

J. A. STAPLES.
VALVE.
APPLICATION FILED MAR. 2, 1906.

949,851.

Patented Feb. 22, 1910.
5 SHEETS—SHEET 1.

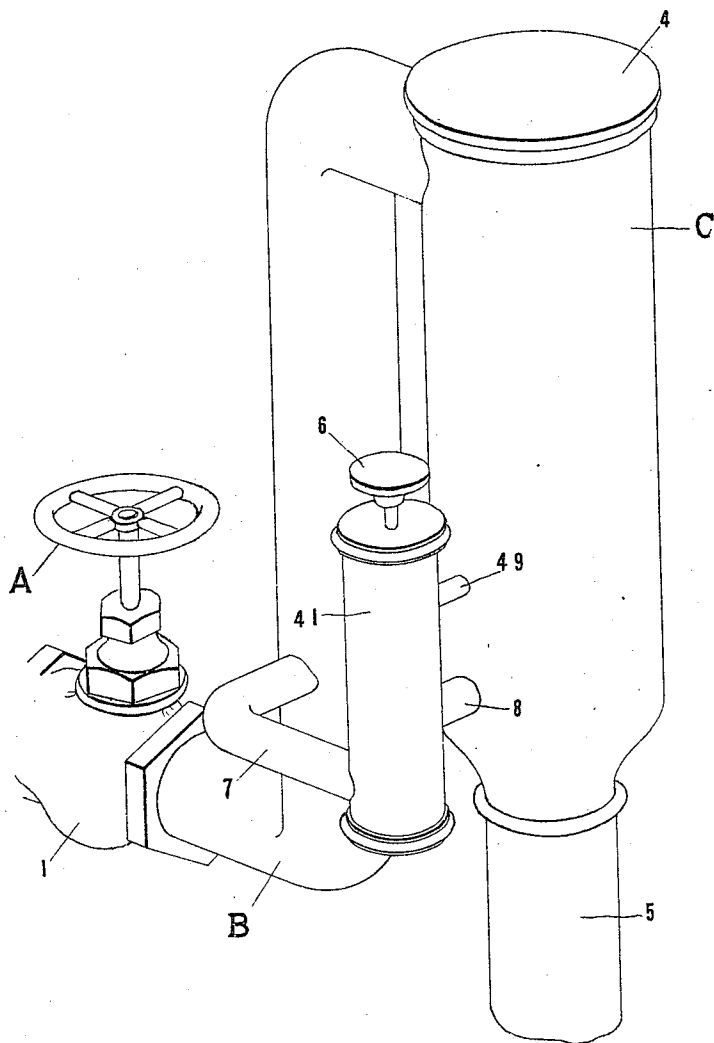


Fig. 1.

WITNESSES:

J. A. Staples
Arthur F. Trevis

INVENTOR

John A. Staples
BY
W. A. D. D. D.
ATTORNEYS.

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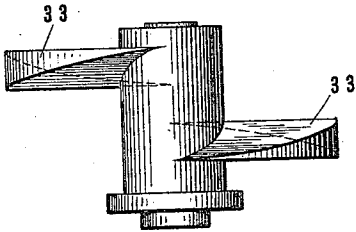


Fig. 5.

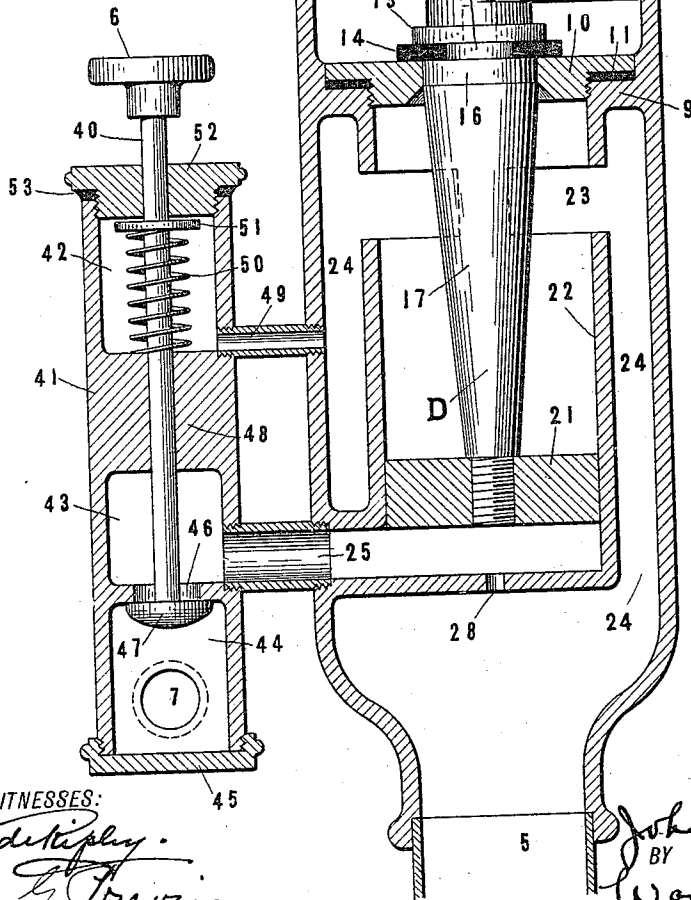


Fig. 2.

