(No Model.) 2 Sheets—Sheet 1.

P. W. DOHERTY.

OPERATING MECHANISM FOR VALVES OF WATER CLOSET OR OTHER TANKS.

No. 411,888. Patented Oct. 1, 1889.

Fig. 1.

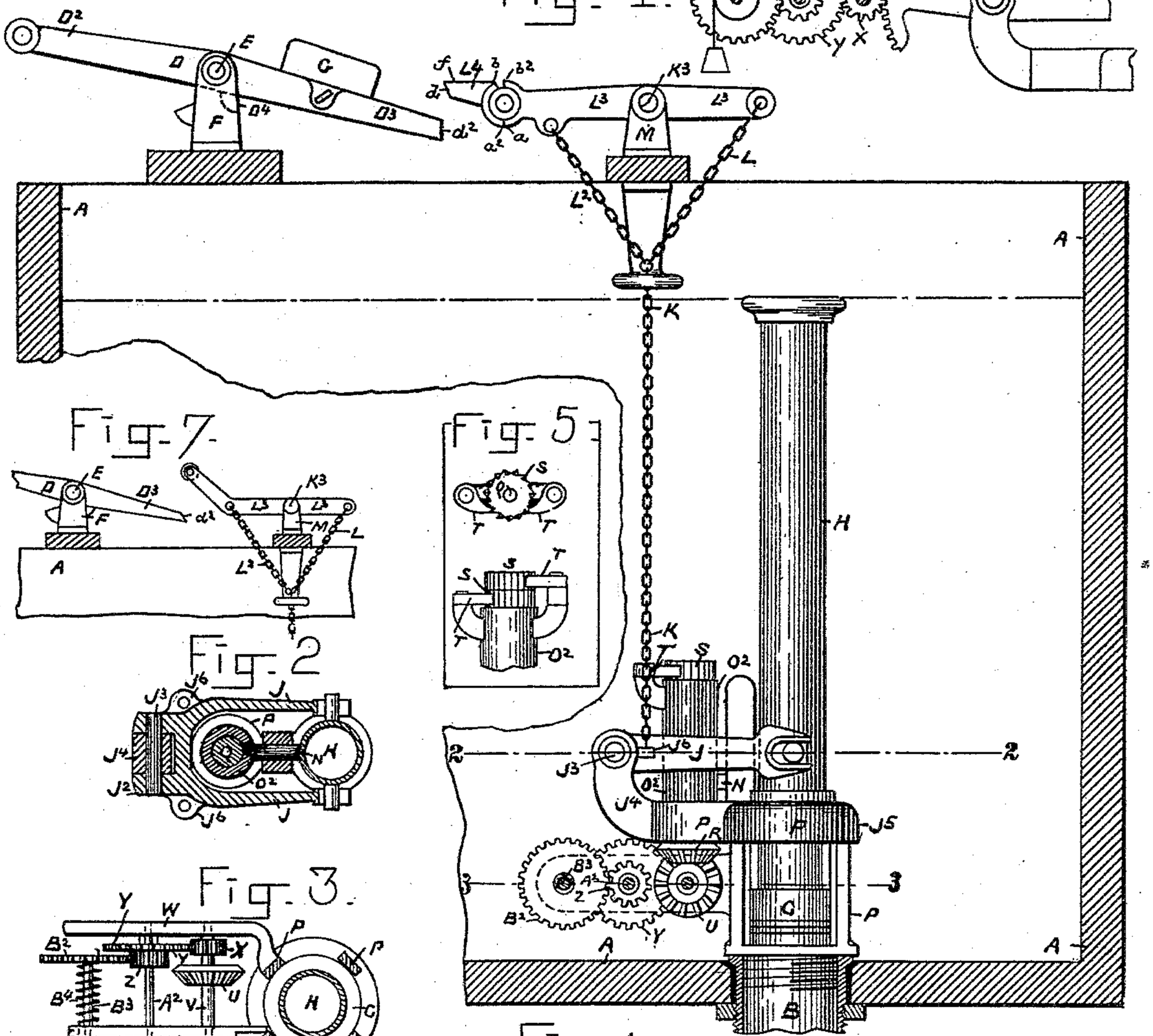


Fig. 6.

