April 22, 1930. J. C. OWENS 1,755,558

FLUSHING VALVE

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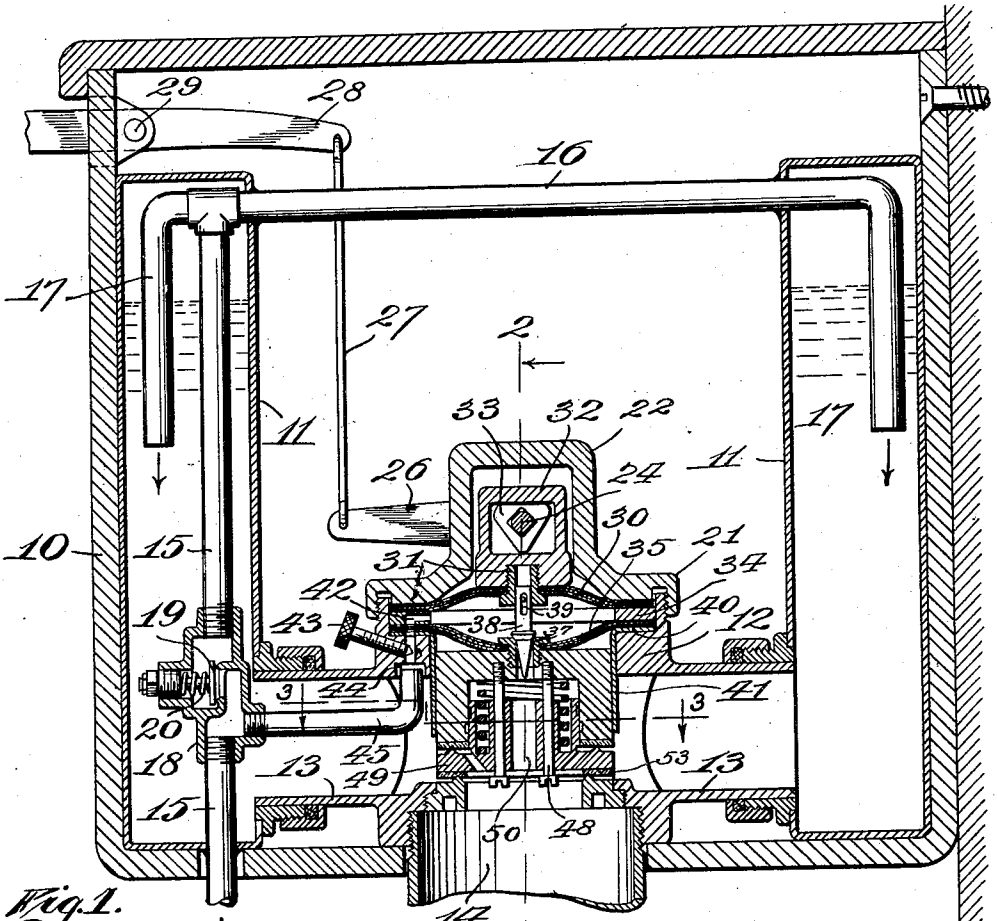


Fig. 1.

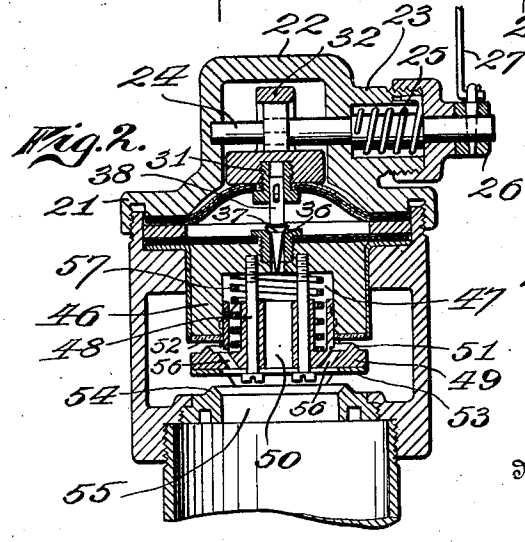


Fig. 2.

