May 14, 1935. W. A. LESTER 2,001,390

FLUSHING VALVE MECHANISM

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Fig. 1.

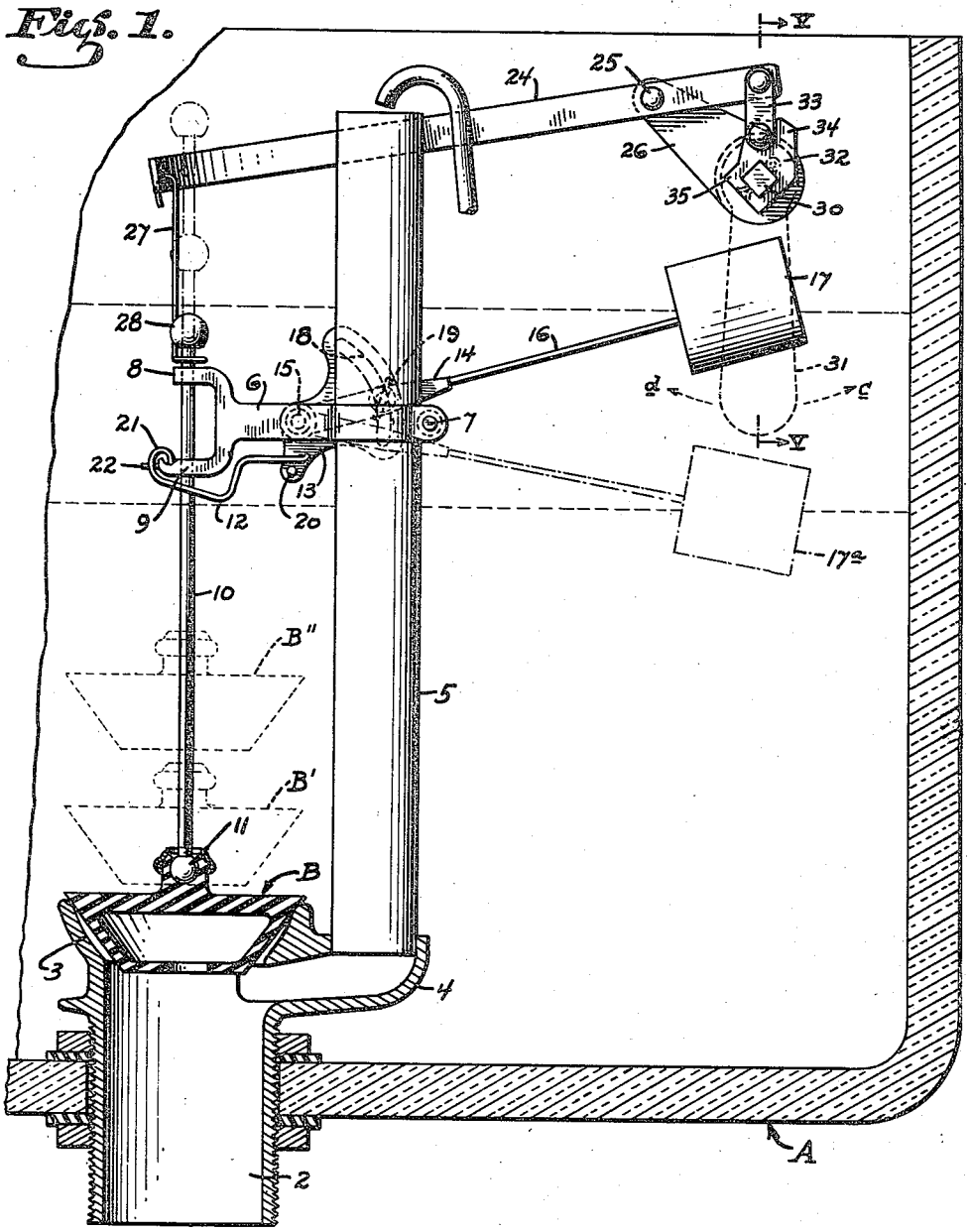

Fig. 2.

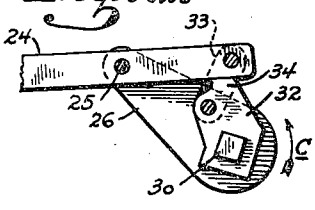

Fig. 3.

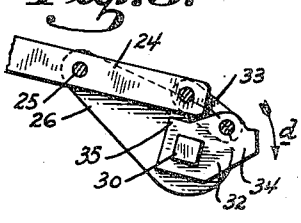

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Fig. 4.

