No. 615,622. Patented Dec. 6, 1898.

D. T. KENNEY.

VALVE FOR WATER CLOSETS.

(Application filed May 14, 1898.)

(No Model.) 2 Sheets—Sheet 1.

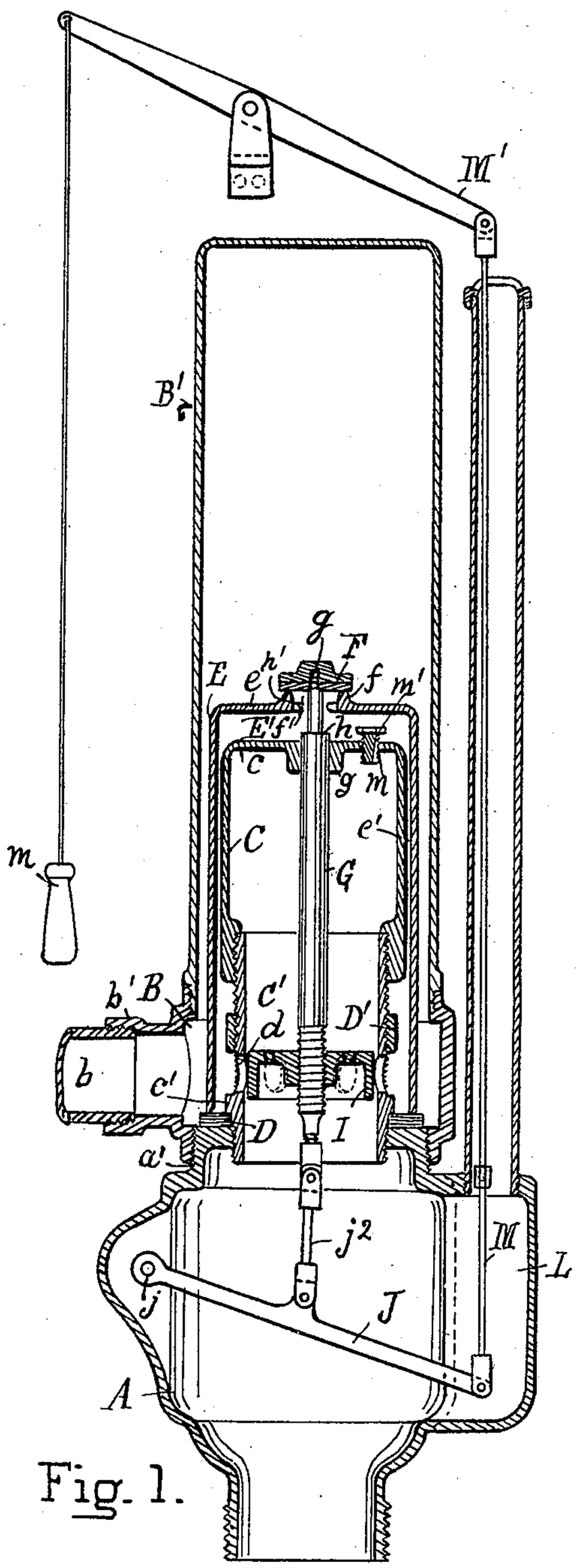

Fig. 1.

