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C. H. PHILLIPS.

FLUSHING TANK FOR WATER CLOSETS.

APPLICATION FILED JAN. 11, 1904.

NO MODEL.

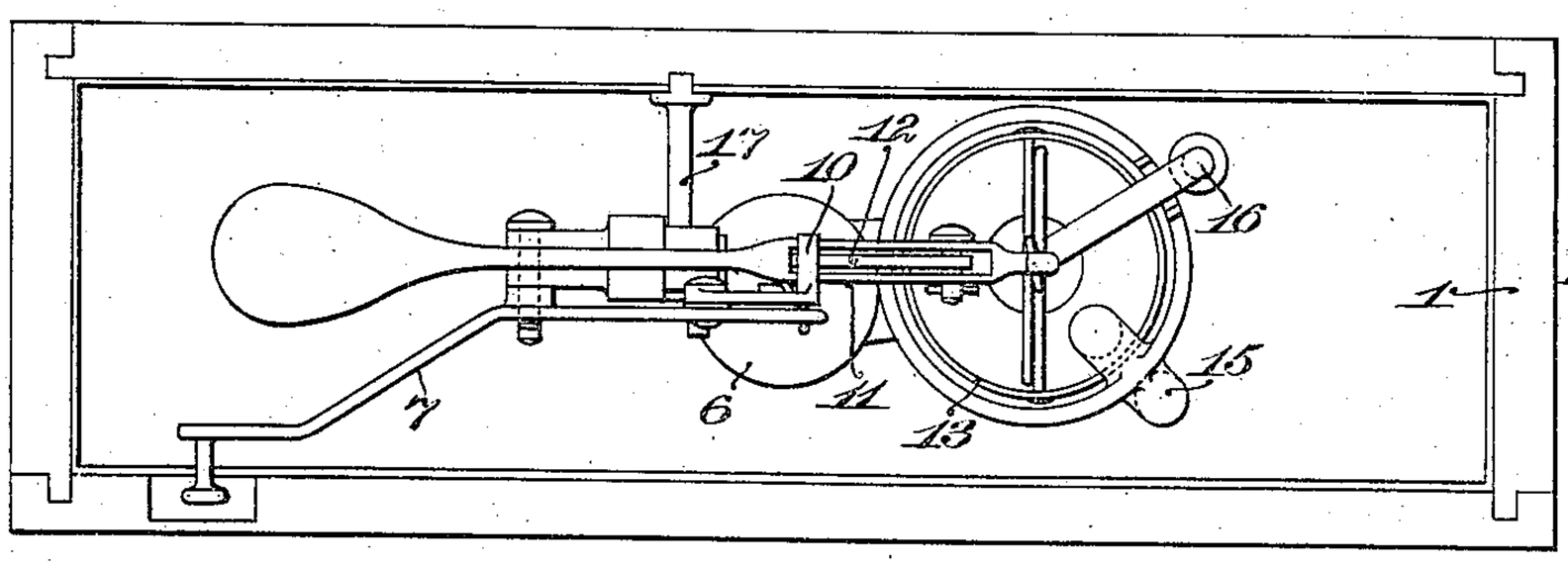

Fig. 1.

