(No Model.) 2 Sheets—Sheet 1.

H. K. WOOD.

VALVE MECHANISM.

No. 578,803. Patented Mar. 16, 1897.

Fig. 1.

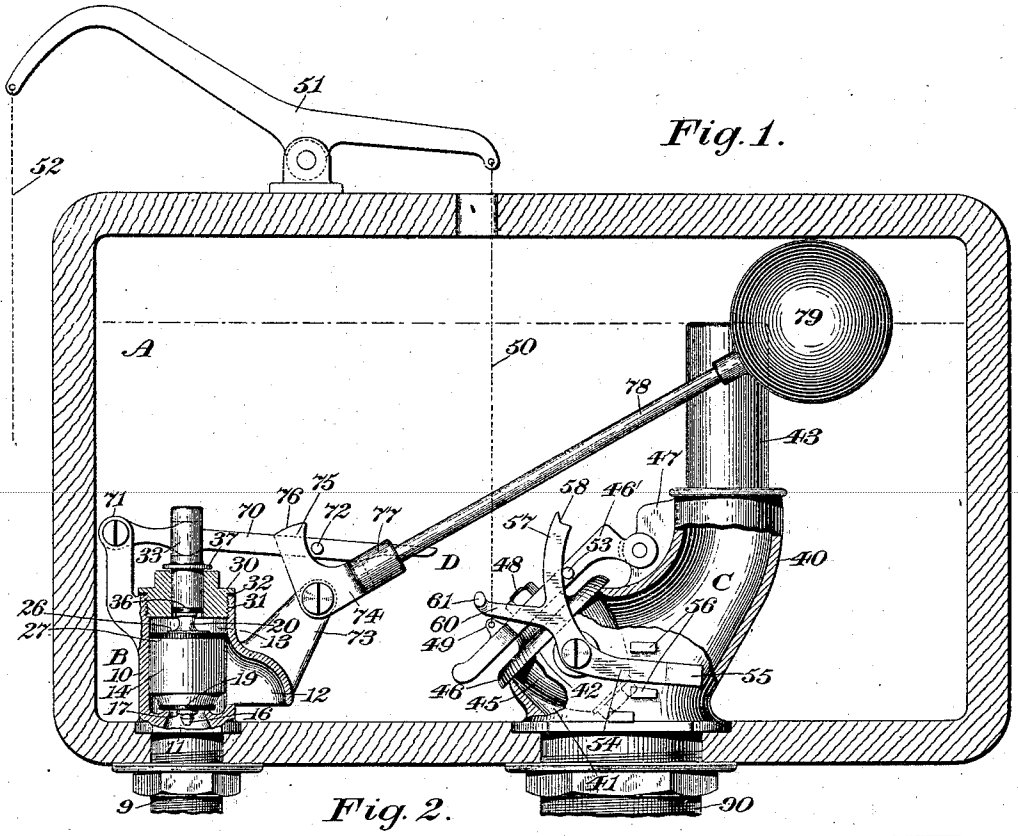
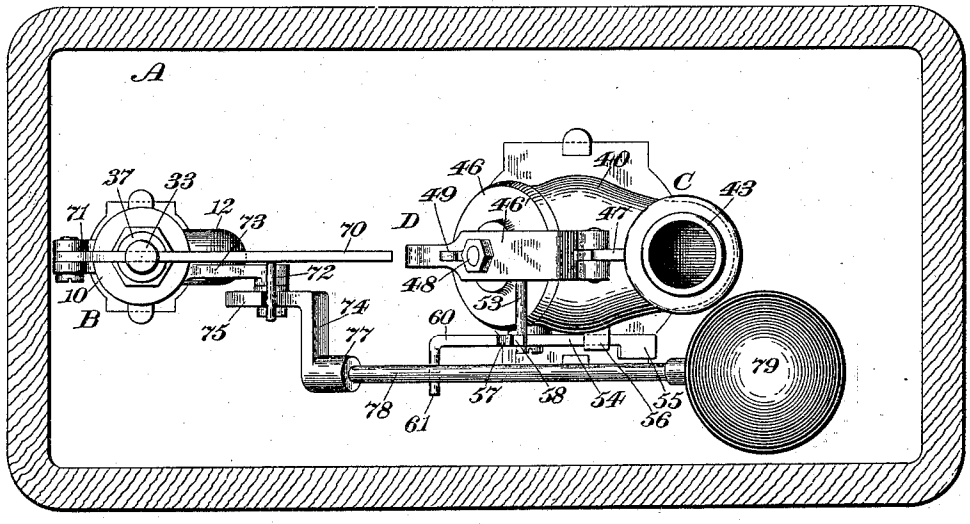