WITNESSES:
J. Clyde Kipling
Arthur G. Previer

INVENTOR
John A. Staples
BY
W. A. Field
ATTORNEYS.

J. A. STAPLES.
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5 SHEETS—SHEET 3.

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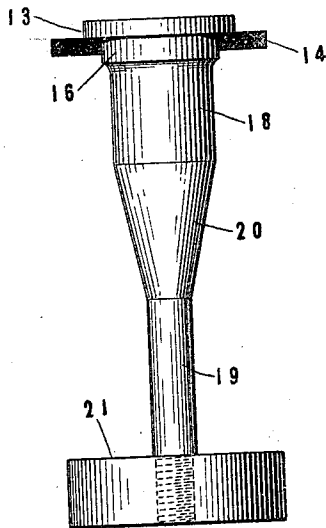


Fig. 6.

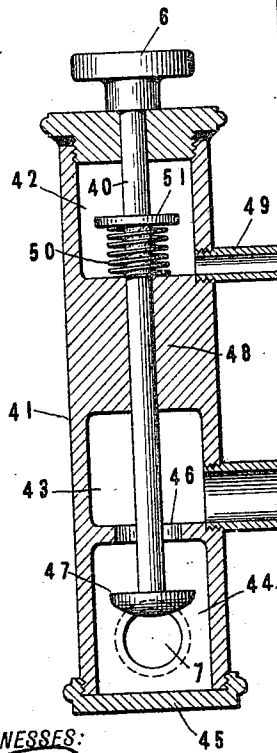


Fig. 3.

WITNESSES:
J. A. Staples
Arthur G. Brown

INVENTOR
John A. Staples
BY
W. J. H. Hines
ATTORNEYS

J. A. STAPLES.
VALVE.

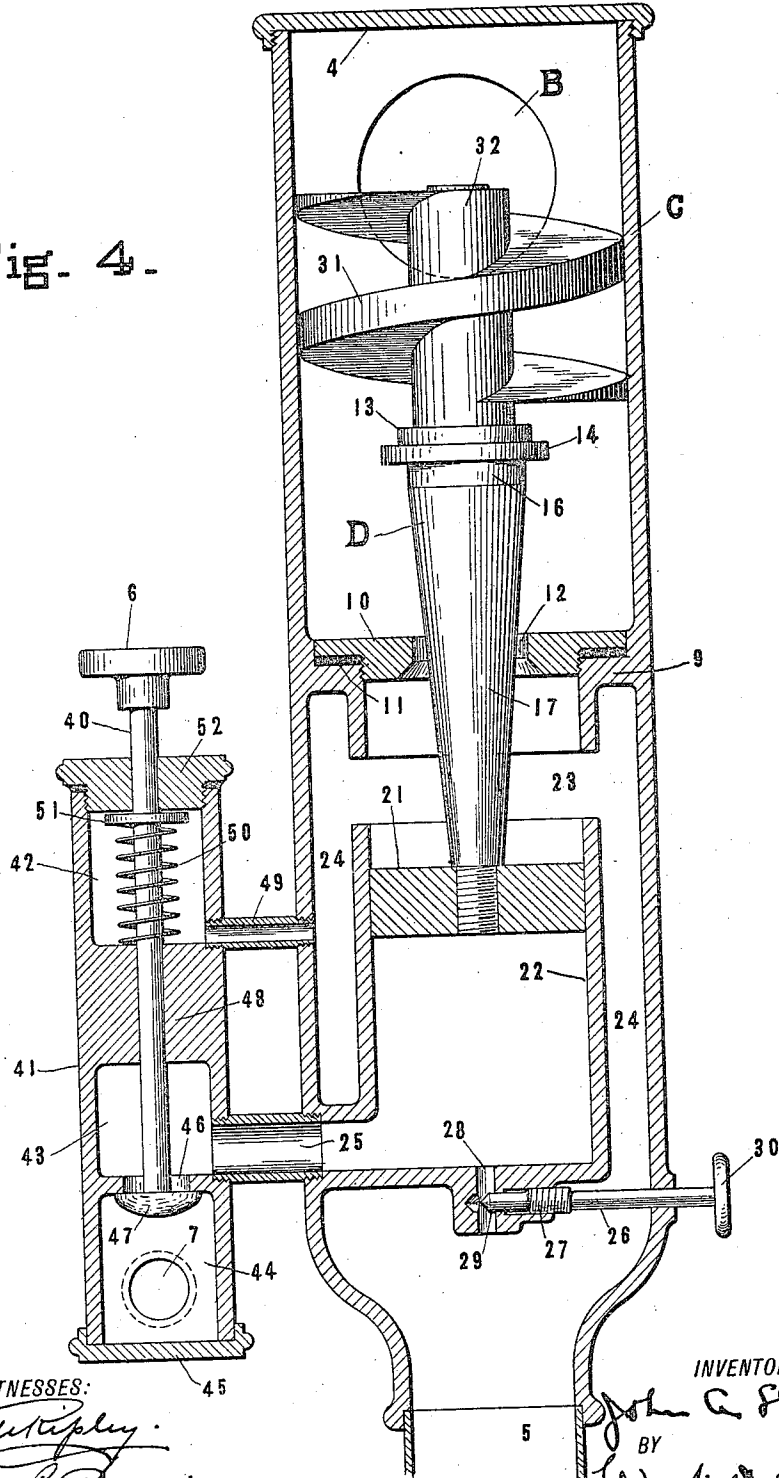
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5 SHEETS—SHEET 4.

