

Dec. 13, 1949

J. C. OWENS

2,491,131

COMBINED OVERFLOW TUBE AND FLUSHING VALVE

Filed March 27, 1947

2 Sheets-Sheet 1

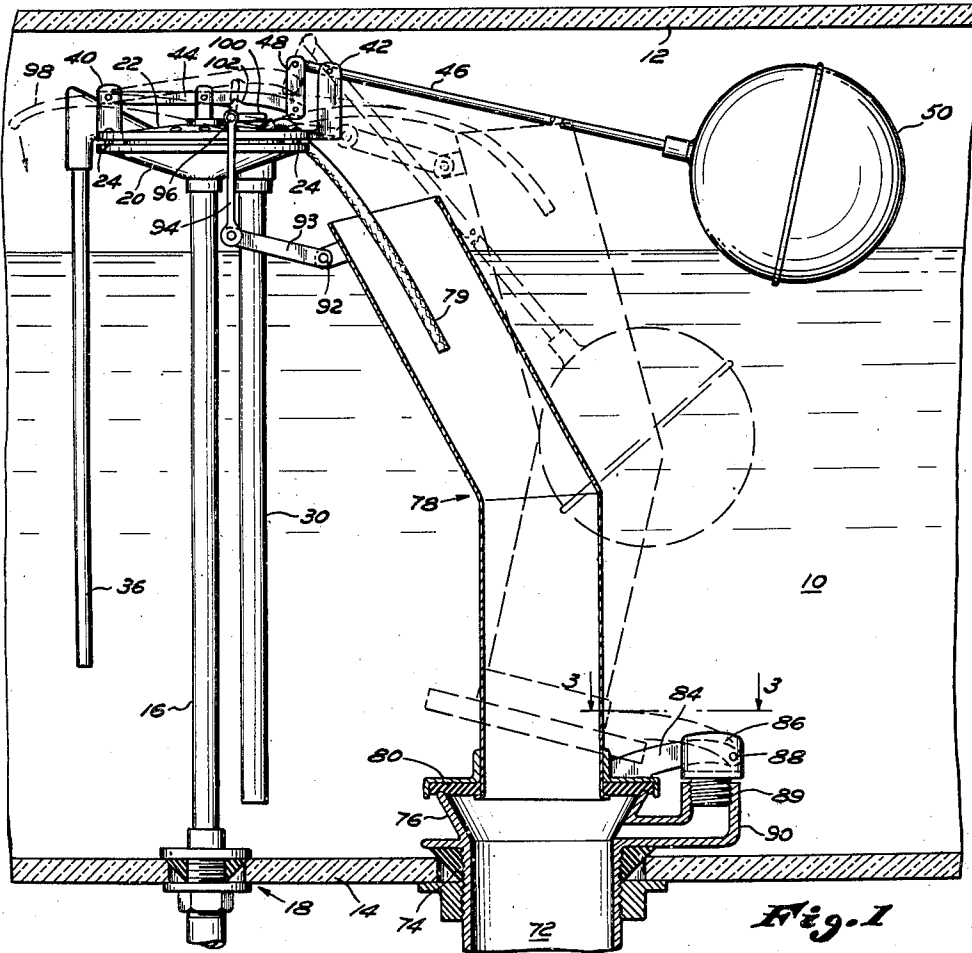


Fig. 1

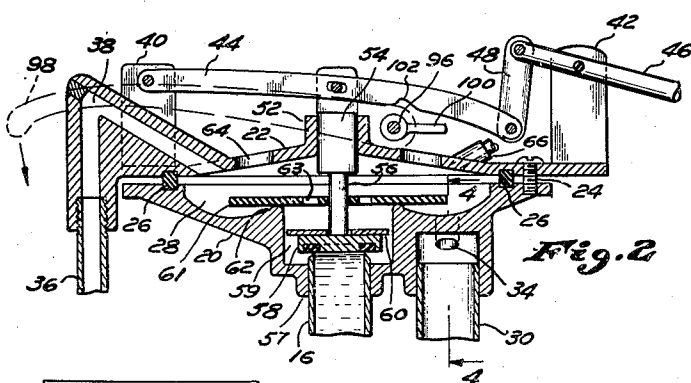


Fig. 2

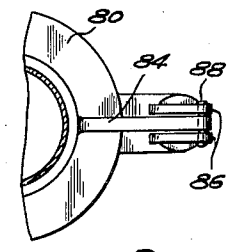


Fig. 3

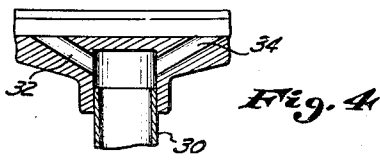


Fig. 4

INVENTOR.
JESSE C. OWENS
BY *Stuart M. M...*
ATTORNEY

Dec. 13, 1949

J. C. OWENS