Fig. 2.



Witnesses:
J. L. Edwards Jr.
Fred. J. Dole.

Inventor:
Hubert K. Wood.
By his Attorney,
F. A. Richards.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

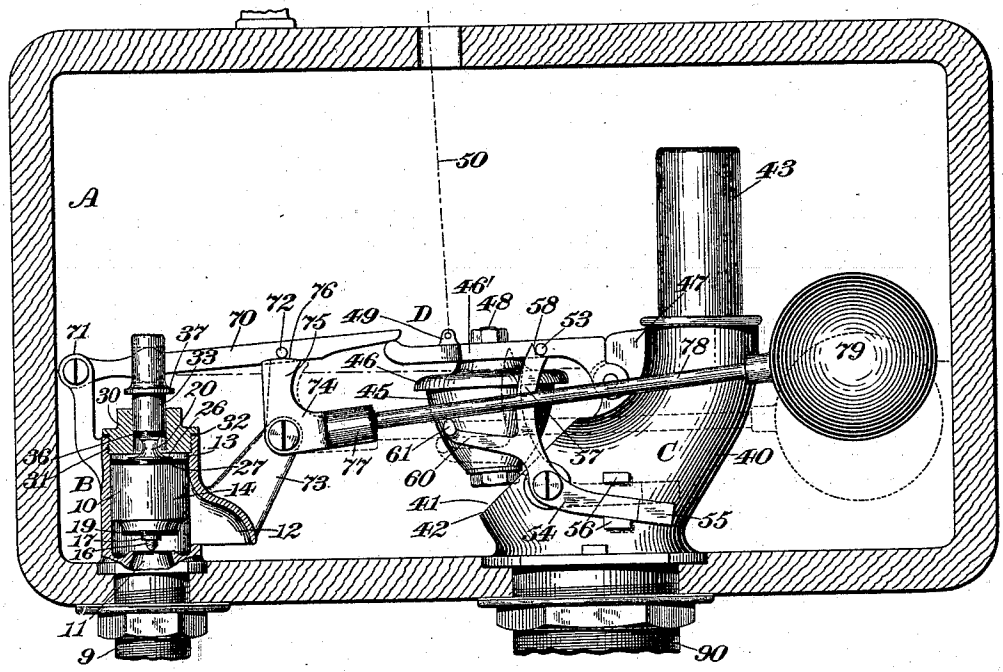


Fig. 4.

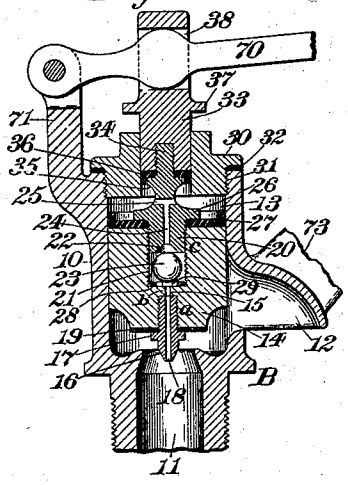


Fig. 5.

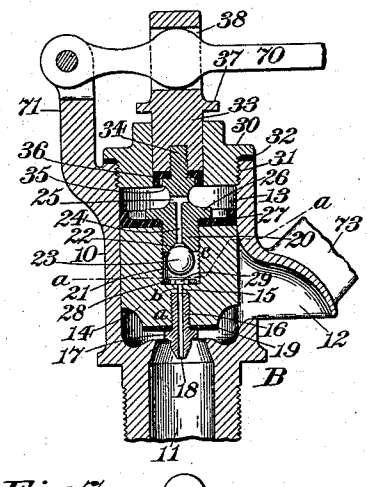


Fig. 6.

