C. H. PHILLIPS.

AUTOMATIC FLUSHING MECHANISM.

APPLICATION FILED SEPT. 25, 1905.

968,974. Patented Aug. 30, 1910.

Fig. 1.

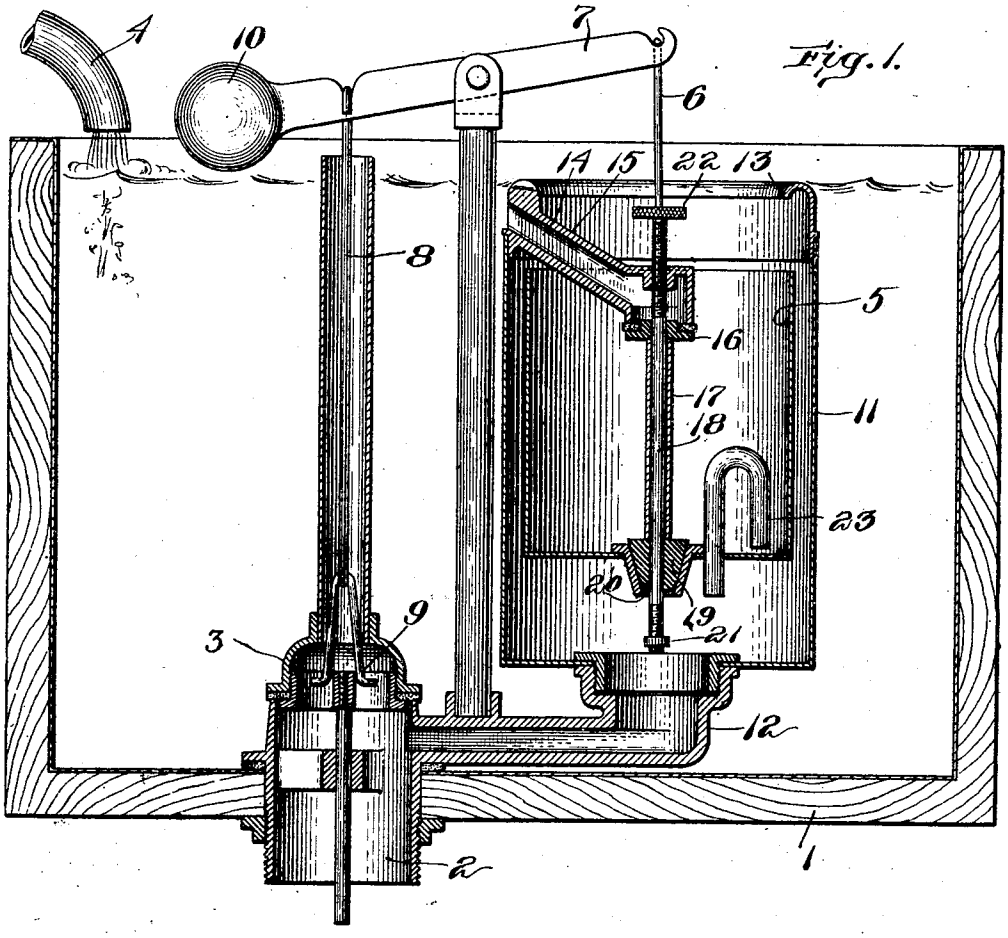
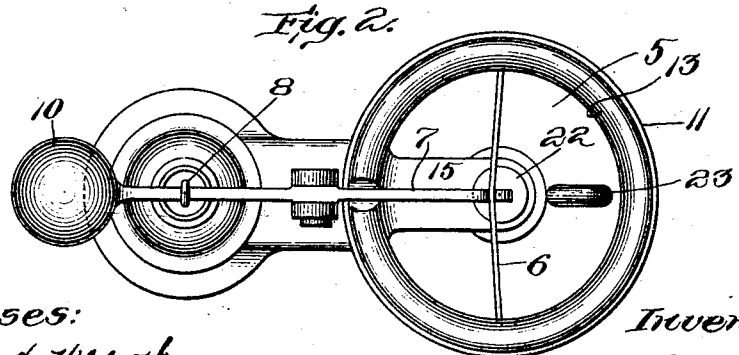


Fig. 2.



