(No Model.) 4 Sheets—Sheet 1.

J. MENZIES.

VALVE FOR WATER CLOSETS.

No. 542,485. Patented July 9, 1895.

Fig. 1

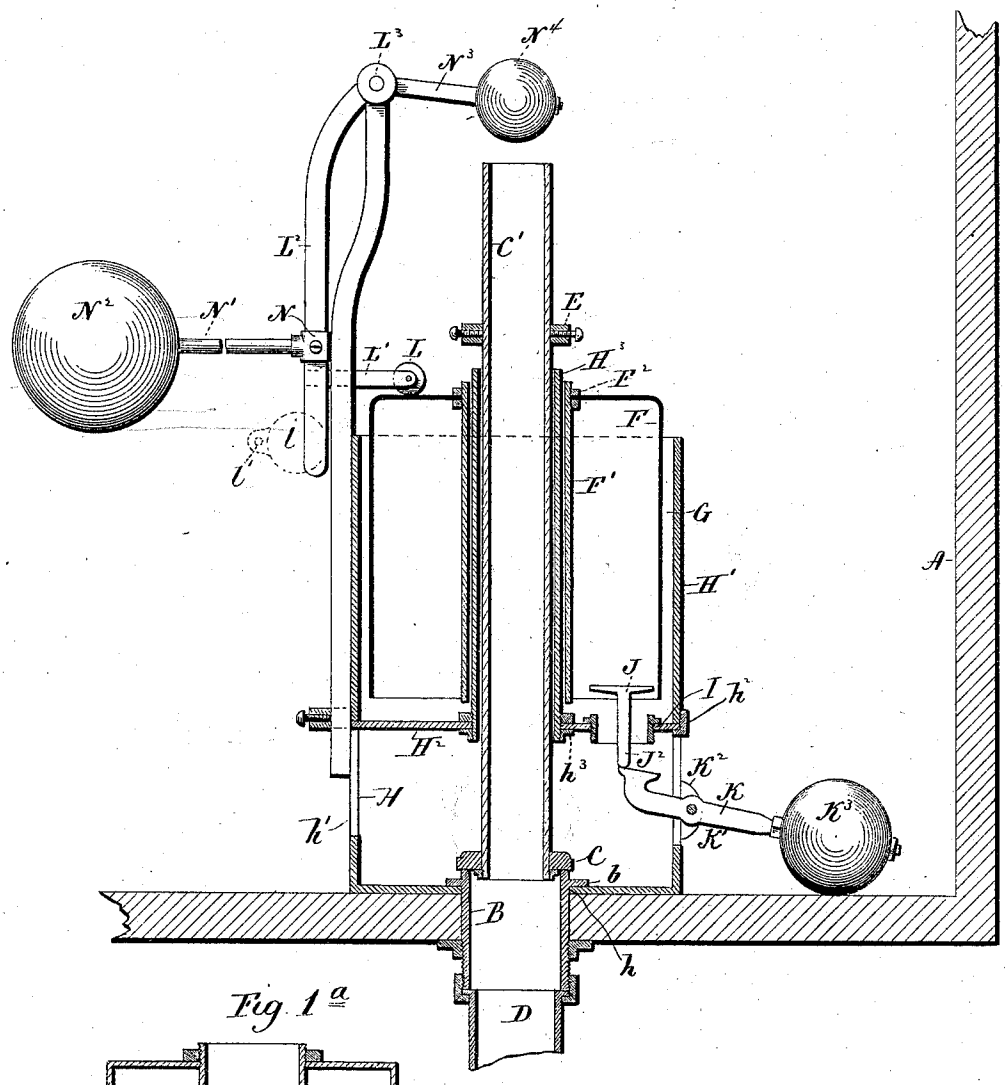
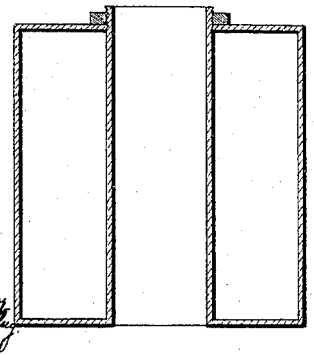


Fig. 1ª



Witnesses
J. H. Shumway
William D. Hoyt

John Menzies
Inventor
By Alley Eaton & Seymour

(No Model.) 4 Sheets—Sheet 2.

