Dec. 13, 1949 J. C. OWENS 2,491,130

FLUSHING TANK AND VALVE

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Fig. 1.

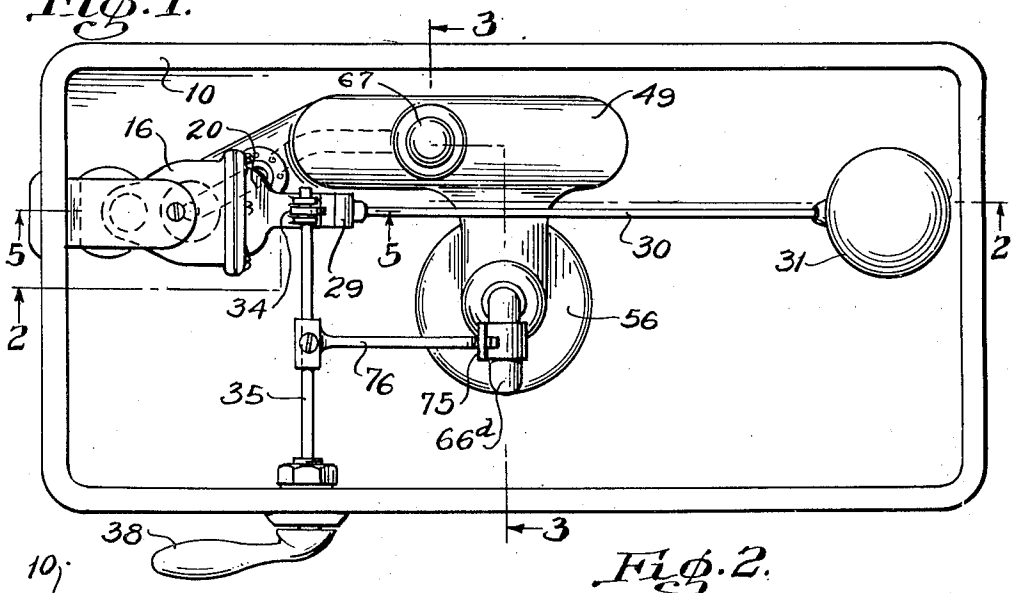
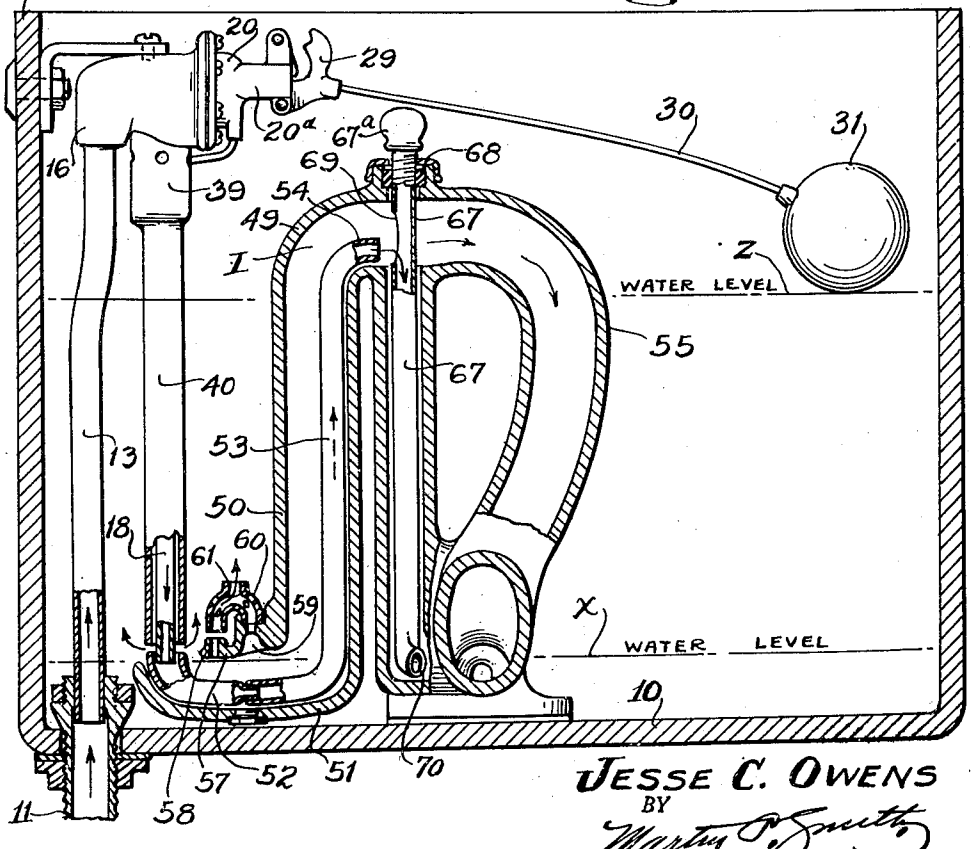