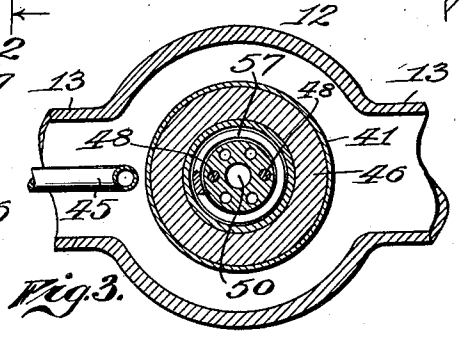


Fig. 3.

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Fig. 4.

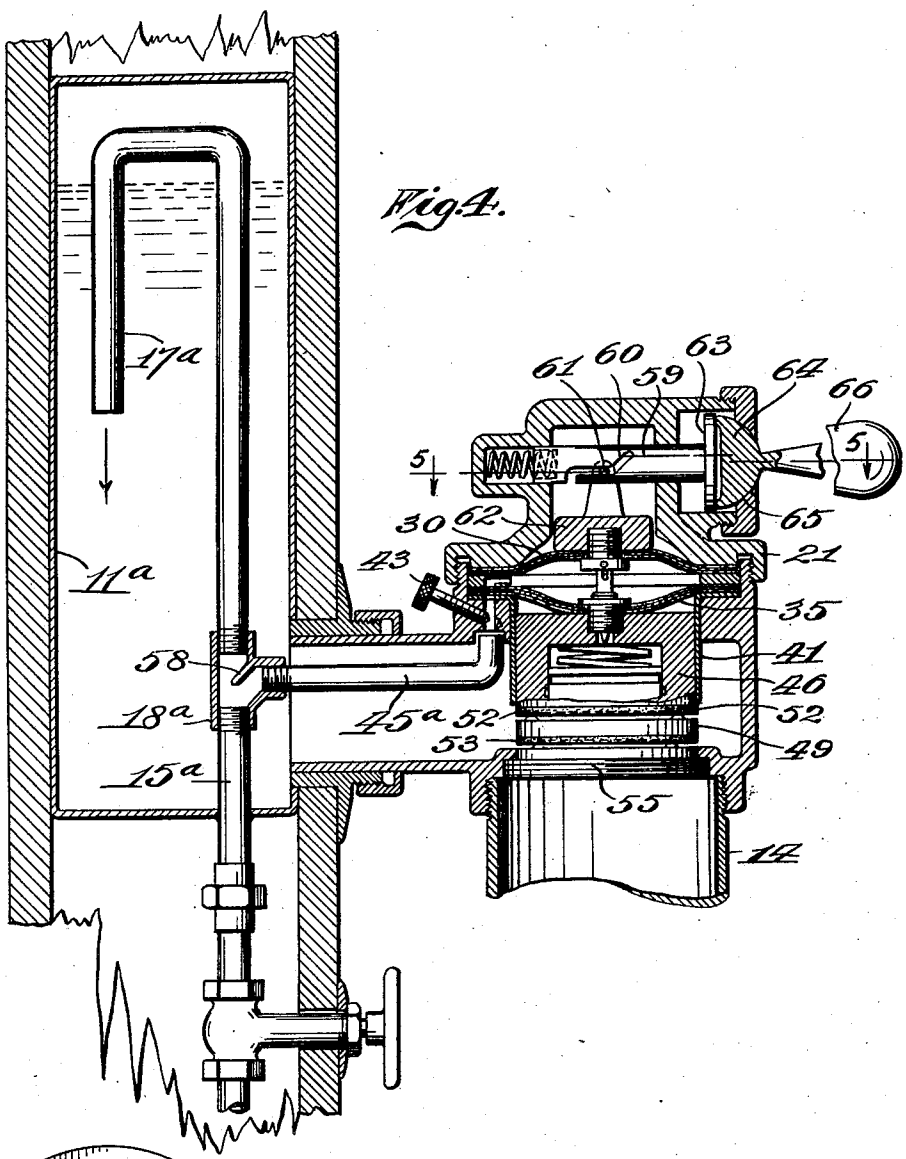
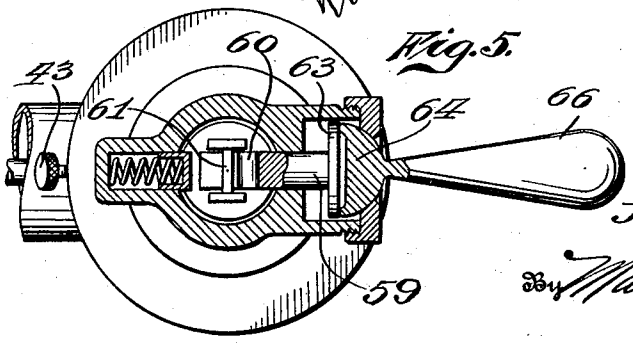


Fig. 5.