2,491,131

COMBINED OVERFLOW TUBE AND FLUSHING VALVE

Filed March 27, 1947

2 Sheets-Sheet 2

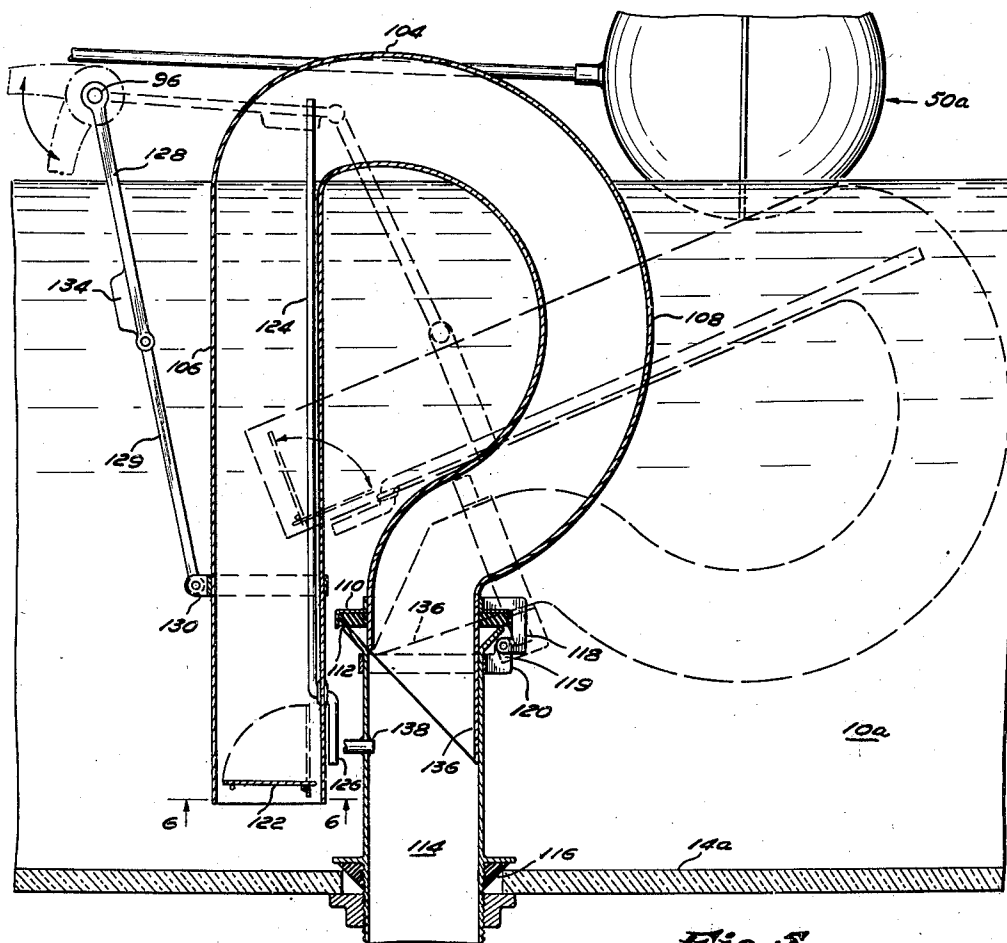


Fig. 5

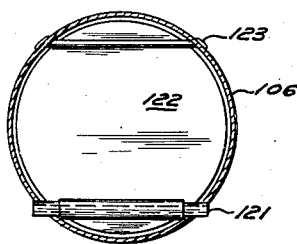


Fig. 6

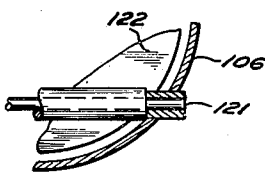


Fig. 7

INVENTOR.
JESSE C. OWENS

BY

Stuart M. Maul
ATTORNEY

UNITED STATES PATENT OFFICE

2,491,131

COMBINED OVERFLOW TUBE AND FLUSHING VALVE

Jesse C. Owens, Los Angeles, Calif.