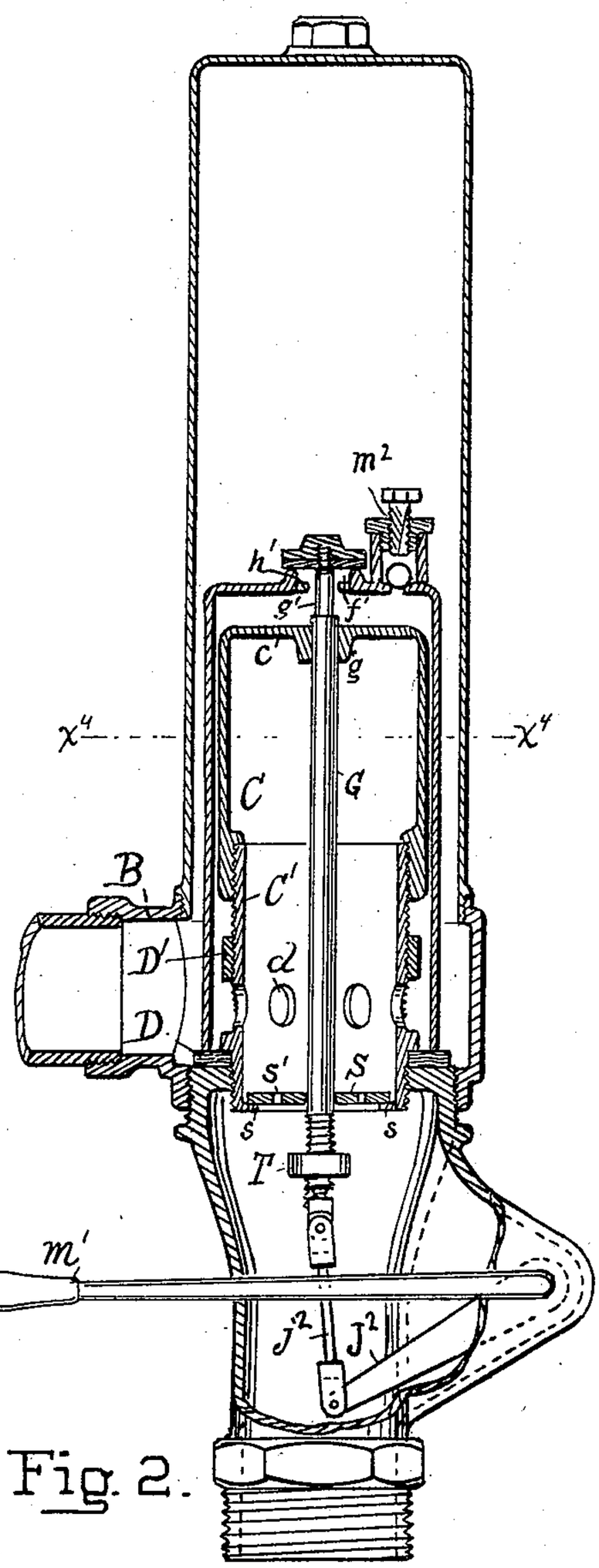

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

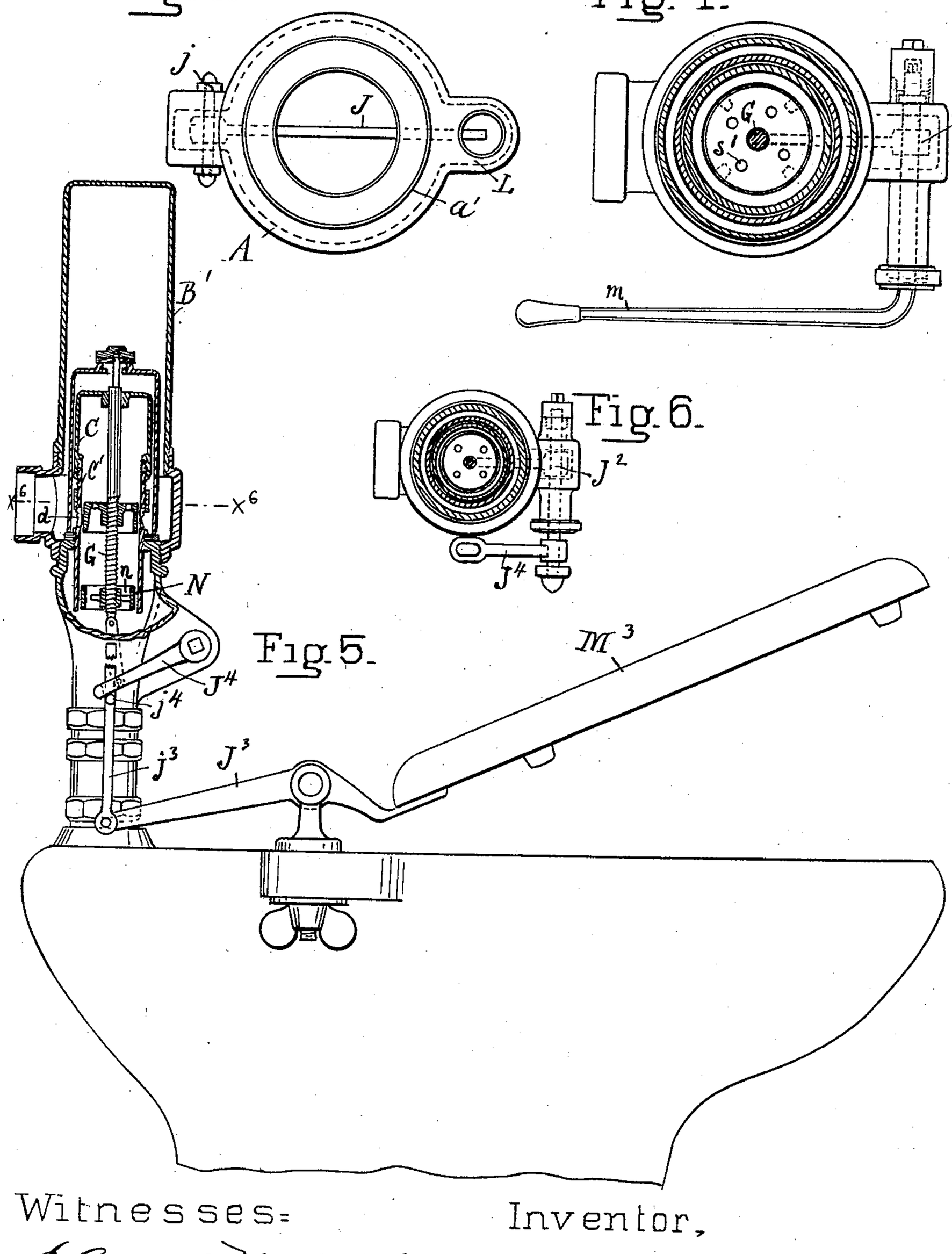

Fig. 4.

Fig. 6.

Fig. 5.

Witnesses:

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UNITED STATES PATENT OFFICE.

DAVID T. KENNEY, OF NORTH PLAINFIELD, NEW JERSEY.

VALVE FOR WATER-CLOSETS.

SPECIFICATION forming part of Letters Patent No. 615,622, dated December 6, 1898.

Application filed May 14, 1898. Serial No. 680,723. (No model.)

To all whom it may concern:

Be it known that I, DAVID T. KENNEY, a citizen of the United States of America, residing in the borough of North Plainfield, county of Somerset, and State of New Jersey, have invented certain new and useful Improvements in Valves for Water-Closets, of which the following is a specification.

The object is to provide a valve which will be easily and smoothly opened and will be closed easily and slowly by the weight of the moving parts.

With this object in view the invention consists in providing with the main valve an auxiliary chamber on the discharge side thereof and an auxiliary valve for letting water into the auxiliary chamber before and while the main valve is opening. This auxiliary valve should be smaller than the main valve, so as to be easily lifted against the water-pressure. It is closed while the main valve is closing. There is also an exit from the auxiliary chamber which is open while the main valve is closing. The size of this exit is determined by how quickly it is desirable to have the main valve close. It is much smaller than the auxiliary valve.

The invention consists in other novel constructions and combinations of the parts hereinafter fully described and claimed.

In the drawings which form a part of this specification, Figure 1 is a vertical section through a flushing-valve arranged to be operated by a pull. Fig. 2 is a vertical section through a modified valve arranged to be operated by a lever. Fig. 3 is a top view of the outlet-chamber of the valve shown in Fig. 1. Fig. 4 is a cross-section of the valve on the line x^4 x^4 of Fig. 2. Fig. 5 is a side view of a valve similar in its general features to that of Fig. 1, with the casing broken away and the upper part shown mainly in cross-section, the valve being arranged to be operated by a seat attachment. Fig. 6 is a cross-section of the valve viewed from above on line x^6 x^6 of Fig. 5.

The outlet-chamber A of the flushing-valve is connected to the bowl of the water-closet in any approved manner.

The inlet-chamber B of the flushing-valve is screwed onto a suitable support, as a nozzle a' at the upper part of the outlet-chamber A. A cap B′ forms the top part of the inlet-chamber B. A water-inlet pipe b is screwed into a branch b', projecting laterally from the inlet-chamber B.