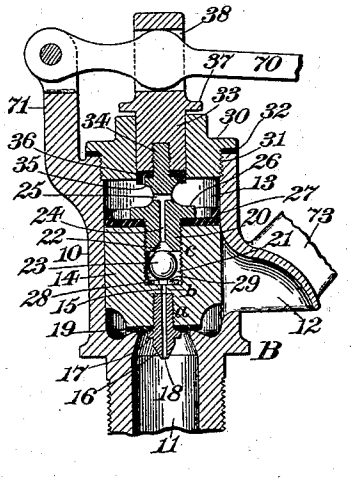
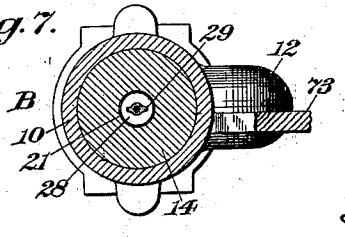


Fig. 7.



Witnesses:
E. L. Edwards Jr.
Fred. J. Dole.

Inventor:
Hubert K. Wood.
By his Attorney,
F. A. Richards.

UNITED STATES PATENT OFFICE.

HUBERT K. WOOD, OF HARTFORD, CONNECTICUT.

VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 578,803, dated March 16, 1897.

Application filed May 28, 1896. Serial No. 593,423. (No model.)

To all whom it may concern:

Be it known that I, HUBERT K. WOOD, a citizen of the United States, residing in Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Valve Mechanism, of which the following is a specification.

This invention relates to means for controlling the inflow and outflow of fluid to tanks or reservoirs and other apparatus of analogous character and is more particularly designated as "valve mechanism" for tanks.

The invention is more especially applicable for regulating the inlet and outlet of fluid to water-closet tanks; and the object thereof is to provide an improved mechanism of this character operable to permit a quick outflow and a steady inflow of the fluid to the tank at certain predetermined periods in the operation of the apparatus.

A further object of the invention is to provide an improved valve mechanism for regulating the inflow of water to the tank and which in its operation will be free from the rattling and banging usually appertaining to devices of this class.

In the drawings accompanying and forming part of this specification, Figure 1 is a vertical longitudinal sectional view of a tank—such as a water-closet tank—with this improved valve mechanism applied thereto, portions of such valve mechanism being shown in section, the inlet and outlet valves being closed and the tank supplied with fluid to its normal level. Fig. 2 is a top view thereof. Fig. 3 is a longitudinal sectional view of a tank, showing a part of the valve mechanism in section, the inlet and outlet valves being shown open to permit the inflow and outflow of the water, and the float being illustrated in different positions. Fig. 4 is a central vertical sectional view of the inlet-valve mechanism with the valve member open. Fig. 5 is a view similar to Fig. 4, but showing the valve member moving toward its seat. Fig. 6 is a view similar to Figs. 4 and 5 with the valve member seated; and Fig. 7 is a transverse sectional view taken in line *a a*, Fig. 5.

Similar characters designate like parts in all the figures of the drawings.

As a preface to the description of this improved valve mechanism, it is to be understood that while such mechanism is illustrated in connection with a water-closet tank it is so represented merely for the purposes of illustration and description, as it is obvious that the mechanism is applicable to other tanks and apparatus for regulating the inflow and outflow of fluid in an analogous manner to that herein shown and described.

In valve mechanisms as usually constructed, especially in that class used in connection with water-closet tanks, one disadvantage has been the rattling and banging of the valve members when in operation and which is caused to a great extent by the sudden closing of said valve members. In order, therefore, to obviate this serious disadvantage, I have provided an improved valve mechanism which will be operable without such defects and which in a general way comprises, in connection with a suitable tank or reservoir, (designated generally by A,) inlet-valve mechanism, (designated generally by B,) outlet-valve mechanism, (designated generally by C,) and connecting mechanism or means (designated generally by D) between said inlet and outlet valve mechanisms.

