K. W. BARTLETT.

LIQUID TREATING APPARATUS.

APPLICATION FILED NOV. 20, 1908.

1,035,301. Patented Aug. 13, 1912.

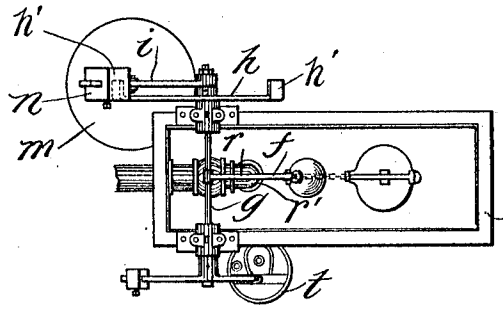

Fig. 1

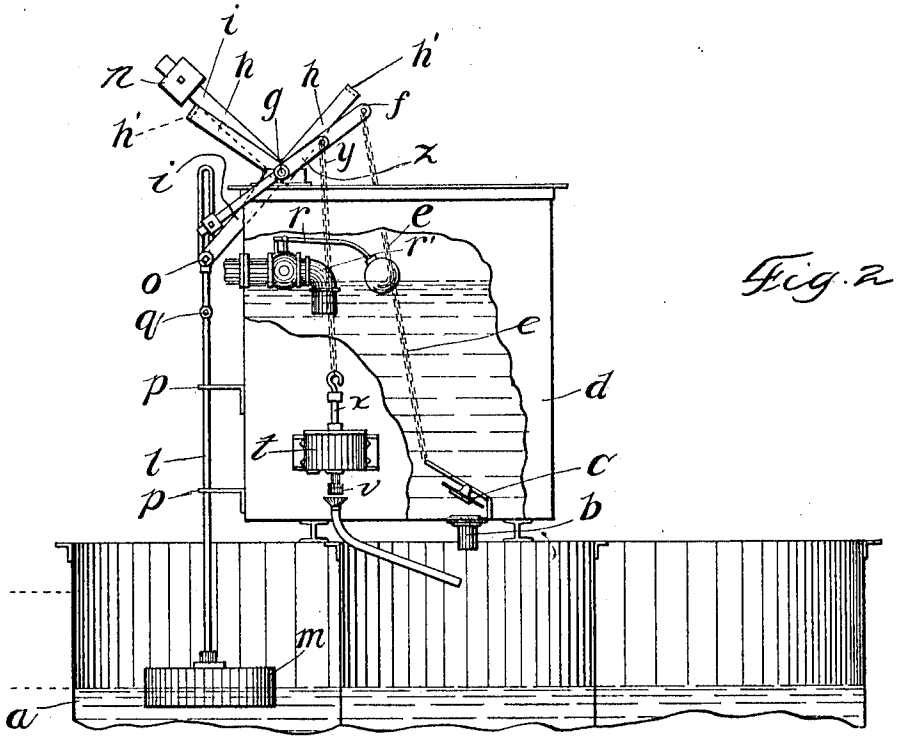

Fig. 2.

Witnesses

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LIQUID-TREATING APPARATUS.

1,035,301. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed November 20, 1908. Serial No. 463,728.

To all whom it may concern:

Be it known that I, KENT W. BARTLETT, a citizen of the United States, residing at Madison, in the county of Dane and State of Wisconsin, have invented a certain new and useful Improvement in Liquid-Treating Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to apparatus for controlling the flow of fluids and is of particular service in connection with water softening outfits, and when adapted to water softening outfits the invention also includes an improvement in the means for supplying the chemical with which the water is to be treated.

My invention in its various aspects is well exhibited by the accompanying drawings, showing the preferred embodiment thereof, in which—

Figure 1 is a plan view of apparatus made in accordance with my invention; Fig. 2 is a side elevation thereof shown in association with a settling tank, parts being broken away to show hidden mechanism.

Like parts are indicated by similar characters of reference throughout the different figures.

