

(No Model.)

3 Sheets—Sheet 1.

W. S. COOPER.

VALVE AND VALVE OPERATING MECHANISM FOR WATER CLOSET  
RESERVOIRS.

No. 371,430.

Patented Oct. 11, 1887.

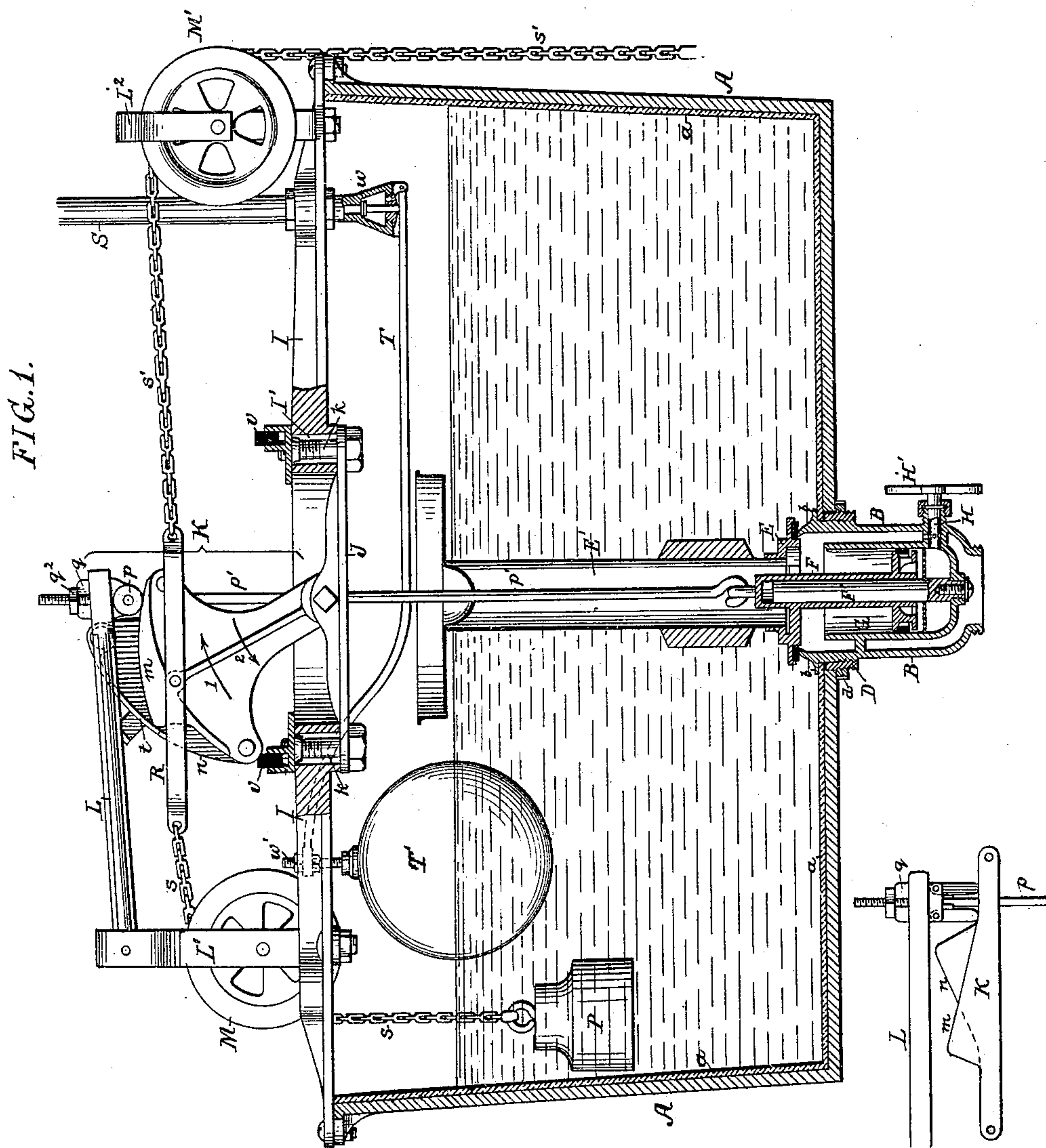
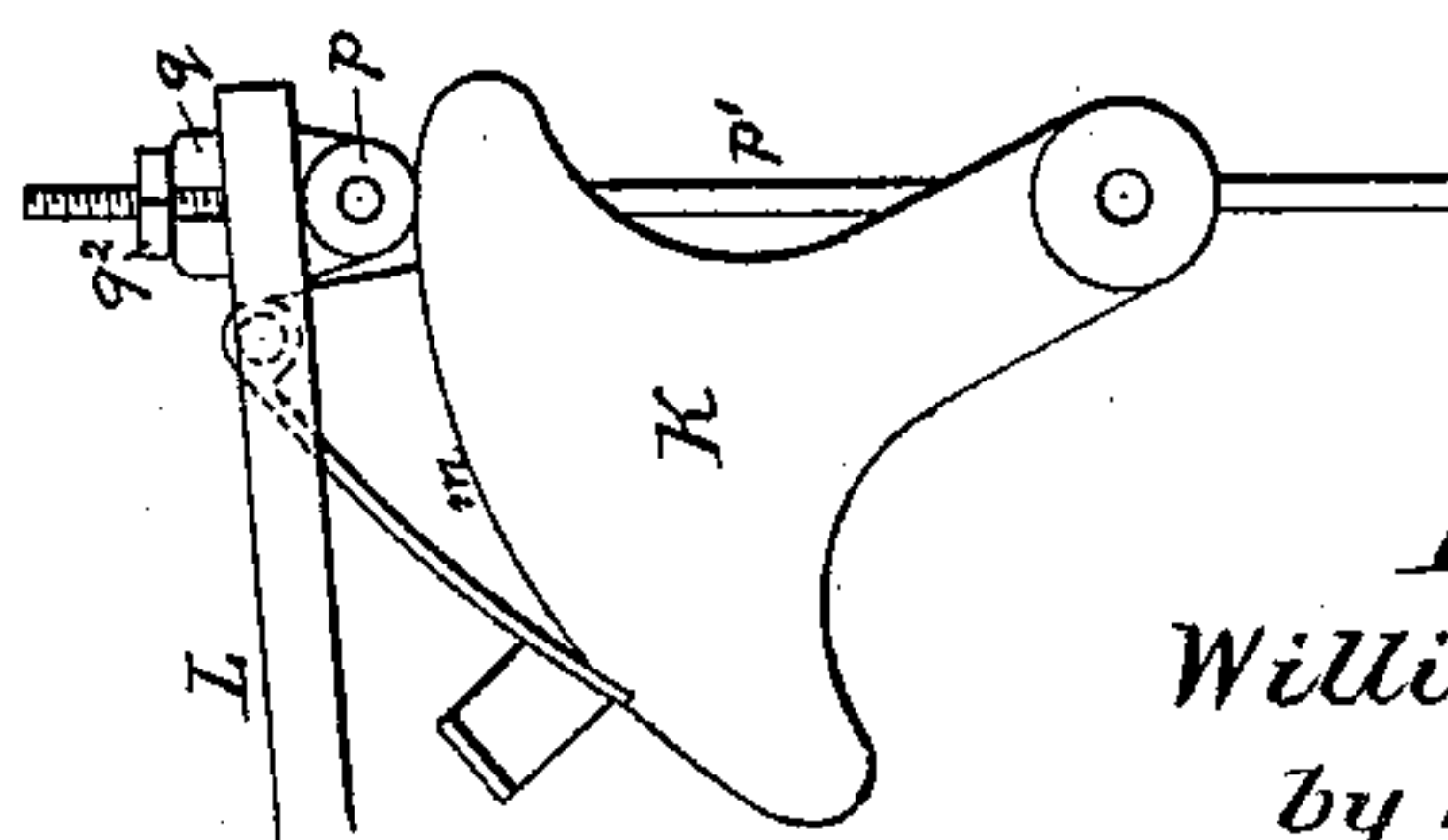