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FLUSHING VALVE

Application filed May 29, 1929. Serial No. 366,949.

My invention relates to a flushing valve that is especially designed for use in connection with toilet bowls and the like, and the principal objects of my invention are, to generally improve upon and simplify the construction of the existing forms of toilet tank flushing valves, to provide a valve of the character referred to that may be inexpensively manufactured and installed, to provide a flush valve that is practically silent in operation during flushing action and during the refilling of the tank, further to provide a device of the character referred to that is economical in the use of water and which is non-leaking when properly installed.

Further objects of my invention are, to provide a flush valve wherein the pressure of the water from the source of supply, for instance the city water mains, is utilized for effecting a forcible discharge of the water contained within the tank in which the valve is located, thereby materially increasing the effectiveness of the valve in accomplishing the flushing operation, and, further, to provide a flush valve wherein the pressure of the water from the source of supply is utilized for compressing air and which latter is effective, when the valve is opened, in adding force to the flushing water as it discharges through the valve.

Further objects of my invention are, to provide a flush valve that will operate effectively under comparatively low pressures as well as high pressures, to provide a flush valve that is strong and substantial in construction and which has comparatively few operating parts, thereby minimizing the liability of this valve becoming inoperative and ineffective due to failure of the parts to function properly, and further to provide a flush valve that may be located within the standard forms of water tanks that are now generally used in connection with toilet bowls, or in connection with tanks that are located in a building wall.

My present invention is an improvement on the pressure flushing device disclosed in U. S. Letters Patent No. 1,566,769, issued to me December 22nd, 1925, and also my copending patent applications filed July 16th, 1926, Serial No. 122,815 and Serial No. 273,120, filed April 26th, 1928.

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

Fig. 1 is a vertical section taken through the center of a tank such as is ordinarily used in connection with toilet bowls and showing my improved flush valve associated with said tank.

Fig. 2 is a vertical cross section taken on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 1.

Fig. 4 is a vertical section showing my improved flush valve associated with a tank that is located within a building wall.

Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 4.

Referring by numerals to the accompanying drawings which illustrate a practical embodiment of my invention, 10 designates a tank of the type that is usually employed in connection with toilet bowls and arranged within this tank, which forms a housing for my improved flush valve, is a pair of tanks 11, preferably formed of sheet metal, and which tanks are made air and water tight so as to contain water and air under pressure.

Located in the lower portion of tank 10 is a vertically disposed cylindrical valve body 12 and leading from opposite sides thereof to the lower portions of the tanks 11 are short tubular members 13.

Screw-seated in the lower end of the valve body 12 and leading downwardly through an opening in the bottom of tank 10 is a water outlet or discharge pipe 14 that leads downwardly to the bowl with which the flush valve is associated.

Leading through an opening in the bottom of tank 10 and into one of the tanks 11, is a water supply pipe 15 that is connected to a suitable source of supply, for instance the city mains, and the upper end of this pipe which terminates in the upper end of the tank in which it is located, is connected by

a T to a horizontally disposed pipe 16, the ends of which are extended vertically downward, as designated by 17 in the upper portions of the tanks 11.

Located in pipe 15 and within the lower portion of the tank 11 in which said pipe 15 is located, is a housing 18 containing an adjustable check valve 19 that is arranged so that it opens to permit water to flow upwardly through pipe 15 and which is also effective in enabling the flush valve to operate with relatively low pressures.

Associated with this check valve is a spring 20 that normally retains the valve upon its seat and the tension of which spring may be adjusted so as to regulate the opening movement of said valve.

Screw-seated on the upper end of the valve body 12 is a cap 21, and formed integral with the center thereof is an upwardly projecting housing 22.