J. MENZIES.

VALVE FOR WATER CLOSETS.

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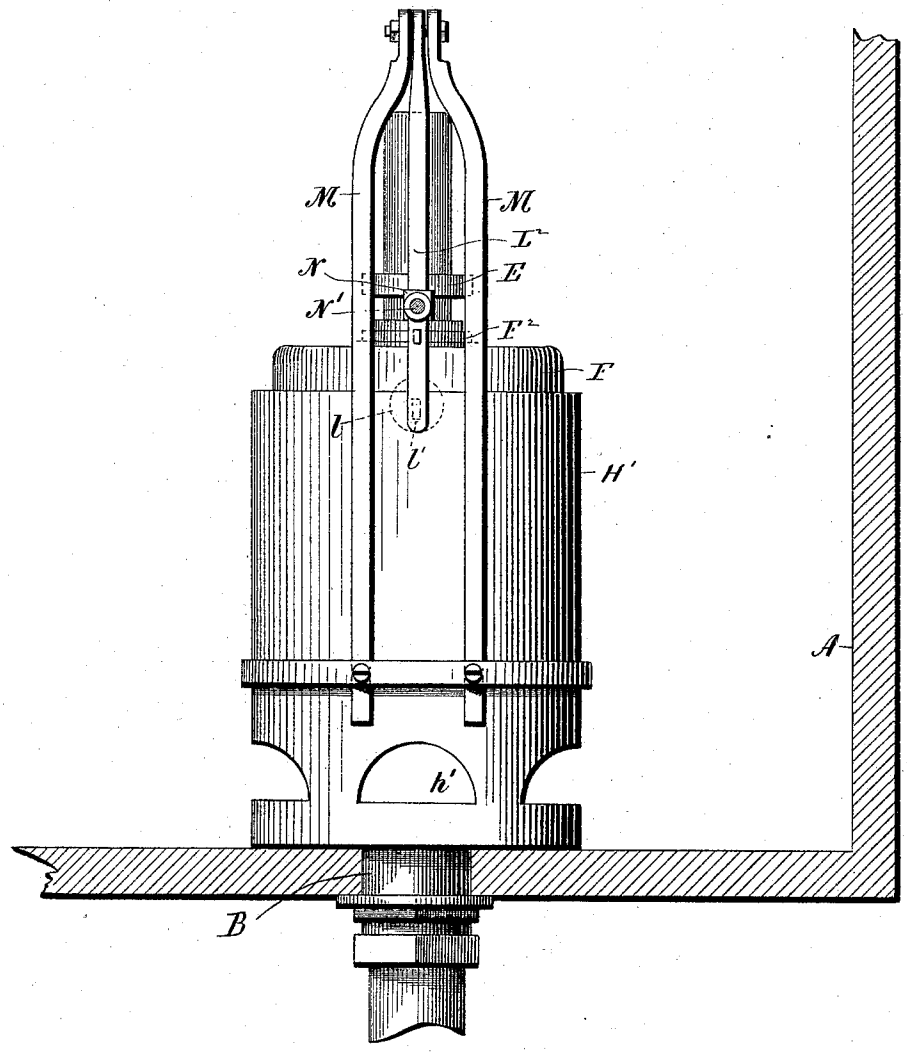
Fig. 2



Witnesses
J. H. Shumway
Lillian D. Kelsey

John Menzies.
Inventor
By Atty
Earle Seymour

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J. MENZIES.

VALVE FOR WATER CLOSETS.

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Fig. 3.

