

No. 630,437.

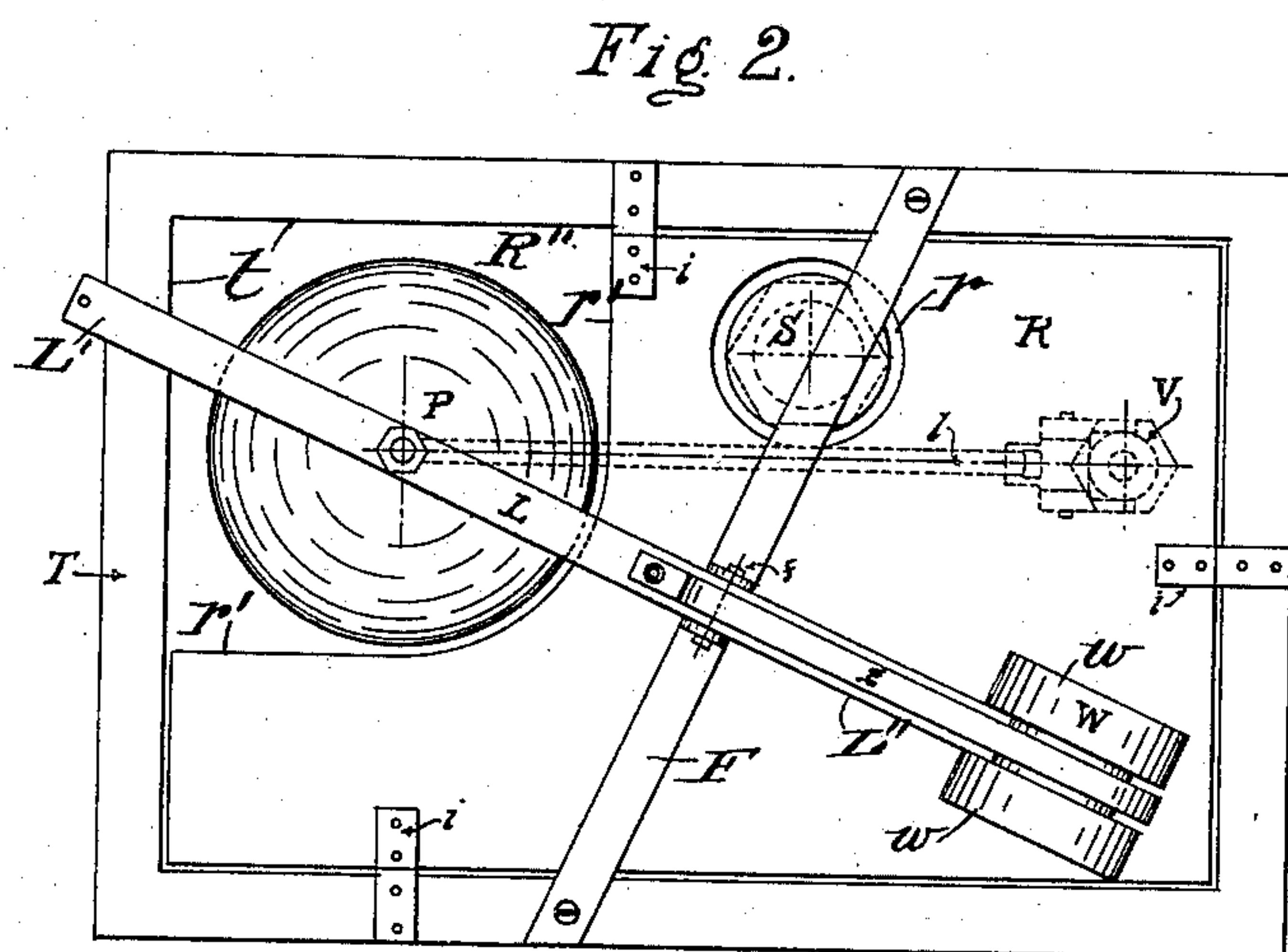
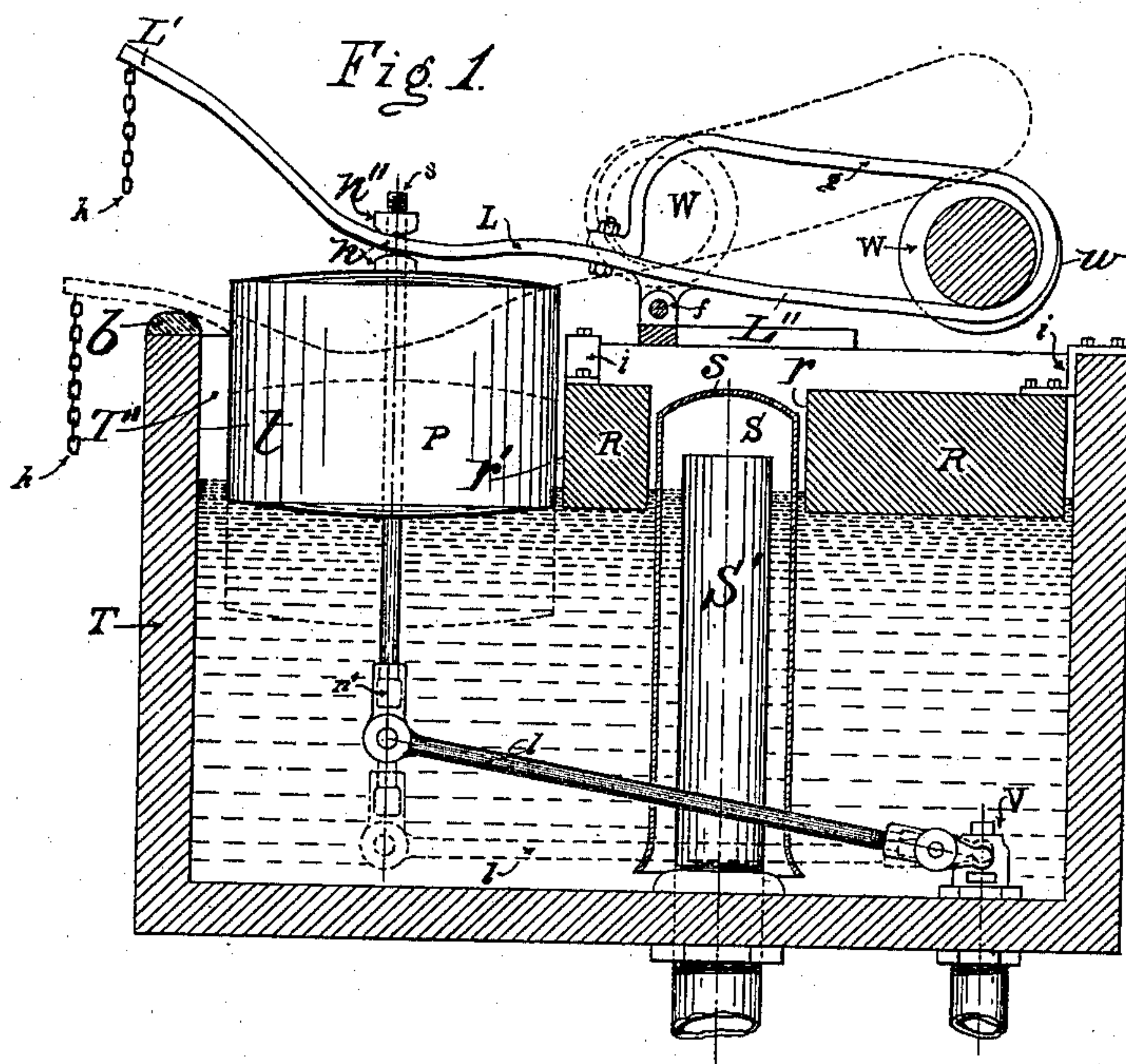
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C. J. BALL.