FIG. 1.



*FIG. 11.*

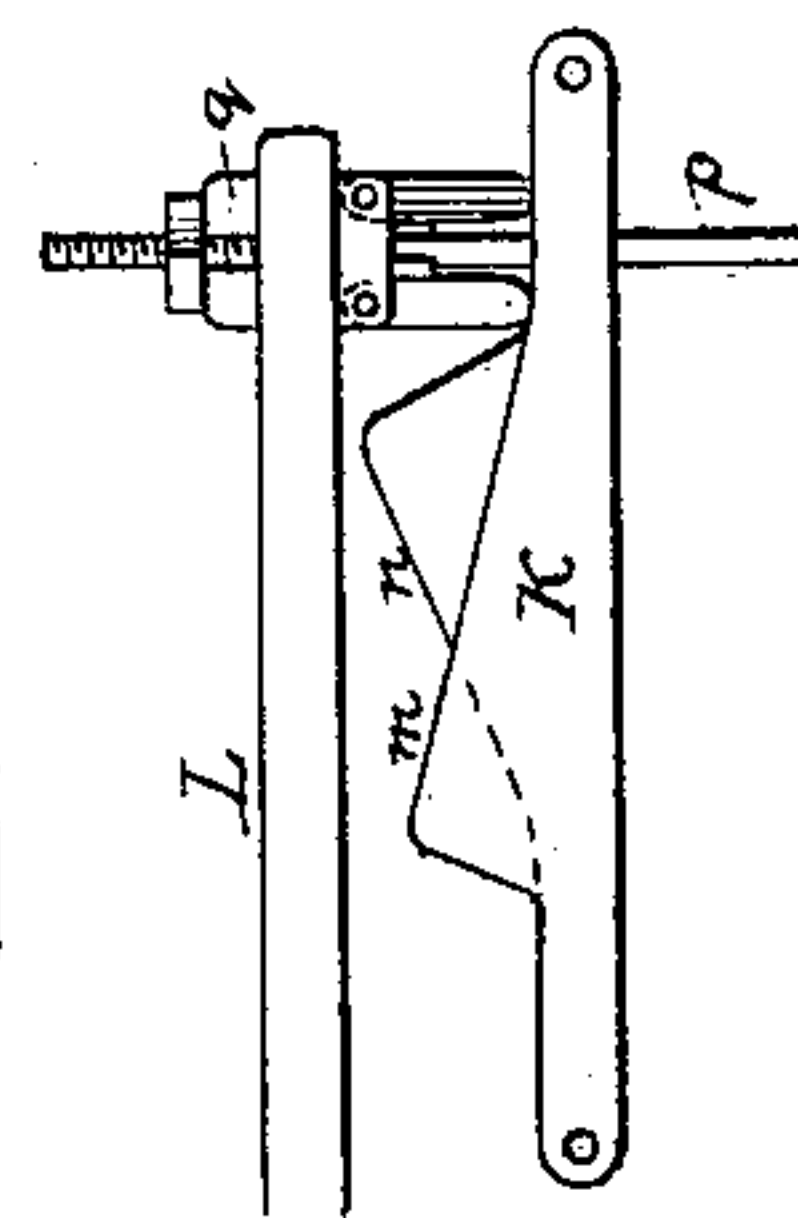


FIG. 12.

Witnesses:  
 Alf. Bartoff  
 William D. Coumel

*Inventor:*  
*William S. Cooper*  
*by his Attorneys*  
*Harrison & Sons*

(No Model.)