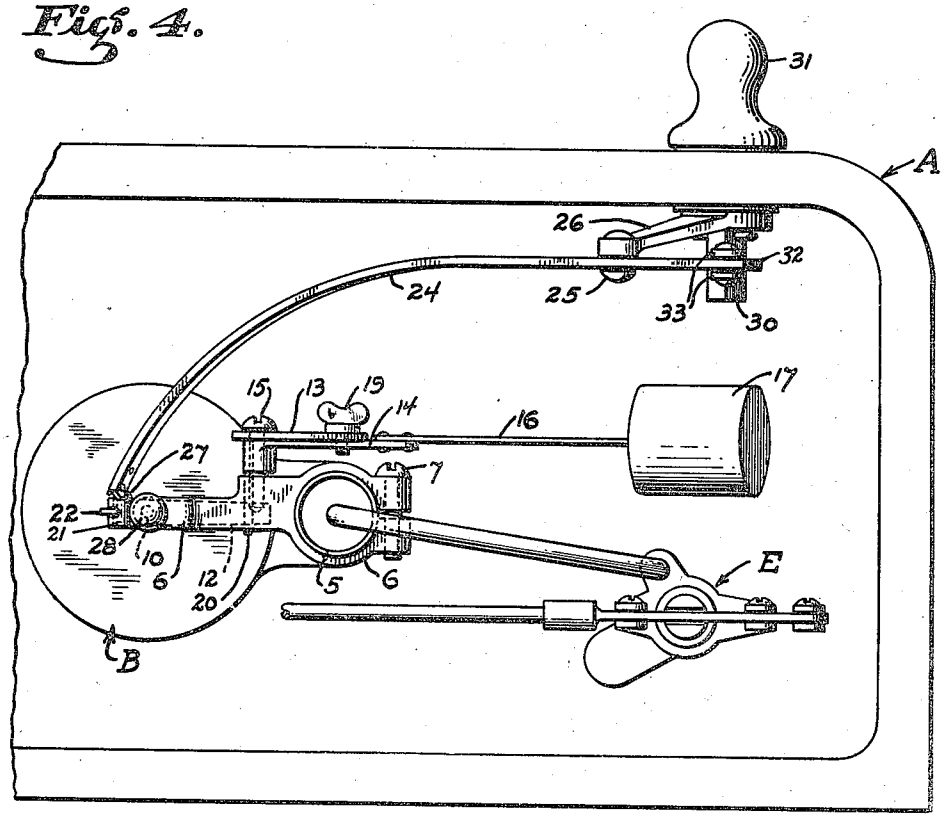


Fig. 6.

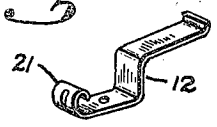


Fig. 5.

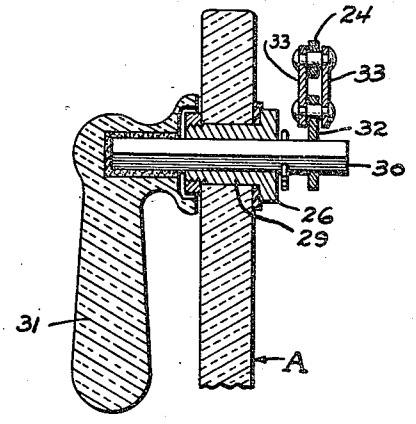


Fig. 7.

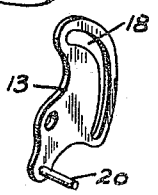
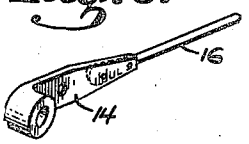


Fig. 8.



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FLUSHING VALVE MECHANISM

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Application July 7, 1934, Serial No. 734,176

5 Claims. (Cl. 4—67)

This invention relates to a flushing valve and particularly to a means whereby the amount of water used for flushing a toilet bowl, or the like, may be controlled.

Practically all toilet bowls in use today are equipped with a flushing tank and a valve mechanism whereby the flow of water from the tank to the bowl is controlled. The quantity of water used in each flushing operation is considerable as the amount of water employed must not only be sufficient to completely flush the bowl but must also be sufficient to assist in carrying matter removed from the bowl through the sewer pipes connected therewith.

The same quantity of water, usually from six to eight gallons, passes through the bowl during each flushing operation and is a source of considerable waste as only a small amount of water will suffice in many instances; for instance, if the bowl is used for urination only, or if a person merely expectorates into the bowl, or throws a cigarette stub, or the like, therein, the amount of water used for flushing could obviously be very materially reduced and considerable saving of water would result.