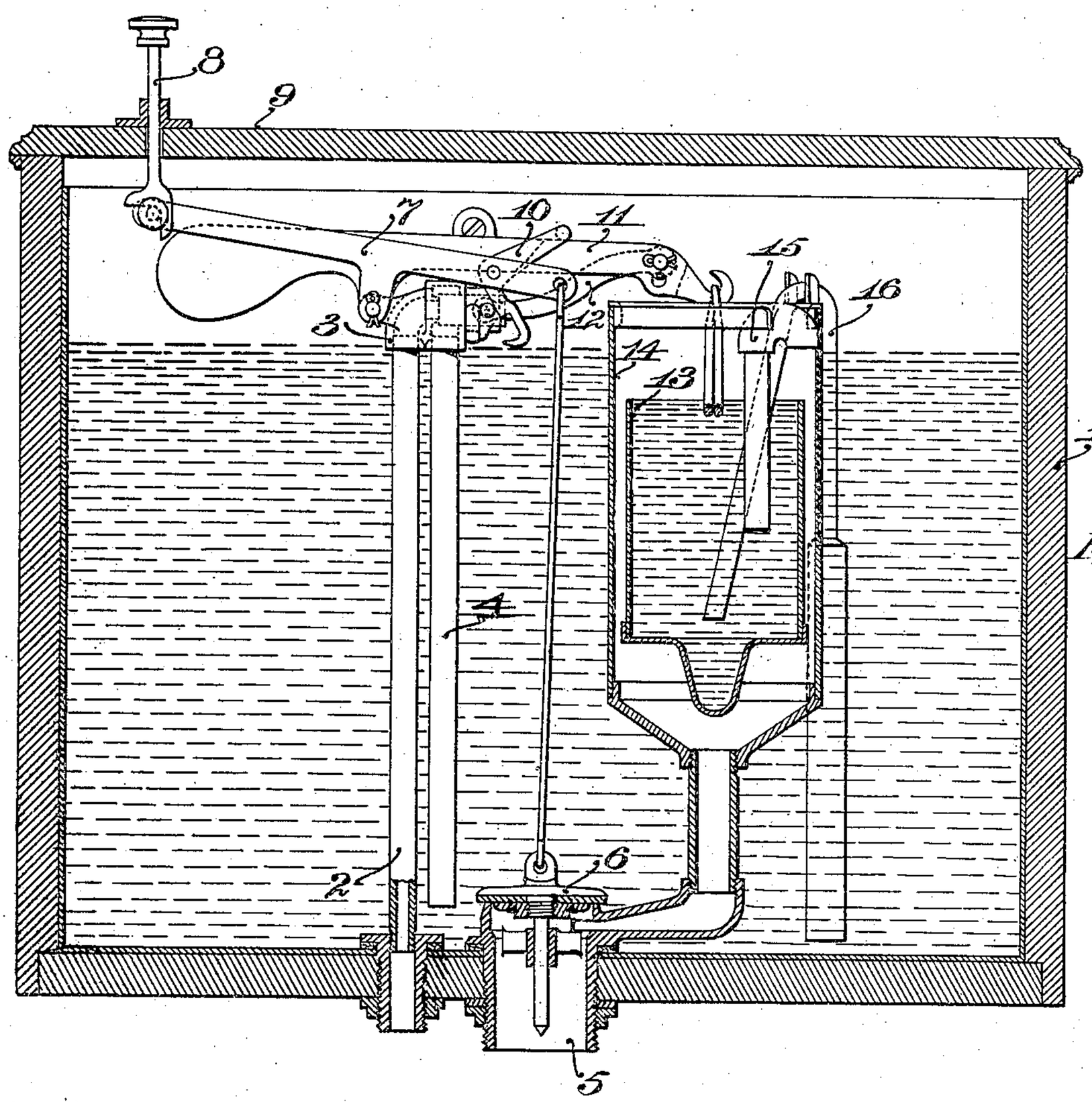

Fig. 2.

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No. 768,688. Patented August 30, 1904.

UNITED STATES PATENT OFFICE.

CHARLES H. PHILLIPS, OF MAPLEWOOD, MASSACHUSETTS.

FLUSHING-TANK FOR WATER-CLOSETS.

SPECIFICATION forming part of Letters Patent No. 768,688, dated August 30, 1904.

Application filed January 11, 1904. Serial No. 188,431. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. PHILLIPS, a citizen of the United States, residing at Maplewood, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Flushing-Tanks for Water-Closets; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to an improvement in flushing-tanks for water-closets.

The object of the present invention is to reorganize and improve the valve-operating mechanism illustrated and described in my application filed May 12, 1902, Serial No. 106,849.

To the above ends the present invention consists in the devices and combinations of devices hereinafter described, and particularly defined in the claims.

In the accompanying drawings, illustrating the preferred form of the invention, Figure 1 is a plan; and Fig. 2 is an elevation of the same, showing the tank, the water-bucket, the casing, and the connections between the casing and the outlet in section.