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AUTOMATIC FLUSHING MECHANISM.

968,974. Specification of Letters Patent. **Patented Aug. 30, 1910.**

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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 Automatic Flushing Mechanisms; 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 improvements in automatic flushing mechanism.

The invention relates particularly to flushing mechanism of the type in which a tank is filled with water by a constantly running stream from a suitable source of supply, and the valve controlling the outlet from the tank is automatically opened when the water in the tank reaches a predetermined maximum level and the water in the tank is discharged to the apparatus to be flushed, the flushing valve being automatically closed after a certain period of time or after the water has reached a predetermined minimum level, whereupon the tank again becomes filled and the flushing operation is automatically repeated.

The object of the present invention is to improve the mechanism by which the flushing valve is automatically and periodically opened and closed with a view to rendering the operation of this mechanism more positive and reliable.

To this end the invention contemplates a flushing mechanism in which the flushing valve is operated by a bucket which operates to open the flushing valve by the weight of the water delivered thereinto and to close the flushing valve when the water is discharged therefrom.

The invention consists particularly in the improved means for delivering water to and discharging it from the bucket.

The invention is more particularly described in connection with the accompanying drawings, in which—

Figure 1, is a vertical section of a flushing mechanism including the water tank, embodying the preferred form of the present invention, and Fig. 2 is a plan view of the valve actuating mechanism.

The illustrated embodiment of the invention is constructed as follows:

The tank 1 is provided with an outlet 2 through which it is connected with the apparatus to be flushed, and the flow of water through the outlet is controlled by a flushing valve 3. The tank is filled from a supply pipe 4 through which a constant stream of water is delivered to the tank. The frequency of discharge of the apparatus is determined by the size of the stream admitted.

The automatic mechanism for periodically opening and closing the flushing valve 3 comprises a bucket 5 suspended by a bail 6 from a pivoted lever 7 connected by a link 8 with the flushing valve 3. The link 8 is provided with prongs 9 which engage the flushing valve to lift it after a limited vertical movement with respect thereto, so that the bucket may descend some distance for a purpose hereinafter described without opening the flushing valve. The lever 7 is provided with a counterpoise 10 operating when the bucket is empty to hold the parts in the position shown. The bucket 5 is suspended within a casing 11 supported upon an extension 12 from the seat of the flushing valve, through which the casing 11 is connected with the outlet 2.

The casing 11 is normally free from water, but when the level of the water in the tank rises above the top of the casing it flows over and is directed by the incurved edge 13 of the casing into the bucket 5. This overflow from the tank into the bucket continues until the weight of the bucket and the water contained therein is sufficient to overbalance the counterpoise 10.

It is desirable in devices of this character that the flushing valve be opened as quickly as possible, in order to cause a sudden flow of water and it is also desirable that the valve be positively held both in its open and in its closed position with sufficient force to prevent chattering or leakage of the valve. Where, as in previous devices of this character the overflow alone from the tank is depended upon to depress the bucket and open the valve the operation of the valve is not positive owing to the fact that the bucket descends and opens the valve as soon as a quantity of water barely sufficient for this purpose is delivered to the bucket, and upon