The object of the present invention is generally to improve and simplify the construction and operation of flushing valves, and particularly to provide a valve and an actuating mechanism therefor whereby the amount of water used in the flushing operation may be varied.

The flushing valve and the mechanism actuating the same is shown by way of illustration in the accompanying drawings, in which—

Fig. 1 is a central vertical section of the flushing tank, said view showing a major portion of the valve actuating mechanism in side elevation.

Fig. 2 is a detail view and side elevation partially in section of the mechanism whereby the main flushing lever is actuated, said view showing the position assumed by said mechanism when the bowl is to be partially flushed.

Fig. 3 is a similar view showing the position of the actuating mechanism when the bowl is to be fully flushed.

Fig. 4 is a plan view of Fig. 1.

Fig. 5 is a vertical section taken on line V—V of Fig. 1, showing the manually controlled actuating handle and a portion of the mechanism actuated thereby.

Fig. 6 is a perspective view of the valve rod gripping clutch.

Fig. 7 is a perspective view of the bell crank whereby the tripping clutch is actuated.

Fig. 8 is a perspective view of the float actuated lever whereby the bell crank shown in Fig. 7 is operated.

Referring to the drawings in detail, and particularly Figs. 1 and 2, A indicates a flushing tank of suitable size and make, in the bottom of which is secured an outlet or flushing pipe 2 which is connected at its lower end with a toilet bowl, or the like, in any suitable manner. The upper end of the flushing pipe terminates in a valve seat 3 to receive a valve B, whereby the flow of flushing water is controlled. Formed just below the valve seat 3 is a conduit or side extension 4 and supported thereby is a standard form of overflow pipe 5. Adapted to be slipped over the upper end of the pipe 5 is a bracket 6 which is secured at any desired elevation with relation to the valve seat by means of a clamping screw 7. The outer end of the bracket is fork-shaped, as shown, to form a pair of guide bearings 8 and 9 through which extends a vertically disposed valve rod 10. This rod has a snug fit in the bearings 8 and 9 and serves as a support for the valve B, there being a ball and socket connection 11 between the rod and the valve as will hereinafter be more fully described.

The bracket 6 serves several functions: first that of a guide for the valve rod 10; secondly, it functions as a support for a gripping lever or clutch generally indicated at 12; third, it functions as a support for a bell crank generally indicated at 13; and fourth, it functions as a pivotal support for a float actuated lever 14. The lever 14 pivots on a pin or a like bearing member 15 secured at one side of the bracket. It is provided with an extended arm or rod 16 on the outer end of which is secured a float 17. The bell crank 13 is arcuate at one end and an arcuate slot 18 is formed therein. A clamping screw 19 extends through the slot and the arm 14 and forms a means whereby the bell crank and the arm 14 may be secured with relation to each other so as to function as one lever. The clamping screw 19 and the slot 18 form an adjustable connection between the two levers whereby the position of the levers with respect to each other may be changed, this being important as the amount of water employed during the partial flushing is regulated thereby as will hereinafter appear.

The other arm of the bell crank 13 extends in a downward direction and carries a crank pin 20 and this pin is engageable with the free end of the gripping arm or clutch 12. This arm is nothing more or less than a flat strip of metal bent in the shape shown. Its outer end terminates in

a hook 21 and this hook forms a pivotal support for the gripping lever. The valve rod 10 extends therethrough and when the gripping lever is free with relation to the crank pin 20 it assumes an angular position and as such grips and clutches the rod, but when the free end of the gripping lever is raised by the crank pin 20 the gripping action is released and the valve and rod are free to move vertically in a downward direction. The hooked end of the gripping arm is slotted and a pin 22 extends therethrough. The pin and slot cooperate to guide the gripping arm and to secure it against lateral movement. Suffice it to say, that the clutch or gripping lever as illustrated is disposed below the bracket and engages the valve rod 10 at a point below the bracket. The pivotal point 21 of the gripping lever is disposed above the point of contact with the rod and the free end of the gripping lever, which is actuated by the crank pin 20, is also disposed at a point above the contact between the lever and rod.

During the operation of flushing the toilet bowl it is necessary to lift the valve B with relation to its seat. It is the purpose of the present invention to lift the valve to assume two positions, the first position indicated by dotted lines at B', and the second position indicated by dotted lines at B''. When the valve is raised to the position indicated at B' the water contained in the flushing tank will only be partially released and this will be termed "partial flushing operation", but when the valve is raised to the position indicated at B'' the water in the tank will be substantially discharged and this will be known as "full flushing operation". In view of the fact that the valve is raised from a seat to assume either one or another of the positions shown, mechanism for raising the valve into either of these positions must be provided.

