a push button, a suitable tell-tale signal being provided for indicating the operation of the apparatus.

Further objects of this invention are to provide a novel form of water softening apparatus in which the device is driven from an electric, or other suitable motor, and is provided with automatically controlled valves which function in a regular and timed sequence to cause the proper flow of the salt solution and of the water so that the zeolites may be washed first in one direction and thereafter in the other direction after the salt solution has been given the requisite length of time to thoroughly permeate and regenerate the zeolites.

An embodiment of the invention is shown in the accompanying drawing, in which:

The single figure is a diagrammatic view of the apparatus.

Referring to the drawings, it will be seen that the water softener is indicated by the reference character 1 and is provided with a bed of zeolites which extend to the point indicated by the reference character 2. These zeolites, as described in my co-pending application, are carried by a suitably perforated bottom member 3 spaced from the bottom of

the apparatus. The bottom of the apparatus preferably is provided with a cusp-like center 4 and with rounded outer portions 5. Above the cusp-like center a bell-shaped portion 6 of the normal supply pipe 7 is positioned. A discharge pipe 8 extends from adjacent the upper portion of the apparatus. Above the water softener a brine tank 9 is positioned.

The main water supply from the street mains is indicated by the reference character 10, the waste pipe by the reference character 11, and the service pipe for the softened water by reference character 12.

Before describing in detail the mechanism, it is thought expedient to give a brief account of the sequence of operation in regenerating the zeolites. The apparatus first cuts off the supply of water in the service pipe and turns into the softener a predetermined amount of brine, the waste pipe being temporarily connected to the softener to permit a small amount of water to be displaced by the entering brine. Thereafter the valves are all closed for a suitable period of time to allow the brine to thoroughly permeate and regenerate the zeolites. Thereafter the supply pipe is connected to the upper portion of the softener and the waste pipe is connected to the pipe 7 so that water from the supply mains may wash downwardly through the softener and remove any excess salt. Thereafter the supply pipe is connected to the pipe 7 and the pipe 8 is connected to the waste pipe to thereby provide for the reverse flow of the water for thoroughly washing the zeolites and agitate them by passing upwardly from the bottom to the upper portion of the zeolite bed, causing the zeolites to boil or stir and thus thoroughly free them from any foreign matter.

Thereafter the supply pipe is again connected to the pipe 7 and the pipe 8 is connected to the service pipe. The automatic mechanism now stops itself and the parts are in their initial position.

The mechanism for accomplishing the sequence of operations described above is diagrammatically shown in the drawings, and it will be seen that the apparatus comprises

a main shaft 13. This main shaft is very slowly driven in a step-by-step manner by means of the ratchet wheel 14 rigidly mounted thereon and actuated from the spring-pressed pawl 15. This spring-pressed pawl is operated in any suitable relatively slow manner, as, for example, by means of an eccentric 16 mounted on the shaft 17 of a worm wheel 18. This worm wheel meshes with a worm 19 carried by the shaft of a second worm wheel 20. The worm wheel 20 meshes with a worm 21 mounted on the motor shaft 22, the armature of the motor being indicated by the reference character 23 and the fields by the reference character 24. The supply leads for the motor are indicated by reference characters 25 and 26. It is to be noted that a tell-tale lamp 27 is connected across these leads so that when energy is supplied to the motor the lamp will light and indicate the operation of the apparatus.

In order to stop the motor when desired, a pair of slip rings 28 and 29 are suitably insulated from and carried by the shaft 13. The slip ring 28 is discontinuous and has an insulated gap 30 therein. The slip ring 29 is continuous. The slip rings are engaged by brushes 31 and 32, the brush 31 being connected to the lead 25 and the brush 32 to the lead 33. The other lead 26 passes upwardly and the leads 26 and 33 are connected by means of a cut out switch 34 with supply mains.

In order to initiate the operation of the motor, when the brush 31 rests upon the insulating segment 30 of the ring 28, the push button, or manually operable switch, 35 is provided and is adapted to bridge the brushes 31 and 32. This switch and the tell-tale lamp 27 are located in any convenient place, as in the kitchen of a home, while the other portion of the device may be located in the cellar, or wherever desired, so that a remote control of the automatic softener is secured.

When the switch or button 35 is closed, current passes to the motor and it starts operating. The button is held closed a short interval until the insulating segment 30 moves from beneath the brush 31. Thereafter the button may be released as the rings 28 and 29 are electrically connected, as indicated at 36. The motor will continue to function although the button or switch 35 is open, the tell-tale lamp 27 indicating the correct functioning of the motor. The rapid rotation of the motor is very much reduced by the mechanism described, and a slow oscillatory motion is imparted to the pawl 15 which consequently rotates the shaft 13 in a slow step-by-step manner.

The shaft 13 may carry suitable cams, such as indicated by the reference characters 37, 38 and 39. The cam 39 is provided with a single projection 40. The cam 38 is similarly provided with a single projection 41. The

cam 37 is provided with two diametrically opposed projections 42 and 43. These last projections are elongated, as indicated, while the other projections are relatively short in extent.