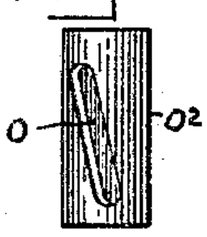
Fig. 7.

Fig. 5.

Fig. 2.

Fig. 3.

Fig. 4.



WITNESSES:

C. S. Gooding.

Geo. C. Dent.

INVENTOR:

Patrick W. Doherty

by: Brown Bros.

Attys.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 8

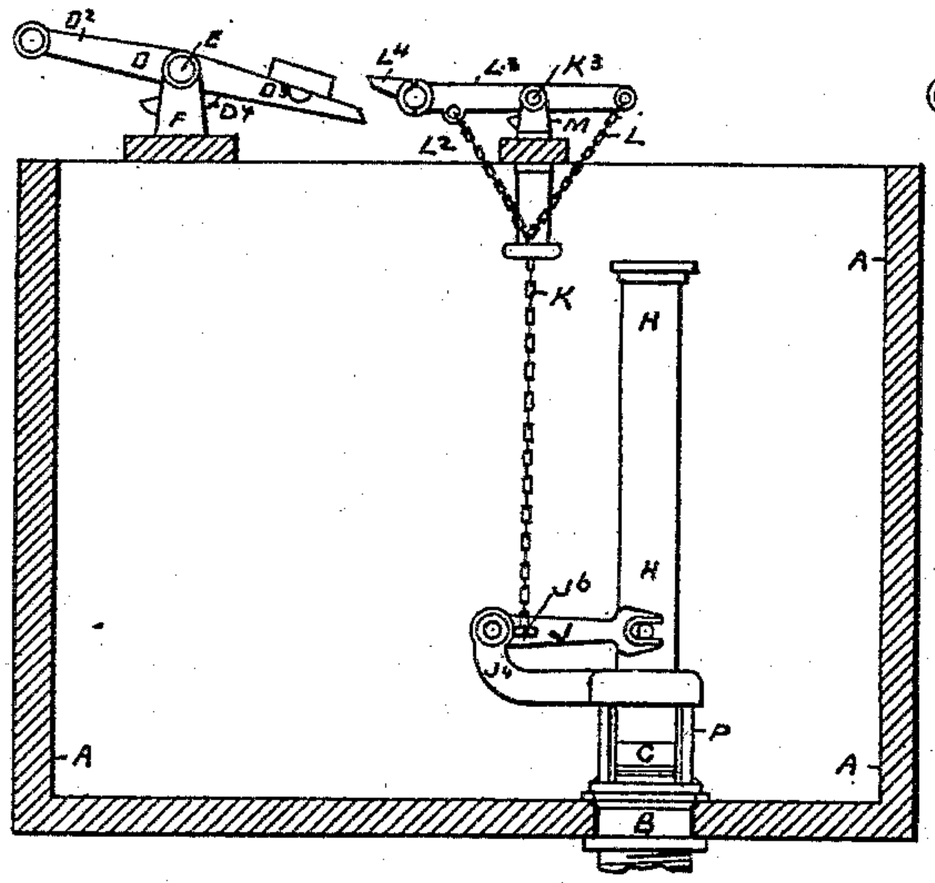


Fig. 10.