The mechanism employed in the present instance comprises a lever 24, which is pivotally mounted as at 25, on a bracket arm 26. A wire link 27 connects one end of said lever with the upper end of the rod, said rod being provided with a stop shoulder or head 28 with which the lower end of the wire link engages when the valve lifting lever 24 is raised. Extending through the side wall of the tank, see Fig. 5, is a bearing bushing 29 of standard construction having the bracket arm 26 formed integrally with its inner end. Extending therethrough is a rotatable rod 30 on the outer end of which is secured a manually controlled operating handle 31. It should be noted that while the rod 20 is square to facilitate the making of non-rotatable connections at its ends, it passes through a round bore in the bushing 29 so that it is free to rotate therein. The rod 30 may, of course, be rounded where it passes through the bushing, if desired, but the construction shown is preferred because it is less expensive and because there is no necessity for a perfect bearing surface between the rod and the bushing. Secured on the inner end of the rod is a crank arm 32, see Figs. 1, 2, 3, and 5, and connecting said crank with the free end of the lever 24 is a link 33, hence if the lever 31 is grasped and swung in one direction or another, a turning movement will be transmitted to the rod 30 and this will, in turn, swing the crank 32 and as it swings the crank will exert a pull on the link 33 and thereby impart a rocking movement to the lever 24, causing the link 27 to engage the shoulder or head 28 of the valve rod and lift it, together with the valve, away from the seat 3. The handle 31 shown in the present instance is known as a two-way handle, as it may be swung from a vertical position to either side. This is important in the present instance as when the handle 31 is swung to one side the valve will be lifted to the partial flushing position shown at B' and when swung to the other side the valve will be lifted to the full flushing position indicated at B''. This is accomplished as follows.

By referring to Fig. 1, the position of the operating handle 31 and the crank 32 actuated thereby are shown as normal or inoperative position. By swinging the arm 31 in the direction of arrow *c*, the crank 32 will swing in the same direction and the swinging movement will be limited by a stop lug 34 when this engages the underside of the arm or lever 24. By thus limiting the swinging movement the lever 24 is merely rocked sufficiently to lift the valve to the partial flushing position indicated at B'. On the other hand, if the arm 31 is grasped and swung in the direction of arrow *d*, crank 32 will swing in the same direction, the lever 24 will again be rocked on its pivot, but to a greater degree, its rocking movement being, however, limited by the stop shoulder 35 of crank 32 engaging the underside of the lever 24. When the arm 31 has been swung to its limit the valve will have been raised to the position indicated at B'' and this will insure a full or complete flushing operation.

The present mechanism accordingly provides a manually controlled actuating mechanism whereby valve B may be selectively raised to assume either one or another of two positions. This manually actuated means for selectively raising the valve being the handle 31, the crank arm 32, link 33, lever 24, and the wire link 27. Whenever the valve is raised to one position or the other it will be automatically retained in its raised position by means of the gripping lever or clutch 12, as this hangs free on its pivotal or fulcrum support 21 and as such automatically grips or clutches the rod and prevents the valve from returning to its seat. Means are accordingly provided for automatically retaining the valve in either of its raised positions when it has been manually raised.

It is now necessary to provide means for releasing the valve from either position so that it may properly close after the partial flushing operation or a full flushing operation. The means employed in the present instance is automatically actuated by means of the float 17. For instance, if the valve has been raised to the partial flushing position indicated at B' it will be retained in this position by the gripping lever or clutch 12 but as the water runs out through the outlet connection 2 the water level will rapidly decrease, float 17 will drop with it until it assumes the dotted line position indicated at 17*a*. This dropping movement of the float is transmitted as a swinging movement to the arms 13 and 14 and the crank pin 20 will, accordingly, swing to a position where it will engage the free end of the gripping arm or lever 12 and trip it, thus releasing the rod and permitting proper closing of the valve at the end of the partial flushing operation. On the other hand, if the valve is raised to the full flushing position shown at B'' it will again be automatically retained by the gripping lever or clutch 12 and it will again be released when float 17 reaches the position shown at 17*a*, but the valve will not close in this instance until the tank has been substantially flushed as it will float