FLUSHING TANK.

(Application filed Jan. 10, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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FLUSHING-TANK.

SPECIFICATION forming part of Letters Patent No. 630,437, dated August 8, 1899.

Application filed January 10, 1899. Serial No. 701,741. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. BALL, a citizen of the United States, and a resident of the city of Los Angeles, State of California, have invented certain new and useful Improvements in Flushing-Tanks for Water-Closets and other Purposes, of which the following is a specification.

My invention relates more particularly to that class of flushing-tanks in which the flushing is secured by siphonic action.

As heretofore constructed flushing-tanks of the kind mentioned are generally filled with water admitted through an inlet-valve which is opened and closed by the descending and ascending movements of a float connected to the inlet-valve generally through the medium of a lever. The flushing action is obtained by discharging the water in the tank through a siphon, normally inoperative, but which is usually set in operation by opening an outlet-valve in the tank or in a pipe leading therefrom or directly or indirectly connected therewith, the siphon itself frequently forming such outlet-valve and resting on a seat in or near the bottom of the tank. When the outlet-valve is opened, it permits water from the tank to flow down the long leg of the siphon, thus initiating the siphonic action whereby the contents of the tank are discharged, whereupon the float descends, opening the inlet-valve, and thereby admitting water to again fill the tank. Owing to the great liability of the outlet-valve to leak, whereby the float is permitted to descend and reopen the inlet-valve, it has heretofore been proposed to dispense with the outlet-valve and secure the initial action of the siphon by immersing a plunger-float in the water of the tank, thereby raising the level of the water in the entire tank, and consequently in the short leg of the siphon, to a point high enough to start the siphonic action; but this is open to the objection that it requires considerable effort to immerse a plunger large enough to raise the level of the water in the entire tank and the further objection that its action is so sluggish as to render it necessary to hold the float depressed for a considerable period of time to fully initiate the siphonic action. Since in many constructions now in

use the closure of the inlet-valve is dependent upon the buoyancy of the float, it follows that the closure of said valve depends upon the height of the water in the tank and therefore that the inlet-valve will be closed just at the moment when the water reaches its maximum level, at which time an equilibrium exists between the buoyancy of the float and the pressure of the supply-water, and hence the inlet-valve is not firmly seated. If said level is lowered by any cause, as by leakage of an outlet-valve, the inlet-valve will again be opened slightly and water will flow in to supply that flowing out at the leak. This opening of the inlet-valve is very slight and the pressure in the service-pipe will cause a fine stream to flow through the inlet-valve, which by means of grit and dirt in the water will soon so cut the valve and its seat as to render an effective closure thereof impossible. A further objection is that when the inlet-valve is held to its seat solely by the buoyancy of the float any slight increase in the pressure in the service-pipe, such as usually occurs at night, is sure to cause a leak in the inlet-valve.

The objects of my invention are to construct a tank flushing by siphonic action or in other manner which shall dispense with all valves except the inlet-valve, shall act easily and promptly, and shall effectively prevent leaks at the inlet-valve and hold it firmly to its seat even when pressure in the service-pipe is greatly increased, and to provide means to keep the inlet-valve wide open till the tank is nearly filled.

With these objects in view the invention consists in a tank having a siphon, a suitable inlet-valve, and a block of considerable thickness loosely fitting in and substantially closing the upper portion of said tank except at a cut-away portion in said block, within which cut-away portion a plunger-float is free to move up and down, said float being connected to the inlet-valve so that by its downward movement siphonic action is initiated and the inlet-valve is opened and by its upward movement the inlet-valve is closed. The block, with its cut-away portion, affords a cheap and easily-applied means for forming a neck within which the plunger-float acts to quickly raise the

level of the water to initiate siphonic action, and also enables the water to rise in filling the tank till the level of the water in the tank reaches the lower face of the block, after which the float quickly rises in the neck. The result of this is that the inlet-valve remains well open till the tank is filled and then closes with a quick final movement of the float.