In the preferred form thereof herein shown and described the inlet-valve mechanism B, which is disposed in a suitable position in the tank A, and which tank may be of any desired construction adapted for the purpose, comprises a chambered casing 10, having an inlet-port 11 in connection with the usual water-supply by means of a pipe 9 and an outlet-port 12 for the passage of the fluid into the tank. This casing is provided with a valve-chamber 13, in which the main-valve member 14 reciprocates. In the form illustrated this valve member 14 is provided with a central bore 15, extending longitudinally therethrough, and which bore is preferably shown of differential diameters, that part thereof nearest the valve-seat, as *a*, being provided with screw-threads for the reception of a threaded nipple 16, having an annular flange 17, and which nipple 16 has one end thereof extending into the inlet-port 11 and is provided with a longitudinal perforation 18, which communicates with that portion of the bore 15 of the valve member which has the

smallest diameter, as *b*. Intermediate the nipple-flange 17 and the face of the valve member 14 a suitable packing 19 is disposed.

That part of the bore 15 which is of the largest diameter, as *c*, and which communicates with the main-valve chamber 13 is provided with interior threads, with which an externally-threaded and annular-flanged plug 20 is adapted to engage, and which plug 20 forms, in connection with such bore *c*, a second or supplemental valve chamber 21 in the valve member 14. This plug 20 is provided at its lower end with a valve-seat 22, (herein shown in its preferred form as a cone-shaped seat,) and with which a supplemental-valve member of any suitable construction, but preferably a ball 23, is adapted to engage. Extending longitudinally through the plug and communicating with this valve-seat is a perforation or bore 24, which ends in a two-way passage 25, communicating with the valve-chamber 13.

Between the upper end of the valve member 14 and the annular flange or collar 26 of the plug 20 a suitable cup-shaped packing 27 is disposed, whereby a tight joint is formed in the valve-chamber.

The lower wall of the supplemental-valve chamber 21 is recessed and has a removable plate 28 resting therein and provided with a slot 29 of larger diameter centrally thereof than at its sides, whereby when the ball-valve in said supplemental chamber is seated in that portion of the slot which has the largest diameter a small stream of water or fluid can pass through the elongated portions of said slot at each side of the ball-valve and into the supplemental-valve chamber 21, from thence into the passage 24 of the plug 20, and finally into the main-valve chamber 13 in the manner hereinafter set forth. As a means for closing the upper end of this main-valve chamber 13 an externally-threaded and annular-flanged removable plug 30 engages with the interior threads 31 of the valve-chamber 13, a suitable packing 32 being interposed between the flange and the upper end of the valve-chamber casing. This plug 30 is centrally bored to receive an actuating stem or rod 33, which is also centrally bored and threaded adjacent to its lower end to receive a threaded extension 34 of the plug 20. Intermediate the lower end of this stem 33 and an annular flange or collar 35 of the plug 20 a cup-shaped packing 36 is disposed, to thereby form a water-tight joint at this point. In the construction shown this stem 33 is provided with an annular flange or collar 37 above the plug 30, and which flange serves as a stop to divert the water laterally should the same penetrate around the packing 36 and stem 33 and thus prevent the same from spurting out of the tank when an uncovered reservoir is used. The actuating-stem 33 is provided with a transverse slot 38 for the reception of the inlet-valve-actuating lever or rod of the connecting mechanism hereinafter set forth.