such descent the further delivery of water ceases, especially in case of the slow flow of the water into the tank, since the water escapes from the flushing valve faster than it flows into the tank, so that upon the first opening of the flushing valve the overflow into the bucket ceases. In the present invention the overflow over the top of the casing 11 is not depended upon to provide the bucket with sufficient water to cause it to open the flushing valve, but only sufficient to cause it to open an auxiliary passage for the flow of water into the bucket located at such a depth below the maximum level of the water in the tank that sufficient water will flow into the bucket to provide an excess weight over that required to open the flushing valve before the level of water in the tank falls below the level of such opening. To this end the casing 11 is provided with a bucket supply passage 14, formed in a hollow arm 15 extended therefrom to the center of the bucket and affording a passage for water from the tank, below the maximum water level, into the bucket. This passage is adapted to be closed by a bucket inlet valve 16 carried upon the upper end of a tube 17 mounted to slide freely upon a rod 18 which in turn is supported in the hollow arm 15. The lower end of the tube 17 rests upon the bucket outlet valve 19 which closes the bucket outlet 20. The bucket inlet valve 16, being supported by the bucket, is normally held closed by the counterpoise 10 of the lever 7 which is of such weight as to overbalance the empty bucket and to exert in addition somewhat more than sufficient force upon the valve 16 to maintain it closed against the head of water thereabove. The counterpoise therefore prevents the admission of water to the bucket through the bucket supply passage until such quantity of water has overflowed into the bucket that its weight taken in connection with that of the empty bucket and the pressure of the water on the valve 16 is sufficient to raise the counterpoise. Thus the flow of water into the bucket operates gradually to build up sufficient weight to overbalance the counterpoise and then the bucket suddenly falls a short distance limited by the engagement of the prongs 9 on the lower end of the link 8 with the upper inner surface of the flushing valve body. The weight of the flushing valve and the pressure of the water upon it are sufficient to hold the bucket from further descent until more water flows into it through the passage 14. But the valve 16 being open water quickly flows into the bucket and in sufficient quantity to overbalance the weight of the flushing valve and the pressure of water upon it. The flow of water into the bucket will not cease with a mere balance of weight but will continue not only until the flushing valve is opened but long enough thereafter to provide an excess weight tending to hold the flushing valve open, for the water continues to flow until the level in the tank falls below the level of the opening therefrom into the passage 14. The passage 14 is made generous in size so that the overbalancing and excess weight are quickly secured. In this connection, it may be remarked that this excess of weight is particularly desirable in embodiments of the invention in which the flushing valve is closed (and not, as in the illustrated embodiment, provided with an air passage from above the surface of the water in the tank to the underside of the valve), as the pressure required to open the valve is less than that required to keep it open owing to the weight of the column of water thereunder. This is not so important in the illustrated embodiment of the invention because the air passage prevents the exertion of such suction on the flushing valve. This construction of the flushing valve is preferred not only for this reason but for the further reason that when the flushing valve is closed it closes much more gently than a solid valve and because of the elimination of the suction thereon.

The closing of the flushing valve is accomplished, when sufficient time has elapsed after the opening of the flushing valve to permit the desired amount of water to have been discharged from the tank, by discharging the contents of the bucket. In the illustrated embodiment of the invention this time is made regulable so that, for example when a larger number of bowls or closets are to be flushed, the flushing valve shall be held open for a longer time than for a fewer. The outlet 20 in the bottom of the bucket is conical and normally closed by the valve 19 of corresponding shape. Upon the lower end of the rod 18 is a nut 21 which acts as a stop to engage the valve 19 during the fall of the bucket after it has received its overbalancing load of water, which nut arrests the downward movement of the valve and as this occurs before the bucket has fallen its full distance it opens the outlet 20 and permits the water to begin to flow out of the bucket. The rod 18 is screw threaded through the hollow arm 15 and provided upon its upper end with a knurled head 22 so that by turning the head the rod 18 may be screwed up and down, by which means the position of the stop nut 21 may be varied and as a consequence the effective area of the outlet may be regulated so that the flow of water therethrough may be faster or slower as desired. When the stop is raised the flow is the faster and consequently the time during which the flushing valve is open will be the shorter and the amount of water discharged from the tank will be the less. When the stop is lowered,

on the contrary, the amount of water discharged from the tank will be greater.

After a certain amount of water has been discharged from the bucket its weight and the weight of the water therein is no longer sufficient to overbalance the weight of the counterpoise and the flushing valve and then the bucket rises and the flushing valve and the outlet 20 are closed.