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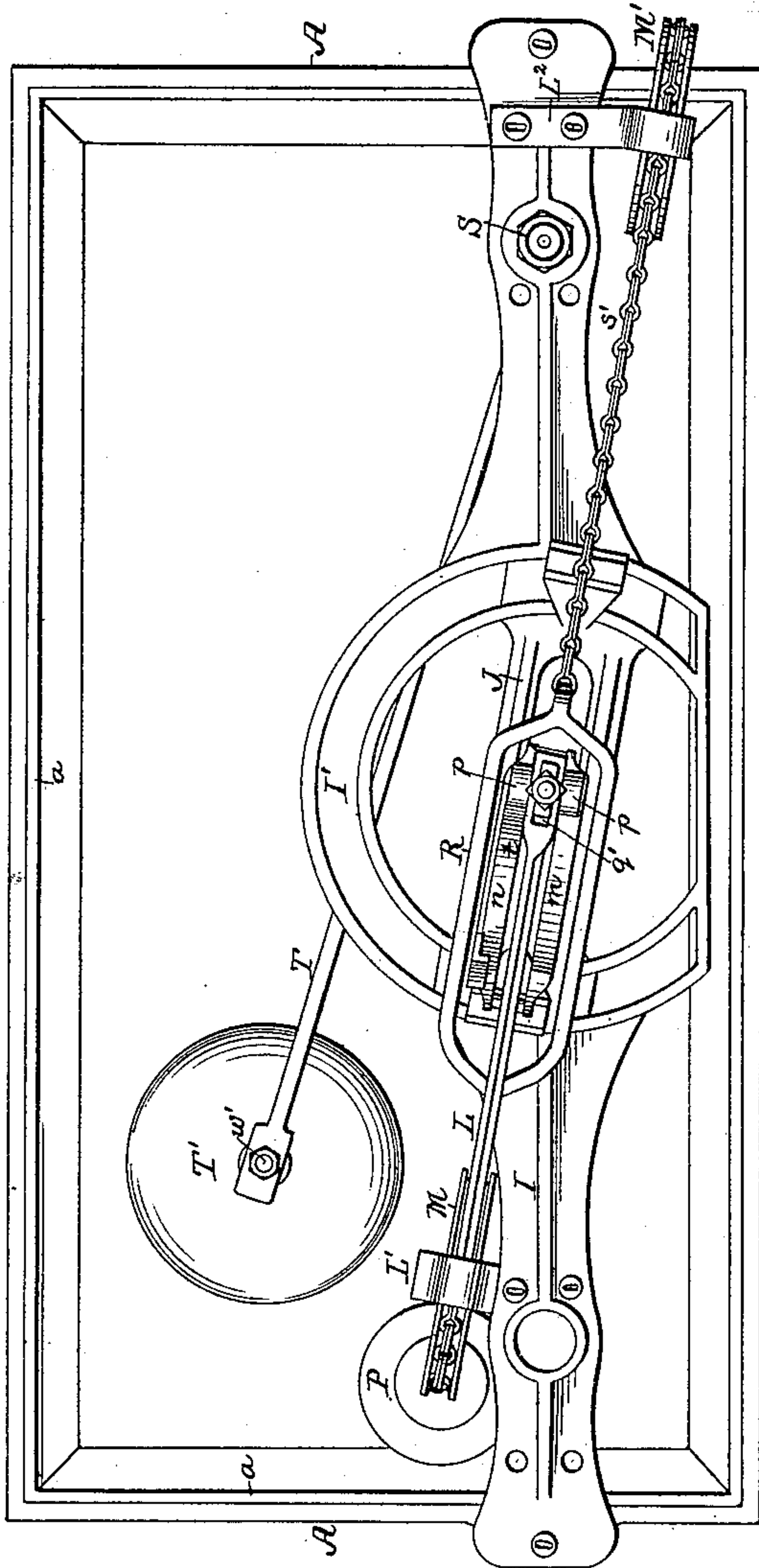
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FIG. 2.



Witnesses:  
*Alex. Barkoff*  
*William D. Corner*

Inventor:  
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by his Attorneys  
*Hewson & Sons*



(No Model.)