The outlet-valve mechanism C is disposed in position in the tank in any suitable and desired way and in the preferred form thereof herein shown and described comprises a casing 40, having an outlet-port 41, which in the construction shown has an inclined seat 42, although it will be understood that this outlet-port and its seat may be formed in various ways without departing from the scope of this invention. The casing is provided with an overflow-pipe 43, extending upward to the normal height of the water and which communicates with the outlet-port to thereby permit the outflow of the water should the same rise above its normal level. The outlet-port closure or valve member in this construction preferably comprises a conically-shaped plug 45, adapted to extend into and of sufficient weight to maintain a firm seat on the mouth of the outlet-port. This plug has an annular flange 46, adapted to engage the outlet-port seat 42 when the member is in its closed position. As one means for supporting and actuating this plug 45 a bifurcated lever 46′ is pivotally secured to an extension 47 of the casing 40 and is connected to said plug by means of a bolt 48, which extends through the same. This lever 46′ is provided with a perforated ear 49, adapted to receive the lower end of a chain or cord 50, extending from a pull-lever 51, pivotally secured to the tank in the ordinary way, the opposite end of said pull-lever being provided with the usual pull chain or cord 52. Extending laterally from this lever 46′ is a suitable stop pin or projection 53, for the purpose hereinafter set forth.

Pivotally secured to one side of the casing is a bifurcated lever in the nature of a bell-crank lever 54, having a weighted end 55 and adapted for movement between two stop devices 56, formed on the side of the casing 40. One member or arm 57 of the bifurcated end of this lever is preferably curved to engage the stop-pin 53 of the lever 46′, whereby it can be held in close engagement therewith by means of its weighted end during the upward movement of the valve member 45. This arm or member 57 has a recessed end 58, adapted to engage the laterally-extending pin or projection 53 and thereby hold the valve-plug open. The other member or arm 60 of this bell-crank lever is provided with a laterally-extending pin or projection 61 in position to be engaged by the float-lever to thereby actuate the bell-crank lever and permit the plug 45 to descend in a manner hereinafter set forth.

The connecting mechanism D in its preferred form comprises a suitable lever or rod 70, having one end thereof hinged to an arm or extension 71 of the inlet-valve casing 10, and said lever extends through the transverse slot 38 of the inlet-valve stem 33 and thus constitutes the inlet-valve-actuating lever.

This lever or rod 70 is provided with a laterally-extending pin 72 in position to be engaged by the end of a float-lever in a manner hereinafter set forth.

Pivotally secured to an arm or extension 73 of the inlet-valve casing 10 or at any other suitable place is an angle-lever 74, which is provided with an upwardly-extending arm 75, having a cam-face 76 concentric with the pivotal point of said angle-lever 74, and which cam-face is adapted to engage the laterally-extending pin 72 of the inlet-valve-actuating lever 70 at certain predetermined periods in the operation of the mechanism. Secured in a sleeved end 77 of this angle-lever is a float-rod 78, having a float 79 of any desired construction at its opposite end.

In the operation of this improved valve mechanism, the water being at its normal level in the tank in order to flood the closet bowl or basin with which the outlet-port is connected by a pipe, as 90, the lever 51 is pulled, whereby the outlet valve or closure 45 is moved upward, the laterally-extending pin 53 thereof traveling along the curved face of the lever 57 until it reaches the free end thereof, when the recessed end 58 of said lever 57, by means of its weighted end, is moved into position to engage said stop-pin 53 and hold the valve open. (See Fig. 3.) During its upward movement the outer end of the lever 46′ engages the end of the inlet-valve-actuating lever 70 and moves the same upward, thereby actuating the inlet-valve to permit the inflow of water to the tank, which is of course of less volume than the outflow through the outlet-port. As the outflow decreases the amount of water in the tank the float descends until the cam-face 76 of the lever 74 is moved into position to engage the laterally-extending pin or stop 72 of the inlet-valve-actuating lever 70, whereby the same is held in position to maintain the inlet-valve open. On the further downward movement of the float the rod 78 thereof engages the laterally-extending arm 61 of the bell-crank lever 54 and depresses the same, thereby disengaging the recessed end 58 of the curved arm or member 57 from the stop-pin 53 and permitting the valve-plug to descend and cut off the outlet, whereupon the tank will again be supplied with water until the float reaches its normal level, when the cam-face 76 of the lever 74 will be actuated to release the laterally-extending pin 72 of the inlet-valve-actuating lever 70, and thus permit the inlet-valve to close to cut off the supply of water to the tank. This closing of the main inlet-valve is regulated by means of the supplemental valve, so that the rattling of the same is prevented—that is to say, if the water from the inlet-port during the closing movement of the main valve were permitted to flow with great force into the valve-chamber above the valve member it would close the said member upon its seat suddenly; but owing to this particular construction when the cam-face of the float-lever releases the inlet-valve-actuating lever 70 the water in the valve-chamber above the inlet-valve member, having greater pressure at this point, owing to its larger area than at the inlet-port thereof, tends to move the valve member toward its seat, and which closing movement is regulated by the supplemental valve in the following manner: During the closing movement of the main-valve member the supplemental-valve member 21 seats itself on its conical seat and thereby prevents the sudden inflow of water to the main-valve chamber. The supplemental valve, however, does not seat itself so firmly as entirely to cut off the flow of water to the main-valve chamber, as owing to the constant fluctuation of such supplemental valve, due, mainly, to the weight thereof and to the fact that the pressure of water is not sufficient to maintain the valve tightly against its seat, such supplemental valve permits the passage of a small stream around the same, so that the main-valve member is slowly closed, owing to the gradual increase of water in the main-valve chamber. When the main-valve member is closed firmly on its seat, the ball 21 moves into position to engage the slotted plate 28 and thereby cuts off a greater portion of the inflow of water from the inlet-port to the valve-chamber, the elongated portions of the slot, however, permitting a slight outflow from the valve-chamber and a decrease in the pressure thereof when the valve member is moved upward.