949,851.

Fig. 4.



WITNESSES:

J. A. Staples
Arthur G. Previn

INVENTOR

John A. Staples

BY

Worfield Dues
ATTORNEYS

J. A. STAPLES.
VALVE.

APPLICATION FILED MAR. 2, 1906.

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5 SHEETS—SHEET 5.

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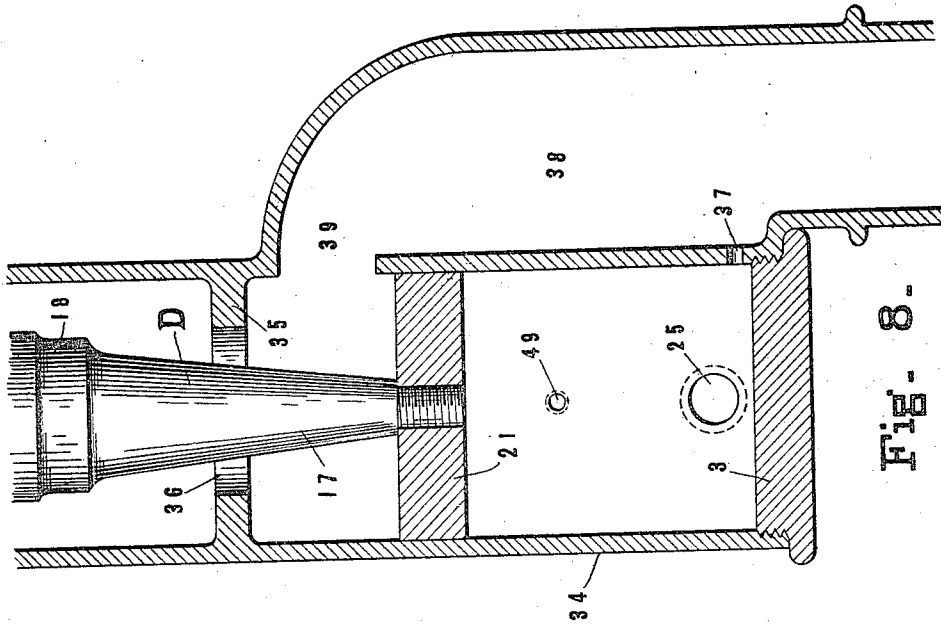


Fig- 8-

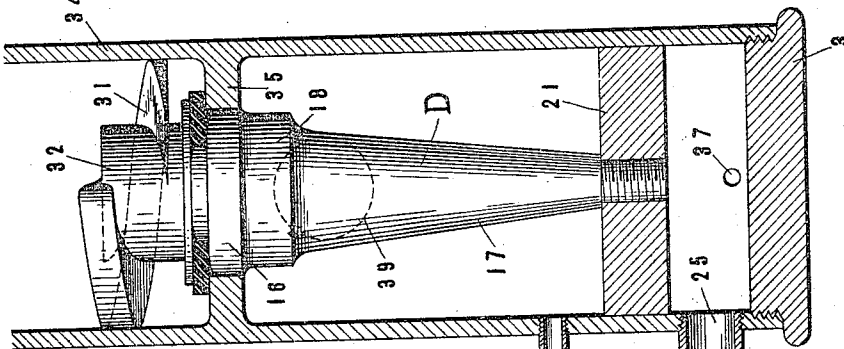
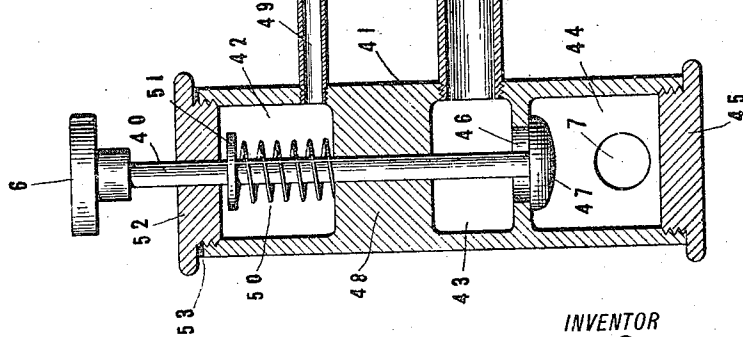


Fig- 7-



WITNESSES:

J. A. Staples
Arthur G. Previn

INVENTOR

John A. Staples
BY
W. A. Staples
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN A. STAPLES, OF NEWBURGH, NEW YORK.

VALVE.

949,851.

Specification of Letters Patent.

Patented Feb. 22, 1910.

Application filed March 2, 1906. Serial No. 303,757.