The water that is to be treated is admitted to a settling tank *a* through a pipe *b* which is provided with a valve *c* adapted to be widely opened or completely closed for the purpose of permitting a full flow of water through the pipe *b* or for cutting off this flow of water entirely. As a source of supply from which the water is furnished to the settling tank, I have indicated a tank *d*, through the bottom of which one end of the pipe *b* desirably projects, the valve *c* being located within the tank to open and close this end of said pipe. The valve is desirably hinged along one side and is connected with one end of the chain *e* at the opposite side, the other end of said chain being attached to the free end of an arm *f* that is fixed upon a rotatable rod *g*. When the rod *g* is rotated in one direction, the valve *c* is lifted, thereby to permit the full flow of water through the pipe *b* into the settling tank *a*, and when said rod *g* is rotated in the opposite direction, the chain *e* is permitted to slacken, whereupon the valve *c* will close through the joint action of gravity and suction. The rod *g* is automatically rotated in both directions by means of the mechanism illustrated, which includes an arm *h* fixed upon the rod *g*, an arm *i* rotatable upon the rod *g*, a vertical rod *l* having pin and slot connection at its upper end with the arm *i*, and a float *m* provided at the lower end of said rod *l* and riding upon the water in the settling tank. The arm *h* is somewhat in the form of a bell-crank lever and is fixed upon the shaft *g* at its elbow. When the water in the settling tank is receding toward its lower limiting level, the float *m* is correspondingly lowered, thereby to swing the right-hand weighted end of the arm *i*, which is also in the form of a bell-crank journaled upon the shaft *g* at its elbow, toward the rod *l* sufficiently to carry the right-hand end of the arm *i* in this movement just beyond the vertical, whereupon said arm *i*, being adjustably weighted at *n*, will drop forcibly to strike the end of the arm *h* that is nearer the rod *l*, whereby the arm *h* will be rotated in a manner to have the end thereof adjacent to the rod *l* move downwardly, said arm *h* in this movement rotating the rod *g* so as to elevate the arm *f* and thereby widely open the valve *c* so as to permit the full flow of water through the pipe *b* into the settling tank. The arm *i* falls in order thus to elevate or open the valve *c* when the water in the settling tank *a* has reached its lower limiting level. As the water in the settling tank rises, the slotted upper end of the rod *l* rises, the bottom of the slot engaging the pin *o* carried by the arm *i*, thereby to rotate the arm *i* upon and with respect to the shaft *g*. Continued upward movement of the float *m* takes part in effecting the return movement of the arm *i*, the movement of the arm *i* by the rod *l* continuing until the weighted end of said arm just passes the vertical, whereupon said arm *i* will fall into engagement with that end of the arm *h* more remote from the rod *l*, thereby occasioning a rotation of the rod or shaft *g* opposite to that which was previously secured, whereupon the arm *f* is lowered and the chain *e* is permitted to

slacken, so that the valve *c* may be closed by the action of gravity and suction. The falling movement of the arm *i* that causes the chain *e* to slacken occurs when the water in the settling tank *a* has reached its upper limiting level, the float continuing to be supported by the water in the settling tank inasmuch as the arm *i* in falling to permit a closure of the valve *c*, has relative movement with respect to the rod *l*, in that the pin *o* carried by the arm *i* rises in the slot in the upper end of said rod *l*, there thus being lost motion between the float and the arm *i*.

The arm *h* in order that it may be engaged by the weighted arm *i* is desirably provided with transversely extending fingers h^1 that lie across the plane of movement of the arm *i*. The rod *l* desirably passes through two guides *p* near the lower end of the rod, which serve to direct the float *m* in vertical movement. Said rod *l*, owing to its pin and slot connection with the rod *h*, is desirably formed in two sections that are flexibly united at *q*, so that the upper portion of the rod *l* may depart slightly from the vertical as said rod *l* is shifted by the movement of the float *m*.