A guide C for the main valve is provided with a plate c or other suitable obstruction at its upper part and preferably at its top. The guide C is preferably made in two parts, of which the upper part or guide proper is screwed onto the lower part C′. The lower part is screwed into the outlet-chamber and is provided with a collar c', which secures a facing-plate D, of leather or other soft material, to the top of the outlet-chamber.

The plate D forms the seat for the main valve, but the main valve can be made watertight in any other approved manner. The lower part of the guide is provided with lateral water-passages d, consisting of one or more holes. A ring D′ is screwed onto the part C′, so that the area of the said water-passages may be regulated.

The main valve E is cylindrical in form and is closed at its upper end by a plate e. There is a chamber or space E′ inside the main valve between the plates c and e. A very narrow annular passage e' is formed between the main valve and its guide, so that the water may pass slowly between the valve and its guide from the chamber E′. This exit from the auxiliary chamber is open at all times toward the discharge-chamber, but its connection with the inlet-chamber is closed when the main valve is closed. It is not necessary that this exit shall be open, except while the main valve is closing, nor is it essential that exit should be toward the discharge-chamber. In Fig. 2 an adjustable exit m^2 is provided from the auxiliary chamber into the inlet-chamber, which may be adjusted to determine the speed of closing of the main valve. This exit is closed by a valve which opens upwardly while the main valve is settling and is closed by the water-pressure when the main valve is closed. The weight of the main valve and the moving parts attached thereto will cause it to settle. However, in any construction the space between the guide and the main valve will be found of advantage.

A nut screwed upon the end of the valve-stem G, which projects through the main valve, constitutes an auxiliary valve F and

rests on a seat *f* on the plate *e*, the passage or port *f'* through the plate *e* being normally closed by the auxiliary valve. This auxiliary valve acts as an equalizing-valve to the main valve when the main valve is being opened and as a retarding-valve when the main valve is being closed.

The valve-stem G slides in a boss *g* on the plate *c*. The upper part *g'* of the stem G is smaller than the main portion of the stem, so that a shoulder or projection *h* is formed on the stem below the plate *e* for the purpose of raising the main valve. The part *g'* of the valve-stem projects up between the projections *h'* in the passage *f'*. The upper end of the narrow part of the stem G carries a washer for the auxiliary valve F.

There is provided a cut-off I, preferably consisting of a hollow cylinder, which slides in the lower part C' of the guide, and when the valve is closed closes the water-passages *d*. The cut-off I is provided with a top plate, through which are cut openings, so that there is a free communication between the spaces above and below it, and it is preferably screwed on the valve-stem, so that its vertical position may be adjusted thereon. It may be supported from the stem by a wire web. It is preferable to have the cylinder I make a sliding fit with the guide or to groove it along its sides, in order to prevent the inlet-passages *d* being entirely closed by the cut-off when the latter is in its normal position.

The valve-stem is raised by any approved mechanism. The various mechanisms shown will be described later.

When a valve arranged as shown in Fig. 1 is operated so as to raise the valve-stem, the auxiliary valve is first opened. It remains open while the main valve is being opened. The water which stands under pressure in the inlet-chamber now enters the chamber E' through the port *f'*, and as the connection between the said chamber and the outlet-chamber is of restricted area the chamber E' is filled, so that the pressure on the main valve is substantially equalized by the opposing pressure thus created on the discharge side thereof. The valve-stem then raises the main valve, and the water for flushing the closet flows from the inlet-chamber directly into the outlet-chamber, the passages *d* being uncovered when the cut-off I is lifted on the upward movement of the valve-stem. When the valve-stem has been raised to its full extent and is released, the parts slowly assume their original positions by gravity, the auxiliary valve closing first, there being no opposing friction and the auxiliary valve being directly connected with the weighted parts. After the auxiliary valve has been closed the seating of the main valve is retarded by the water contained within the chamber E'. The speed with which the main valve descends will depend upon the rate at which the water escapes from this chamber, which is determined by the area of the narrow annular passage *e'* and by the weight of the moving parts. The guide may be provided with an opening—as, for instance, a hole *m*—which may be provided with a regulator, as the notched screw *m'*; but the passage between the main valve and the guide will be provided also. The auxiliary valve seated upon the main valve descends therewith. The valve-stem carries down with it the auxiliary and main valve and the cut-off I, which as it descends past the lateral water-passages *d* gradually reduces the discharge area thereof. The vertical openings through the cut-off prevent suction on the cut-off. The flushing action of the water ceases and the closet stops siphoning when the cut-off I passes in front of the passage *d*, which occurs before the main valve seats. The water which subsequently flows by the cut-off forms a gentle afterrush or refill, which fills the bowl to the required height. The continued descent of the main valve finally seats it and entirely shuts off the escape of water from the inlet-chamber. This flushing-valve will work in any position.