The illustrated embodiment of the present invention is described as follows:

The tank proper, 1, is of the ordinary shape of low-down tanks, lined with copper in the usual manner. An inlet-pipe 2 leads up to the inlet-valve 3, from which leads the pipe 4 to the bottom of the tank, so that the incoming water is discharged beneath the surface of the water in the tank. The inlet-pipe may be supplied from any suitable water-supply, such as a street service or building-tank service. The inlet-valve is of the usual plunger type. The outlet-pipe 5 is located in the bottom of the tank, and normally closed by the outlet-valve 6. The outlet-valve is opened by a lever 7, pivoted upon the side of the inlet-valve and connected at one end with the outlet-valve by means of a link. The opposite end of the lever is adapted to be connected by a chain with the usual pull-handle and also to be engaged by the end of a push-slide 8, mounted in the cover 9 of the tank. A latch 10, consisting of a bell-crank lever, is pivoted upon the side of the outlet-valve-operating lever 7. The depending arm of said latch 10 engages a pin projected laterally from the inlet-valve casing when the said lever 7 is raised and rests thereon, supporting the said lever in its raised position and holding the outlet-valve open until the inlet-valve opens, when the inlet-valve-operating lever 11 engages a lateral projection on the side of the horizontal arm of said latch and trips its other end off the pin, thereby permitting the outlet-valve to close. The depending arm of the latch is provided with a hook, which prevents the outlet-valve-operating lever from being raised inadvertently beyond a proper height.

The above-described construction constitutes means for opening, holding open, and closing the outlet-valve.

The inlet-valve is operated by the inlet-valve-operating lever 11, which is pivoted upon the side of the inlet-valve, the same pin constituting the pivot for both the outlet and the inlet valve operating levers. The inlet-valve-operating lever is connected at one end by means of a link 12 with the plunger of the inlet-valve, pivotal connections with the plunger and lever being provided. Two holes are provided in the lever 11, the one under the other, so that the pin pivotally connecting the lever 11 and link 12 may be placed in either, as desired. These holes are so arranged that the lever 11 will occupy a lower or a higher position when the inlet-valve is closed, depending upon whether the pin is in the upper or lower of the holes, respectively. The other end of the lever 11 is weighted so that the lever 11 normally tends to move in the direction to pull upon the link 12 and withdraw the plunger of the inlet-valve from its seat, and thereby open the inlet-valve. Upon the extreme end of the lever 11 beyond its point of connection with the link 12 is hung a water-bucket 13 of such capacity that when filled it exerts upon the lever 11 sufficient force not only to close the inlet-valve, but to hold the same closed with a pressure in excess of the pressure of the water tending to open it and sufficient besides to preponderate the opposite weighted end of the said lever. This bucket 13 is contained within a casing 14,

within which it may freely move up and down and which also protects the same from the buoyant effect of the water in the tank. The casing 14 is connected with the outlet-pipe 5 below the outlet-valve. When the bucket 13 is filled with water, the inlet-valve, through the means described, is held closed. When the bucket 13 is emptied, the pressure of the water in the inlet-pipe and the weight of the lever 11 operate to open the inlet-valve. The water-bucket is filled and emptied by means of siphonic connections, being filled by the siphon 15 and emptied by the siphon 16. The siphon 15 consists of an elbow formed integral with the casting forming the lip of the casing 14 and a short pipe connected therewith. Its outer end is short and dips into the tank, while its inner end is longer and dips into the bucket 13. When the inlet-valve is open, the bucket 13 being empty and the outlet-valve closed, the water rises in the tank until it reaches the bend of the siphon 15, through which water then flows into the bucket, and through the means described the inlet-valve is closed. This siphon continues to draw water from the tank until the level of the water in the tank falls below the tank-leg of the siphon. The sizes of the tank and bucket and the length of the tank-leg of the siphon 15 are such that more water is drawn from the tank than is sufficient to fill the bucket, the excess flowing into the casing and through the connections to the outlet-pipe and thence to the bowl of the closet, thus affording a refill for the bowl. The emptying of the water-bucket by the siphon 16 is timed so as to be completed at approximately the time when the tank is emptied through the opening of the outlet-valve. The bend of the siphon 16 is located above the level of the bend of the siphon 15, and one leg depends into the bucket and the other and longer leg depends into the tank. The bucket-leg of the siphon 16 is uniform in size, and its end is located over a well or depression in the bottom of the bucket and in such position that when the bucket rises to its highest position it is close to the bottom of the bucket, as a consequence of which it practically completely empties the bucket at each operation.