The water in the supply tank *d* is desirably retained therein at a constant level. In other words, the tank *d* is desirably a constant level chamber having suitable apparatus such as the balanced float valve structure *r*, upon the inlet pipe r^1 for the purpose stated. By this arrangement water may not only flow through the pipe *b* at constant volume, but under constant head or pressure as well.

The apparatus *t* for supplying chemical to the water is broadly claimed in my copending application Serial No. 394,232, filed September 23, 1907. The chemical is discharged from the apparatus through the pipe *v*. The discharge opening is likely to accumulate a chemical crust unless the feature of my invention about to be described is employed. This feature resides in a plunger *x*, suitably weighted, which is attached by means of a chain *y* to an arm *z* fixed upon the shaft *g*. When the arm *f* falls upon corresponding rotation of the arm *g*, the arm *z* likewise falls, permitting the chain *y* to descend, whereupon the weighted plunger *x* is permitted to descend and penetrate the opening *w*, whereby the chemical crust is removed by the plunger. The plunger also serves to operate as a valve to seal the opening *w* when the chemical is not to flow, the valve *x* being elevated when the chemical is to flow when the float *m* in the settling tank has become sufficiently lowered.

It will be seen that the various parts of the apparatus coöperate to produce a water softener, since there is present means for producing an intermittent flow of water to the settling tank for the purpose of being there located to be subject to the action of a chemical and thereafter to be withdrawn to be used where softened water is required. The flow of water into the settling tank is governed by the level of the water in the settling tank, and the flow of chemical into the settling tank is also governed by the level of the water in the settling tank. As illustrated in Fig. 2, the water in the settling tank has reached the predetermined lower level when its supply is to be replenished and when chemical is added in suitable proportion to the added quantity of water. During the time the float *m* descends from the upper limiting level in the settling tank to its lower limiting level, the upper slotted end of the rod *l* engages and presses down upon the pin *o*, thereby gradually to swing the weighted arm *i* to the left until it has passed sufficiently beyond the vertical to permit the weight *n* forcibly to complete the movement of the arm *i* to the left, in which movement the structure *h* will have its portion h^1 engaged by the arm *i*, thereby to cause a rotation of the shaft *g*, whereby the arms *f* and *z*, which are both fixed to the shaft *g*, are elevated, thereby to lift the water valve *c* and chemical valve *x*, whereupon water and chemical flow into the settling tank in proportions determined by the rate and volume of the flowing chemical and water. As the float *m* rises in consequence of the water added to the settling tank, the rod *l* will elevate the pin *o* until the weight *n* has been moved sufficiently to the right of the vertical to permit said weight to fall, whereupon the arm *i* carrying the weight will engage the element h^1 at the right to cause a reverse movement of the shaft *g*, whereby the arms *f* and *z* are lowered to close the valves *c* and *x*. It should be borne in mind that the arm *i* is free to rotate upon the shaft *g* and that the pin *o* is carried upon a right angular extension of the arm *i* which is somewhat in the form of a bell crank lever journaled at its elbow upon the rod *g*.

I claim:—

1. Apparatus of the class described including a fluid-receiving tank, a constant level chamber for supplying said tank with fluid, means for governing flow to said tank from said constant level chamber, a shaft serving by its rotation to govern said means, an arm fixed between its ends upon said shaft, a weighted arm rotatably mounted between its ends, a float changed in position upon changes in the liquid level and serving to move the weighted arm so as to cause the same to fall in one direction when the float

has been raised and in the alternative direction when the float has been lowered, said weighted arm being adapted for engagement with the other arm upon one side or the other of the connection of the other arm with said shaft, whereby said shaft is rotated in different directions to effect control of the means that govern the flow.