To all whom it may concern:

Be it known that I, JOHN A. STAPLES, residing at Newburgh, in the county of Orange and State of New York, have invented certain new and useful Improvements in Valves, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates broadly to means for controlling the flow of fluids, but it more particularly concerns improvements in apparatus includable in the class of so-called automatic flushing devices, such as are frequently employed for sanitary purposes. Since, however, it will be conducive to clearness in disclosing the invention to describe the same through its structural embodiment, the herein-stated forms, in which the invention is well illustrated in its preferred form and in which certain eminent advantages and characteristic features more prominently appear, have been selected for the purpose.

Heretofore, it has been customary to provide apparatus of this character with tanks of considerable size and in which the water accumulates relatively slowly, but is abruptly discharged therefrom at intervals. This arrangement is well suited for low pressure systems, but as such systems are being supplemented by more modern systems in which a very high pressure is employed, it is desirable to adapt a flushing apparatus to the present conditions. It is, accordingly within the scope of this invention to formulate a flushing mechanism which, while being adapted to low pressure storage systems, is, however, particularly applicable to high pressure systems, and which is capable of fully utilizing the energy of water under pressure to efficiently flush sanitary or like apparatus, and in which undue waste of water will be prevented.

The invention has in view, among other objects, the provision of a means of the class described which is adapted for being very easily and surely operated and in which a preliminary actuation of a readily yielding member suffices to initiate the operation which will subsequently automatically take place through the utilization of energy inherent in the water or other fluid whose flow is controlled by the apparatus.

Another object within the purpose of the invention is to devise a flushing apparatus which will with certainty and promptness

effect a sudden delivery of a predetermined quantity of water whenever desired by an operator.

Another object within the contemplation of this invention is a flushing valve so adapted that while the same will freely deliver water, upon a proper actuation of a starter, it will, nevertheless, substantially cease to deliver such water if such starter be inadvertently retained in other than its normal position, and, consequently, excessive or accidental consumption of water will be obviated.

Another object accruing to this invention is a hydraulically operated mechanism which will effect a sudden discharge of water suitable for flushing sanitary apparatus and in which the closure will take place in a gradual manner and without setting up a "water hammer" in the supply pipes or injuring the valve features through undue violence of abutment.

Another object which this invention seeks to realize is an apparatus peculiarly suitable for use in connection with high pressure mains, either with or without the interpositioning of cushioning means.

Another object of this invention is to produce an apparatus of the class stated, in which a valve will be normally retained against its seat through the pressure of the water and with sufficient force to seal with certainty the outlet against discharge of water, and in which hydraulic pressure is utilized in actuating the valve to unseat the same. The valve parts are also so proportioned and modeled that the pressure of the water in the mains will suffice to not only press said valve securely against its seat but also, by a suitable controlling means, to unseat said valve by opposing in the opposite direction thereagainst a force which will be sufficient to over-balance all seating pressure and render the unseating of the valve possible.

It is also within the purpose of this invention to provide means that will promptly hydraulically unseat the valve and subsequently effect a closure of the same at a slower rate, which may be readily determined.

Another object is to so arrange the flush-controlling valve that any undesirable pounding or vibration of the water will be prevented and to cause the valve to close the outlet at such a rate that a water-seal may

remain in the bowl flushed by the apparatus.

Still another object within the range of the invention is to so construct the valve that
 5 when the same is in the unseated position, sufficient resistance will be afforded to the same, by the flow of the water in discharging, to insure the seating of the valve after a predetermined interval and to impart to
 10 the same a rotary movement whereby its action will be facilitated, and other advantages attained.

Another object is to provide an instrumentality of the class specified which, from
 15 an operative standpoint, will in usage possess a high degree of efficiency and effectiveness, and which, structurally considered, will be of the greatest possible simplicity, being composed of but few parts, all adapted for
 20 being made at a minimum of cost and individually so formed as to be capable of being readily assembled into a neat and compact arrangement for accomplishing the purposes intended.

Other objects and advantages will be in part obvious and in part pointed out hereinafter.

With these and other ends in view, this invention accordingly consists in the features
 30 of construction, combinations of parts and arrangement of elements which will be exemplified in the embodiment thereof hereinafter described and the scope of the application of which will be indicated in the following claims.

In order that this invention may be more fully understood and made comprehensible to others skilled in its related arts, drawings illustrating a convenient manner of carrying
 40 out the same are appended as a part of this specification, and, while the controlling principles of the invention may be otherwise applied by modifications falling within the scope of the claims, the herein disclosed embodiment is that which it will ordinarily be
 45 preferable to employ in practice, and is regarded as representing substantial improvements over the many implied and obvious variations of the same. In such drawings,
 50 it is to be noted that like numerals refer to corresponding parts throughout all the figures, of which—

Figure 1 is a view in general perspective showing the arrangement of parts in the
 55 preferred construction. Fig. 2 is a vertical section showing the preferred apparatus with the parts in position to close the same against discharge of water. Fig. 3 is a like section showing the controlling means in
 60 operative position and with the discharge valve in an extreme uppermost position, in which its lower end cuts off the discharge of water. Fig. 4 illustrates a position assumed by the parts during the flushing
 65 and illustrates the partial descent of the

valve toward its seat prior to effecting a closure of the outlet. Fig. 5 is a side elevation showing a modified form of the means adapted to positively insure the
 70 seating of the valve. Fig. 6 is a side elevation showing a modified form of closure valve, which is adapted to vary the discharge of water in a somewhat different manner from the valve shown in the preceding figures. Fig. 7 is a sectional view showing
 75 a modified form of this invention, in which a discharge of water takes place through a side flushing pipe. Fig. 8 is a section transverse to that shown in Fig. 7 and serving to more clearly show certain details of the arrangement.