It is to be observed that by the use of the well in the bottom of the bucket the bucket-leg of the emptying-siphon may be made longer, thereby securing a greater difference in level between the height of the water in the bucket when the cup is full and when it is empty, thus insuring a sufficient margin of weight to hold the inlet-valve firmly closed without making the bucket of inconvenient size. After emptying the bucket the siphon 16 empties itself completely of water.

The tank-leg of the siphon 16 is enlarged at a point between the top and bottom. The purpose of this enlargement will be best understood from a consideration of the operation of this siphon. Let us assume that the outlet-valve is closed and the inlet-valve is simultaneously opened when the siphon 16 is empty and then trace the operations from this point. The level of water in the tank rises and the level of water in the tank-leg of the siphon 16 rises therewith, expelling air from the siphon through the bucket-leg. This operation continues until the level of the water in the tank reaches the level of the bend in the filling-siphon 15, when water flows therethrough into the bucket 13, thus trapping a quantity of air in the bucket-leg of the emptying-siphon 16, which may conveniently be referred to as an "air-bubble." The location of the bend of the emptying-siphon 16 above the level of the bend of the siphon 15 or above the level of the upper edge or lip of the casing 14 prevents the water from rising to the level of the bend of the siphon 16 and the filling of the siphon 16 with water, and consequently prevents said siphon from acting as a filling as well as an emptying siphon. The subsequent fall of the level of the water in the tank due to refill and the rise of water in the bucket 13 cause the position of the air-bubble in the siphon to be shifted somewhat; but this is practically of no moment. The apparatus maintains now its position of parts and condition until the outlet-valve is again opened and the level of water in the tank is lowered sufficiently to set the emptying-siphon 16 in operation. The fall of the level of the water in the tank is accompanied by a movement of the air-bubble in the siphon, and water enters the bucket-leg of the siphon and follows the retreating air-bubble until such time as the height of the water column in the tank-leg of the siphon, ignoring the air-bubble, exceeds the height of the bend of the siphon above the level of the water in the bucket, when siphonic action begins and continues until the bucket is emptied. Since the volume of the enlarged portion of the tank-leg of the emptying-siphon 16 exceeds the volume of the smaller portion of the siphon length for length, it is apparent that when the air-bubble reaches this enlargement it will be shortened and the siphonic action will therefore be started sooner than without such enlargement. The position of the enlargement governs the time of the beginning of the siphonic action. The higher the enlargement the sooner the siphonic action begins, and vice versa. It is desirable that the enlargement be at such height that the emptying of the bucket may be coincident in time with the emptying of the tank, so that the tank may be completely emptied before the inlet-valve is opened and the outlet-valve is closed; but, on the other hand, it is desirable, for reasons which will be shown later in connection with the discussion of leakage, that the siphonic action begin while the level of the water in the tank is still so high that the remaining fall shall exceed the depth of water

in the bucket. These considerations serve to fix between narrow limits the most favorable position of the enlargement. The air-bubble feature of the emptying-siphon affords a convenient means of delaying the beginning of the emptying of the bucket, with the advantage that the inlet-valve is held closed with the weight of the full bucket until the proper time. The enlargement of the tank-leg of the emptying-siphon may be extended to the end of the leg or not, as may be desired, the function of the enlargement being to afford a volume sufficient to receive the air-bubble, or a part thereof, so as to start the siphonic action before the level of the water in the tank has fallen so low that the subsequent fall would be less than the depth of water in the bucket.