Application March 27, 1947, Serial No. 737,667

4 Claims. (Cl. 4—50)

1

This invention relates to hydraulic valves, and more particularly to valves of the type employed in flushing toilets and the like.

It is an important object of my invention to provide an improved operating assembly for a flush tank which includes a novel combined flush valve and safety overflow.

Another purpose is the provision of such valve assemblies which are particularly adapted to eliminate the gurgling, hissing, or sucking sounds caused by breaking of the water current by sudden inrush of air.

A further object is the provision of a pivotally mounted overflow line operatively connected with the present valve assembly.

Still another purpose is the provision of a self-actuating syphon in operative association with my novel valve system.

An additional object is the provision of a plurality of water lines adapted to supply the reservoir tank and also to operate successively a flushing and refill operation of the toilet bowl, all of which operations are operatively correlated in the desired sequence of my present mechanism.

Other objects and advantages of the invention will be apparent from the following description and claims, the novelty consisting in the features of construction, combination of parts, the unique relations of the members and the relative proportioning, disposition, and operation thereof, all as more completely outlined herein and particularly pointed out in the appended claims.

Referring to the drawings which form part of the present specification:

Figure 1 is a rear elevational view in section, of my combined overflow tube and flush valve.

Figure 2 is a vertical sectional view taken through the head of the supply valve assembly.

Figure 3 is a top plan view of a portion of the lower pivotal mounting of the overflow pipe, taken along the line 3—3 of Figure 1.

Figure 4 is a horizontal sectional view through a tank refill line associated with the valve assembly, taken along the line 4—4 of Figure 2.

Figure 5 is a rear elevational view, partly in section, of a modified form of overflow pipe which may be used with my valve assembly.

Figure 6 is a bottom plan view of the butterfly valve of the overflow pipe as seen along the line 6—6 of Figure 5.

Figure 7 is an enlarged detail view of a portion of the valve of Figure 6.

As illustrated, there is provided a reservoir tank 10 of conventional shape and volume, the top 12 and bottom 14 being shown in part. A water

2

supply line 16 enters the tank through a suitable packing gland 18, and bears on its upper extremity a bowl-shaped flange 20 disposed at suitable elevation below the top 12 of the tank. An oppositely curved cover 22 is rigidly secured to the bowl 20 as by screws 24, the intersection between the complementary parts being rendered airtight by an annular gasket 26.

The chamber 28 formed between bowl 20 and cover 22 has three water outlets, two of which supply water to the tank 10 and the third to the toilet bowl (not shown). The principal delivery pipe 30 to the tank extends downwards from the under face of the bowl 20, being in communication with the chamber 28 through a pair of oppositely arranged angularly disposed channels 32 and 34 (Figure 4) drilled or otherwise formed in the body of the bowl 20. This construction is designed to avoid the gurgling sounds caused by air breakage of the water line which are so objectionable in common flush valves. A secondary delivery pipe 36 for the tank has its intake channel 38 disposed higher than the bowl chamber 28, so that water flows through it only when the chamber is full of water under pressure from the supply line 16.

The control chamber cover 22 is provided with two pairs 40 and 42 of diametrically aligned lugs disposed at opposite sides of its outer edge, each pair of lugs having pivotally mounted therebetween a vertically swingable lever arm 44 and 46, both of which are swingable in the same plane and pointed in the same direction. The two lever arms 44 and 46 are interconnected by a vertical link 48 connecting their respective ends intermediate the two pairs of lugs and preferably materially closer to the pair 42 than to the pair 40. The longer lever arm 46, which is thus fulcrumed on lugs 42, carries a hollow sphere or ball float 50 on its outer end. The shorter lever arm 44 is somewhat upwardly bowed over the valve cover 22 and is connected intermediate its ends to a vertically reciprocating piston 54 for a purpose presently evident.

Medially located on the upper face of the cover 22 is an upstanding annular boss 52 which is vertically apertured to guide the piston 54 therein. The piston 54 normally extends into the chamber 28 and has attached thereto a dependent rod 56 of lesser diameter, which rod carries on its lower end a plunger valve 58, reciprocable in a recess 59 of the bowl 20 upon movement of the piston. An annular valve seat is provided within the recess 59, a convenient manner of forming the valve seat 57 being by arranging the parts so that the

3

upper end of the water supply line 16 projects through the bottom of the recess 59 and for a slight distance above the plane of the upper surface of the bottom of the recess. The annular recess 59 is of larger diameter than the plunger valve 58, with the result that when the valve 58 is lifted off its seat 57, water thus permitted to enter the bottom of the recess 59 from the supply line 16 can pass upwardly around the valve 58 and, after traversing the vertical length of the recess 59, enter the chamber 28.