As tending to render better understood the dominant features of this invention, it may be pointed out, preliminary to entering
 85 into a detailed description of the shown embodiments, that delicate and complicated mechanisms have heretofore been considered necessary for the proper automatic control of water, especially when the same is under
 90 a very high pressure. Efforts have hitherto been made to devise an apparatus adapted to lift a valve from its seat by introducing water at the tank pressure under said
 95 valve, but without practical success, since the fact has not been sufficiently recognized that the pressure tending to close the valve cannot be fully compensated unless the effective surface at the bottom of the valve is at least equal to that in the top. In
 100 prior construction, a difference in this respect has been due to the fact that the effective releasing or bottom surface of the valve is less than the effective seating or
 105 top surface by an area equal to that employed as a seat for the valve. In systems employing a high pressure, the difference of areas due to this cause is sufficient to seriously mitigate against the proper working
 110 of the valve, but this is effectively remedied by the hereinafter-described invention through the providing of an unseating area considerably greater than the seating area, and, consequently, the unequal amounts of pressure applied at top and bottom simultaneously will with certainty effect the unseating of the valve.

In the practical carrying out of this invention, the flushing apparatus will preferably be directly interposed between the sanitary bowl and the supply main, and will,
 120 whenever desired, be furnished with a valve A, shown on Fig. 1, which is interposed between the apparatus and the main so that the flow of water through the former may be suitably regulated to any predetermined
 125 rate. Such valve may be of any desired type and construction, and may be set in the wall in a permanent or other manner. Moreover, the adjustment of the valve may be made once for all by a determination of
 130

its best set for any particular condition, or a convenient access thereto may be provided to permit of a ready adjustment from time to time. Leading from such valve is a supply-pipe B which leads into communication with the valve-casing C in any suitable manner, which will of course be adapted in this respect to particular conditions of use. The arrangement shown in the figure, however, is very convenient in most instances and is well adapted for clearly setting forth the invention. Thus, the supply-pipe B leads upward and enters the valve-casing C at the top thereof. In order that access may readily be had to the interior of such casing for the repair or inspection of the parts therein, a removable cap 4 may close the top thereof. The flush from said casing takes place ultimately through the discharge pipe 5 by means of which the water is led to the closet bowl in the usual manner. The flushing action of the apparatus is under manual control through the instrumentality of a suitable actuating lever or button denoted by 6, which is connected to a suitable valve whereby water is admitted underneath a piston head mounted on the valve, the water being taken in from the supply pipe through a suitable conduit 7 and entering the flushing valve through a conduit 8.

The valve-casing in the present embodiment is shown interiorly divided into an upper chamber 54 and a lower chamber 24 by an intermediate partition 9, which also provides an outlet 12 for the water. In the preferred form, the valve seat 10 is screw threaded to such partition, with an interposed packing 11 arranged to secure a fluid-tight joint. The outlet 12 will normally be closed by a valve D which will be maintained on its seat through the pressure of the water in the overlying chamber 54, which pressure will generally correspond to that in the mains. To this end, the valve provides an annular shoulder 13 adapted to circumscribe the opening and, if desired, a suitable packing 14 may be interposed in order that a more perfect closure may be effected. A convenient manner of retaining such packing in place is to provide an annular recess 15 within which said packing is seated and thereby positioned against easy displacement.

Experience has demonstrated that if the valve be provided with an ordinary plain annular head and it is closed under a high pressure, there will be a tendency for the valve to pound or hammer on its seat. This action is probably due to the water attempting to rush out under the bottom of the valve just at the instant of closure and when it is being thrust home. As will be clear, such attempts will result in a slight instantaneous elevation of the valve, which will in turn be forced down by the pressure of the water, and this action may continue for a

few seconds, producing an undesirable vibration and hammering of the valve. To eliminate such action, the valve is continued, for a short distance, as a cylinder 16 which closely fits with the orifice and substantially closes the same. As a result of this arrangement, the outlet is practically closed before the valve has fully settled on its seat. Thus, during the interval required to traverse the length of such cylindrical portion, there is no tendency for the water to squeeze in under the valve and cause it to be uplifted. It will be understood in this connection that the cylindrical length 16 may be given, if desired, a very slight taper or other form, the essential function of the same being to check the flow of water in a suitable manner prior to the final seating of the valve.