Furthermore, the invention consists in a tank having means for permitting the out-flow of water for flushing purposes, an inlet-valve, a plunger-float controlling the closing movements of said inlet-valve, and a power device rendered active by the plunger-float when the water in the tank has nearly reached its normal level to effect the final closing movement of the inlet-valve, which power device acts to quickly close the valve and firmly hold it to its seat even against greatly-increased pressure in the service-pipe.

Furthermore, the invention consists in a tank having a block of considerable thickness loosely fitting in and substantially closing the upper portion of said tank, except at a cut-away part in said block, which forms a neck or portion in which the water can rise higher than in the main body of the tank, a plunger-float capable of moving up and down in said neck portion, an inlet-valve connected to said plunger-float, a siphon, means for depressing said plunger-float, whereby the siphonic action is initiated and the inlet-valve opened, and a shifting weight inoperative when the valve is full-opened, but shifted by the plunger-float on the final closing movement of the valve, so as to press the latter firmly on its seat and hold it there.

The invention finally consists in the combinations of elements hereinafter described, and pointed out in the claims.

The tank may be in the form of an open-topped vessel or cistern having a closure-piece or block of suitable thickness inserted therein, which piece has an opening therethrough constituting the upwardly-projecting neck within which the plunger-float may operate. The lower face of the block or closure-piece should be at or near and preferably slightly below the level of the water in the tank when the inlet-valve is closed. The block should be of such thickness that its sides act as walls extending upward from the bottom surface of the block, and it may be either a solid block of material or it may be formed from a sheet of material with the side walls struck up to correspond with the side walls of a solid block. Such closure-piece may, if desired, fit snugly in the mouth or open top of the tank; but I prefer to make it slightly smaller than the tank, into which it loosely fits, and to secure it in position by any suitable means. There is also provided a second opening through the closure-piece into or through which the crown of the siphon projects.

It will be apparent that the inventive idea involved may be expressed in different me-

chanical structures, and I have illustrated one of such structures in the accompanying drawings; but the same are to be understood as illustrative only and not in any way defining the limits or scope of the invention.

In said drawings, Figure 1 is a vertical section, parts being shown in elevation; Fig. 2, a plan view of Fig. 1.

Like letters refer to like parts throughout both views.

T represents a tank, which may be of any desired shape and of any suitable material and is closed at its top, except as to a portion T', which has upwardly-projecting walls rising a considerable distance above the interior face of the top or upper wall of the main body of the tank. I construct said top or upper wall in the form of a block R, Fig. 1, of any suitable material, preferably several inches in thickness and of such size as to fit loosely within the open top of the tank. An opening r is formed in the block R, into or through which the crown s of the siphon S may freely project, and the block is further cut away, preferably at one corner, as shown at R'', Fig. 2. Such block is adjustably secured at the proper height within the mouth or open top of the tank and prevents the water in the main body of the tank from rising higher than the inner or lower face of the block. When thus secured within the tank, the face r' of the cut-away portion thereof, together with the walls t of the tank T opposite thereto, constitute, in effect, an upwardly-projecting neck or portion to the tank.

S is a siphon of any suitable construction, the upper end of whose long leg S' projects somewhat above the inner or lower face of the block R. As shown, the siphon projects into the opening r of the block R; but it is manifest that the parts might be so arranged as to allow the siphon to project into the open neck or portion R'', in which case the opening r in the block R would be omitted. P is a plunger-float, which may be of any suitable size and desired shape. It may be an open vessel with either the open or closed end immersed in the water, or it may be a closed vessel, or it may be a solid block of buoyant material. Preferably it is of such horizontal cross-section as to largely fill the neck-opening R'', so that when it is depressed and partially immersed the water displaced by it will have a comparatively small cross-sectional area in the neck-opening R'' within which to rise, and consequently a slight depression of the plunger will cause a correspondingly great elevation of the water-level in the neck-opening R'', in the opening r , and in the crevices surrounding the block R and between it and the walls of the tank T. The immediate effect of this great and rapid rise in the water-level is to suddenly fill the crown s of the siphon with water, expelling the air therefrom and starting siphonic action.