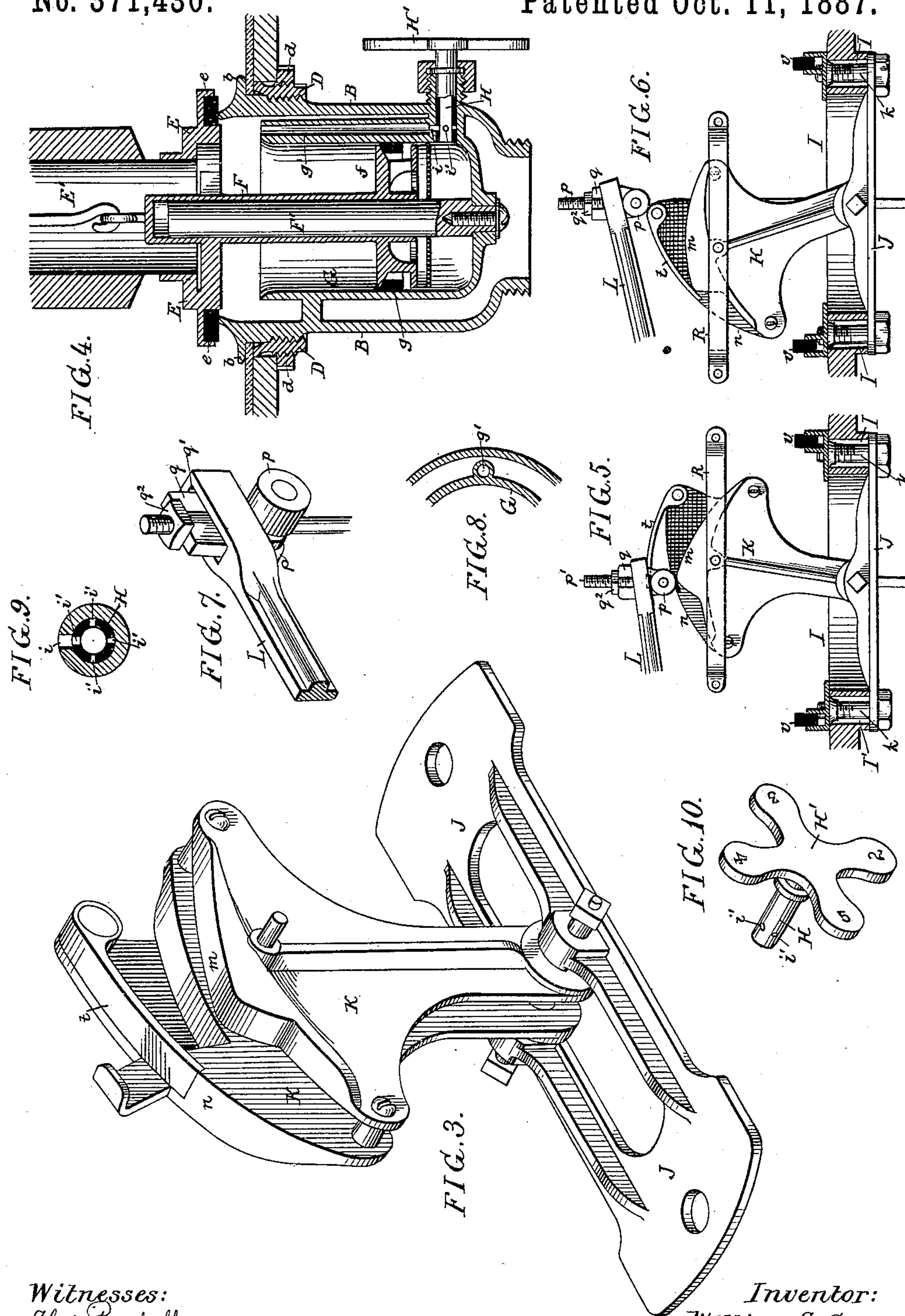
3 Sheets—Sheet 3.

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Witnesses:  
Alex. Barkoff  
William D. Conner.

Inventor:  
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# UNITED STATES PATENT OFFICE.

WILLIAM S. COOPER, OF PHILADELPHIA, PENNSYLVANIA.

VALVE AND VALVE-OPERATING MECHANISM FOR WATER-CLOSET RESERVOIRS.

SPECIFICATION forming part of Letters Patent No. 371,430, dated October 11, 1887.

Application filed July 26, 1886. Serial No. 209,096. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM S. COOPER, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain  
5 Improvements in Valves and Valve-Operating Mechanism for Water-Closet Reservoirs, of which the following is a specification.

One object of my invention is to provide a water-closet with an automatic flushing arrangement of a simple and effective character, a further object being to readily regulate the volume of water admitted to the closet for flushing purposes, and a still further object being to provide for the ready adjustment of  
15 the float controlling the inlet-valve of the tank.

In the accompanying drawings, Figure 1 is a longitudinal section of a water-closet tank or reservoir provided with discharge-valve and apparatus in connection therewith for effecting the automatic fore and after flushing of the closet in accordance with my invention; Fig. 2, a plan view of the tank; Fig. 3, a perspective view, on a larger scale, of the device for operating the valve to provide for the flushing of the closet; Fig. 4, an enlarged view of  
25 the valve and parts connected therewith; Figs. 5 and 6, diagrams illustrating the operation of the valve-controlling device; Figs. 7, 8, 9, and 10, detached views of parts of the apparatus; and Figs. 11 and 12, views showing modifications of part of the invention.

In Fig. 1 A represents the casing of the tank, which may be of wood or metal, the tank, when made of wood, being provided with a metallic lining, *a*.  
35

B is the casing of the discharge-valve, which is secured to the bottom of the tank; but in the case of a wooden tank it is advisable to secure the valve-casing directly to the metallic lining of the tank, in order to prevent the loosening of the connection and consequent leakage, due to the shrinking or warping of the wood of which the tank is composed. I therefore provide the valve-casing with a projecting flange, *b*, near the upper end, and on  
45 the casing below this flange I form a screw-thread, to which is adapted a threaded sleeve, D, the metallic lining *a* of the tank being securely clamped between the top of this sleeve and the flange *b* of the valve-casing, so as to  
50 insure the formation of a perfectly-tight joint

between said casing and the lining. The sleeve D is threaded externally for the reception of a nut, *d*, which bears upon the under side of the wooden casing of the tank and serves  
55 to secure the valve-casing B thereto. (See Fig. 4.)