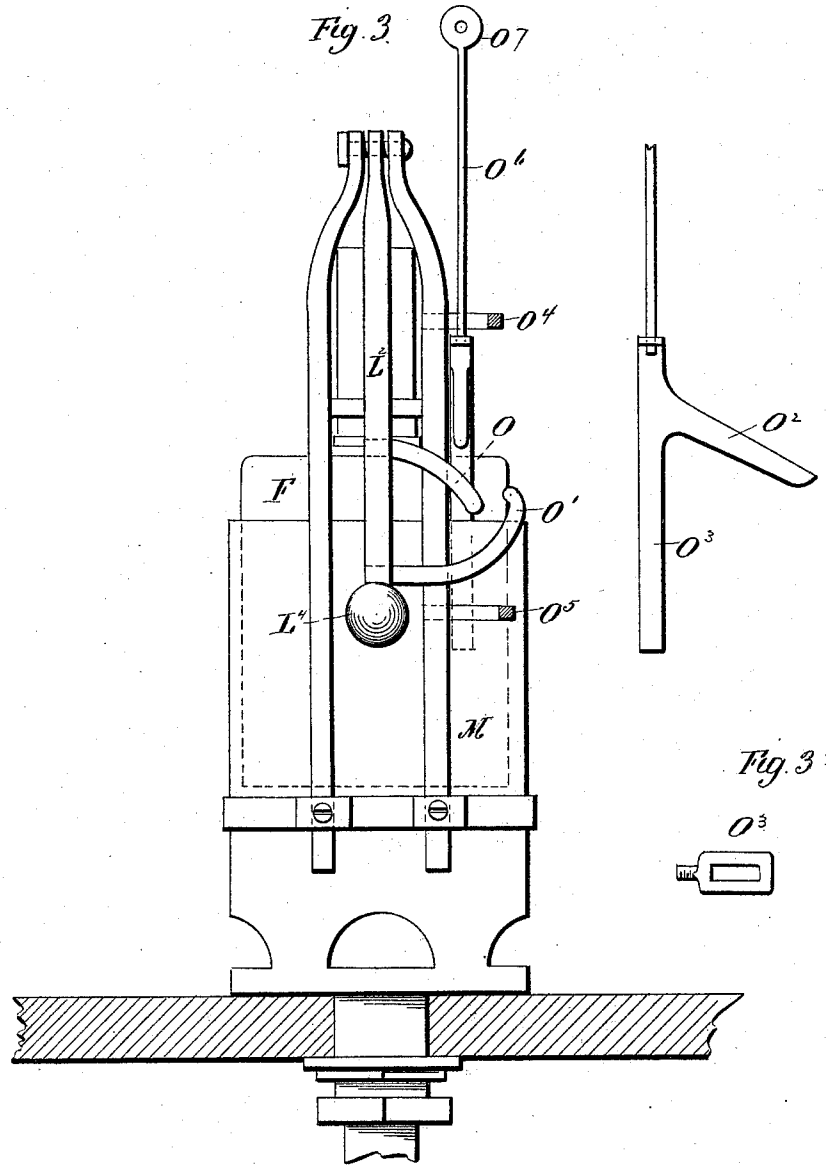

Fig. 3a.

Witnesses
J. H. Shumway
Lillian D. Kelsey

John Menzies
Inventor.
By Alley & Earle Seymour

(No Model.)

4 Sheets—Sheet 4.

J. MENZIES.

VALVE FOR WATER CLOSETS.