In United States Letters Patent numbered 566,770 and 566,771, granted to me September 1, 1896, I have shown and claimed a construction wherein an auxiliary valve serves as a relief-valve to discharge the contents of a water-chamber to permit the main valve to be easily opened; but, as before pointed out, the valve F in the construction here shown differs therefrom in providing for the flow of water from the inlet-chamber to the chamber E' on the discharge side of the main valve to equalize the pressure on the opposite sides thereof. The construction herein described also differs from those of my patents in that the capacity of the chamber E' increases as the main valve is opened. The valve F permits this to be done without unnecessary force. The chamber E' may be called an "auxiliary" chamber, as it acts as an equalizing-chamber while the main valve is being opened and as a retarding-chamber while the main valve is being closed. The terms "auxiliary valve" and "auxiliary chamber" are used in the claims to designate a valve or chamber having one or both of these functions, as the context may show.

Other devices equivalent to the cut-off of Fig. 1 may be used for reducing the flow of water before the main valve closes. In Fig. 2 a plate S is shown, such as is described and claimed in my application filed June 16, 1897, Serial No. 640,969. This plate is freely slidable on the valve-stem, and when the main valve is on its seat the plate S rests on a stationary support *s*. This support projects from the guide or from the outlet-chamber, and may be a continuous flange or projecting lugs. This support may be located at any point below the inlet-holes *d*. It could with advantage be raised higher than shown in the drawings.

The plate S retards, but does not wholly stop, the flow of water into the outlet-chamber,

as it is provided with holes s' when the support s is a continuous flange. When the support consists of projections, the water can pass between the projections. The plate S is lifted by a projection T, secured on the valve-stem. This projection may be a nut screwed on the valve-stem, so that its vertical position can be adjusted. When the valve-stem is pushed up, the auxiliary valve opens first. The main valve and the cut-off are then raised. The cut-off is lifted above the water-passages d before the main valve is raised to its full extent. The parts descend slowly by gravity. The relief-valve closes first, and then the main valve commences to descend. The plate S descends with the valve-stem and rests on the support s before the main valve closes. The flushing ceases as soon as the cut-off passes the passage d, but the afterrush or refill flow to the bowl continues until the main valve finally seats. After the cut-off is rested upon its support it is no longer supported by the main valve and tends to check the descent of the main valve, which seats gently and without noise or jar.

Three different forms of mechanism for operating the valve are illustrated in the drawings. One form of such mechanism is shown in Fig. 1, in which a lever J is secured on a fulcrum which is set in a recess in the wall of the outlet-chamber A. The lever J works inside the outlet-chamber and is connected to the lower part of the valve-stem by a link j^2. This link is hinged to a teat on the lever J, so that when the parts are being assembled or taken apart it will lie flat along the arm. The outer end of the lever J plays up and down in a recess L of the outlet-chamber and is connected to the end of a rod M, the upper end of which is connected to a lever M', through which it is operated by the pull m. The rod M is inclosed in a pipe screwed into the wall of the outlet-chamber above recess L. The outlet-chamber is carefully shaped to admit of the assembly of the parts, being rounded and extended downward at the lower corners and having the recesses opposite each other. It will be seen that in this figure no stuffing-box is needed nor shown.

In Fig. 2 the valve is operated by a handle m', attached to a lever J^2, which operates the valve through a link similar to the link j^2 of Fig. 1.