The above-described operation is that incident to the normal and proper operation of the apparatus. In the case of special conditions the operation of the apparatus is somewhat modified and requires, perhaps, special consideration. Let us assume a slow leak at the outlet-valve. The level of the water in the tank will by such a leak be gradually lowered, and the air-bubble of the emptying-siphon will follow the retreating level of water in the tank until such time as the height of the water in the bucket-leg of the emptying-siphon reaches the bend of the said siphon, in which event if the leak be small and slow water will trickle over the bend and seep down the sides of the tank-leg of the emptying-siphon and gradually empty the bucket without starting ordinary siphonic action. The time at which the level of the water in the bucket-leg of the emptying-siphon reaches the bend of the siphon and the water begins to overflow the bend must be early enough so that the level of the water in the tank is such that its subsequent possible fall exceeds the depth of the water in the bucket, because after the slow overflow begins the fall in the level of the water in the bucket, due to such overflow, will be at the same rate as the fall in the level of the water in the tank. Consequently in order that the bucket shall be emptied and the inlet-valve again opened it is imperative that the beginning of the withdrawal of water from the bucket should begin at the time stated. Under these circumstances a slow leak in the outlet-valve will not put the apparatus out of normal operation, but will operate to open the inlet-valve and refill the tank in the same manner as it is normally refilled. Therefore if a tank were left long out of use, having a very slow leak at the outlet-valve, the tank in spite of such leak would when next used be ready for operation, irrespective of what the level of the water in the tank might be at that time. Again, let it be assumed that after a slow leak at the outlet had continued for some time and before the inlet-valve had been opened by the gradual withdrawal of water from the bucket the outlet-valve was opened by the user. The rapid emptying of the tank would only operate to accelerate the emptying of the bucket to its normal rate and the tank would be refilled. Another condition is worthy of attention—namely, that which occurs when the outlet-valve is again opened by the user after the refilling of the tank and prior to the completion of the filling of the bucket by the filling-siphon, enough water having been delivered to the bucket to close the inlet-valve, but not enough to fill the bucket. Under these conditions the length of the column of water which must be raised in the bucket-leg of the emptying-siphon will be materially in excess of the normal height of such column necessary to start the siphonic action of the emptying-siphon, and as a consequence a greater fall of water must occur in the main tank before the siphonic action begins, which necessitates a provision for a sufficient fall of level of the water in the tank thereafter to empty the bucket. In order to provide for the successful operation of the tank under this exceptional state of affairs, the length of the tank-leg of the emptying-siphon above the enlargement should be such that when the siphon begins to operate the column in the said part of the tank-leg and above the air-bubble added to the column below the air-bubble will be more than sufficient to overbalance the water-column in the bucket-leg, and thereby insure the complete emptying of the cup. The time necessary to fill the bucket from the level at which it operates to close the inlet-valve to its top is extremely small, and consequently the chance that the outlet-valve would be opened by the user at precisely this time is very remote; but it has been considered desirable to provide against even this remote contingency, and the best embodiment of the invention contemplates such provision, although it is to be understood that an apparatus devoid of this provision must still be within the purview of this invention viewed in its broader aspects.

A bracket 17 is secured to one side of the tank and is extended toward the inlet-valve, passes down, under, and around the same, lying in a notch formed between the valve-seat enlargement and a projection from the piston-casing, and affords a steady support for the inlet-valve and the parts supported by and associated therewith.

While the principal use contemplated for the present invention is in connection with flushing-tanks for water-closets, still it is not limited thereto, but may be advantageously employed for other purposes—as, for example, in connection with tanks for supplying water to domestic hot-water boilers or in any place where it is desired to maintain the level of water in a supply-tank between certain levels by turning on the supply when the water falls to a predetermined level and turning it off when it rises to another predetermined level

and maintaining the supply closed while the level is falling from the higher to the lower level.

The present invention is not limited to the illustrated embodiment thereof, but is susceptible of embodiment in other and different forms without departure therefrom, and, except where otherwise expressly limited by their terms, the claims are to be construed as defining in general terms the constructions covered thereby.

Having thus described the invention, what is claimed is—

1. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, means for filling the bucket from the tank, and means for emptying the bucket when the tank is emptied having provisions by virtue of which the emptying of the bucket begins after the water-level in the tank has fallen a predetermined distance below its normal level, substantially as described.

2. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, means for filling the bucket from the tank, and a siphon for emptying the bucket having provisions by virtue of which it begins to draw water from the bucket after the water in the tank has fallen a predetermined distance below its normal level, substantially as described.

3. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, means for filling the bucket from the tank, and an air-bubble siphon for emptying the bucket, substantially as described.

4. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, means for filling the bucket from the tank, and a siphon for emptying the bucket provided with an enlargement in its tank-leg, substantially as described.

5. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, means for filling the bucket from the tank, and a siphon having one leg dipping into the bucket and the other leg dipping into the tank for emptying the tank when the level of the water in the tank falls, the leg of the said siphon dipping into the tank being enlarged at a point below the bend of the siphon, substantially as described.

6. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, means for filling the bucket, and a siphon having one leg in the bucket and the other leg in the tank, the leg in the tank being enlarged at a point above the level of the lower end of the other leg, substantially as described.

7. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, a siphon for filling the bucket after the tank has been filled, and a siphon for emptying the bucket after the tank has been substantially emptied, substantially as described.

8. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, a siphon for filling the bucket after the tank has been filled, provided with a long leg depending into the bucket and a short leg depending into the tank, and a siphon for emptying the bucket when the tank is emptied, substantially as described.

9. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, a siphon for filling the bucket after the tank has been filled, having a long leg depending into the bucket and a short leg depending into the tank, the length of the short leg determining the amount of water drawn from the tank into the receptacle, and a siphon for emptying the bucket having its long leg in the tank and its short leg in the bucket, substantially as described.

10. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket acting when filled to close the inlet-valve, means for filling the water-bucket, and a siphon for emptying the water-bucket having one leg depending in the water-bucket and the other leg depending in the tank, the latter leg having an enlargement located at such a point that the siphon will begin to draw water from the bucket when the water in the tank has fallen substantially to the level of the enlargement, at which time the depth of the water in the tank must exceed the depth of the water in the bucket, substantially as described.

11. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve including a water-bucket, a siphon for filling the water-bucket when the tank is filled, and a siphon for emptying the water-bucket when the tank is emptied, the bend of the empty-

ing-siphon being located above the highest level of the water in the tank, substantially as described.

12. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve comprising a water-bucket, a siphon for filling the water-bucket when the tank is filled, having its bend located below the highest level of the water in the tank, and a siphon for emptying the water-bucket, having its bend located above the highest level of the water in the tank, substantially as described.

13. A flushing-tank for water-closets, having, in combination, an outlet-valve, an inlet-valve, an outlet-valve-operating lever, an inlet-valve-operating lever mounted alongside of the outlet-valve-operating lever, connections between said levers and their respective valves, a bell-crank latch pivotally mounted upon the outlet-valve-operating lever having a depending portion and a horizontal portion, a stationary stop-pin, the stop-pin and the depending portion of the latch being arranged so that when the outlet-valve-operating lever is moved upon its fulcrum to open the outlet-valve the latch swings over the stop and maintains the outlet-valve lever in the position to which it has been moved holding the outlet-valve open, the horizontal portion of the latch being provided with a projection extended across the path of motion of the inlet-valve-operating lever, the arrangement of the said projection and inlet-valve-operating lever being such that when the inlet-valve-operating lever moves in the direction to open the inlet-valve it strikes the projection of the latch and turns it so as to permit the outlet-valve-operating lever to move in the direction to close the outlet-valve, substantially as described.

14. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, an inlet-valve-operating lever, connections between the inlet-valve and the inlet-valve-operating lever comprising a link, said inlet-valve-operating lever having a plurality of points of connection with the said link so that the position of the inlet-valve-operating lever may be varied with respect to the valve, substantially as described.

15. Inlet-valve-operating mechanism for tanks, having, in combination, an inlet-valve, means for opening and closing the inlet-valve including a water-bucket arranged to rise and fall, means for filling the water-bucket, and an emptying-siphon having one leg in the bucket and the other leg in the tank, said bucket being provided in its bottom with a well to receive the bucket-leg of the emptying-siphon when the bucket rises, substantially as described.

16. A flushing-tank for water-closets, having, in combination, an outlet-valve, an outlet-pipe, an inlet-valve, means for closing the inlet-valve including a water-bucket for holding water, a casing in which the bucket is suspended, connections between the casing and the outlet-pipe, and a siphon for filling and overflowing the bucket having a long leg in the bucket and a short leg in the tank, substantially as described.

17. A flushing-tank for water-closets, having, in combination, an outlet-valve, an outlet-pipe, an inlet-valve, means for closing the inlet-valve including a water-bucket for holding water, a casing in which the bucket is suspended, connections between the casing and the outlet-pipe, and a siphon for filling and overflowing the bucket, having a long leg in the bucket and a short leg in the tank, the bend of the siphon being below the top of the casing and the short leg terminating above the level of the top of the bucket when the bucket is filled, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES H. PHILLIPS.

Witnesses:

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