It will be noted on referring to the drawings that said valve D continues in the form of a taper 17, and this is done for several reasons. In the first place, since the device is designed for use in connection with high pressure systems, it is advisable that the outflow of water be gradually stopped; otherwise the parts of the apparatus or the conduits leading thereto may be damaged by the momentum of the water. This liability is more prominent in apparatus of this nature in which no cushioning means for checking the water hammer is resorted to. Furthermore, if the stream be directed into the closet with sufficient force to properly flush the same, and then if this stream be suddenly checked from its full velocity, it will sweep entirely out of the bowl without leaving sufficient water therein to form a seal. If, however, the flow be slowly diminished toward the conclusion of the flush, the seals provided by the bowl will remain completely filled with water as is desired. To this end, the valve tapers gradually in a direction opposite to that required for its unseating and, as a consequence, when the valve is fully raised an effective flushing outlet will be provided, which outlet will be slowly diminished in area as the valve descends. It will be obvious that any desired variation of flow may be realized through similar variations in the contour of the extension from the valve. Thus, Fig. 6 indicates a valve having a reduced cylindrical portion 18 which is adapted to give a regular reduced flow of water while such portion is traversing the outlet, and at its lower end such valve has a still further reduced cylindrical portion 19 which will permit of a full flush taking place; and intermediate such portions is a tapering portion 20 by means of which the change from full to partial flush may be accomplished in an even, gradual manner. The means for controlling the movement of the said valve may now be considered. Referring to the drawings, it will be seen that the end of the

valve is provided with a piston head 21 which is arranged to have a fluid-tight reciprocation within a suitable cylinder 22, after the fashion of a dash pot. Such cylinder may be arranged with relation to the other parts in various ways, but that shown on the drawings is probably the most satisfactory in actual practice, and in such form the cylinder extends toward said outlet and provides at its upper end relief or overflow openings 23 for the passage of water during its discharge, whereby pressure is removed from the upper side of the piston head. Such openings will lead to the discharge pipe 5 in any suitable manner, either directly or such discharge pipe 5 may be enlarged at its upper end as indicated by 24, providing an annular passage for the discharge of the water. The piston head 21, as will be noted by reference to the drawings, is considerably greater in area than the closure part of the valve, and this is in order that such valve may be readily uplifted against the pressure in the overlying chamber. Ordinarily it will be desirable to operate the valve hydraulically as thereby the multiplicity of parts is eliminated and the same may be greatly simplified structurally, and to this end the lower part of cylinder 22 is provided with inlet 25 through which water may be admitted to the under side of the piston head 21 in order to raise the same, as will be clearly understood.

The action of the valve under the influence of the water pressure may now be understood. The water inflows through the inlet 25 and accumulates under the piston head of valve D, thus elevating the same thereby, as will at once be seen, unseating the valve, and as a result the water at once begins to rush through the outlet, into the cylinder above the piston head and out through the openings 23, thence to the closet, in which a thorough flushing action takes place. The pressure on top of the piston head is much less than the pressure below the same, as excess water may readily escape through the openings 23. Since the piston head 21 is considerably larger than the closure portion of the valve, it will be clear that, if water under the same pressure as that in the valve chamber be admitted to the under sides of said piston head, the valve will be elevated against the resistance and pressure of the water. It will thus be seen that by reason of the larger preponderance of upward pressure upon the valve, all forces tending to hold the same upon its seat are quickly and positively overcome, there being in this case a decisive over-equalization and a large margin of upward force so as to easily overcome the resistances due to friction, sticking of the valve and other causes. It may here be

pointed out that the action of the valve may be further controlled by suitably proportioning and arranging the piston head 21 with reference to the openings 23. Thus these features may be so disposed that upon an opening of inlet 25 the valve will rise and more or less completely cover the openings 23 and cut down the effective flushing area thereof. This will prevent any excessive waste of water due to inadvertence or disarrangement of the controlling parts. It will thus be seen that by reason of this action, the apparatus is well adapted for connection with the well-known type of closets in which the flush is controlled by pressure upon the seat, it being clear that, as in this case no flush would occur until the actuating means were released, the apparatus used in this connection would not become operative until the pressure upon the seat were removed. The means for regulating the interval of duration of the flush may now be described. The cylinder 22 is provided with a small drain through which the water supporting the valve may slowly outflow. The time of settling of the valve will necessarily depend to a large extent upon the size of the drain, and, while in many cases such size may be readily predetermined at the time of constructing the apparatus, it, in other cases, will be advisable to employ an adjustable cock for regulating the size of the drain opening. One form of cock useful for the purpose is shown on Fig. 4 and indicated by 26, and may have adjusting screw-threads 27 and terminate in the drain opening 28 in a pointed, conical end 29, which will vary the effective delivery area of such drain according to the adjustments given the cock by the thumb nut 30. It will, of course, be noted in this connection that the water may always flow through said drain, even when being initially introduced into said chamber, but as the said drain is of a considerably less area than the inlet 25, this will not have any objectionable effect upon the action of the apparatus.

While it will be clear that the valve should return upon allowing water to drain from the cylinder, nevertheless it is possible that undue friction would, in ordinary use, at times prevent such return; and to that end this invention provides the valve with a means for offering a resisting friction to the flow of water, which thereby exerts a considerable pressure against the valve and tends to return the same to its seat. Such expedient is shown on the several views of the drawing in modified forms, but that indicated on Figs. 2 to 4 is regarded as the preferred construction and consists of a spiral 31 firmly secured to a shank 32 projecting from the inner or upper end of the valve. The pitch or inclination of said spiral will necessarily vary according to require-