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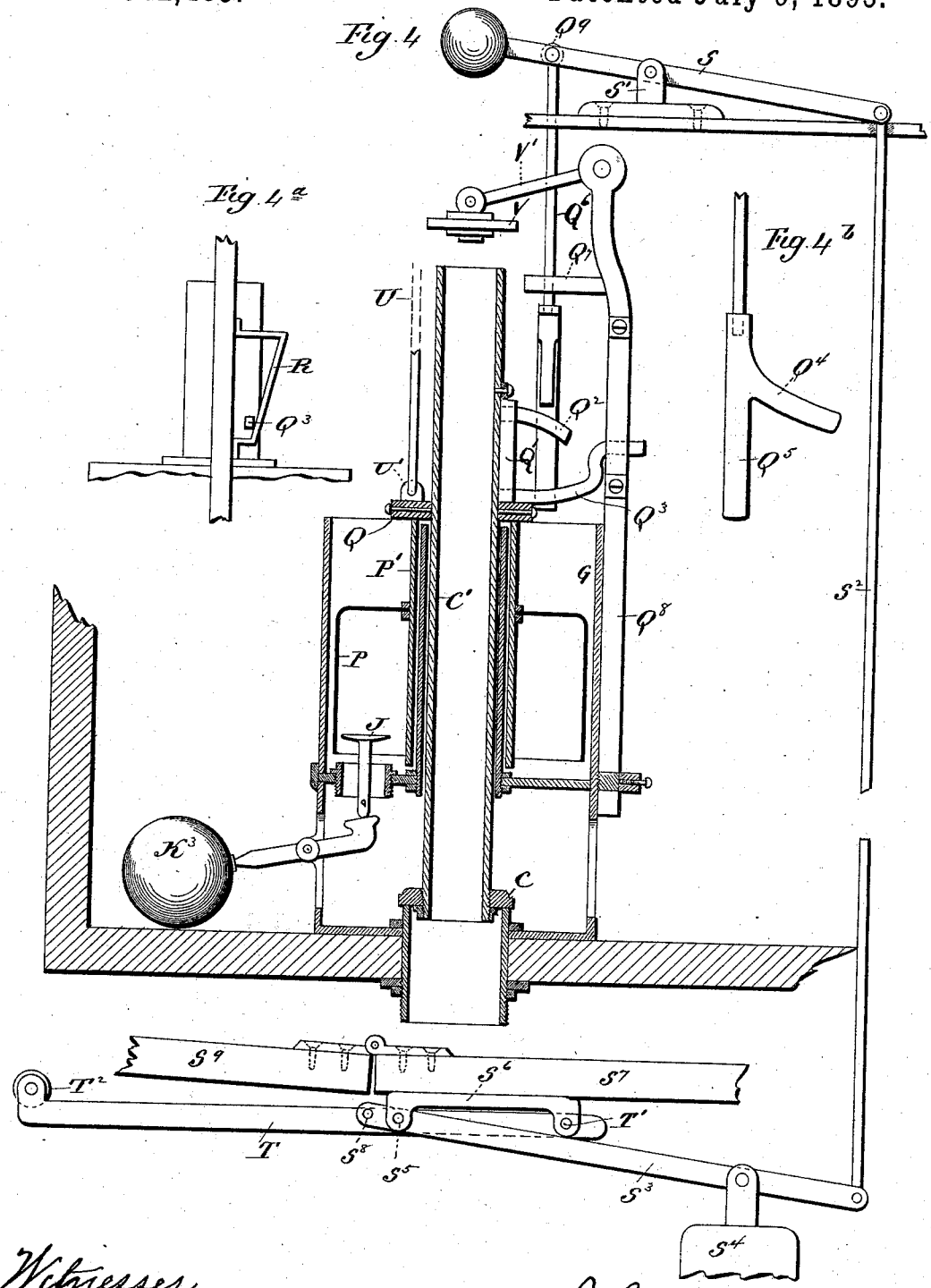

Witnesses,
J. H. Shumway
Lillian D. Kelsey.

John Menzies
Inventor
By Atty
Earle Seymour

UNITED STATES PATENT OFFICE.

JOHN MENZIES, OF NEW HAVEN, CONNECTICUT.

VALVE FOR WATER-CLOSETS.

SPECIFICATION forming part of Letters Patent No. 542,485, dated July 9, 1895.

Application filed June 18, 1894. Serial No. 514,917. (No model.)