Fig. 2.



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Fig. 3.

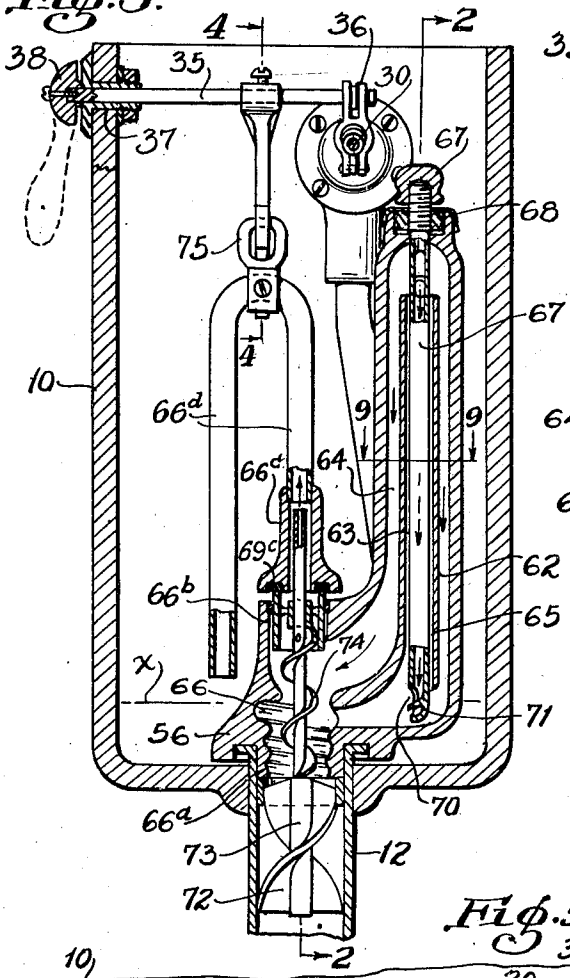


Fig. 4.

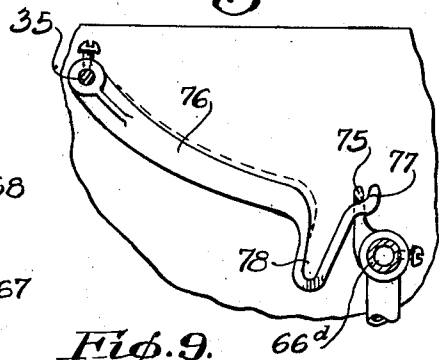


Fig. 9.

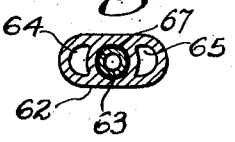


Fig. 7.

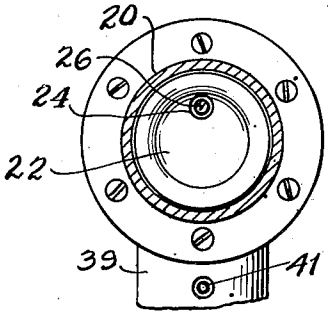


Fig. 5.

