Aug. 27, 1929. W. L. McLAUGHLIN ET AL 1,726,082

WATER SOFTENER DEVICE

Filed April 23, 1928

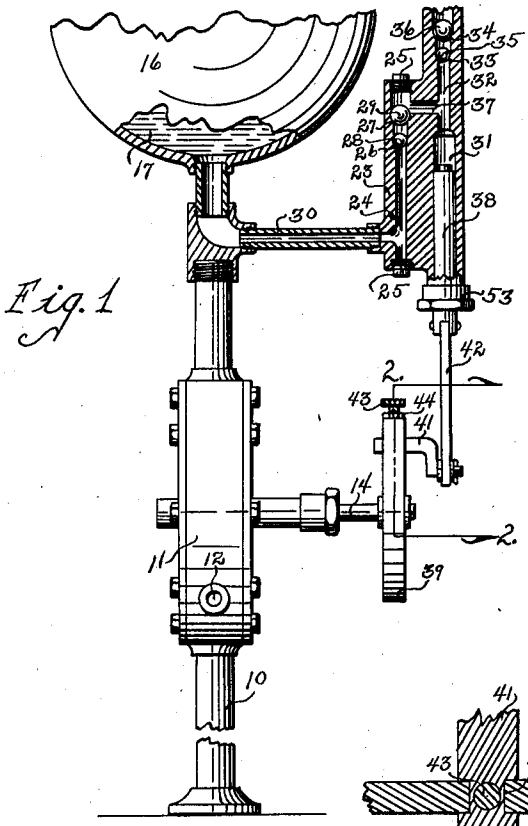

Fig. 1

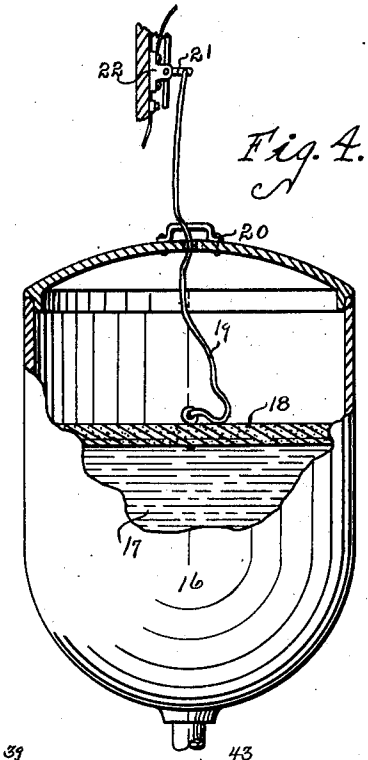

Fig. 4.

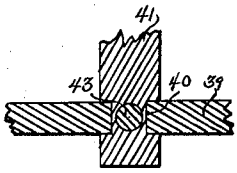

Fig. 5.

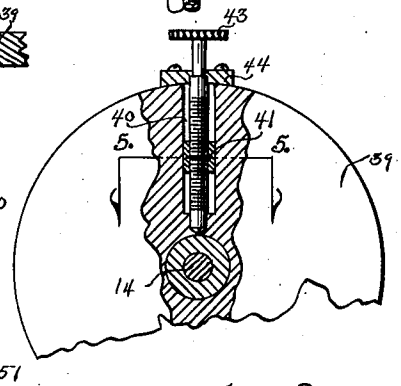

Fig. 2.

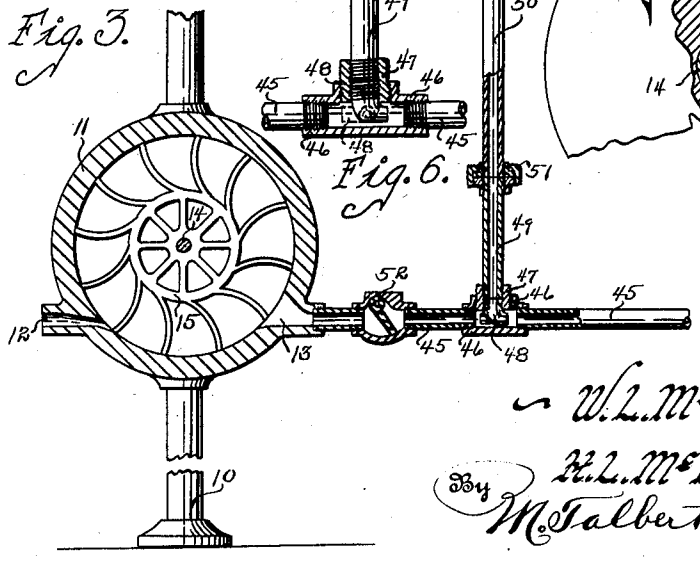

Fig. 3.

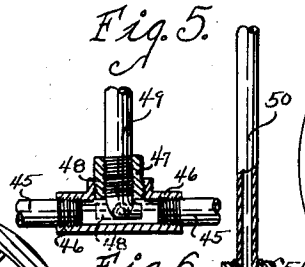

Fig. 6.