V is the inlet-valve, which may be of any preferred construction, and l is a lever hav-

ing its fulcrum at f' and operatively connected to the valve in such manner as to open it by the downward movement of the lever and close it by the upward movement thereof. A stem s is pivotally connected to the lever l through the medium of an adjusting-nut n' , which stem is permanently connected to the plunger-float P in any suitable manner—as, for example, by soldering it thereto.

Any suitable means may be employed to depress the plunger-float to effect the initial siphonic action and the opening of the inlet-valve. I have shown a lever L fulcrumed at f on a cross-bar F , supported by the side walls of the tank, said lever L being connected, as by a nut n'' , to the projecting end of the stem s' and having its arm L' projecting over the end of the tank, with the usual pull-chain h attached thereto. For the purpose of adjustably securing the lever L to the stem s' it is here shown as held between two nuts n n'' on the screw-threaded upper end of the stem; but it is evident that I might use other means of adjustment, as by substituting washers for the nut n . By thus adjustably securing the lever to the stem the desired immersion of the plunger-float may be obtained and the timing of the action of the shifting weight, herein-after described, accurately accomplished. I prefer to place a buffer b on the upper edge of the tank to limit the downward movement of the arm L' and also to prevent the noise that would be caused by the striking of the lever against the tank; but manifestly the parts may be so adjusted that the edge of the tank itself will act as a stop to limit the downward movement of the lever and plunger-float. As heretofore stated, siphonic action will be quickly initiated and the inlet-valve opened by a very small depression of the plunger-float, and it is manifest that the closing movement of the inlet-valve will not begin until the tank is again filled nearly to its normal level, when the water will reach the plunger-float, which will again be buoyed up by the rising water, carrying with it the long arm of the lever l and closing the valve.

As a means for preventing any leak of the valve due to its failure to become firmly seated or to an increased pressure in the service-pipe I have provided a power device which at the time when the plunger-float is wholly depressed is partially or wholly inactive, but which is rendered active by the final upward movement of the plunger-float at the instant when the inlet-valve is about to close. This power device may assume various forms, but for purposes of illustration I have shown it in the shape of a shifting weight W on the arm L'' of the lever L . This weight is preferably in the form of a flanged cylinder, as shown, the flanges w depending on either side of the lever-arm L'' and being held in position by a guide g , which may be the return end of the lever-arm L'' . In practice the guide g is so arranged as to permit the weight W to move from the extreme outer end of the

lever-arm L'' to a point immediately over or nearly over the fulcrum f of the lever L . The relative lengths of the arm L'' and that part of arm L' between the fulcrum f and the stem s' and of the long and short arms of the lever l are such that a weight W of, say, one pound will produce a vastly-increased effective pressure on the inlet-valve V to hold it firmly to its seat when the weight is at the outer end of the arm L'' . The operation of this portion of the device will be readily understood. When the arm L' of the lever L is depressed by a pull on the chain h , the plunger-float P is depressed, the siphonic action initiated, the inlet-valve V opened, and at the same time the arm L'' of the lever L is elevated, causing the weight W to roll thereon as a track to the position shown in dotted lines, Fig. 1—that is, to a point over or nearly over the fulcrum f —when it has little or no tendency to tilt the lever in either direction. Notwithstanding the fact that the pull on the chain h may be quickly released the siphonic action is so prompt that the tank will be rapidly emptied, the several parts remaining in the positions shown by the dotted lines in Fig. 1. In this position the inlet-valve will be wide open and will so remain until the level of the water becomes sufficiently high to buoy up the plunger-float. This will not occur until the water has nearly reached its normal level, so that the inlet-valve remains fully open until this level is nearly reached, after which the rising of the water slowly lifts the plunger-float, and thereby gradually closes the inlet-valve. The upward movement of the plunger-float also elevates the arm L' of the lever L , correspondingly depressing the arm L'' . This depression of the arm L'' will not cause any movement of the weight W from its position over the fulcrum f until it has progressed far enough to cause the downward incline of the arm L'' to be from rather than toward the fulcrum f , which does not occur until the valve V is about to close; but when the arm L'' is depressed far enough to incline it from the fulcrum f the weight W quickly shifts from its position over the fulcrum to the outer end of the arm L'' , thereby acting as an effective power device to hold the inlet-valve firmly closed.