So far in the description of the present invention, the siphon 23 with which the bottom of the bucket is provided, has been ignored. This siphon, however, does not affect the mode of operation of the apparatus as so far described. It is desirable in apparatus of this character that the flushing valve be relieved entirely of strain tending to lift it while it is closed, to the end that it may bear upon its seat with as great a pressure as its weight and the weight of the water bearing thereon will permit. It is also desirable that the bowl or closet flushed by the apparatus be provided with a re-fill, as the rush of water incident to the flushing operation will frequently empty the traps of such apparatus. After the bucket has discharged a portion of its contents through the bucket outlet 20, the bucket rises a short distance until the flushing valve seats itself, but the weight of the water in the bucket is still sufficient to hold the prongs 9 of the link 8 with some pressure against the flushing valve 3 tending to open it. The siphon 23 draws off the remainder of the contents of the bucket at this time, and this relieves the flushing valve of the lifting pressure exerted thereon by the weight of the water in the bucket. At the same time this water so drawn from the bucket is discharged into the casing and flows through the extension into the tank outlet and thus to the apparatus. Thus the siphon 23 in completing the emptying of the bucket not only serves to deliver a small quantity of water through the flushing pipe after the flushing valve has closed to insure the refilling of the traps of the apparatus which is flushed, but its action also results in lightening the bucket so that not only is the flushing valve relieved from all tendency of the bucket to draw it open, but also the bucket is overbalanced by the counterpoise so that the bucket inlet valve is held firmly against its seat. The size of the bucket and the amount of water contained therein at the time of its first rising movement are such as to provide sufficient water for re-filling the trap of the bowl or closet. It is to be noted in this connection that the position of the bend of the siphon in the bucket is determined as a minimum by the level of the water in the bucket when such water and the bucket will overbalance the counterpoise. This condition is imposed especially in such adjustment of the tank supply as permits a very slow in-flow of water resulting in a slow over-flow of the water from the tank into the bucket to provide its preliminary load. That is to say, the water must not begin to flow out through the siphon 20 before the weight of the water in the bucket, taken in connection with the weight of the bucket, is sufficient to overbalance the counterpoise, as otherwise, in case of a flow of water into the bucket in quantity only sufficient to be siphoned off by the siphon 20, the apparatus would remain in a position of poise, water flowing over into the bucket and out through the siphon. The maximum level of the bend of the siphon must not, of course, exceed the maximum height of water in the bucket. These considerations suggest another condition which the construction of the siphon must meet, viz: that its size must be small enough to prevent it from drawing off the water from the bucket faster than the water flows in through the bucket inlet valve, as otherwise the water would simply flow through the bucket without building up sufficient weight to lift the flushing valve.

The present invention is not limited to the illustrated embodiment thereof as it may be embodied in other and different forms within the scope of the following claims.

Having now described the invention, what is claimed is:—

1. Periodic flushing mechanism, having, in combination, a tank, means for delivering water constantly thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve, an inlet to the bucket connected with the tank below the maximum water level, a valve normally closing the inlet, means for opening the valve to fill the bucket when the water in the tank reaches the maximum level, and means for emptying the bucket, substantially as described.

2. Periodic flushing mechanism, having, in combination, a tank, means for delivering water constantly thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve, an inlet to the bucket connected with the tank below the maximum water level, a valve normally closing the inlet, means for opening the valve to fill the bucket to provide an excess of water in the bucket sufficient to lift and hold lifted the flushing valve when the water in the tank reaches the maximum level, and means for emptying the bucket, substantially as described.

3. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling

the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve, comprising a bucket connected with the flushing valve, connections between the bucket and the tank for delivering water to the bucket when the water in the tank reaches a maximum level, and auxiliary filling means having a valve for discharging water into the bucket from the tank, the filling valve being normally closed but being opened upon the first descent of the bucket, and means for emptying the bucket, substantially as described.

4. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve, connections between the bucket and the tank for delivering water to the bucket when the water in the tank reaches a maximum level, an auxiliary connection between the bucket and the tank entering the latter at a point below the maximum water level so as to discharge water into the bucket after the water level has begun to fall, a valve for controlling the auxiliary connection opened automatically upon the descent of the bucket, and means for emptying the bucket, substantially as described.

5. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve, a casing located within the tank and inclosing the bucket, an outlet from the casing, two inlets to the casing arranged to discharge water into the bucket, one of the inlets being normally closed by a valve arranged to open upon the descent of the bucket, and means for discharging the contents of the bucket into the casing, substantially as described.

6. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket, an inlet thereto, an inlet valve, connections between the flushing valve and the bucket having provision for limited movement of the bucket independent of the flushing valve when the water upon reaching a maximum level flows into the bucket, connections between the bucket and the inlet valve for opening the inlet valve upon such movement of the bucket, and means for emptying the bucket, substantially as described.

7. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a movable bucket connected with the flushing valve, connections between the bucket and the tank for delivering water to the bucket when the water in the tank reaches a maximum level, and an auxiliary filling valve for discharging water into the bucket from the tank, the filling valve being opened by the descent of the bucket and the connections between the bucket and the flushing valve having provision for lost motion so that the bucket may descend partly and open the inlet valve before opening the flushing valve, substantially as described.

8. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve and suspended free from the water in the tank, connections between the bucket and the tank for delivering a preliminary and an auxiliary load of water to the bucket, said bucket being provided with an outlet valve, and means for opening the outlet valve upon the descent of the bucket, substantially as described.

9. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve and connections between the bucket and the tank for delivering water to the bucket when the water in the tank reaches a maximum level, an outlet valve in the bucket opening upon the descent of the bucket, and means for varying the effective area of the outlet valve, substantially as described.

10. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve, connections between the bucket and the tank for delivering a preliminary and an auxiliary load of water to the bucket, said bucket being provided with an outlet valve, means for opening the outlet valve upon the descent of the bucket having provision for varying the amount of opening of the outlet valve, substantially as described.

11. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling

the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket and connections between the bucket and the tank for delivering water to the bucket when the water in the tank reaches a maximum level, an outlet valve in the bucket arranged to open upon the descent of the bucket, and a discharge siphon for completing the emptying of the bucket after the bucket has first risen and the outlet valve has closed, substantially as described.

12. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket and connections between the bucket and the tank for delivering water to the bucket when the water in the tank reaches a maximum level, a conical outlet in the bucket, a conical outlet valve for closing the outlet, and adjustable means for moving the outlet valve a variable distance from its seat upon the falling of the bucket so as to regulate the discharge from the bucket, substantially as described.

13. Periodic flushing mechanism, having in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket, connections between the bucket and the tank for delivering water to the bucket when the water in the tank reaches a maximum level, an auxiliary filling connection between the tank and the bucket, an inlet valve controlling the same, an outlet valve controlling the outlet from the bucket, and connections between the inlet valve and the outlet valve for simultaneously pressing the valves against their seats when the bucket is in a raised position, substantially as described.

14. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve, connections between the bucket and the tank for delivering water to the bucket having provision for increasing the flow of water into the bucket after a portion of the descent of the bucket, an outlet valve in the bucket, means for opening the outlet valve upon the descent of the bucket, means for lifting the bucket part way after a portion of the water has been discharged therefrom, and auxiliary means for emptying the bucket, substantially as described.

15. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve, connections between the bucket and the tank for delivering water to the bucket when the water in the tank reaches a maximum level, an auxiliary filling inlet for discharging water into the bucket from the tank, a valve for closing said inlet, means for causing the bucket to hold said valve closed until after it has received a preliminary load and made a partial descent, an outlet valve in the bucket opened upon the descent of the bucket, and auxiliary bucket emptying means operating to complete the emptying of the bucket, and to close and hold closed the auxiliary filling inlet substantially as described.

16. Periodic flushing mechanism, having in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve comprising a bucket connected with the flushing valve, having provision for delivering two supplies of water to the bucket, the one when the water in the tank reaches the maximum level and the other after the level of the water in the tank has begun to fall, the latter supply being controlled by a valve connected with the bucket and opened during the first part of the descent of the bucket, such supply providing an excess of water in the bucket sufficient to lift and hold lifted the flushing valve, substantially as described.

17. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve, comprising a bucket and connections between the bucket and the tank for delivering a preliminary and an auxiliary load of water to the bucket when the water in the tank reaches a maximum level, an outlet valve in the bucket arranged to open upon the descent of the bucket, and a discharge siphon for completing the emptying of the bucket after the bucket has first risen and the outlet valve has closed, substantially as described.

18. Periodic flushing mechanism, having, in combination, a tank, means for delivering water thereto, a flushing valve controlling the outlet from the tank, and automatic mechanism for periodically opening and closing the flushing valve, comprising a bucket and connections between the bucket and the tank for delivering a preliminary and an auxiliary load of water to the bucket when the water in the tank reaches a maxi-

mum level, a conical outlet to the bucket, a conical outlet valve for closing the outlet, and adjustable means for moving the outlet valve a variable distance from its seat upon the falling of the bucket so as to regulate the discharge from the bucket, substantially as described.

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

CHARLES H. PHILLIPS.

Witnesses:
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