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UNITED STATES PATENT OFFICE.

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WATER-SOFTENER DEVICE.

Application filed April 23, 1928. Serial No. 272,343.

The principal object of this invention is to provide a water softener device that may be secured in any water pipe line that has water passing through it under pressure.

A further object of this invention is to provide a water softener device that may be minutely and positively adjusted relative to the amount of softening liquid mixed with a given quantity of water.

A still further object of this invention is to provide a water softener that may be easily adjusted to compensate for various water pressures, thereby insuring its successful functioning under any condition.

A still further object of this invention is to provide a water softener device that is economical in manufacture and durable in use.

These and other objects will be apparent to those skilled in the art.

Our invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in our claims and illustrated in the accompanying drawings, in which:

Fig. 1 is a side view of the motor and pump portions of our device with sections cut away to more fully illustrate its construction.

Fig. 2 is a front sectional view of the pump adjusting means taken on line 2—2 of Fig. 1.

Fig. 3 is a front sectional view of the water motor and adjusting means for compensating for various water pressures.

Fig. 4 is a side sectional view of the water softener supply tank and means for giving alarm when the same is empty of the water softening solution.

Fig. 5 is a plan sectional view of the pump adjusting means and is taken on line 5—5 of Fig. 2.

Fig. 6 is an enlarged sectional view of the means for adjusting the device to various water pressures.

The water softener devices now on the market are very cumbersome and costly in manufacture thereby placing them beyond the financial reach of many. These large machines have heretofore been necessary due to the impracticability of the small "piston type" to cope with various water pressures. We have overcome these disadvantages as will be appreciated by those skilled in the art.

We have designated the base portion of our device by the numeral 10. Mounted on this base is the impeller housing 11 having the inlet opening 12 in one side and designed to communicate with the water pipe line not shown. On the opposite side of this housing is the outlet opening 13. Journaled in this housing as shown in Fig. 1 and Fig. 3, is the impeller shaft 14. Inside the housing 11 and secured on the shaft 14 against relative movement thereto is the impeller 15. Secured to and supported on the top of the housing 11 is the water softening solution supply tank 16.

We have designated the water softening solution by the numeral 17 which varies in strength and character with the kinds of water to be softened. The numeral 18 designates a float in the tank 16, secured to which is the rope or wire 19, passing through the lid 20 and connected to the operating arm 21 of the ordinary electrical switch 22. This switch is designed to be electrically connected to an electric bell or other suitable alarm, not shown, in order that when the float reaches a position in the lower portion of the supply tank, a warning will be given that the water softening solution is getting low in the tank and should be replenished. The numeral 23 designates a cylinder block having a vertical passageway 24 extending completely through the same. Threaded into each end of this passageway is a plug 25. In the upper portion of the passageway is a valve seat 26 and a second valve seat 27, the lower one of which is the smaller. Normally resting on these valve seats are the balls 28 and 29, respectively. The numeral 30 designates a pipe having one end communicating with the bottom portion of the supply tank and its other end communicating with the lower portion of the vertical passageway 24. Extending from the bottom of the cylinder block and up into the same is the cylinder bore 31, communicating with the second vertical passageway 32. In this passageway 32 are the two valve seats 33 and 34, the lower one of which is the smaller. Normally resting on these seats are the balls 35 and 36 respectively, as shown in Fig. 1. The numeral 37 designates a passageway communicating with the passageway 24 at a point above the valve seats 26 and 27 and the passageway 32 at a point below the valve seats 33 and 34.

Slidably mounted in the bore 31 is the piston 38. Mounted on the shaft 14 is the wheel

39 having the radial slot 40. Slidably mounted in the slot 40 and engaging both sides of the wheel 39 as shown in Fig. 5, is the crank arm 41 having its forward end portion bent toward the center of the wheel 39. The numeral 42 designates a link pivotally secured to the forward end of the crank arm and the piston 38, respectively. Extending into the slot 40 and threaded through the crank arm 41, is the turn screw 43. This screw is rotatably mounted in the slot 40 and is prevented from radial movement thereto by the retaining collar 44 secured to the wheel 39 by suitable means.

Having one end communicating with the outlet opening 13 is the pipe 45, having in its length the T connection 46. Threaded into this connection 46 is the plug 47, through the center of which is a hole. The numeral 48 designates an L tube member threaded into the plug 47 from the under side and designed to extend into the T when the plug is screwed into the same. Threaded into the opposite end of the plug 47 is the pipe 49. The numeral 50 designates a pipe having one of its ends designed to communicate with the passageway 32 above the valve seats 33 and 34 and its other end connected to the free end of the pipe 49 by the union 51. In the line of the pipe 45 between the T connection and the outlet opening 13 is a check valve 52, for preventing any of the softening solution, or water to return to the inside of the housing 11.