To provide for the automatic action of a valve of the character hereinbefore described, I may, as shown in Fig. 5, connect the lever J^2 with the closet-seat M^3 in any approved manner—as, for instance, through the lever J^3 and link j^3, provided with a pin j^4, which engages with the end of a slotted lever J^4, attached to the lever J^2. The depression of the seat will lift the main valve. To prevent the flushing from continuing so long as the seat is depressed, which would result in the emptying of the tank and the waste of water, I provide a cut-off in the form of a hollow cylinder N, supported on the stem G by a spider n, the position of the cut-off on the stem being adjustable by any suitable means. For instance, the hub of the spider may be threaded and may screw upon the stem, as shown, the cut-off being so positioned that when the stem has been fully raised the cylinder N will be across and obstruct the water-passages d, thus cutting off the flow of water. It will be seen, however, that upon the initial movement of the main valve from its seat the water will commence to flow through the passages d and down through the hollow cylinder N, and that this flow will continue until the upward movement of the stem has caused the cylinder N to obstruct the passages d, providing a flow of limited quantity for the preliminary wetting of the bowl. When the seat is relieved of the weight which has been depressing it, it will be lifted by a spring or weight, (not shown,) the link j^3 sliding through the slot in the end of the lever j^4, but being so long that it does not slip out of it. The parts of the valve return to normal position and the flushing and afterflow take place in the manner before described in connection with Fig. 1.

It will be seen that the auxiliary valve F and shoulder h form stops or shoulders upon the stem, limiting its motion in respect to the main valve. Thus the valve F by shifting against the upper surface of the main valve insures the seating of the latter on the descent of the stem, and in the several forms of my invention herein shown I by preference so adjust the weight of the several parts of the valve-raising mechanism as to cause the stem to normally hold the main valve closed. The construction is also such as to facilitate taking the valve apart for repair or otherwise. The auxiliary valve F can be unscrewed, and the main valve E can then be lifted off. The guide C C' is also removably attached to the nozzle a'. It can be unscrewed therefrom. The parts C and C' can also be unscrewed from each other.

It will be obvious that many changes can be made without departing from the spirit of my invention.

Therefore, without limiting myself to the details shown, what I claim is—

1. The combination of an inlet-chamber provided with an outlet, a main valve closing the outlet when seated, an auxiliary chamber, and an auxiliary valve for connecting the inlet and auxiliary chambers, substantially as described.

2. The combination of an inlet-chamber provided with an outlet, a main valve closing the inlet when seated, an auxiliary chamber, an auxiliary valve for connecting the inlet and auxiliary chambers, means for opening the auxiliary valve while the main valve is being opened, an exit for the auxiliary chamber, and means for opening the exit while the main valve is closing, substantially as described.

3. The combination of an inlet-chamber

provided with an outlet, a main valve closing the outlet when seated, a plate forming with the main valve an auxiliary chamber, and an auxiliary valve for connecting the inlet and auxiliary chambers, substantially as described.

4. The combination of an inlet-chamber provided with an outlet, a main valve closing the outlet when seated, a plate forming with the main valve an auxiliary chamber having an exit of restricted area, and an auxiliary valve for connecting the inlet and auxiliary chambers, substantially as described.

5. The combination of an inlet-chamber provided with an outlet, a main valve closing the said outlet when seated, a plate forming with the main valve an auxiliary chamber, this chamber having an exit of contracted area, and an auxiliary valve to fill the auxiliary chamber, substantially as described.

6. The combination of an inlet-chamber provided with an outlet, a main valve closing the same outlet when seated, a plate supported inside the main valve and forming therewith an auxiliary chamber, an auxiliary valve for connecting the inlet-chamber and the auxiliary chamber, and means for first actuating the auxiliary valve and then the main valve, substantially as described.

7. The combination of a valve-seat, a guide provided with a lateral water-passage above the seat, a plate closing the upper part of the guide above the passage, a main valve slidable over the guide and forming a chamber above the plate, a small passage being provided for connecting the chamber with the discharge-outlet of the valve, and an auxiliary valve closing the port in the main valve and operating to admit water to the chamber, substantially as described.

8. The combination of a valve-seat, a guide provided with a lateral water-passage above the seat, a plate closing its upper part above the passage, a main valve slidable over the guide and forming a water-chamber above the plate, a small passage being provided for connecting the chamber with the discharge-outlet of the valve, an auxiliary valve closing a port in the main valve and operating to admit water to the chamber, and a valve-stem connected to the auxiliary valve and operating to open the main valve after the auxiliary valve, substantially as described.