It will be understood, as before stated, that various constructions of the supplemental valve might be used as substitutes for the ball, the valve-seats being correspondingly changed, and that the valve-actuating mechanism can be variously modified without departing from my invention.

Having described my invention, I claim—

1. A valve comprising a chambered valve-casing having an inlet and an outlet port; a main-valve member therein; and a normally freely-movable supplemental valve disposed in the main valve and automatically movable to regulate the closing movement of the main valve.

2. A valve comprising a chambered valve-casing having an inlet and an outlet port; a main-valve member having a longitudinal bore forming a supplemental-valve chamber; and a ball-valve disposed in the chamber of the main valve and operable to regulate the closing movement of said main valve.

3. A valve comprising a chambered valve-casing having an inlet and an outlet port; a main-valve member disposed therein and having a longitudinal bore of differential diameters; a removable, longitudinally-bored plug fitting in that part thereof having the largest diameter and forming a supplemental-valve chamber; and a supplemental-valve member therein operable to regulate the closing movement of the main-valve member.

4. A valve comprising a chambered valve-casing having an inlet and an outlet port; a valve member operable therein and having a longitudinal bore of differential diameters; a nipple disposed in one end of said member and having a longitudinal perforation; a longitudinally-bored plug disposed in that portion of the bore having the largest diameter and forming a supplemental-valve chamber; and a supplemental-valve member in said chamber operable to regulate the closing movement of the main valve.

5. A valve comprising a chambered valve-casing having an inlet and an outlet port; a valve member therein having a longitudinal bore forming a supplemental-valve chamber; a plate disposed at the lower end of said supplemental chamber and having a slot of differential diameters; and a supplemental-valve member operable in said supplemental-valve chamber to control the closing movement of said main valve and adapted to regulate the flow of water through said slotted plate.

6. A valve comprising a chambered valve-casing having an inlet and an outlet port; a main valve in said casing having a longitudinal bore of differential diameters; a longitudinally-perforated nipple disposed in one end of said valve member; a longitudinally-bored plug disposed in that portion of the valve-member bore having the largest diameter and thereby forming a supplemental-valve chamber, said plug having a conical seat; a slotted plate mounted on the lower wall of the supplemental-valve chamber; and a supplemental ball-valve operable in said supplemental-valve chamber to regulate the closing movement of the main valve.