The cam 37 controls the valves 44, 45, 46 and 47. The valves 44 and 45 are connected to the supply pipe 10 and are respectively connected to the pipe 8 and the pipe 7 of the water softener. The valves 47 and 46 are each connected to the waste pipe 11 and are connected to the pipes 7 and 8 respectively of the water softener. The cam 38 controls the valve 48 and also controls the valve 47. The valve 48 is connected to the service pipe 12 and to the pipe leading from the upper portion of the water softener. The valve 47, it will be noted, is provided with two stems, as indicated at 49 and 50, which act as cam puller and ride upon the cams 37 and 38 respectively. The cam 39 controls the brine valve 51 which is connected between the brine tank 9 and the pipe 8 of the water softener. It is to be noted that the plungers of each of the valves may be spring-pressed outwardly, one of such constructions being indicated by the reference character 52.

The operation of the apparatus is as follows: Assuming that the operator has depressed the button 35 and the motor has started to actuate the shaft 13, it will be noted that the normal connection from the supply main 10 through the valve 44 to the pipe 7 of the water softener and from the pipe 8 through the valve 48 to the service pipe 12 is immediately interrupted, by the action of the cams. It is to be noted further that the valves 45 and 47 are diametrically opposed, while the valve 44 is displaced slightly from the diametrical line through the valve 46.

When the cams move in the direction indicated by the arrow a slight distance, the projection 41 arrives beneath the plunger 50 of the valve 47 and consequently connects the pipe 7 of the water softener with the waste pipe 11. At the same instant the projection 40 arrives beneath the plunger of the valve 51 and consequently a predetermined amount of brine is admitted to the softener, the amount of brine admitted being of course dependent upon the extent or length of the projection 40 and the speed of operation of the shaft 13. After a short interval of time the valves 47 and 51 close and nothing thereafter takes place for a material length of time, allowing the brine to circulate through and regenerate the zeolites, or other softening agent.

Continued rotation of the cams causes the projection 42 to open the valve 45 and the projection 43 to simultaneously open the valve 47. This connects the water supply pipe 10 through the valve 45 with the pipe 8 and connects the pipe 7 through the valve 47 with the

waste pipe 11. Water thereafter flows downwardly through the zeolites and washes the excess salt from the apparatus through the waste pipe. This operation continues a predetermined length of time depending on the extent of the projections 42 and 43.

After the water has flowed in the downward direction through the zeolites for the requisite length of time, the projection 42 passes beneath the valve 44 and the projection 43 passes beneath the valve 46. This connects the water supply pipe 10 through the valve 44 with the pipe 7 and connects the pipe 8 through the valve 46 with the waste pipe 11. The water now flows upwardly through the zeolites and discharges through the waste pipe. This action continues a predetermined length of time until the projection 42 moves from beneath the valve 46. At this instant the brush 31 arrives at the insulating segment 30 and the motor stops. It is to be noted that due to the displacement of the valve 44 from the diametrical line through the valve 46, it is held open by the projection 43. Further it is to be noted that the projection 41 has again arrived at the valve 48 and consequently connects the pipe 8 through the valve 48 with the service pipe 12. Further, the valve 44 connects the supply pipe 10 to the pipe 7 so that the normal operation of the water softener can now take place.

It will be seen, therefore, that the automatic mechanism will cut off the supply of water in the service pipe, insert brine, and subsequently cause the washing of the zeolites first in the downward direction and thereafter in the upward direction, finally restoring the original connection.

It will be seen, further, that these operations are wholly automatic and controlled by a single push button. This therefore makes the apparatus substantially fool-proof and allows the operation to be initiated by an un-skilled operator.

It will be seen further that the apparatus, considering the complicated functions that it performs, is relatively simple and is very compact, and is, as stated, substantially fool-proof.

Although the invention has been described in considerable detail, such description is intended as illustrative rather than limiting, as the invention may be variously embodied and as the scope of such invention is to be determined as claimed.

I claim:—

1. In a device of the class described, a power driven shaft, a plurality of cam members thereon, one of said cam members having diametric opposed engaging surfaces, a plurality of control valves upon opposed sides of the shaft, one set of valves being diametrically opposed and the others being displaced from a diametric line.

2. In a device of the class described, a pow-

er driven shaft, a plurality of cams carried by the shaft, one of said cams having diametric opposed engaging portions, a trio of valves arranged upon opposite sides of the shaft and having spring-pressed plungers co-operating with the cams, one of the end valves on one side of the shaft being diametrically aligned with the central valve on the opposite side of the shaft and the other valves at opposite sides of the shaft being slightly displaced from a diametric line.

In testimony that I claim the foregoing I have hereunto set my hand at Fort Wayne, in the county of Allen and State of Indiana.

VERNON L. TANNEHILL.