Extending through this housing and through an air tight bearing 23 on the side thereof, is a shaft 24, and mounted thereon, within the bearing 23, is a torsional spring 25 that yieldingly resists rotary motion of the shaft in one direction. Secured on the outer end of this shaft 24 is an arm 26, to the outer end of which is connected a vertically disposed link 27 and the upper end of the latter is connected to the inner end of a hand lever 28 that projects through an opening in the upper portion of tank 10, and said lever being fulcrumed at 29 to the wall of said tank 10.

The parts just described provide means for manually actuating the flush valve through a partial rotation of shaft 24 and after said shaft has been partially rotated it will be returned to its normal position by spring 25.

Arranged within the upper portion of the valve body 12 and retained therein by the cap 21, is a diaphragm 30 in the form of a disc of resilient metal that is covered with rubber or rubber composition, and extending upwardly through the center of this diaphragm is a short tubular member 31 that is externally threaded and screw-seated on the threaded upper portion of said member is the lower portion of a yoke 32 that occupies the chamber within the housing 22.

Secured on shaft 24 and disposed within the yoke 33 is a substantially triangular cam 33, one of the flat faces of which normally rests against the flat under face of the upper portion of yoke 32.

The edge of diaphragm 30 rests upon a ring 34 that is positioned in the upper portion of body 12 and the ring rests on the edge of a diaphragm 35 that comprises a disc of resilient metal covered with rubber or rubber composition and the central portion of this diaphragm 25 curves downwardly in opposition to the upwardly curved central portion of diaphragm 30.

Extending downwardly through the center of the diaphragm 35 is a short tubular member 36 and normally resting on a seat that is formed at the upper end of the opening through this member is a small valve 37 that is carried by a stem 38 and the upper portion of this stem is arranged for sliding movement within the tubular member 31, there being a pin and slot connection 39 between the upper portion of the valve stem 38 and said tubular member 31.

The edge of diaphragm 35 rests upon a flange 40 that is formed integral with and projects outwardly from the upper end of a cylinder 41, which latter extends downwardly from the upper portion of the valve body 12 into the chamber within said body between the inner ends of tubular members 13.

This cylinder 41 is preferably composed of non-corrodible metal or it may be formed of glass or vitrified earthen material having a glazed surface.

Formed through the upper portion of the valve body 12 through the flange 40 and the ring 34 is a small duct 42, the upper end of which communicates with the chamber between the diaphragm 30 and 35 and seated in the upper portion of the wall of valve body 12 is an adjusting screw 43, the inner end of which is adapted to enter the duct 42 and control the flow of water therethrough.

The lower end of duct 42 is enlarged to form a baffle chamber 44 and terminating within said baffle chamber is the upturned inner end of tube 45, the outer end of which is connected to valve housing 18 at a point below the check valve 19 therein.

Arranged for sliding movement within cylinder 41 is a short cylindrical block 46 of non-corrodible metal, glass, or porcelain having a glazed surface. Formed in the underside of this block is a recess 47, the upper end of which is in communication with the opening through tubular member 36, the lower portion of which latter, is screw-seated in the upper end of said block.

Seated in the upper portion of block 46 and extending downwardly through the chamber 47 are vertically disposed pins or screws 48 and arranged to slide freely thereupon is a valve 49, provided through its center with an opening 50.

Formed on top of this valve 49 is a concentric rib 51 that is adapted to engage a seat or gasket 52 that is carried by the under side of the block 60.

Carried by the under face of valve 49 is a gasket 53 that is adapted to engage on a concentric rib 54 that projects upwardly from a ring 55 and the latter being screw-seated in the lower portion of valve body 12 just above the outlet pipe 14.

Formed through the valve 49, inside the rib 51 are ports 56 and which ports are inclined inwardly so that their lower ends communi-

cate with the opening through ring 55 inside the rib 54.

Arranged in the chamber 47 in cylindrical member 46, is an expansive coil spring 57 that normally exerts downward pressure on valve 49.

Under normal conditions or while my improved valve is at rest the various parts of the device occupy the positions as illustrated in Fig. 1. The water within the tanks 11 is under the same pressure as the water within the city mains or source of supply and the air that is trapped in the upper portions of the tanks 11 above the water therein is under the same degree of pressure as the water.

Water under pressure occupies the chamber between the diaphragms 30 and 35, thereby forcing said diaphragms apart and holding cylinder 46 and valve 49 at their downward limits of movement so that gasket 53 rests on ring 54 and gasket 52 rests on rib 51, thereby cutting off the flow of water downwardly through outlet pipe 14.