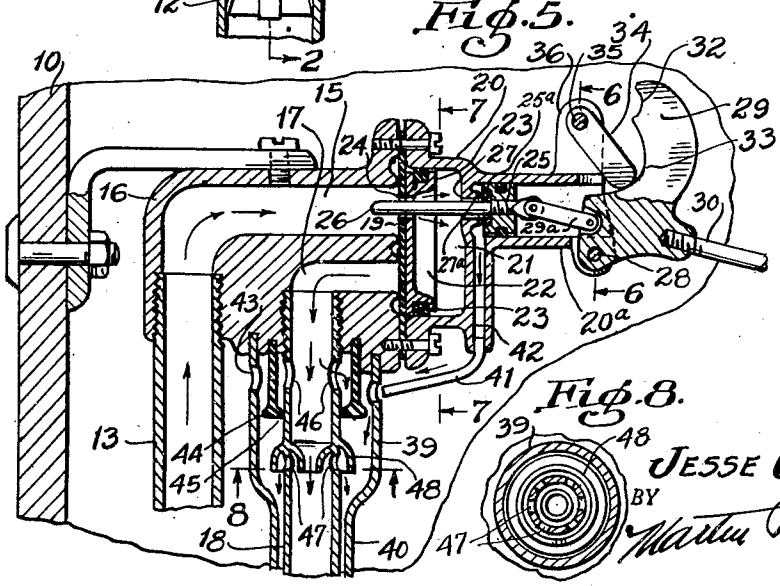


Fig. 6.

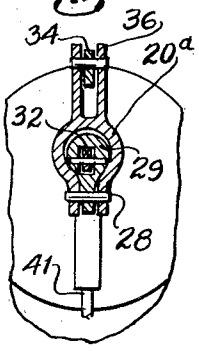


Fig. 8.

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FLUSHING TANK AND VALVE

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5 Claims. (Cl. 4—44)

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My invention relates to a tank and ball cock valve of the particular type used for flushing toilet bowls, urinals and the like and this application should be read and considered in connection with the ball cock flush valve and storage tank forming the subject matter of my copending application for U. S. Letters Patent, filed February 15, 1943, Ser. No. 475,863, now Patent No. 2,412,691.

An object of my present invention is to improve generally upon and simplify the construction of the flushing tank and valve disclosed in my aforesaid copending patent application by combining with a simple, practical and inexpensive storage tank, a highly effective flushing valve of the float controlled ball cock type in such a manner that the combined parts cooperate with maximum efficiency and substantially eliminate the undesirable hissing and gurgling noises which usually attend bowl flushing operations and the refilling of the bowl and storage tank.

Further objects of my invention are: to provide a flushing tank having an improved goose neck structure, which, in operation, is highly effective in "boosting" or pulling the stored water from the tank, so as to accomplish the flushing function quickly and effectively, to provide a combined flush tank and ball cock valve that will operate with maximum efficiency with either high or low pressure of water supply, and to provide in a device of the character referred to, means for automatically counteracting and breaking any siphonic conditions that may develop and tend to draw contaminated water into the supply line.

With the foregoing and other objects in view, my invention consists in certain novel features of construction and arrangement of parts, which will be hereinafter more fully described and claimed and illustrated in the accompanying drawings in which:

Fig. 1 is a plan view of my improved flush tank and valve.

Fig. 2 is a compound, vertical longitudinal section taken on the lines 2—2 of Fig. 1.

Fig. 3 is a compound, vertical cross section taken on the line 3—3 of Fig. 1.

Fig. 4 is a detail section taken on the line 4—4 of Fig. 3.

Fig. 5 is an enlarged vertical section taken on the line 5—5 of Fig. 1.

Fig. 6 is a cross section taken on the line 6—6 of Fig. 5.

Fig. 7 is a cross section taken on the line 7—7 of Fig. 5.

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Fig. 8 is a horizontal section taken on the line 8—8 of Fig. 5.

Fig. 9 is a cross section taken on the line 9—9 of Fig. 3.

Referring by numerals to the accompanying drawings, 10 designates a conventional flushing tank formed of any suitable material, open at the top and having a water supply pipe 11 and a flushing water outflow pipe 12 connected to the tank bottom. Suitably connected to the supply pipe 11 is a pipe 13 leading upwardly within the end of the tank to a duct 15 in a valve housing 16 which also is provided with an outlet duct 17, to which is connected the upper end of a depending outflow tube 18.