The valve E has a packing-ring, *e*, which bears upon a valve seat formed by the upper end of the casing B, the valve being hollow to  
60 permit the escape through the same of the water which passes through the overflow-tube E', carried by the valve. The valve has a downwardly-projecting hollow stem, F, which is guided by a rod, F', secured to and projecting  
65 upward from the bottom of a bucket, G, the latter being supported in the valve-casing B and receiving a plunger, *f*, carried by the stem F of the valve, this plunger having the usual sliding piston-ring, *g*, which will not interfere  
70 with the lifting of the plunger in the bucket and the free passage of the water around the same into the space below the plunger, the piston-ring, however, preventing the upward flow of water around the plunger on the descent of the latter, so that the water beneath  
75 the plunger is trapped in the bucket and can escape only through the contracted passage of a governing-valve, the speed of descent of the plunger being thereby limited, and the  
80 time during which the discharge-valve E is permitted to remain open more or less extended, to accord with the desired volume of water to be admitted to the closet for flushing purposes.

The bucket G has at one side a discharge-  
85 passage, *g'*, having at the bottom a port, *i*, and the governing-valve consists of a tubular stem, H, having a series of radial ports, *i'*, of different areas. The rate of discharge of the water from the bucket G depends upon which of  
90 these ports is brought into line with the discharge port *i*, and the outer end of the hollow valve-stem is provided with an operating-handle, H', having arms suitably marked to indicate which of the ports of the valve-stem is in  
95 action and the rate of flow of the water due to the adjustment of the valve.

In order to provide for the automatic flushing of the closet, first, as soon as the seat is occupied, and again after the person using the  
100 closet rises from the seat, I provide a duplex cam, the movement of which in one direction



serves to open the valve E to a certain extent, and then permit it to close gradually, a further opening and gradual closing of the valve being effected by the movement of the cam in the opposite direction.

The tank has at the top a cross-bar, I, enlarged at the center and having in this enlarged portion a segmental slot, I', to which are adapted the bolts k, whereby I secure to the cross-bar a frame, J, which carries the duplex cam K, the latter consisting of a lever pivoted to the frame J, and having two cam-faces, m and n, each adapted to act upon an anti-friction roller, p, carried by a block, q, free to slide on a rod, p', connected to the valve E, said block being adapted to a slot, q', near the end of an arm, L, which is hung to a stud, L', secured to and projecting upward from the cross-bar I of the tank. The cams m and n face in opposite directions—that is to say, the cam m will act upon and lift one of the rollers p and the wing-block q when the cam K is drawn to the right, while the cam n will act upon the other roller p and lift the same and the block when the cam is drawn to the left. The block q acts upon a nut, q<sup>2</sup>, at the upper end of the rod p', so as to lift said rod, the block being, however, free to fall without corresponding movement of the rod.

The stud L' provides a bearing for the spindle of a pulley, M, around which passes a chain, s, connected at one end to a weight, P, and at the other end to a yoke, R, centrally pivoted to the cam K, the opposite end of said yoke being connected to one end of a chain, s', which passes around a pulley, M', hung to a stud, L<sup>2</sup>, on the bar I, the opposite end of said chain s' being connected to the seat of the closet, or to a pendent handle or other suitable operating device. It will thus be seen that when there is a pull upon the chain s' there will be movement of the cam K in the direction of the arrow 1, Fig. 1, one of the rollers p rising on the cam-face m and the other roller tripping a pivoted toe, t, which forms part of the cam-face n; but as soon as the pull upon the chain s' ceases, the cam K, under the action of the weight P, will be drawn backward in the direction of the arrow 2, Fig. 1, the cam-face n being thus brought into action, so that for each complete movement of the cam K there will be two lifts of the discharge-valve E and a gradual descent of the same after each lift.

The yoke R serves as a ready means of imparting a direct pull to the cam K, the yoke being pivoted to the cam at or about the central line of the same. Suitable stops, v, serve to check the movement of the lever K in each direction.

When but a single lift of the valve for each movement of the cam is desired, one face, m, of the cam may be concentric with the pivot, as shown, for instance, in Fig. 11.

By providing the cross-bar I with a central segmental slot, the lever K and its carrying-

frame can be adjusted to any desired angle on the cross-bar I, and the operating-chain s' may be permitted to hang in the most convenient position.