To actuate the valve, lever 28 is manually operated and through connections 27 and 26, shaft 24 is partially rotated and following the movement of triangular cam 33, yoke 32 will be slightly elevated and through pin and slot connection 39 stem 38 will be raised a short distance so as to withdraw valve 37 from its seat at the upper end of tubular member 36.

Following the unseating of this valve 37, which functions as a pilot valve, water under pressure will discharge from the chamber between the diaphragms 30 and 35 downwardly through tubular member 36, thence through chamber 47, and thence through opening 50 into outlet pipe 14. As the water pressure within the chamber between the diaphragms 30 and 35 is thus initially reduced, the diaphragm 35 will return to its normal straight or flat condition, thereby elevating cylindrical body 36 and valve 49 carried thereby, so that when said valve 49 is elevated as shown in Fig. 2, the outlet through ring 55 will be open so as to permit the outward flow of water under pressure from the tanks 11 and this water discharging through pipe 14 will effect the desired flushing action through the bowl with which the valve is connected. This discharge of water from the tanks 11 will lower the pressure of the water, thereby permitting the adjustable check valve 19 to open so that water at the maximum pressure may flow upwardly through pipe 15, thence through pipe 16 and which water will discharge downwardly from the end portions 17 of the pipes 16 and thus the flow of the water from the tanks 11 will be accelerated during the flushing action.

When the pressure upon lever 28 is relieved, spring 25 will rotate shaft 24 to its normal position so that cam 33, acting upon yoke 32, will move the same and the diaphragm 30 downward to their normal positions and following this action water will flow upward through pipe 15 past check valve 19, which is forced open and this water will discharge from ends of pipe 16 to refill the tanks 11 and the chambers within tubular members 13 and valve body 12.

A portion of the water from pipe 15 will flow through pipe 45, thence through duct 42 that is controlled by screw 43 and this water entering the chamber between the diaphragms 30 and 35 will, as the pressure within said chamber is built up, force diaphragm 35 downwardly and consequently move the cylindrical body 36 downward so that gasket 53 on the underside of 49 will engage its seat which is formed by the rib 54 on ring 55.

Thus the main outlet opening is closed slightly before the body 46 reaches its downward limit of movement for valve 49 carrying gasket 52 is forced downward under the influence of expansive spring 57 and following the seating of the valve 49, as just described, any water that remains in the lower portion of the tanks may discharge through ports 56, which remain open until gasket 52 on the under side of valve body 46 engages the seat formed by the rib 51 and which action occurs when the body 46 is forced to its downward limit of movement by the pressure that is built up within the chamber between the diaphragms 30 and 35.

Thus after the valve is closed and sufficient water has entered the tanks 11 to compress air in the upper portions of said tanks to a pressure equal to that of the pressure of the water supply the various parts of the valve will be in proper position for a subsequent operation.

In Figs. 4 and 5 I have illustrated my improved flush valve associated with a tank that is located in a building wall, preferably to the rear and above the bowl with which the valve is associated. In this construction the water supply pipe 15^a leads upwardly through the tank 11^a that is located in the wall and the upper end of said pipe is bent downwardly to form a depending nozzle 17^a.

In this form of valve it may be found desirable to dispense with the adjustable check valve 19 and form in the housing 18^a that is located in pipe 15^a an inclined deflector 58 that is arranged to deflect a part of the water upwardly through the supply pipe into and through the pipe 45^a that leads to the port that communicates with the chamber between the diaphragm.

In this form of valve a spring held plunger 59 is arranged for operation in the housing that projects upwardly from the cap 21 and formed in said plunger is a slot having an inclined portion 60. Passing through this slot is pin 61 that is seated in a member 62 that bears on top of the upper diaphragm and which corresponds to yoke 32. Carried by

the outer end of plunger 59 is a disc 63 and bearing against this disc is the beaded edge of a hemispherical body 64 that is arranged for operation in a socket blade 65 and said body being carried by the inner end of a handle 66.