The outlet end of duct 15 and inlet end of duct 17 are normally closed by a flexible diaphragm 19 the edge of which is clamped between housing 16 and a cap 20, the latter being provided with a chamber 21 within which is loosely mounted a piston 22 provided in its periphery with a rubber or leather packing ring 23 having a slit or groove adapted to receive water pressure and thereby perform the functions of a cup-washer packing.

Under normal conditions water under pressure in chamber 21, which passes through registering apertures 24 in diaphragm 19 and piston 22, acts against the latter to hold the diaphragm in position to close the ends of ducts 15 and 17. (See Fig. 5.)

Formed integral with cap 20 in longitudinal alignment with duct 15 is a short tubular member 20a open at its outer end, arranged to slide within said tube is a piston 25 in which is seated an axial rod 26 which passes through an aperture 27 in cap 20 and through registering apertures 24.

An annular seat 27a is formed around the end of aperture 27 and adapted to rest on said seat and close said aperture, is a packing ring 25a, seated in the face of valve 25.

Rod 26 is slightly smaller in diameter than the apertures 24 and 27 and thus the flow of water through said apertures is restricted.

Provided at 28 to the outer lower end of tube 20a, is the lower end of a finger 29, in which is seated one end of a rod 30 carrying a float 31. A pivoted link 29a connects finger 29 with the end of rod 26 in tube 20a.

The inner edge of finger 29 is pivoted with notches 32 and 33, one above the other, which notches are adapted to receive the end of a short finger 34 which is carried by a horizontal rod 35 journalled in a bearing 36 on tube 20a and a bear-

ing 37 in the side wall of tank 10. A handle 38 is mounted on the end of rod 35 outside the tank.

Surrounding the upper end of the outflow tube 18 is the enlarged upper end 39 of a hush tube 40 which surrounds the greater portion of said tube 18, and the upper end of this hush tube is secured to housing 16. A small tube 41 leads from the lower end of a duct 42 formed in the cap 20, the upper end of which duct communicates with the inner end of the chamber in tube 20^a; and the lower end of the tube 41 is arranged to discharge into one of preferably a plurality of air inlet apertures 43 formed in the upper portion of the enlarged upper end 39 of the hush tube.

Secured to housing 16 between the tube 18 and enlarged upper portion 39 of the hush tube, is a short concentric tube 44 of rubber which extends below the apertures 43, and the lower end of this rubber tube is provided with inner and outer beads 45, which are adapted to make contact with the tubes 18 and 39 as said rubber tube is expanded and contracted by water pressure. Normally the beads 45 are out of contact with the adjacent walls as seen in Fig. 5.

The wall of tube 18 within rubber tube 44 is provided with apertures 46 and formed in said wall a short distance below these apertures, are small apertures 47, immediately above and over which are located internal and external baffle rings or shields 48.

Located within tank 10, slightly offset rearwardly from tubes 13 and 40, is a gooseneck or inverted U-shaped tubular member 49, having a vertically disposed leg 50, the lower end of which terminates in a shallow bowl 51, the outer end of which is located beneath the open lower ends of tubes 13 and 40. The horizontally disposed portion 52 of an L-shaped tubular member 53 is located in bowl 51 with the open end of said member 53 spaced slightly below the open lower end of tube 40, with the open lower end of tube 18 projecting a short distance into the end of said portion 52 and with clearance between said ends.

The vertical leg of member 53 projects upwardly through the vertical leg 50 of the gooseneck with the open upper end of said member 53 terminating in a short horizontally disposed nozzle 54 which projects toward the upper end of the curved downwardly extending leg 55 of said gooseneck.

The lower end of leg 55 terminates in a short lateral extension 56 in the bottom of the tank which is suitably connected to the upper end of outflow tube 12.