However, loosely mounted upon the rod 56, just above the valve 58, is a disc 60, preferably of rubber or similar material, the diameter of which is greater than that of the plunger valve 58, but slightly less than the inside diameter of the recess 59. Consequently, after water has passed the valve seat 57 and flows upwardly around the valve 58, it impinges against the disc 60, carrying it upwards on the rod 56.

Also loosely mounted upon the rod 56 and above the disc 60 is a second disc 61, also preferably of rubber or similar material; but this disc is of materially greater diameter than the recess 59, with the result that it normally rests upon the rim 62 of the recess 59. A series of openings 63 spaced about the center of the disc 62 are effectively closed by the smaller disc 60 when the latter is forced upwardly into engagement with the under surface of the disc 62 by upward motion of water within the recess 59, and both discs 60 and 62 thereafter will be forced upwardly until the upper, larger disc 62 engages the under surface of the bowl cover 22 in position to close a plurality of openings 64 provided in the cover 22.

However, when the valve 58 is seated, closing off the flow of water into the chamber 28, both discs 60 and 62 will fall by gravity to the respective positions thereof illustrated in Figure 2, opening the chamber 28 to the atmosphere through the aperture 64 and thereby precluding any possibility of the partial vacuum therein which would be necessary were the valve to develop any siphonic action resulting from loss of pressure within the supply line 16. In this manner, all possibility for contaminated water to be drawn back into the supply line 16 from either the toilet fixture or the storage tank 10 is precluded.

In the bottom of the reservoir tank there is provided the customary arrangement of flushing outlet for emptying the contents of the tank into the toilet (not shown). The outlet in this case comprises a vertical conduit 72 fixedly secured in the floor 14 of the tank by a suitable packing gland 74 and having a funnel-shaped mouth 76 disposed within the tank near the base thereof. An open-ended overflow pipe 78 is pivotally mounted across the funnel mouth so as when thus seated, to prevent water in the tank from running out the outlet conduit 72 except by passing through the overflow pipe, that is, by entering at the top of the latter. This mounting of the overflow conduit is attained by means of a horizontal flange 80 disposed about its bottom end and having an annular gasket retained against its under face so as to establish a substantially fluid tight seal between the low end of the overflow conduit 78 and the upper edge of the funnel mouth 76. A laterally projecting arm 84 extending outward from the upper face of the flange 80 has its outer end inserted between a pair of up-standing, parallel lugs 86 to which it is pivotally connected by a transverse pivot pin 88, the lugs being conveniently anchored by a threaded plug

4

89 inserted in an upturned pipe elbow 90 radiating from the base of the funnel.

Means are provided for manual actuation of the apparatus to unseat the overflow conduit 78 from the upper edge of the funnel mouth 76, and thereby permit water stored within the tank to escape therefrom through the conduit 72. The upper end of the overflow pipe 78 is pivotally connected at 92 to one end of a link 93, the other end of which is pivotally connected to the lower end of a lever 94. The upper end of the lever 94 is rigidly attached to a horizontally disposed shaft 96 which is rotatably journaled in such position in the front vertical wall of the tank that it extends above the valve cover 22 between the boss 52 and the lugs 42. Also rigidly secured to the shaft 96 is an operating handle 98 located outside the tank and an actuating key or finger 100 disposed within the tank. The finger is situated beneath and in vertical alignment with the piston-connected lever arm 44 and upon its upswing caused by rotation of the shaft 96 the moving finger is adapted to abut against and lift the lever 44 and thereupon lodge in a notch 102 cut in the lower edge of the arm 44, thus supporting the arm 44 in raised position.