To operate this form of flush valve handle 66 is engaged and moved vertically or laterally and the head 64 on the inner end of said handle operating in its socket will bear against disc 63 and move the latter and the plunger 59 inwardly so that pin 61 rides up the inclined portion 60 of the slot in said plunger, thereby elevating member 62 that is connected to the upper one of the diaphragms and following this action the flush valve will operate as hereinbefore described.

Thus it will be seen that I have provided a flush valve that is relatively simple in construction, inexpensive of manufacture and which is very effective in performing the functions for which it is intended.

Among the especially desirable features of my invention are, the provision of means whereby the force of jets of water under pressure are utilized for accelerating the discharge of water through the valve during flushing operations, the means whereby the pressure of water within the tank is utilized for closing the valves that control the outlet of water from the tank and the various parts that are combined to bring about the proper sequence the movements of the various operating parts of the valve when same is opened and closed.

In some parts of the country the character of water supplied for domestic purposes is such that metal exposed to the water will corrode in a comparatively short time and where such conditions exist the cylinder 41, the valve block 46 and valve 49 may be formed of noncorrodible metal or of glass or porcelain having glazed surfaces and thus the corroding action of the water is resisted on these parts which are essential to the successful operation of the valve.

A further advantage of my improved construction is that the valve will operate with comparatively low pressure for by providing the adjustable spring held check valve 19 the water that enters the tank through pipe 15 will, before opening the valve 19, pass through pipe 45 into the chamber between the diaphragms, thereby building up sufficient pressure to cause the valve to function properly before the low water pressure opens the spring held check valve 20 and passes upwardly into the pipe 16 having the depending end portions 17.

It will be understood that minor changes in the size, form and construction of the various parts of my improved flush 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. The combination with a pair of airtight tanks, of a housing connecting the lower portions of said tanks, a discharge pipe leading from the intermediate portion of said housing, a manually operable flush valve normally closing said outlet pipe, a water pressure supply pipe leading to the upper ends of the tanks and the ends of which supply pipe within the tanks are extended downwardly so as to direct jets of water downwardly within the tanks when the flush valve is open to permit water to discharge from said tanks.

2. The combination with a pair of airtight tanks, of a housing connecting the lower portions of said tanks, a discharge pipe leading from the intermediate portion of said housing, a manually operable flush valve normally closing said outlet pipe, a water pressure supply pipe leading to the upper ends of the tanks, the ends of which supply pipe within the tanks are extended downwardly so as to direct jets of water downwardly within the tanks when the flush valve is open to permit water to discharge from said tanks and means for utilizing pressure of the water from the supply pipe to normally maintain the flush valve in closed position.

3. In a flushing device, a tank, an outlet pipe leading therefrom, means for supplying water under pressure to said tank, a pair of cooperating valves controlling the flow of water through said outlet pipe, one valve being located above the other, a spring arranged between said valves, a pair of diaphragms arranged above the upper valve and a valve connected to the upper one of said diaphragms and controlling an outlet opening from the chamber between said diaphragms.

4. In a flushing device, a tank, an outlet pipe leading therefrom, means for supplying water under pressure to said tank, a pair of cooperating valves controlling the flow of water through said outlet pipe, one valve being located above the other, a spring arranged between said valves, a pair of diaphragms arranged above the upper valve, a valve connected to the upper one of said diaphragms and controlling an outlet opening from the chamber between said diaphragms, and manually operable means for elevating the upper one of said diaphragms and the valve connected thereto.

5. In a flushing device, a tank, an outlet pipe leading therefrom, means for supplying water under pressure to said tank, a pair of cooperating valves controlling the flow of water through said outlet pipe, one valve being located above the other, a spring arranged between said valves, a pair of diaphragms arranged above the upper valve, a valve connected to the upper one of said diaphragms

and controlling an outlet opening from the chamber between said diaphragms, and controllable means for admitting water under pressure into the chamber between said diaphragms.

6. In a flushing device, a tank, an outlet pipe leading therefrom, means for supplying water under pressure to said tank, a pair of cooperating valves controlling the flow of water through said outlet pipe, one valve being located above the other, a spring arranged between said valves, a pair of diaphragms arranged above the upper valve, a valve connected to the upper one of said diaphragms and controlling an outlet opening from the chamber between said diaphragms and outlet ports formed through the lower one of said valves.