To all whom it may concern:

Be it known that I, JOHN MENZIES, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Valves for Water-Closets; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a view, partly in elevation and partly in section, of one form which an apparatus constructed in accordance with my invention may assume; Fig. 1ª, a detached view of a modified form of valve-float; Fig. 2, a view in side elevation of the construction shown by Fig. 1 with the primary ball-float broken away; Fig. 3, a view in elevation of a modified form of the apparatus when adapted to have its float released by a hand-pull; Fig. 3ª, a detached plan view of one of the guides in which the pull-rod works; Fig. 4, a view of the apparatus when adapted to be started in operation by means of connections with the closet-seat; Fig. 4ª, a detail view showing the guide-frame in which the guide-finger carried by the tubular stem of the tank-valve plays; Fig. 4ᵇ, a detached view in side elevation of the trip-finger, the trip-bar, and the trip-rod.

My invention relates to an improved noiseless valve for water-closet tanks, the object being to produce a simple and effective construction, not liable to derangement, and adapted to be set in operation either manually or otherwise, and to effect the discharge of the water contained in the tank with the minimum amount of noise and agitation.

With these ends in view my invention consists in a noiseless valve having certain details of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

My improved device may be arranged to be operated automatically, in which case the discharge-valve will be opened intermittently at intervals represented by the time required to fill the tank, or it may be operated manually by a hand-pull or by a system of levers connecting it with the closet-seat.

As shown in Figs. 1 and 2 of the drawings, the device is arranged to operate automatically. In this construction the tank A, which may be of any approved form, has its bottom provided with a coupling B, the upper end of which extends up into the tank and forms a seat for the main discharge or tank valve C, while its lower end projects below the bottom of the tank and is threaded for the attachment of the discharge-pipe D, which leads to the bowl of the closet. The said valve C is secured to the lower end of a long vertically-arranged tube C′, which has the twofold office of forming a stem for the valve and an overflow for the tank. Toward its upper end this stem is provided with a vertically-adjustable operating-collar E, which is engaged for lifting the stem, and hence opening the valve, by means of an inverted annular valve-float, having its upper end closed and its lower end open, and comprising, as shown, a shell-like body F and a tube F′, corresponding to the said body in length and secured to the inwardly-turned and closed upper portion thereof, which is thereto provided with an internally-threaded collar F², receiving the externally-threaded upper end of the tube. The said valve-float is located in an annular float-chamber formed in the upper end of a vertically-arranged cylindrical cup-like structure, secured to the bottom of the tank concentric with the coupling B, the main discharge or tank valve C, and the tubular stem C′ of the said valve. As herein shown, this cup is composed of a cast-metal body H, a ring H′ corresponding to the said body in diameter, a diaphragm H² introduced between the upper end of the body and the lower end of the ring, and a guide-tube H³, secured at its lower end to the center of the diaphragm and extending at its upper end above the upper end of the ring. The said body has a central opening *h* formed in its bottom to adapt it to receive the upper end of the coupling B, which is constructed with a flange *b*, which bears upon the inner face of the bottom of the cup, so as to hold the same in place, as clearly shown in Fig. 1. The lower end of the said body is constructed with an annular series of semicircular openings *h*′, which permit the water contained in the tank to find ready access to the valve C and coupling B. At its upper end the cup body is constructed

with an internally-threaded offsetting flange h^2, which receives the externally-threaded lower end of the ring H′. The diaphragm H^2 is located within this flange and is held down by the impingement upon its upper face of the lower end of the ring H′. The tube H^3 has its lower end externally threaded and screwed into an internally-threaded collar h^3, mounted in the center of the diaphragm. I do not limit myself to constructing the "cup," so called, as described, for obviously it may be formed in other ways. The outer wall of the said annular float-chamber G is formed by the said ring H′, while its inner wall is formed by the guide-tube H^3, which is intermediate in diameter between the external diameter of the tubular valve-stem C′ and the internal diameter of the float-tube F′ before mentioned, while the bottom of the said chamber is formed by the diaphragm H^2. The said tubular valve-stem C′, float-tube F′, and guide-tube H^3 are concentric with each other.