9. The combination of an outlet-chamber, an annular valve-seat, a guide secured to the outlet-chamber and provided with a collar for clamping the valve-seat in position, the guide having also a lateral water-passage above the collar, a plate closing its upper part above the passage, a main valve slidable over the guide and forming an auxiliary chamber above the plate, a small passage being provided for connecting the chamber with the discharge-outlet of the main valve, and an auxiliary valve closing a port in the main valve and operating to admit water to the auxiliary chamber, substantially as described.

10. The combination of a valve-seat, a guide comprising a lower part secured to the valve-seat and provided with a lateral water-passage, and an upper part screwed onto the lower part and provided with a plate closing its upper end, a main valve slidable over the guide and forming an auxiliary chamber above the plate, a small passage being provided for connecting the chamber with the discharge-outlet of the valve, an auxiliary valve closing a port in the main valve and operating to admit water to the auxiliary chamber, and a ring slidable on the lower part of the guide and affording means for regulating the area of its lateral water-passage, substantially as described.

11. The combination of a main-valve seat, a guide provided with a lateral water-passage above the valve-seat, a plate closing its upper part, above the passage, the plate being provided with an opening through it and means for varying the area of the opening, a main valve slidable over the guide and forming an auxiliary chamber above the plate, and an auxiliary valve closing a port in the main valve and operating to admit water to the auxiliary chamber, substantially as described.

12. The combination of an outer chamber for holding water under pressure, a hollow main valve closing an outlet from the outer chamber and normally held to its seat by the pressure of the water in the outer chamber, of a stationary plate supported inside the main valve and forming an auxiliary chamber in its upper part, and an auxiliary valve also normally held to its seat by the pressure of the water in the outer chamber and operating to equalize the pressure in the two said chambers when raised, thereby permitting the main valve to be raised easily, substantially as described.

13. The combination of an outer chamber for holding water under pressure, and provided with an outlet, of a hollow main valve closing the outlet from the outer chamber, a stationary plate supported inside the main valve and forming therewith an auxiliary chamber, an auxiliary valve for admitting the pressure-water from the outer chamber to the equalizing-chamber before the main valve is opened, and a single stem operating positively to open first the auxiliary valve and then the main valve, substantially as described.

14. The combination of an inlet-chamber provided with an outlet, a guide, provided with lateral water-passages connecting the inlet-chamber and the outlet, and carrying a plate, a hollow main valve slidably mounted on the guide and closing the lateral water-passages when seated, and forming with the plate an auxiliary chamber, an exit-passage formed between the guide and main valve, and an auxiliary valve for permitting the auxiliary chamber to fill when the main valve is moved to uncover the discharge-port, substantially as described.

15. The combination of a guide having a water-passage in its side, a valve slidable over the guide and closing the water-passage when in its normal position, a cut-off working inside the guide to obstruct the water-passage, a stem for actuating the valve and controller, and means for retarding the closing of the valve, substantially as described.

16. The combination of a valve-seat, and a guide provided with a lateral water-passage above the valve-seat, a plate closing its upper part above the water-passage, a main valve slidable over the guide and forming an auxiliary chamber above the plate, a small passage being provided for connecting the auxiliary chamber with the discharge-outlet of the main valve, an auxiliary valve closing a port in the main valve and operating to admit water to the auxiliary chamber, and a cut-off working in the lower part of the guide and operating to obstruct the free flow of the water through the lateral water-passage, before the main valve closes, substantially as described.

17. The combination of a valve-seat, a guide provided with a lateral water-passage above the valve-seat, and a plate closing its upper part above the passage, of a main valve slidable over the guide and forming an auxiliary chamber above the plate, a small passage being provided for connecting the chamber with the discharge-outlet of the valve, an auxiliary valve closing a port in the main valve and operating to admit water to the auxiliary chamber, a cut-off working in the lower part of the guide and operating to obstruct the free flow of water through the lateral water-passage before the main valve closes, and a single stem operatively connected with the valves and cut-off, substantially as described.