The block q has on opposite sides projecting wings, and said block, by engagement with the slot in the arm, serves to retain the rollers p in proper position for engagement with the cams m and n.

In carrying out my invention it is not necessary that a pivoted cam should be used in all cases, as a sliding cam—such, for instance, as shown in Fig. 12—may be substituted therefor, if desired, and pivoted toes may be carried by the block and acted upon by rigid cams, as also shown in said figure, each toe having a suitable bearing at the rear, so that it is held rigidly when acted upon by its cam to lift the valve-rod, but can swing freely over the cam on the reverse movement.

The pipe S, which supplies the tank with water, has at the lower end the usual valve, w, operated by an arm, T, which carries at the outer end the usual ball-float, T'. Usually the arm T is made of wire, so that the attendant who fits up the closet can by bending the wire adjust the float ball to any desired level, and thus regulate the depth of water maintained in the tank; but the bending of the arm back and forth a number of times, in order to effect the proper adjustment of the float, frequently results in the weakening of the arm to such an extent that when it is subjected to strain in the performance of its duty it breaks and permits the opening of the valve and the flooding of the apartment. I therefore make the valve-operating arm rigid, and preferably with an upward bend at the outer end, and I provide the float-ball T' with a threaded stem, w', adapted to an opening at the outer end of the arm T, nuts adapted to the threaded stem of the ball and bearing upon the top and bottom of the arm serving to permit the vertical adjustment of said ball to any desired position without in any way bending or distorting the arm itself, or the float may have a plain stem held in place on the arm by a set-screw or pin, the nuts, however, being preferred.

It will be observed, on reference to Fig. 2, that the cross-bar I has duplicate openings for the reception of the supply-pipe S and for the set-screws which secure the studs L' and L<sup>2</sup>, so that the parts may be adjusted to permit the operating-chain s' to hang down either on the right-hand side or on the left-hand side of the tank, as may be found most convenient.

I am aware that it has been proposed to use for operating the valve of a water-closet a pair of trip-levers, the primary lever acting upon the secondary lever and the latter upon the valve-rod; but in my case I use but a single laterally-movable cam structure having a direct-lifting action upon the rod.

I claim as my invention—

1. The combination of the tank and its lining, the valve-casing having a flange, a sleeve-



nut, between which and the flange on the valve-casing the lining of the tank is confined, and an outer nut for bearing on the casing of the tank, all substantially as specified.

5 2. The combination of the valve-casing, the valve, its plunger, and the trapping-bucket, with a discharge-passage and a discharge-valve consisting of a hollow stem with ports of different areas, all substantially as specified.

10 3. The combination of the valve and its operating-rod, with a cam movable laterally beneath a bearing at the upper end of said rod and acting upon said bearing to impart a direct vertical lift to the rod, all substantially  
15 as specified.

4. The combination of the valve-stem and its operating-rod, with a cam having oppositely-inclined faces, said cam being movable laterally beneath and acting upon a bearing at  
20 the upper end of the valve-rod, so as to impart a direct lift to said valve-rod both on the forward and backward movement of the cam, all substantially as specified.

5. The combination of the valve and its operating-rod, the block on the latter, the pivoted arm forming a guide for said block, and the laterally-movable cam acting directly upon the block to elevate the valve-rod, all substantially as specified.

30 6. The combination of the valve and its operating-rod, the block free to slide on the latter, the adjusting-nut on the rod, and a laterally-movable cam for elevating the block and rod, all substantially as specified.

7. The combination of the laterally-movable 35 cam having oppositely-inclined faces placed side by side, and the valve-rod having opposite projections, one for each cam, one cam or projection having a pivoted toe, all substantially as specified. 40

8. The combination of the laterally-movable cam having oppositely-inclined faces placed side by side, with a space between them, and the valve-rod passing down through said space and having opposite projections, one for each 45 cam, one of said cams having a pivoted toe, forming part of the acting face of the cam, all substantially as specified.

9. The combination of the cam, the yoke pivoted thereto, and operating and retracting 50 chains connected to said yoke, all substantially as specified.

10. The combination of the valve-operating device of a water-closet reservoir, the carrier therefor, and a supporting-bar having a slot 55 for the reception of the bolts, whereby said carrier is secured to the bar, for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two sub- 60 scribing witnesses.

WM. S. COOPER.

Witnesses:

WILLIAM D. CONNER,  
HARRY SMITH.