2. Apparatus of the class described including a fluid-receiving tank, a constant level chamber for supplying said tank with fluid, means for governing flow to said tank from said constant level chamber, a shaft serving by its rotation to govern said means, an arm fixed between its ends upon said shaft, a weighted arm rotatably mounted between its ends, a float changed in position upon changes in the liquid level and serving to move the weighted arm so as to cause the same to fall in one direction when the float has been raised and in the alternative direction when the float has been lowered, said weighted arm being adapted for engagement with the other arm upon one side or the other of the connection of the other arm with said shaft, whereby said shaft is rotated in different directions to effect control of the means that govern the flow, the connection of the float with the weighted arm affording lost motion between the float and the weighted arm, whereby the weighted arm is not shifted to the position from which it may fall until the float has been either fully raised or fully depressed upon the liquid reaching either its upper level or lower level, whereby the flow is fully permitted or is cut off.

3. Apparatus of the class described including a fluid-receiving tank, a constant level chamber for supplying said tank with fluid, means for governing flow to said tank from said constant level chamber, a shaft serving by its rotation to govern said means, an arm fixed between its ends upon said shaft, a weighted arm rotatably mounted between its ends, a float riding upon the liquid in the receiving tank and changed in position upon changes in the liquid level and serving to move the weighted arm so as to cause the same to fall in one direction when the float has been raised and in the alternative direction when the float has been lowered, said weighted arm being adapted for engagement with the other arm upon one side or the other of the connection of the other arm with said shaft, whereby said shaft is rotated in different directions to effect control of the means that govern the flow.

4. Apparatus of the class described including a fluid-receiving tank, a constant level chamber for supplying said tank with fluid, means for governing flow to said tank from said constant level chamber, a shaft serving by its rotation to govern said means, an arm fixed between its ends upon said shaft, a weighted arm rotatably mounted between its ends, a float riding upon the liquid in the receiving tank and changed in position upon changes in the liquid level and serving to move the weighted arm so as to cause the same to fall in one direction when the float has been raised and in the alternative direction when the float has been lowered, said weighted arm being adapted for engagement with the other arm upon one side or the other of the connection of the other arm with said shaft, whereby said shaft is rotated in different directions to effect control of the means that govern the flow, the connection of the float with the weighted arm affording lost motion between the float and the weighted arm, whereby the weighted arm is not shifted to the position from which it may fall until the float has been either fully raised or fully depressed upon the liquid reaching either its upper level or lower level, whereby flow is either fully permitted or is cut off.

5. Apparatus of the class described including a fluid-receiving tank, a constant level chamber for supplying said tank with fluid, means for governing flow to said tank from said constant level chamber, a float, and mechanism governing said means and caused to operate by the float when the liquid that supports it reaches either its upper or lower level, whereby flow is either fully permitted or is cut off.

6. Apparatus of the class described including a fluid-receiving tank, a constant level chamber for supplying said tank with fluid, means for governing flow to said tank from said constant level chamber, a float riding upon the liquid in the receiving tank, and mechanism governing said means and caused to operate by the float when the liquid that supports it reaches either its upper or lower level, whereby flow is either fully permitted or is cut off.

7. Apparatus of the class described including a fluid-receiving tank, a constant level chamber for supplying said tank with fluid, means for governing flow to said tank from said constant level chamber, a float, and mechanism governing said means and having lost motion connection with said float, and caused to operate by the float when the liquid that supports it reaches either its upper or lower level, whereby flow is either fully permitted or is cut off.

8. Apparatus of the class described including a fluid-receiving tank, a constant level chamber for supplying said tank with fluid, means for governing flow to said tank from said constant level chamber, a float rid-

ing upon the liquid in the receiving tank, and mechanism governing said means and having lost motion connection with said float, and caused to operate by the float when the liquid that supports it reaches either its upper or lower level, whereby the flow is either fully permitted or is cut off.

In witness whereof, I hereunto subscribe my name this seventeenth day of Nov. A. D., 1908.

KENT W. BARTLETT.

Witnesses:
SALLY LOEHRER,
JACKSON REUTER.