In operation, the handle 98 is depressed, thereby causing the following three actions to occur: (1) by rotation of the lever 94, the overflow pipe 78 is unseated from the funnel mouth 76, thereby allowing the tank contents to escape through the flushing outlet 72; (2) by raising the lever 44 by the finger 100, the ball float 50 is forced below the level of the water stored within the tank; and (3) the plunger valve 58 is lifted from the supply line 16 by the piston 54, thereby allowing water from the supply line 16 to enter the chamber 28 and to flow therefrom through the refill tube 79 to the well of the toilet bowl and through pipes 30 and 36 to the tank, but at a lesser rate than that at which water stored within the tank escapes through the flushing conduit 72. When the water drops below the level of the displaced ball float 50 (shown in broken lines in Figure 1), the float then falls further with the receding water, thereby further raising the bowed lever 44 and releasing the finger 100 from the notch 102. The depressed operating handle 98 will then swing back to its original position, due to the relatively greater weight of the overflow conduit 78, which also is restored to its seated position atop the funnel mouth 76, thus terminating the flushing operation. The well of the toilet bowl is now filled by water running through the tube 79 while the tank is filled by the pipes 30 and 36. As the water rises in the tank, it raises the float 50 so as to progressively cut off the water inlet 16 by depression of plunger valve 58. The capacity of the outlet 66 is such that the required quantity of water will be delivered to the toilet bowl during the time required to fill the tank 10 by the lines 30 and 36.

A modified construction is shown in Figure 5 wherein a siphon tube 104 disposed in the tank is formed with one of its legs 106 preferably straight and normally vertical, with its lower open end spaced somewhat above the bottom 14a of the tank. The other leg 108 of the siphon tube 104 is curved to substantially semicircular or looped form. The lower extremity of the looped portion 108 is provided with an outer annular flange 110 retaining a rubber gasket 112 on its lower face so as to seat upon the top edge of a funnel-shaped outlet, or flushing conduit

114, mounted in the bottom of the tank by suitable packing gland 116 and leading to the toilet bowl (not shown). The loop and attached bottom flange 110 are pivotally mounted upon the outlet pipe 114 by a suitable pin 118 connecting the outer edge of the flange with a vertical lug 119 correspondingly mounted on a collar 120 rigid with the outlet pipe 114.

Within the lower, open end of the vertical section 106 of the overflow conduit 104 there is mounted an inwardly opening, unidirectional butterfly valve consisting of a flat disc 122 carried by a horizontally disposed pivot pin 121 inserted across the pipe at one side of the disc, while the opposite edge of the disc, when closed, abuts against a similar pin 123. When the conduit is tipped over, the disc serves to prevent backward movement of the water normally standing in the arm. Along the inner side of the upright arm there is fixedly mounted a small diameter pipe 124 having its upper end opening normally within the overflow conduit above the level of water standing therein, while its lower open end 126 is disposed outside the vertical section of the overflow pipe 104 spaced slightly above the lower end thereof. The function of the small pipe 124 is to conduct air from its lower end 126, immediately the latter has been uncovered by lowering of the level of the water within the tank 10a, and to deliver the air to the upper portion of the siphon tube and thereby break the siphonic action and thus terminate the flushing action.

A tipping lever 128 is attached at its upper end to the operating handle 98 by a shaft 99 journaled in the front wall of the tank. The lower end of the lever 128 is connected by a link 129, which is pivotally connected to a fixed, embracing collar 130 mounted on the lower portion of the vertical arm 106 of the overflow conduit. The lever 128 has a weight 134 attached adjacent its lower end, so that upon the overflow conduit 104 being momentarily tipped over within the tank by downward movement of the handle 98 (and upward movement of the lever 128), the action of the weight 134 will restore the parts to their original positions upon release of the handle. It will be seen, however, that the effect of tipping the overflow pipe 104 is to close the butterfly valve 122 and cause the water thus held in the vertical arm to flow over into the loop 108 while at the same time water flows into the opposite or outlet end of the loop from the tank so that substantially the whole movable section of the overflow channel 104 which is thus beneath the water level is thereby filled with water before escape of any appreciable volume of water down the outlet 114 from the tank. As a factor contributing to this same end, it should be noted that the cylindrical end of the loop, which is disposed in the outlet funnel, has its terminal edge disposed in a plane at approximately 45° to the axis of the pipe, with the longest protruding lip portion thereof 136 positioned symmetrically along the side of the loop adjacent the pivot 118. Upon the loop being tipped back, such lip is thereby moved to a position extending across the outlet 114, effectively limiting escape of water from the tank into the outlet and yet permitting entrance of water to the loop.

At this point, withdrawal of the operator's hand from the handle 98 allows the lever weight 134 to drop the overflow loop to its original position in communication with the flushing conduit 114. The water now filling the loop flows

past the seated end thereof down the outlet 114, and since the tube is full and in communication with the tank by the now opened butterfly valve, it acts as a siphon channeling the water from the tank down the outlet 114 into the toilet bowl until the water level in the tank reaches the lower end of the vertical pipe 124, whereupon air is conveyed therethrough to the top of the loop, thus breaking the suction or siphonic action, but, due to the small bore of the pipe 124, in such manner as again to avoid objectional gurgling in the system.