Fig. 9

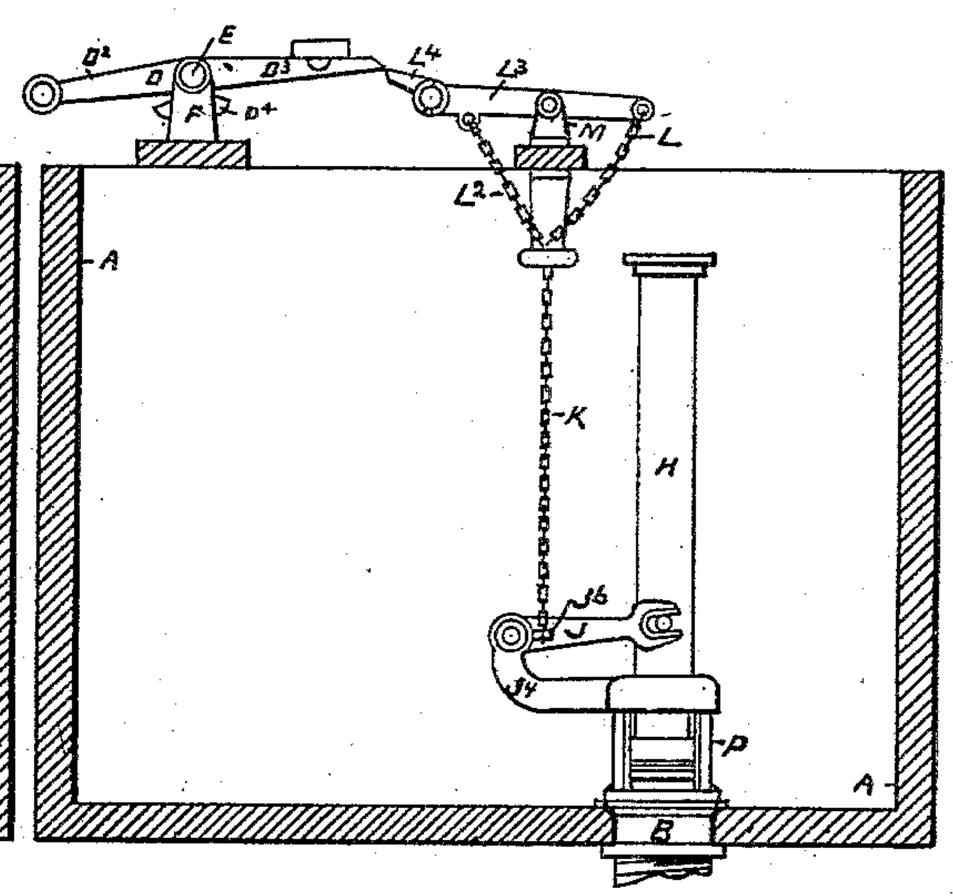