The practical operation of the device is as follows:

When any water is used, it must pass through the housing 11, thereby rotating the impeller 15, which in turn rotates the wheel 39. When this wheel is rotated the piston 38 will naturally be reciprocated, thereby forcing any of the water softening solution that is in the bore 31, upwardly past the balls 35 and 36, which act as return check valves, and into the pipe 50 from which it passes into the pipe 45 and is mixed with the water passing through that pipe. The bore 31 is kept supplied with the softening solution by the same passing through the pipe 30 from the supply tank 16 into the passageway 24, up and past the balls 28 and 29, which act as return check valves, through the passageway 37 and into the bore 31. As the bore 31 is lower in height than the supply tank, the solution will by gravity automatically pass from the tank 16 into the bore. However this passing of the solution into the bore is aided by the suction caused by the downward movement of the piston 38. It will readily be noted that the amount of downward and upward movement of the piston will correspond to the amount of softening fluid that is injected into the pipe 50 each time the wheel 39 makes one revolution. The amount of this movement is obtained by the use of the screw 43 which is capable of moving the crank arm 41 to various distances from the center of the wheel. By the crank arm 41 being bent at its forward end toward the center of the wheel 39 the arm may easily be placed so that its forward end is concentric with the center of the wheel 39, whereby the movement of the piston 38 would be imperceptible. The gland 53, containing packing not shown, which is threaded on the cylinder block and embraces the piston 38, prevents any leakage of the solution around the piston.

The purpose of the L member, which is the outlet of the water softening solution into the water flowing through the pipe 45, is to compensate for various water pressures. If the L member was turned so that its discharge end pointed toward the flow of the water, and the flow was very rapid, a suction would be created adjacent the open end of the L member, thereby drawing all the solution out of the tank 16 without the use of the piston 38. On the other hand if the L member was turned against the flow, the resistance would be so great that little if any of the solution would be forced into the water. This however depends entirely upon the pressure and rapidity of movement of the water and may easily be compensated for by loosening the connections and moving the end of the L member to the correct angle with the flow of the water whereby the resistance to the incoming water softening solution is correct for the proper functioning of the device. The turning of the L tube member is shown by dotted lines in Fig. 6.

Some changes may be made in the construction and arrangement of our improved water softener device, without departing from the real spirit and purpose of our invention and it is our intention to cover by our claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

We claim:

1. In a device of the class described, a cylinder block having a bore, a supply tank communicating with said bore, an outlet passageway designed to lead to the water to be softened, a piston slidably mounted in said bore, a rotatably mounted shaft, a means for rotating said shaft, a wheel mounted on said shaft, an arm capable of radial adjustment relative to and secured to said wheel, and a link pivotally secured to said piston and said arm, respectively.

2. In a device of the class described, a cylinder block having a bore, a supply tank communicating with said bore, an outlet passageway designed to lead to the water to be softened, a piston slidably mounted in said bore, a rotatably mounted shaft, a means for rotating said shaft, a wheel mounted on said shaft, a radial slot in said wheel, an arm slidably mounted in said slot, a means for securing said arm in various positions in said slot

against sliding movement, and a link pivotally secured to said piston and said arm, respectively.

3. In a device of the class described, a cylinder block having a bore, a supply tank communicating with said bore, an outlet passageway designed to lead to the water to be softened, a piston slidably mounted in said bore, a water motor having a drive shaft, a wheel mounted on said shaft, a radial slot in said wheel, an arm slidably mounted in said slot and having its free end bent toward the center of said wheel, a screw in said slot and threaded through said arm, a collar secured to said wheel and embracing said screw for preventing any radial movement of the screw relative to said wheel, and a link having one end secured to said piston and its other end secured to the free end of said arm.

4. In a device of the class described, a pipe through which the water to be softened is designed to flow, a discharge tube member extending transversely into said pipe and having its end inside said pipe bent at a right angle to itself; said tube being capable of manual rotation for the placement of said end in said pipe at various positions relative to the flow of water in said pipe, and a mechanism for injecting the water softener solution through said tube into said pipe.

5. In a device of the class described, a pipe through which the water to be softened is designed to flow, a T-connection interimposed in said pipe, a discharge tube member extending into said T and having its end inside said T bent parallel with the flow of water through said pipe; said bent end capable of being manually swung to various positions against or with the flow of water through said pipe, and a mechanism for injecting the water softening solution through said tube into said pipe.

6. In a device of the class described, a cylinder block having a bore, a supply tank communicating with said bore, a piston slidably mounted in said bore, a rotatably mounted shaft, a means for rotating said shaft, a wheel mounted on said shaft, an arm having one of its ends operatively connected to said piston and its other end slidably secured to and radially adjustable on said wheel, a pipe through which the water to be softened flows, an outlet tube having one end communicating with the inside of said bore and its other end extending into said pipe and bent in a right angle to itself inside said pipe, and a means for rotating the bent end of said tube to various positions with or against the flow of water through said pipe.

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