7. A valve comprising a chambered valve-casing having an inlet and an outlet port; a main-valve member in said chambered casing and having a longitudinal bore of differential diameters; a longitudinally-perforated nipple disposed in one end of said valve member; a longitudinally-bored plug disposed in that portion of the bore of the valve member having the largest diameter and thereby forming a supplemental-valve chamber, said plug having a two-way passage connecting its longitudinal bore with the main-valve chamber and also having a conical seat; a plate having a slot of differential diameters mounted on the lower wall of the supplemental-valve chamber; a ball-valve operable in said supplemental chamber to regulate the closing movement of said valve; and means secured to said longitudinally-bored plug for operating said main valve.

8. The combination of a tank, valve mechanism therein comprising a casing having an outlet-port; a valve member pivotally secured to said casing and operable to close said port and having a laterally-extending stop device; means for actuating said valve member to open said port; a bell-crank lever pivotally secured to the casing and having a weighted end and operable on the actuation of the valve member to hold said member open, said lever having a laterally-extending arm; and a float pivotally secured in position and adapted to have its rod engage said laterally-extending arm of the bell-crank lever, to thereby disengage said lever from the stop device of the valve member and permit said valve member to close.

9. The combination of a tank, an inlet-valve comprising a chambered casing having an inlet and an outlet port and a valve member operable therein; means for actuating said valve member; an outlet-valve comprising a casing having an outlet-port; a valve member operable to close said port; means for actuating said outlet-valve member, to thereby open said outlet-port and simultaneously actuate the inlet-valve; means for holding said outlet-valve member open during a predetermined period in the operation of the apparatus; and means operable to engage said valve-member-holding means to thereby disengage the same from the outlet-valve member and permit the closing of the same and to simultaneously engage the inlet-valve-actuating means and hold the same open after the outlet-valve member is closed.

10. The combination of a tank, valve mechanism therein comprising an inlet-valve and means for actuating the same, and an outlet-valve and means for actuating the same, said outlet-valve being operable to open the inlet-valve; means for holding said outlet-valve open; and means operable to engage the outlet-valve-holding means to actuate the same and permit the closing of said outlet-port and to simultaneously engage the inlet-valve-actuating means, to thereby hold said inlet-valve open after the closing of said outlet-valve.

11. The combination of a tank, valve mechanism therein comprising an inlet-valve, and means for actuating the same, and an outlet-valve and means for actuating the same, said outlet-valve being operable to actuate the inlet-valve to open the same; means for holding said outlet-valve open; and a float operable to actuate said outlet-valve-holding means, to thereby release the same from the outlet-valve member and permit the closing thereof and to simultaneously engage the inlet-valve-actuating means to hold the same open after the closing of the outlet-valve member.

12. The combination of a tank, valve mechanism therein comprising an inlet-valve having an actuating-lever provided with a stop device; an outlet-valve, an actuating-lever secured thereto and adapted to engage the inlet-valve-actuating lever on the opening movement of said outlet-valve, and thereby open the inlet-valve; means for actuating said outlet-valve to open the outlet-port; means operable on the opening movement of said outlet-valve to hold said valve open; and means operable to engage the stop device of

the inlet-valve-actuating lever, to hold the same open after the closing of the outlet-valve and also operable to engage the outlet-valve-holding means to disengage the same from the outlet-valve member and permit the closing thereof.

13. The combination of a tank, valve mechanism therein comprising an inlet-valve having a valve-actuating lever and a laterally-extending stop thereon; an outlet-valve having an actuating-lever also provided with a laterally-extending stop and adapted to engage the inlet-valve-actuating lever, to thereby open the inlet-valve; means for actuating the outlet-valve; a lever pivotally secured in position and adapted to engage said laterally-extending stop of the outlet-valve-actuating lever, to thereby hold said outlet-valve member open, said lever also having a laterally-extending arm; and a float pivotally secured in position to engage the laterally-extending arm of the lever, to thereby disengage said lever from the stop of the outlet-valve-actuating lever and permit the closing movement of said outlet-valve member, said float having a cam-face adapted to engage the laterally-extending stop of the inlet-valve-actuating lever and thereby hold the same open during a predetermined period in the operation of the mechanism.

HUBERT K. WOOD.

Witnesses:
FRED. J. DOLE,
HENRY BISSELL.