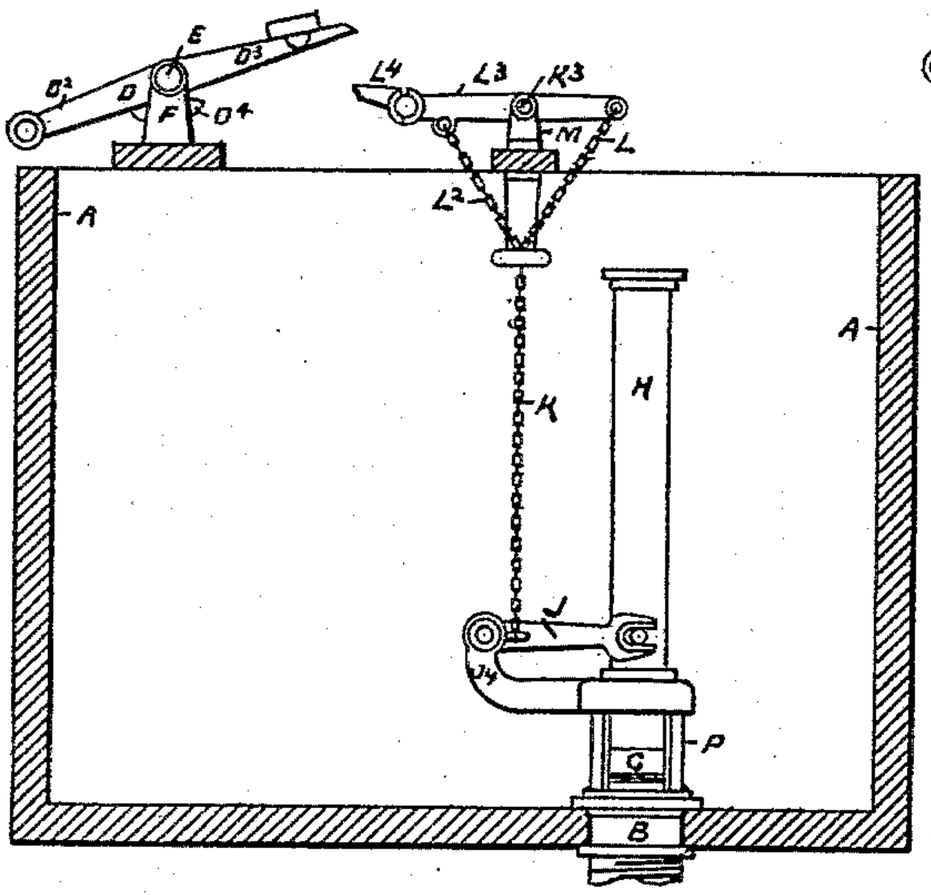
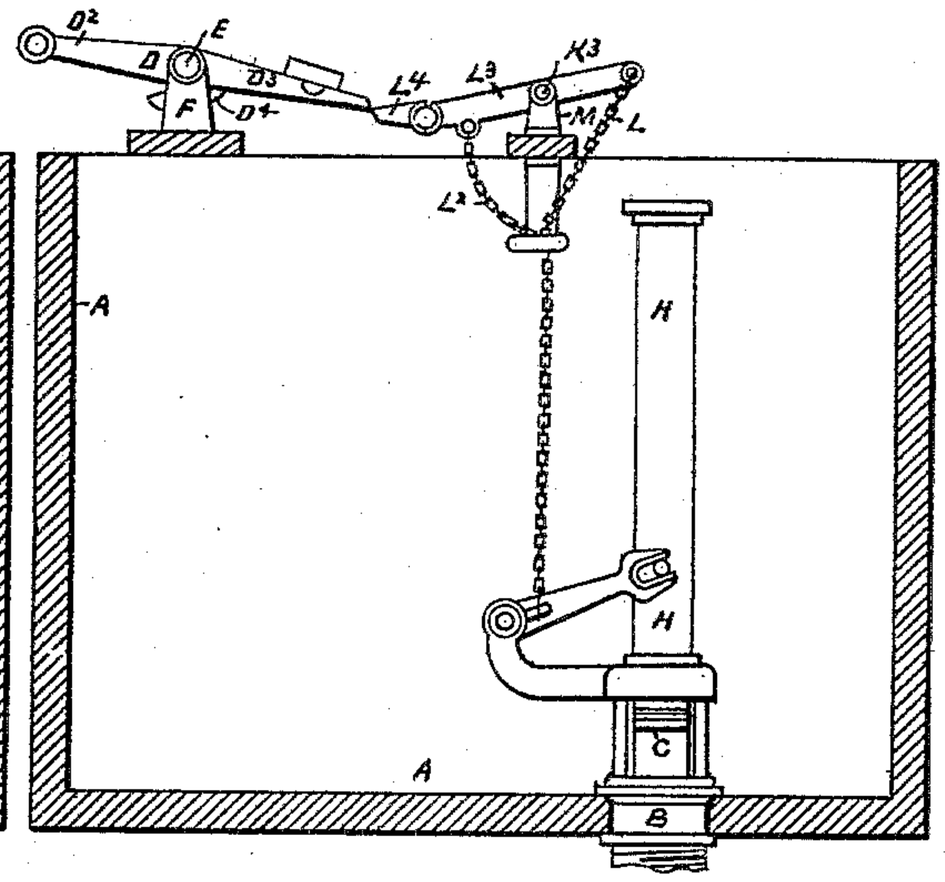