Formed integral with the lower end of leg 50 above the center of bowl 51 is a block 57 having vertical apertures 58 and 59, and secured to said block and communicating with aperture 59 is the lower end of one leg of a small inverted U-shaped member 60 the wall of which is provided with small perforations. The lower end of the other leg of member 60 terminates just above aperture 58 and formed in the top of said member is an outlet aperture 61.

Formed integral with the upper central portion of goose-neck 49 is the upper end of a depending tube 62, having a central duct 63 and diametrically opposite ducts 64 and 65, (see Fig. 9). At the upper end of tube 62, the three ducts 63, 64 and 65 communicate with each other and at the lower end of said tube, said ducts communicate with a chamber 66 in extension 56.

The upper portion of a tube 67 is screw seated in a nut 68 in the upper portion of the gooseneck, which tube extends downwardly through duct 63

which is slightly larger in diameter than said tube 67.

Formed in the upper portion of tube 67 directly opposite the nozzle 54 is short vertically disposed slot 69 and formed in the lower end of said tube is a discharge aperture 70, below which is an inclined deflector plate 71.

This aperture 70 is adapted to discharge water laterally into the lower ends of the ducts 63 and 65 (see Fig. 3). The lower ends of ducts 64 and 65 extend a short distance laterally and communicate with the chamber 66 in member 56. The lower portion of said chamber 66 between the discharge end of duct 65 and outflow tube 12, is formed with a coarse spiral thread or rib 66^a so as to impart whirling movement to and thereby, in effect, accelerate the flow of the water as it passes into said outflow tube.

Seated in the upper portion of the extension 56 above chamber 66 is a short tube 66^b the upper end of which provides a seat for a valve 66^c, which is carried by the lower end of one of the legs of an inverted U-shaped tube 66^d.

The other leg of this tube extends downward to a position adjacent the extension 56 and terminates in a horizontal plane just above the low water level in the tank as shown by dotted line x in Fig. 3.

Seated in the under side of valve 66^c is a ring 66^e of rubber, fiber or the like, which is adapted to rest on the upper end of tube 66^b.

Seated in the upper portion of outflow pipe 12 is a spiral bladed deflector 72 carried by an axially disposed tube 73, which passes upward through chamber 66 and tube 66^b and into valve 66^c, said tube 73 being open at both ends. A spirally disposed web or flange 74 is mounted on tube 73 and extends from the upper end of bladed deflector 72 upward through chamber 66, past the discharge ends of ducts 64 and 65, into tube 66^b.

Secured to the upper or bight portion of tube 66^d, is an eye 75 which receives the end of an arm 76 carried by the rod 35, and that portion of the arm 76 which receives the eye is provided with an upper notch 77 and a longer lower notch 78. (See Fig. 4.)

Under normal conditions the water level within the tank occupies the approximate plane indicated by dotted line Z, Fig. 2, with float 31 resting on top of the water, causing the diaphragm 19 to close the ducts 15 and 17, due to water pressure in chamber 21 against piston 22.

Due to the elevated position of the float 31, the finger 29, acting through link 29^a, forces rod 26 and piston 25 inwardly thus maintaining packing ring 25^a on its seat 27^a thus closing port 27.

To effect the flushing function handle 38 is swung downward to rock shaft 35, thus swinging finger 34 upward to engage finger on the eccentric upper edge of notch 33 in finger 29, thus rocking said finger 29 slightly so as to move float 31 below the surface of the water. The finger 29, rod 30 and float 31 are held in their shifted positions as the end of finger 34 comes to rest in notch 32.

As finger 29 is thus rocked, piston 25 is drawn away from seat 27^a thus opening port 27 and relieving pressure in chamber 21, which permits the piston 22 and the diaphragm 19 to move away from the ends of the ducts 15 and 17, thereby opening ducts 15 and 17 to permit water from supply pipe 13 to flow through ducts 15 and 17 and thence downward through tube 18.

Some of the water thus admitted to the tube 18

passes out through apertures 46 in tube 18 to flow downward in the space between said tube and hush tube 40, and this water expands the lower portion of rubber tube 44 against the wall of the enlarged portion 39 of tube 40, thus, for the time being, cutting off the inlet of air through apertures 43.