or gradually settle as the water level becomes lower and lower during the discharge of the water, and it will not close until it substantially reaches the valve seat when it is pulled forcibly against the seat by the suction of the discharging water. In this connection it is important to point out that the valve indicated at B is only partially buoyant; that is, it is counterweighted in any suitable manner so as to be just barely buoyant, for instance, by thickening the walls of the valve, or otherwise, and as it is barely buoyant it will obviously be pulled against the seat 3 by the suction action of the discharging water when raised to the position indicated at B', but when raised to the position indicated at B'' it will be out of the range of such suction action and will not be pulled by suction against the seat until the water level has reached such a low point as to affect it. The efficiency of a flushing operation depends upon the force and volume of water delivered to the bowl; that is, as large a volume as possible should be delivered to the bowl in a short period of time and with a sudden rush. To accomplish this the valve B must be lifted a sufficient distance above the outlet to permit the water in the tank to freely discharge. If a buoyant valve should be employed it would be impossible to lift it sufficiently high to permit a free discharge as the valve would have to remain in the immediate zone of suction produced by the discharging water to prevent it from floating to the surface, but by employing a valve which is only partially or barely buoyant as here disclosed it becomes possible to lift the valve sufficiently high to permit a rapid free discharge during the flushing operation, as the valve may be raised to a considerably higher point in the zone of suction without any tendency to float to the surface.

The swivel joint formed between the rod 10 and the valve B is also important, particularly when practical conditions are considered. For instance, if the valve and actuating mechanism here shown is being put out by a manufacturer, bracket 6 will obviously be designed so that the valve stem 10 will align with the center of the discharge or outlet connection 2. However, it happens that flushing tanks, outlet connections, actuating mechanisms of different types are made by numerous manufacturers. The dimensions of the parts are not standardized, hence there will be variations in the distance between the pipe 5 and the center line of the outlet connection 2. This may vary as much as one-half inch or more, hence if the mechanism here shown is installed on existing devices allowance must be made for such variations in dimensions and this is taken care of by the ball and swivel connection shown, which accordingly permits proper seating of the valve regardless of whether the valve rod 10 aligns with the outlet connection 2 or not.

The filling valve and the float actuating the same are only partially illustrated at E in Fig. 4. Its construction and operation does not interfere with the construction and operation of the flushing valve and its actuating mechanism here illustrated and for that reason only a partial illustration of the filling valve and its actuating mechanism is shown. Suffice it to say, that when the tank is being partially or fully flushed by the mechanism here illustrated the water level will rapidly lower, the float of the filling valve will obviously drop with the lowering water level and as such open the filling valve and the amount of water discharged during a partial or full flushing operation will automatically be replaced when the valve B is closed.

The main feature of the present invention is that of saving water. This is exceedingly important in many localities as the water is scarce and often expensive. Water is saved by being capable of only partially discharging the flushing tank and it is also saved by not completely emptying the tank during the full flushing operation, that is, valve B will seat during the full flushing operation before the tank is completely empty, as due to its only partially bouyant condition it will be sucked against the seat before the tank is empty; hence preventing all the water from discharging and thus saving this additional amount during each full flushing operation.

While certain features of the present invention are more or less specifically described, I wish it understood that various changes may be resorted to within the scope of the appended claims. Similarly, that the materials and finish of the several parts employed may be such as the manufacturer may decide, or varying conditions or uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. In combination with a flush valve having a stem and a bracket to receive and guide said stem, a pivoted clutch member having a hole formed therein and embracing the stem in a manner to retain the valve in a partially opened position, and means to release said clutch member.

2. In combination with a flush valve having a stem and a bracket to receive and guide said stem, a clutch member pivoted to said bracket and having a hole therein embracing the stem whereby it will clutch the valve against closing movement, and means for moving said clutch member to a non-clutching position.

3. In a flush tank, the combination with a flush valve having a stem and a bracket to guide said stem, of a clutch carried by said bracket to retain the valve in a partially open position, and a float device supported by said bracket and operable upon lowering of the liquid level in the tank to release said clutch.

4. In a flush tank, the combination with a flush valve having a stem and a bracket forming a guide for said stem, of a clutch comprising a member perforated to embrace the stem and pivoted on the said bracket to grip the stem when the valve is raised and retain it in a position within the zone of suction caused by liquid flowing through the valve, a lever pivoted to the said bracket and engageable with the clutch member to release it, and a float on said lever whereby the clutch will be released upon a predetermined lowering of the liquid level in the tank.

5. In a flush tank comprising the usual flush opening and overflow tube adjacent thereto, and having a flush valve closing said opening and including a valve stem guided in a bracket secured to the overflow tube, a clutch member pivoted to said bracket and engageable with the valve stem to prevent closing of the valve when it has been raised to less than its full open position, a float, a lever supporting said float and pivoted relative to said bracket, and means controlled by the lever for releasing said clutch member to permit closing of the valve upon a predetermined lowering of the liquid level in the tank.

WARREN A. LESTER.