Fig. 11.





WITNESSES:
C. S. Gooding.
Geo. B. Dent

INVENTOR.
Patrick W. Doherty.
by: Brown Bros.
Attys.

UNITED STATES PATENT OFFICE.

PATRICK W. DOHERTY, OF BOSTON, MASSACHUSETTS.

OPERATING MECHANISM FOR VALVES OF WATER-CLOSET OR OTHER TANKS.

SPECIFICATION forming part of Letters Patent No. 411,888, dated October 1, 1889.

Application filed September 3, 1888. Serial No. 284,511. (No model.)

To all whom it may concern:

Be it known that I, PATRICK W. DOHERTY, of the city of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Operating Mechanisms for Valves of Water-Closet and other Tanks, of which the following is a full, clear, and exact description.

This invention relates to mechanism for operating valves of water-closet and other tanks to secure their opening and closing, and to mechanism for regulating or controlling or governing the movement of the valve in either its opening or its closing, or both in its opening and its closing, but preferably only in its closing.

The invention in substance consists, first, in the combination, with the opening and closing valve, which may be otherwise of the usual or any other suitable construction or arrangement, and a lever which is fulcrumed on a suitable support or equivalent mechanism therefor and suitably adapted to be operated, of an oscillating or tilting lever fulcrumed on a suitable support and at one end preferably having a hinged or other equivalent toe-piece to engage with and disengage from the operating-lever in each movement of the latter, a chain or other line of a flexible or suitable character at each side of the fulcrum of the oscillating or tilting lever, and both having suitable connection with the valve, and all so that on each movement of the operating-lever the valve will be opened and released to close; second, of an opening and closing valve, which may be of the usual or any other suitable construction and arrangement, and mechanism to secure its opening and closing, in combination with gearing, in communication or connection with the valve either directly or indirectly, and a weight or spring or equivalent means applied to and otherwise adapted in relation to such gearing to act to resist and thereby to regulate, govern, or control the movement of the valve in either one or both directions of its movement, preferably its closing.

In the drawings forming part of this specification, Figure 1 is a longitudinal vertical section of a water-tank and discharge-pipe, and a side elevation of the valve closed, and mechanism of this invention to secure an opening of the valve on both movements of an operating-lever, and to allow the valve after each opening to close and to regulate it in each closing movement. Fig. 2 is a horizontal section-line 2 2, Fig. 1. Fig. 3 is a horizontal section and plan view, line 3 3, Fig. 1. Fig. 4 is an elevation in detail, hereinafter explained. Figs. 5, 6, and 7 are views of modifications hereinafter described. Figs. 8, 9, 10, and 11 are similar views to Fig. 1, on a reduced scale, and otherwise as will hereinafter appear.

In the drawings, A is a tank.

B is a discharge-pipe leading from the bottom of the tank.

C is a valve for opening and closing the discharge-pipe at the tank, suitably arranged and as well known in opening and closing, to move and be guided directly vertically; and D is a lever having a fulcrum E, of a stationary support F of the tank, and at one end portion D^2 suitably connected by a chain and pull (not shown) or otherwise, (not shown,) as well known, so as thereby to be moved in one direction, and at its other end portion D^3 weighted at G, or otherwise suitably adapted and as well known, so as thereby to be moved in the other and opposite direction on a release of the power or force applied to its end D^2, to move it and all otherwise, except as to the features of this invention, as well known in water-tank systems of dwelling-houses, buildings, &c., or otherwise suitably, and therefore needing no more particular description herein.

H is an upright or vertical arm or extension of the valve C, and, as shown, constituting the overflow-pipe of the tank, opening (not shown) at its upper end H^2 to the water-space of the tank, and at its lower end (not shown) having communications through the thickness of the valve with the discharge-pipe B, and in itself neither as a whole nor as to its separate parts forming, except as hereinafter stated, any part of this invention.

J is a horizontal lever having two parallel arms projected from a common head or hub J^2, which has a fulcrum J^3 of a support J^4, making part of the stand J^5, that serves as a guide to the valve C in its up-and-down movement to open and close.