After the water level passes below float 31, the latter lowers a short distance thereby actuating finger 29 to draw away from the engaged end of finger 34 and the latter returns to its normal position under the influence of valve 66c, tube 66d and arm 76, which parts function as counterweights as hereinafter more fully described.

The water under pressure flowing downward between tubes 18 and 40 discharges from the lower end of the latter tube to unite with the water in the tank, while the water discharging from the lower end of tube 18 discharges into tube 52, thence through tube 53, then from nozzle 54 through aperture 69 and flows downward through tube 67, to finally discharge through aperture 70 into the lower ends of ducts 63 and 65.

The action just described sets up siphonic action through the gooseneck, so that the water stored in the tank is drawn from bowl 51, up through leg 50, thence down through leg 55, into chamber 65, and thence through outflow tube 12 to the toilet fixture.

Any water from nozzle 54 which does not enter aperture 69 will unite with the water flowing through the gooseneck and a portion of this water will flow down through ducts 64 and 65 and discharge into chamber 66.

The water passing through chamber 66 into outflow tube 12 will be given a whirling motion by the rib or thread 66a also by the spiral deflectors 72 and 74 and such whirling motion is effective in bringing about a quick withdrawal of the flushing water from the tank.

As the water reaches low level in the tank (the top of bowl 51), the siphonic action is broken by air entering apertures 58 and 59 which is passed upward through member 60 and counteracts the gurgling noises that would otherwise develop as the siphonic action is terminated.

Tube 67 extends to the exterior of the gooseneck through the nut 68, and is rotatable by means of a knob 67a rigid with the upper end of the tube 67 above the gooseneck. The tube 67 should be turned so that aperture 69 receives water direct from the nozzle 54 only when low pressure water supply conditions exist, and when the pressure of the supply is high, said tube is rotated so as to move aperture 69 out of the path of travel of water from said nozzle and so that aperture 70 at the lower end of said tube directs the discharge of water away from the discharge ends of ducts 64 and 65.

Before lever 30 is tripped, eye 75 rests in notch 77 with valve 66c on its seat, the upper end of tube 66b. As rod 35 is rotated and arm 76 is raised at the beginning of the flushing function, eye 75 slips out of notch 77 and drops into the longer notch 78 and when the bottom of the latter notch contacts said eye and lifts same a short distance, tube 66d is correspondingly lifted to unseat valve 66c, thus permitting water from the tank to pass downward through tube 66b and chamber 66 to unite with the water discharging through said chamber into outflow tube 12.

As handle 33 is released after the flushing action has been started the weight of arm 76, tube 66d and valve 66c, rock shaft 35 and thereby return handle to its original position, thus restoring eye 75 to notch 77 and also lowering valve 66c into the upper end of tube 66b. After the flushing function and the siphonic action is broken as herein described, the water from tube 18 continues to flow into the tank to refill same and as float 31 rises on the surface of the water, the action of finger 29, link 29a and rod 26 restores valve 25 to its seat 27a, thus trapping water in chamber 22, and as pressure builds up therein, piston 22 acts to press diaphragm 19 onto the seats around the discharge ends of ducts 15 and 17. Pipe 41 drains the water from chamber in front of piston 25, to the upper end of hush tube 40.

Fingers 29 and 34 also link 29a, piston 25 and pin 26, are preferably formed of stainless steel, plastics or other non-corrodible and non-rusting material.

Should siphonic conditions develope, tending to draw contaminated water into the tank, such conditions will be instantly and automatically counteracted and broken by air entering the tank and its fittings through tube 73, also through apertures 43, 46 and 47.

It will be understood that minor changes in the size, form and construction of the various parts of my improved flushing tank and valve may be made and substituted for those herein shown and described, without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. In toilet fixture flushing apparatus of the character described, a tank, a supply pipe connected thereto, an outflow pipe leading from said tank, a valve connected to said supply pipe, a float for actuating said value, an inverted U-shaped tubular member, means providing a duct from said valve to the lower end of one of th legs of said inverted U-shaped tubular member, the other leg of said inverted U-shaped tubular member being connected to said outflow tube, manually operable means for actuating said float to open said valve, there being an opening in the wall of the inverted U-shaped tubular member, a valve normally closing said opening, and operating connections between said last mentioned valve and said manually-operable float actuating means, which connections include an inverted U-shaped open-ended tube, the lower end of one leg of which is connected to said last mentioned valve.