ments, and similarly the number of convolutions of the same will also be determinate upon particular conditions. In practice, it has been found that one or two turns serve the purpose very effectively, but no doubt cases will exist in which considerable variation in this particular will be desirable. In the form of the expedient shown by Fig. 5, which is a modification, a series of distinct wings 33 are employed in lieu of the single convolution shown by the preceding figures, and it is obvious that such arrangement affords less friction for the passage of water. Clearly the wings may be of any shape and proportions and the number thereof may equally be widely varied within the limits of this invention. In some cases other expedients which would offer friction might also be employed in an equivalent capacity. The action of the curvilinear impeding expedients above referred to under the flow of water is peculiar in that it not only affords a considerable downward pressure against the valve, which tends to seat the same, but it also causes said valve to very rapidly rotate, which action materially aids in reducing the friction against translation, and otherwise facilitates the movements of the valve. This rotary action of a valve provided with convoluted vanes also tends to render more certain the reseating of the valve, which is thereby practically ground home against its seat, thus effecting a tight joint, and it is also probable that the rotation also tends to advance the valve after the flow of the water has been checked by the short cylindrical portion of the valve. It will also be noted that by reason of this rotary tendency of the valve, the same is seated in a new position at each actuation, thus equalizing wear and reducing to a minimum the chance of its becoming, by reason of its corrosion, fast upon its seat.

In the discharge of water by means of the modification shown by Figs. 7 and 8, the flushing takes place to one side of the cylinder rather than annularly around it. This permits of a less expensive casting, as will be seen by referring to said Figs. 7 and 8, in which is also shown a somewhat different type of valve-stem. In this construction the casing designated 34 has an inner partition 35 which is provided with an outlet 36, and the lower part of the casing constitutes a cylinder within which the piston head 21 of the valve closely fits. A cap 3 in a screw-threaded connection with the casing effects a closure of the lower end of the same, and opening into said cylinder above said cap and below the piston head is the inlet 25, while opening therefrom and preferably into the discharge pipe 38 is the outlet 37. The casing 34 is also provided with the overflow or discharge pipe 38 having an upper vent 39 which leads into the cylinder above the

said piston head on the valve. In this form all of the casing parts may be made integral and the whole may consist of a single casting, which will accordingly be of minimum cost.

The valve controlling means may now be considered, and the same has been shown in detail by Figs. 2, 3, 4 and 7 respectively, and is also shown in general elevation in Fig. 1. Such means as here embodied is a valve device and is adapted to control the flow of fluid to the under side of the piston head of the valve to thereby regulate and control the translation of the same. While this invention is not limited to any specific form of valve for this purpose, what is regarded as the form best adapted for practical use has been illustrated and, in the same, 6 designates a finger piece which is supported upon a stem 40 and serves as a means for depressing the latter under manual manipulation. The stem 40 is mounted in a body 41 which is provided with three chambers, 42, 43 and 44 respectively, the latter being connected with the main through a suitable conduit 7 and closed at its lower end by a cap 45 in screw-threaded connection therewith. An orifice 46, which is normally closed by a valve 47 mounted on the lower end of said stem, connects chamber 44 with chamber 43, the latter being in turn connected with the lower end of the aforesaid cylinder 34 by means of the inlet 25. It will now be obvious that, upon depressing valve 47, water will instantly flow into the cylinder and elevate the discharge valve and, as soon as the pressure is released, the water accumulated in the cylinder underlying the discharge valve will outflow through the drain provided for the purpose and the valve will then be seated as aforesaid. It has been found in practice, however, that considerable difficulty is incurred in providing a fluid-tight connection between the stem 40 and the body 41, which connection will at the same time have a sufficient freedom of movement to be actuated by a light pressure and returned by a light spring. To this end this invention provides an elongated partition 48 through which said rod 40 passes prior to its emergence into chamber 42. Although, upon a depression of such stem, water is likely to spurt up around the stem, this water will be received within the chamber 42 and at once drained off into the discharge pipe by means of a small conduit 49. To effect a prompt return of the stem after its depression, an expansile spring 50 bears at its lower end against partition 48 and at its upper end against a suitable collar 51, which is in secure attachment to stem 40. This will keep the stem in an elevated position, and the collar 51 may also have another function in that it may serve as a baffle-plate to prevent the spurting of water along the

upper portion of the stem. To facilitate the inspection and adjustment of the interior parts, a cap 52 may be screw-threaded to the upper end of the body 41 and a packing 5 53 may also be interposed for the purpose of rendering such union fluid-tight. While Fig. 2 shows said controlling means in effective position, a reference to Fig. 3 will show the latter as employed for the purpose of causing 10 the larger discharge valve to rise from its seat.

It will be appreciated that to obtain the best action of the flushing apparatus, the same should be proportioned in accordance 15 with the pressure in the mains, but as this is in some instances impracticable where relatively large variations may exist, the difficulty may be obviated by constructing a flushing device operative to successfully 20 work under a minimum water pressure, such apparatus being furnished with a suitable valve 1, shown on Fig. 1, in order that the flow of water from the mains may be cut down to the most efficient operative extent. 25 By this means various pressures may be accommodated to various bowls.