K is a vertical chain or other line, prefer-

ably a line which is flexible, and at its lower end connected to ear-pieces J^6 on opposite sides of the lever J. This chain K extends upward from its connection with lever-head J^2, and its upper end is attached to two separate lengths L L^2 of chain or other line of flexible or similar character, both of which extend upward in outwardly-flaring directions, and at their upper ends are connected to and on opposite sides of the fulcrum K^3 of a common lever L^3 of a standard M, attached to the tank. The lever L^3 in operation has an oscillating or tilting movement imparted to it by the operating-lever, all as hereinafter appears.

L^4 is a toe-piece pivoted to one end of the oscillating lever L^3, and projecting from it into the vertical plane of movement of the weighted end of the operating-lever. The hub of this toe has shoulders *a b* at opposite points, and the end of the oscillating lever, to which toe is hung, as stated, also has shoulders a^2 b^2 at opposite points, and severally relatively arranged as stops or limits to the throw or swing in both directions of the toe on oscillating lever, as hereinafter explained.

In the normal position of the operating-lever its weighted end is below the end of the pivoted toe L^4 of the oscillating lever L^3, and the bearing-faces *d* d^2 of toe and operating-lever have a corresponding vertical incline and one oblique to a line drawn through the axes of the operating-lever and the toe of the oscillating lever with the shoulders *a* a^2 of oscillating lever and its toe in abutment, and otherwise the direction of said bearing-faces *d* d^2 is such that in the upper swing of the weighted end of the operating-lever the toe will be swung upward, and finally coming to an abutment by its shoulder *b* against the shoulder b^2 of the oscillating lever, carry that lever with it until by the continued movement of both levers in the same direction the levers and toe-piece of oscillating lever escape from each other, leaving the oscillating lever and its toe free to return to their normal positions, and for the operating-lever on its return movement to again come to a rest on the stop D^4 of its supporting-stand F, as will hereinafter more fully appear.

On pulling down on the operating-lever D at its operating end D^2 the oscillating lever L^3, flexibly connected to the valve and on the toe-piece of which the operating-lever then comes to a bearing, is elevated at its toe end and its opposite end depressed, lifting through the chain length L^2, directly connected thereto and to the valve, as explained, the valve from its seat, the other chain-length L connected to the oscillating lever then being free and slack, when the operating-lever and toe of oscillating lever having escaped from each other the oscillating lever and its toe are left free to return to their normal positions, as before stated, and (so far as such mechanism is concerned) also the valve is left free to close. On the then return of the operating-lever to its normal position, its weighted end coming to a rest on the upper edge *f* of the toe of the oscillating lever, it again, first having swung the toe on its axis sufficiently to bring it by its shoulder a^2 to an abutment against the shoulder *a* of the lever, moves or tilts said lever at its toe end downwardly, and thus through the chain-length L directly making connection between the oscillating lever at its end opposite to its toe and the valve. The other chain-length L^2 of valve and oscillating lever then being free and slack, the valve is again opened, until by the continued movement of operating and oscillating levers in the direction stated they escape from each other, leaving the tilting lever as also its toe free to return to their normal positions and the valve to close, the operating-lever having at such time or thereabout also returned to its normal position. The valve, as shown, closes from its own gravity, but obviously it may be arranged to close from gravity acquired after being opened, or from other causes or means, all as well known.

Figs. 8 to 11, both inclusive, illustrate the operating-lever D and its companion and oscillating lever L^3 in their positions at different portions of the movement of the operating-lever and the valve when opened and closed in relation thereto.

In Fig. 8 the levers are shown in their respective normal positions, and the operating-lever at rest on a stationary support D^4 and the valve is closed.

In Fig. 9 the operating-lever D is shown as having moved sufficiently at its operating end D^2 from its normal position to have secured through its action on the toe of and thus on the oscillating lever an opening of the valve and escape of the operating-lever and toe of oscillating lever from each other, leaving the oscillating lever and toe free to return to their normal positions and the valve to close.

In Fig. 10 the operating-lever is shown with its operating end as having reached the limit of its movement, the valve as closed, and the oscillating lever and its toe as returned to their normal positions.