18. The combination of a valve-seat, a guide provided with a lateral water-passage above the valve-seat, a main valve slidable over the guide, a stem slidable in the guide and operatively connected to the main valve, and a cut-off working inside the guide and operated by the stem, the cut-off operating to obstruct the free flow of water through the lateral water-passage before the main valve closes, substantially as described.

19. The combination of a valve-seat, and a guide provided with a lateral water-passage above the valve-seat, a main valve slidable over the said guide, a stem slidable in the guide and operatively connected to the main valve, and a cylinder secured on the stem and slidable in the guide over the lateral water-passage, the cylinder operating to obstruct the free flow of water before the main valve closes, substantially as described.

20. The combination of an outer chamber for holding water under pressure, a hollow main valve closing the outlet from the outer chamber, an auxiliary valve seated on top of the main valve, a stem for raising first the auxiliary valve and then the main valve, and a stationary plate forming an auxiliary chamber in the upper part of the main valve and provided with a guide-hole for the stem to slide in, substantially as described.

21. The combination of an outer chamber for holding water under pressure, and provided with an outlet, a hollow main valve closing the outlet from the chamber, a stationary plate supported inside the main valve and forming a space for receiving water in its upper part, and an auxiliary valve for equalizing the pressure between the outer chamber and space so that the main valve may be raised easily and prevented from closing quickly, substantially as described.

22. The combination of an outer chamber for holding water under pressure, and provided with an outlet, a hollow main valve closing the outlet from the chamber, a stationary plate supported inside the main valve and forming a space for receiving water in its upper part, and an auxiliary valve for equalizing the pressure between the outer chamber and space so that the main valve may be raised easily and prevented from closing quickly, the auxiliary valve being arranged in the outer chamber, substantially as described.

23. The combination of a guide provided with a water-passage, a hollow valve mounted upon the exterior of the guide and closing the passage, when seated, a cut-off located within the guide to close the passage when the main valve is opened, and a retarding-chamber to retard the closing of the valve, substantially as described.

24. The combination of a guide provided with a water-passage, a hollow valve mounted upon the exterior of the guide, and forming therewith an auxiliary chamber, the valve, when seated, closing the passage, and a cut-off moving in the guide and closing the passage when the valve is opened, substantially as described.

25. The combination with a guide provided with a water-passage and a closed top, of a hollow main valve around the guide and moving thereon and forming therewith a chamber, the main valve when seated closing the water-passage, an auxiliary valve, opening and closing a passage connected with the chamber, a cut-off moving within the guide, and means for opening the auxiliary valve and the main valve and for moving the cut-off to close the water-passage, the one after the other, substantially as described.

26. The combination of a guide provided with a water-passage and a closed top, a main valve around the guide, and forming therewith an auxiliary chamber, the main valve when seated closing the water-passage, an auxiliary valve opening and closing a port in the auxiliary chamber, a cut-off moving inside the guide, and a single stem for opening the auxiliary valve and then the main valve, and for moving the cut-off to close the water-passage after the main valve has been opened, substantially as described.

27. The combination of a guide provided

with a water-passage, a main valve closing the passage when seated, an auxiliary chamber, an auxiliary valve opening and closing a port in the auxiliary chamber, a cut-off, and a single stem for opening the auxiliary valve and then the main valve, and for moving the cut-off to close the water-passage when the main valve is opened, substantially as described.

28. The combination of a guide provided with a water-passage, a main valve closing the passage when seated, a cut-off, a single stem for opening the main valve and for moving the cut-off to close the water-passage when the main valve is opened, the stem being provided with a stop engaging the main valve and closing it, and a retarding-chamber to check the closing of the main valve, substantially as described.

29. The combination of a valve, a guide, a support for the guide, a valve-stem passing through the guide and valve, and provided with a nut on the end which projects through the valve, the guide being removably attached to the support, substantially as described.

30. The combination of a valve, a guide, a support for the guide to which it is screwed, and a valve-stem passing through the guide and valve, and an auxiliary valve screwed on the end of the valve-stem which projects through the valve, substantially as described.

Signed by me in New York city, county and State of New York, this 6th day of May, 1898.

DAVID T. KENNEY.

Witnesses:
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ANSON BALDWIN.