The ball float 50a is connected to the inlet valve 58 as previously illustrated, these parts being here eliminated for greater clarity of illustration, the only other difference from the construction of Figure 1 being that in the present modification the tube 79, which supplies water to the bowl after flushing, here enters the outlet pipe 114 below the valve seat, as indicated at 138.

It is thus evident that I have produced a highly effective arrangement of parts for operating a flush tank and which is particularly useful in that special provision made for breaking the water flows at necessary points without permitting appreciable back surge of water and consequent gurgling caused by the introduction of air.

While I have shown and described in some detail, presently preferred embodiments of my combined overflow tube and flush valve, it is to be understood that various modifications may be made in the construction and operation thereof within the scope of the subsequently claimed invention which is to be construed broadly and limited only by the prior art.

I claim:

1. In flushing apparatus including a reservoir tank having an outlet, the combination of a siphon tube pivotally mounted within said tank with its upper, medial portion normally disposed above the full water level within said tank and both its inlet end and its outlet end below said water level, said inlet end being open to the interior of said tank and said outlet end normally in communication with said tank outlet, means for tilting said siphon tube to lower said medial portion thereof to a position below said water level to effect filling the bore of said tube and start flow of water into said outlet around said siphon tube's outlet end whereby siphonic action within said tube and withdrawing water from said tank is initiated upon return of said siphon tube to its normal position, and means for admitting air to said medial portion of said siphon tube to interrupt siphonic action thereof prior to lowering of the water level within said tank to said inlet end of said siphon tube.

2. In flushing apparatus including a reservoir tank having an outlet, the combination of a siphon tube pivotally mounted within said tank with its upper, medial portion normally disposed above the full water level within said tank and both its inlet end and its outlet end below said water level, said inlet end being open to the interior of said tank and said outlet end normally in communication with said tank outlet, means for tilting said siphon tube to lower said medial portion thereof to a position below said water level to effect filling the bore of said tube and start flow of water into said outlet around said siphon tube's outlet end whereby siphonic action within said tube and withdrawing water from said tank is initiated upon return of said siphon tube to its normal position, and a tube opening

7

at one end into the interior of said medial portion of said siphon tube and at its other end into the interior of said tank outside said siphon tube and at a higher position than said inlet end of said siphon tube to admit air to said siphon tube and thereby interrupt siphonic action thereof prior to lowering of the water level within said tank to said inlet end of said siphon tube.

3. In flushing apparatus including a reservoir tank having an outlet, the combination of a siphon tube pivotally mounted within said tank with its upper, medial portion normally disposed above the full water level within said tank and both its inlet end and its outlet end below said water level, said inlet end being open to the interior of said tank and said outlet end normally in communication with said tank outlet, means for tilting said siphon tube to lower said medial portion thereof to a position below said water level to effect filling the bore of said tube and start flow of water into said outlet around said siphon tube's outlet end whereby siphonic action within said tube and withdrawing water from said tank is initiated upon return of said siphon tube to its normal position, and a unidirectional valve mounted adjacent said inlet end of said siphon tube for restraining flow of water from said siphon tube back into said tank.

4. In flushing apparatus including a reservoir tank having an outlet, the combination of a siphon tube pivotally mounted within said tank with its upper, medial portion normally disposed above the full water level within said tank and

8

both its inlet end and its outlet end below said water level, said inlet end being open to the interior of said tank and said outlet end normally in communication with said tank outlet, means for tilting said siphon tube to lower said medial portion thereof to a position below said water level to effect filling the bore of said tube and start flow of water into said outlet around said siphon tube's outlet end whereby siphonic action within said tube and withdrawing water from said tank is initiated upon return of said siphon tube to its normal position, and means for restraining flow of water from said siphon tube back into said tank.

JESSE C. OWENS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
486,994	Weber -----	Nov. 29, 1892
745,724	Griffiths -----	Dec. 1, 1903
874,575	Davis -----	Dec. 24, 1907
2,169,845	McBride -----	Aug. 15, 1939
2,318,978	Tow -----	May 11, 1943

FOREIGN PATENTS

Number	Country	Date
7,500	France -----	Aug. 9, 1907 (1st addition to No. 373,940)