In Fig. 11 the operating-lever is shown on its return movement and sufficiently to have secured an opening of the valve, as before stated, and the operating-lever and toe of oscillating lever as having just escaped from each other, leaving the oscillating lever and its toe free to return to their respective normal positions and the valve to close, the whole ending in a return of the several parts to their normal positions and in the closing of the valve, Fig. 8.

From the description above given it is plain that in each direction of movement of the operating-lever the valve is opened, followed by its closing, thus securing two separate discharges of water from the tank, which preferably should be unequal in quantity, the smaller on the first, and the larger on the second, opening, so as to give to the

closet-bowl connected to the discharge-pipe of the tank what are known as "preliminary" and "after" washes. This inequality in quantity of the washes is obtained by a less opening of the valve for the preliminary than for the after wash, and on the mechanism described it is provided for by an adaptation of the parts to open the valve on the first movement of the operating-lever to a less extent than on the second movement of the operating-lever.

To regulate or govern the movement of the valve either from the operation of the lever mechanisms particularly explained or from any other suitable mechanism, or from the gravity or an acquired gravity of the valve or any other cause, gearing and a weight, spring, or equivalent means are provided and combined and arranged in connection with the valve or the operating mechanism therefor, all so that from their operation the movement of the valve in either direction, preferably in its direction of movement to close, shall be thereby affected in speed, as may be desired. This gearing and weight, spring, or equivalent means applied to it constitute an essential feature of this invention, and are now to be described in detail and in different forms of application.

Figs. 1, 2, and 4, N is a horizontal and radial pin projection of the valve-extension H, and it passes through a vertical extending cam-slot O of a vertical sleeve O^2, which is supported and is free to rotate on the guide-stand P for the valve. Q is a vertical arbor loose within the sleeve O^2 and turning suitable bearings of the sleeve-support and projecting at its opposite ends from said sleeve and support and suitably secured against lengthwise movement while free to turn therein, as, for illustration, at its lower end and below its said support P by a horizontal bevel gear-wheel R, which is fixed to it, and at its upper end and above the cam-slotted sleeve O^2 by a horizontal ratchet-wheel S, which is fixed to it and in position for the toe of a spring-pawl T, hung upon the upper end of said sleeve to engage its teeth in one direction of rotation and to pass freely over its teeth in the other direction of rotation of the sleeve. Preferably this engagement of the pawl and ratchet-wheel is when the valve is on its closing movement, and the pawl and ratchet-wheel are so shown, Fig. 1; but obviously they may be arranged to engage when the valve is on its opening movement, and again by duplicating the pawls and ratchet-wheels and presenting the teeth of the ratchet-wheels and also the toes of the pawls in opposite directions relatively to each other, an engagement of one pawl with one ratchet-wheel is secured in each direction of movement of the valve, all as hereinafter appears. The horizontal bevel gear-wheel R meshes a corresponding vertical bevel gear-wheel U, fixed on a horizontal arbor V, turning in a suitable support W, and said meshing gear-wheel U carries with it a smaller and pinion gear-wheel X, meshing a larger gear-wheel Y, having a smaller and pinion gear-wheel Z, and both carried by a common horizontal arbor A^2, turning in a support W, and the smaller and pinion gear-wheel Z in turn meshing a larger gear-wheel B^2 of a horizontal arbor B^3, turning in said support W and having a spring B^4 coiled around it, and which at one end is secured to it and at the other end to said support.

In both the opening and closing of the valve the cam-slotted sleeve O^2 is rotated, but in opposite directions, Figs. 1, 2, 3, and 4, from its rotation in one direction caused by the closing of the valve and through their then engagement of the pawl and ratchet-wheel connection between it and the vertical arbor Q, described and shown in said figures, it, said arbor Q, is rotated, and the gearing explained is set in motion and in a direction to wind up the coiled spring B^4, the whole thereby producing resistance to the movement of the valve to close, and enabling, as is obvious, with proper adjustments of parts, such movement of valve to be regulated, governed, or controlled, as may be desired. As shown, Figs. 1, 2, 3, and 4, while the valve in opening rotates the cam-slotted sleeve O^2, yet no movement therefrom is imparted to the gearing for the reason that the pawl carried by the sleeve then passes freely and without effect on the ratchet-teeth. As is plain, however, by simply reversing the direction of the ratchet-teeth the pawl will then engage with them and thus the arbor Q rotated and gearing moved to operate on the valve in its opening movement, as has been explained, for its closing movement, but in such case the valve in closing would then have no effect on the gearing.