7. The combination with a tank, of a flushing device for controlling the discharge of water from said tank, which flushing device comprises a housing provided with an outlet opening, said opening being provided with a valve seat, a pair of cooperating valves for controlling said outlet opening, the lower one of which valves normally rests on said seat, a pair of diaphragms arranged in the upper portion of the housing, the lower diaphragm being connected to the upper one of the valves, the lower diaphragm being provided with an outlet opening and a valve carried by the upper diaphragm and normally closing the outlet opening in the lower diaphragm.

8. The combination with a tank, of a flushing device for controlling the discharge of water from said tank, which flushing device comprises a housing provided with an outlet opening, said opening being provided with a valve seat, a pair of cooperating valves for controlling said outlet opening, the lower one of which valves normally rests on said seat, a pair of diaphragms arranged in the upper portion of the housing, the lower diaphragm being connected to the upper one of the valves, the lower diaphragm being provided with an outlet opening, a valve carried by the upper diaphragm and normally closing the outlet opening in the lower diaphragm and controllable means for admitting water pressure into the chamber between said diaphragms.

9. The combination with a tank, of a flushing device for controlling the discharge of water from said tank, which flushing device comprises a housing provided with an outlet opening, said opening being provided with a valve seat, a pair of cooperating valves for controlling said outlet opening, the lower one of which valves normally rests on said seat, a pair of diaphragms arranged in the upper portion of the housing, the lower diaphragm being connected to the upper one of the valves, the lower diaphragm being provided with an outlet opening, a valve carried by the upper diaphragm and normally closing the outlet opening in the lower diaphragm and manually operable means for lifting the central portion of the upper diaphragm and the valve connected thereto.

10. The combination with a tank, of a flushing device for controlling the discharge of water from said tank, which flushing device comprises a valve housing provided with an outlet, a valve seat around said outlet, a valve normally resting on said valve seat, a cylindrical wall within the housing above said valve, a second valve arranged for movement within said cylindrical wall and normally resting on the lower valve, a spring arranged between said valves, a pair of diaphragms arranged in the housing above the uppermost valve and controllable means for admitting water under pressure into the chamber between said diaphragms.

11. The combination with a tank, of a flushing device for controlling the discharge of water from said tank, which flushing device comprises a valve housing provided with an outlet, a valve seat around said outlet, a valve normally resting on said valve seat, a cylindrical wall within the housing above said valve, a second valve arranged for movement within said cylindrical wall and normally resting on the lower valve, a spring arranged between said valves, a pair of diaphragms arranged in the housing above the uppermost valve, controllable means for admitting water under pressure into the chamber between said diaphragms and a valve carried by the upper diaphragm and normally closing an outlet port in the lower diaphragm.

12. The combination with a tank, of a flushing device for controlling the discharge of water from said tank, which flushing device comprises a valve housing provided with an outlet, a valve seat around said outlet, a valve normally resting on said valve seat, a cylindrical wall within the housing above said valve, a second valve arranged for movement within said cylindrical wall and normally resting on the lower valve, a spring arranged between said valves, a pair of diaphragms arranged in the housing above the uppermost valve, controllable means for admitting water under pressure into the chamber between said diaphragms, a valve carried by the upper diaphragm and normally closing an outlet port in the lower diaphragm and manually operable means for raising the central portion of the upper diaphragm and the valve carried thereby.

13. The combination with a tank, of a flushing device for controlling the discharge of water from said tank, which flushing device comprises a housing having an outlet opening, a pair of cooperating valves controlling said outlet opening, a pair of diaphragms arranged in the housing above said valves, the lower diaphragm being connected

to the upper one of the valves, controllable means for admitting water under pressure into the chamber between said diaphragms and a valve carried by the upper one of the diaphragms and controlling an outlet opening in the lower diaphragm.

14. The combination with a tank, of a flushing device for controlling the discharge of water from said tank, which flushing device comprises a housing having an outlet opening, a pair of cooperating valves controlling said outlet opening, a pair of diaphragms arranged in the housing above said valves, the lower diaphragm being connected to the upper one of the valves, controllable means for admitting water under pressure into the chamber between said diaphragms, a valve carried by the upper one of the diaphragms and controlling an outlet opening in the lower diaphragm and manually operable means for raising the central portion of the upper diaphragm and the valve that is carried thereby.

In testimony whereof I affix my signature.

JESSE C. OWENS.