It may here be noted that terms of the nature of "deflect" are used throughout this description and the following claims in a 30 broad sense to indicate any means interposed in the path of a fluid adapted to turn aside or change the course of said fluid or a portion of the same, with respect to the path which the fluid would take if this 35 means were absent. It may also be noted that by the term "taper" is meant the diminution in area of cross-section on a longitudinal axis, irrespective of the contour of said cross-section at any or all points. The 40 term "valve," moreover, is also used in a broad sense to denote any means adapted in one condition to obstruct the passage of fluid to a greater extent than would obtain with the said means in another condition. 45

As many changes could be made in the above construction and many apparently widely different embodiments of my invention could be made without departing from the scope thereof, I intend that all matter 50 contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I 55 claim as new and desire to secure by Letters Patent is:—

1. In apparatus of the class described, in combination, a valve, a valve-chamber, a 60 valve-spindle connected with said valve, means provided with a chamber through which said spindle passes, said chamber being separate from said valve-chamber, a spring within said second chamber adapted to tend to move said spindle, and means 65 adapted to drain said second chamber.

2. In apparatus of the class described, in combination, a valve, a valve-chamber, a valve-spindle connected with said valve, means provided with a chamber through 70 which said spindle passes, said chamber being separate from said valve-chamber, a spring within said second chamber adapted to tend to move said spindle, and means adapted to drain said second chamber, said 75 spindle extending beyond said second chamber and being connected with manually operating means adapted to actuate said valve.

3. In apparatus of the class described, in combination, a valve, a fluid-actuated means mounted above said valve and adapted to 80 press said valve toward its seat, and a fluid-actuated piston positioned beneath said valve and adapted to force said valve from its seat, said piston and said first means being exposed to a common source of fluid- 85 supply and said piston being provided with the greater effective area exposed thereto.

4. In apparatus of the class described, in combination, a valve, means adapted to open 90 the same, means adapted to lead a fluid thereto and therefrom, a deflecting means interposed in the path of the fluid adapted to close the valve, and a tapering member secured to and adapted to precede said valve 95 in its movement toward its seat.

5. In apparatus of the class described, in combination, a valve, means adapted to open the same, means adapted to lead a fluid 100 thereto and therefrom, deflecting means interposed in the path of the fluid adapted to close the valve, and a member tapering in varying degrees secured to and adapted to precede said valve in its movement toward 105 its seat.

6. In apparatus of the class described, in 105 combination, a valve, means adapted to lead a fluid to and from the same, means controlled by fluid within said first means adapted to tend to rotate said valve in its movement with respect to its seat, and means 110 adapted to vary the rate of change of discharge of said valve with respect to the rate of closing thereof.

7. In apparatus of the class described, in 115 combination, a valve, means adapted to lead a fluid to and from the same, means controlled by fluid within said first means adapted to tend to rotate said valve in its movement with respect to its seat, and means 120 connected with said valve adapted to enter and substantially completely obstruct the passage through the seat thereof prior to the seating of the valve.

8. In apparatus of the class described, in 125 combination, a valve, means adapted to lead a fluid to and from the same, means controlled by fluid within said first means adapted to tend to rotate said valve in its movement with respect to its seat, and a 130 tapering member of a varying degree of

taper adapted to precede said valve in its movement with respect to its seat.

9. In apparatus of the class described, in combination, a valve, a piston connected therewith and adapted to actuate the same, a cylinder upon the discharge side of said valve in which said piston is disposed, an auxiliary valve controlling the admission of fluid to said cylinder, said piston being in rigid relation to said valve, a discharge conduit, means adapted to prevent discharge from said first valve passing said discharge conduit, and means adapted upon closing said auxiliary valve to render inoperative said last-mentioned means.

10. In apparatus of the class described, in combination, a valve, means adapted to open the same, means adapted to lead a fluid thereto and therefrom, deflecting means interposed in the path of the fluid adapted to close the valve and to impart a rotary tendency thereto, and a tapering member secured to and adapted to precede said valve in its movement toward its seat.

11. In apparatus of the class described, in combination, a valve, means adapted to open the same, means adapted to lead a fluid thereto and therefrom, deflecting means interposed in the path of the fluid adapted to close the valve and to impart a rotary tendency thereto, and a member tapering in varying degrees secured to and adapted to precede said valve in its movement toward its seat.

12. In apparatus of the class described, in combination, a source of fluid-supply, a valve adapted to afford passage to fluid from said source of supply, means actuated

by said fluid positively adapted to open said valve, deflecting means interposed in the path of the fluid adapted to close the valve, and a tapering member secured to said valve and adapted to precede the same in its movement toward its seat.

13. In apparatus of the class described, in combination, a valve, means tending to seat said valve, fluid-pressure-controlled means adapted to overcome said first means and unseat said valve, a third means adapted to act in conjunction with said first means and re-seat said valve, said third means comprising an inclined deflecting member interposed in the path of the fluid connected with said valve, and a tapering member secured to said valve and adapted to precede the same in its movement toward its seat.

14. In apparatus of the class described, in combination, a valve, means tending to seat said valve, fluid-pressure-controlled means adapted to overcome said first means and unseat said valve, a third means adapted to act in conjunction with said first means and re-seat said valve and tend to rotate the same in seating, said third means comprising an inclined deflecting means interposed in the path of the fluid connected with said valve, and a tapering member secured to said valve and adapted to precede the same in its movement toward its seat.

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

JOHN A. STAPLES.

Witnesses:

W. W. B. SEYMOUR,
R. S. BLAIR.