Fig. 5 shows duplicate pawls and ratchet-wheels applied to the arbor Q and the teeth of ratchets and pawls presented in opposite directions. In this case the gearing described would be driven in both the opening and closing of the valve.

The swinging toe L^1 of the valve-lever may be dispensed with and in its place the lever provided with an angular arm, Fig. 10, without material change in the operation of the lever in conjunction with the operating-lever.

The train of gearing described may be applied to the valve-lever, Fig. 6, in lieu of directly to the valve, as has been particularly explained, and still obtain a regulation or control of the valve in its closing or its opening, or in both, by adapting it substantially as described to be operated on either or both throws of the valve-lever.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination, with a tank for liquid, an outlet-pipe for the liquid, an opening and closing valve to the outlet-pipe, and mechanism adapted to secure an opening and closing of the valve, of gearing composed of a train

or series of wheels severally turning on fixed axes, and having the wheel at one end geared to the valve or some part connected therewith, and the wheels interposed between the opposite end wheels and said end wheels adapted to impart to the wheel at the opposite end of the train to the wheel geared to the valve a speed of rotation reduced as compared with that of the end wheel geared to the valve, and of means—such as a spring, weight, &c.—applied to said train to act as a resistant to its movement, substantially as described, for the purpose specified.

2. The combination, with a tank for liquid, an outlet-pipe for the liquid, and opening and closing valve to the outlet-pipe, and mechanism adapted to secure an opening and closing of the valve, of gearing composed of a train or series of wheels severally turning on fixed axes, and having the wheel at one end geared to the valve or some part connected therewith, and the wheels interposed between the opposite end wheels and said end wheels adapted to impart to the wheel at the opposite end of the train to the wheel geared to the valve a speed of rotation reduced as compared with that of the end wheel geared to the valve, and of means—such as a spring, weight, &c.—applied to said train to act as a resistant to its movement, and also of a ratchet-wheel S, turning on a fixed axis and pawl to engage with and disengage from said ratchet-wheel in the opposite movements of the valve, substantially as described, for the purpose specified.

3. The combination, with a tank for liquid, an outlet-pipe for the liquid, an opening and closing valve to the outlet-pipe, and mechanism adapted to secure an opening and closing of the valve, of a train of gearing connected to the valve or some part connected therewith and adapted to exert resistance to the movement of the valve, and comprising a suitably supported and rotating cam-slotted sleeve O^2, engaged by a pin N of the valve, a pawl T, carried by said sleeve, and an arbor Q, turning in said sleeve and having a ratchet-wheel S, and connected to said gearing-train, substantially as and for the purpose specified.

4. The combination, with a tank for liquid, an outlet-pipe for the liquid, and an opening and closing valve to the outlet-pipe, of a reciprocating lever D, an oscillating lever L^3 at one end, and also one end of said lever D adapted for abutment on and escape from each other in the movement to and fro of lever D, and flexible lines L L^2—such as chains—each connected at one end to and on opposite sides of the fulcrum of lever L^3, and at its other end to the valve or part connected therewith, substantially as described, for the purposes specified.

5. The combination, with a tank for liquid, an outlet-pipe for the liquid, and an opening and closing valve to the outlet-pipe, of an oscillating lever L^3, a lever J, fulcrumed on a suitable support and engaging the valve or some part connected therewith, and lines L L^2—such as chains—connected to the lever L^3 on opposite sides of its fulcrum and to the lever J, substantially as described, for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

PATRICK W. DOHERTY.

Witnesses:
ALBERT W. BROWN,
GEO. C. BENT.