2. In toilet fixture flushing apparatus of the character described, a tank, a supply pipe connected thereto, an outflow pipe leading from said tank, a valve connected to said supply pipe, a float for actuating said valve, an inverted U-shaped tubular member, means providing a duct from said valve to the lower end of one of the legs of said inverted U-shaped tubular member, the other leg of said inverted U-shaped tubular member being connected to said outflow tube, manually operable means for actuating said float to open said valve, there being an opening in the wall of the inverted U-shaped tubular member above said outflow tube, a valve normally closing said opening, and operating connections between said last mentioned valve and said manually-operable float-actuating means, which connections include an inverted U-shaped open-ended tube, an eye carried thereby, and an arm having a pair of notches, one disposed above the other, for receiving said eye.

3. In toilet fixture flushing apparatus of the

character described, a tank, a supply pipe connected thereto, an outflow pipe leading from said tank, a valve connected to said supply tank, a float for actuating said valve, an inverted U-shaped tubular member, means for providing a duct from said valve to the lower end of one of the legs of said inverted U-shaped tubular member, the other leg being connected to said outflow tube, a tube connecting the upper, central portion of said inverted U-shaped tubular member with the lower portion of the leg thereof which is connected to the outflow tube, a tube mounted for rotation in said connecting tube and provided in its upper portion with an inlet opening, and means providing a duct leading from the lower end of the duct which leads from the valve to the lower end of one of the legs of said inverted U-shaped member upwardly to the upper portion of said inverted U-shaped member for discharging water into the inlet opening in said rotatively mounted tube.

4. In a flushing apparatus, a tank having an inlet and an outlet for water, an inverted U-shaped tubular siphon member within said tank having one end connected with said outlet and the other end opening into said tank, connections from said inlet to said open end of said siphon member, means for directing water from said connections upwardly through said open end of said siphon member to induce siphonic action, supplementary means for inducing siphonic action within said siphon member, said supplementary means comprising a tube extending downwardly within said tank and having its lower end opening within said end of said siphon member which is connected to said tank outlet, said lower end of said tube being in position to jet water issuing therefrom toward said outlet and thereby supplement siphonic action within said siphon member, and means for directing water under pressure from said inlet into the upper portion of said tube.

5. In a flushing apparatus, a tank having an inlet and an outlet for water, an inverted U-shaped tubular siphon member within said tank having one end connected with said outlet and

the other end opening into said tank, connections from said inlet to said open end of said siphon member, means for directing water from said connections upwardly through said open end of said siphon member to induce siphonic action, supplementary means for inducing siphonic action within said siphon member, said supplementary means comprising a tube mounted in said siphon member for rotary movement about its own axis and extending downwards from position within the upper portion of said siphon member and having its lower end opening within said end of said siphon member which is connected to said tank outlet, said tube having an opening therein adjacent its upper end within said upper portion of said siphon member, means for directing water under pressure from said inlet toward the upper end of said tube, means for rotating said tube to move said opening adjacent the upper end thereof optionally into or out of position to receive water from said directing means, and means associated with the lower end of said tube for jetting water issuing therefrom towards said outlet to supplement siphonic action within said siphon member.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
904,228	Richardson	Nov. 17, 1908
1,625,311	Gondolf	Apr. 19, 1927
1,839,424	Tracey	Jan. 5, 1932
1,984,394	Candee	Dec. 18, 1934
2,213,753	Teahen	Sept. 3, 1940
2,228,552	Arbogast	Jan. 14, 1941
2,230,235	Collison	Feb. 4, 1941
2,240,102	Textor	Apr. 29, 1941
2,412,691	Owens	Dec. 17, 1946

FOREIGN PATENTS

Number	Country	Date
460,847	Germany	June 6, 1928