From the foregoing description of the particular embodiment of my invention shown in the drawings, it will be apparent that the same inventive idea may be embodied in different structures and in different relative arrangements of the several elements or by using some of the elements and subcombinations without the use of others. For instance, the power device instead of being in the form of a shifting weight on the lever L might be in the form a weight applied to the long arm of the lever l , and the combination of the plunger-float with a tank having a reduced neck might be employed to secure initial siphonic action or the operations of the inlet-valve, or both, without using the power device.

All such modifications and subcombinations, however, clearly fall within the scope of the invention as hereinafter defined in the claims.

Having thus fully described my invention, what I claim is—

1. A flushing-tank with a reduction-block adjustably secured in the upper portion thereof, said block having side walls entirely around the same and extending upward from the bottom surface of the block.

2. A flushing-tank with a reduction-block secured within and loosely fitting the upper portion thereof, said block having side walls entirely around the same and extending upward from the bottom surface of the block.

3. The combination of a flushing-tank with an adjustable reduction-block secured within and partially filling the upper portion of the tank but leaving an open space, said block having side walls entirely around the same and extending upward from the bottom surface of the block, an inlet-valve, a plunger-float and a siphon.

4. The combination of a flushing-tank with a reduction-block having side walls entirely around the same and extending upward from its bottom surface, the block fitting loosely within the upper portion of the tank but leaving an open space, a plunger-float in said space, an inlet-valve and a siphon.

5. In a flushing-cistern the combination of a tank with a reduction-block fitting loosely within the upper portion of the tank, but leaving an open space, an inlet-valve, a plunger-float within said open space and connected to said valve, a power device normally holding said valve closed, and a siphon.

6. In a flushing-cistern the combination of a tank with a reduction-block fitting loosely within the upper portion of said tank, a siphon and an inlet-valve, with a plunger-float and power device operatively connected to

said valve, said power device being rendered inoperative when the float is depressed and automatically rendered operative by the buoyant action of the float.

7. The combination of a flushing-tank having a reduction-block with side walls entirely around the same and extending upward from its bottom surface and cut away to leave an open space, a plunger-float in said space, a lever connected to said plunger-float whereby it may be depressed, a siphon having its crown above the normal level of the water in the tank, an inlet-valve connected to said plunger-float, and a power device normally holding said inlet-valve closed.

8. In a flushing-tank the combination of a siphon, an inlet-valve, a plunger-float adjustably connected thereto, a lever adjustably connected to said plunger-float, a shifting weight on said lever and a stop for said weight on said lever near its fulcrum, substantially as described.

9. In a flushing-tank the combination of a siphon, an inlet-valve, a plunger-float adjustably connected thereto, a lever connected to said plunger-float, a shifting weight on said lever, and a stop for said weight on said lever near its fulcrum.

10. The combination of a tank, a reduction-block adjustably secured in the upper portion of the tank, an inlet-valve, a plunger-float adjustably secured thereto, an operating-lever adjustably secured to said float and a shifting weight on said lever.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

CHARLES J. BALL.

Attest:

S. T. CAMERON,
W. R. EDELEN.