I may here remark that the valve-float may, if preferred, be drawn from a single piece of metal. If desired, also, its lower end may be closed, as shown in Fig. 1ª. The said diaphragm has mounted in it a collar I, the upper end of which forms a seat for a secondary discharge or float-chamber valve J′, having a downwardly-projecting stem J^2, which is engaged for opening the valve by the inner end of a float-lever K, hung on a pivot K′, mounted in lugs K^2, (of which only one is shown,) formed upon the outer face of the lower end of the cup-body H, the outer end of the said lever being furnished with a secondary ball-float K^3, of any approved construction. The valve-float is normally maintained in its depressed position, in which its upper end is depressed below the operating-collar E, mounted on the valve-stem C′, by means of a roller L, located in the inner end of a horizontally-arranged arm L′, the outer end of which is rigidly secured to the lower end of a vertically-arranged releasing-lever L^2, which is hung at its upper end on a horizontal stud L^2, mounted in the converging upper ends of two corresponding uprights M M, the lower ends of which are rigidly secured to the exterior surface of the flange h^2 of the cup-body H. The lower end of the said releasing-lever L^2 has mounted upon it a vertically-adjustable sleeve N, receiving the inner end of the stem N′ of a ball-float N^2, which primarily makes the action of the construction now being described automatic, as will appear later on. The upper end of the said releasing-lever has connected with it the stem N^3 of a ball-float N^4, which is located directly over the upper end of the tubular valve-stem C′, and fits into it when the same is raised to prevent air from being sucked through it during the discharge of the water contained in the tank.

Having now described the construction of of a purely-automatic form of my improvement, I will proceed to set forth the operation thereof.

For convenience of description I will assume that the parts of my improved device are in the positions in which they are shown in Figs. 1 and 2 of the drawings, which represent the main discharge or tank valve in its closed position and the secondary or float-chamber valve in its open position. If now water is admitted into the tank it will flow through the openings h' in the cup-body H and rise in the cup as fast as it rises in the tank. The first effect will be to lift the float K^3 of the float-chamber valve J, which will then close under the action of gravity, but as soon as the water reaches the level of the said valve it will lift and open the same and enter the float-chamber and immerse the open lower end of the float, the upper end of which is closed. There being, therefore, no escape for the air contained by the float, the same will not fill with water any farther than the contained air is capable of compression by the pressure of the water. The compressed air confined in the float will now tend to buoy it up and lift it, which it would at once do except for the restraining influence of the roller L mounted in the arm L′, the roller being at this time engaged with the top of the float. When the water rises in the tank so as to reach the primary ball-float N^2 it will gradually lift the same, which in turn will swing the releasing lever L^2 on its pivot L^3, and gradually withdraw the roller L and arm L′ away from the closed upper end of the float. Then, when the water has risen to its full height in the tank, the valve-float will be released, when the contained air in it will at once lift it against the operating-collar E mounted on the stem C′ of the discharge-valve C.

It is designed that in the construction now being described the lifting power of the float shall be sufficient not only to lift the weight of the tank-valve and its stem, but also to overcome the suction upon the said valve, so that the valve-float will be able to at once lift the valve from its seat and support it in an elevated position while the water in the tank is being discharged through the cup-body and coupling. As the water falls and nears the bottom of the tank it will allow the secondary ball-float K^3 to drop, whereupon the inner end of the float-lever K will engage with the stem J^2 of the secondary or float-chamber valve J′, which will be lifted from its seat so as to permit the water in the said chamber to be discharged. As the water flows out of this chamber the valve-float will gradually descend and permit the descent of the tubular valve-stem C′ and allow the tank-valve C to rest again upon its seat. Then, when the valve-float reaches its normal position, the roller L, carried by the arm L′, rides back over its closed upper end under the gravity of the releasing-lever L^2 and the primary ball-float N^2 and its stem N′. The parts of the apparatus are thus left in positions of readiness for the refilling of the tank and the repetition of the operations just detailed. It will thus be seen that

the operation of my device, when constructed as shown in Figs. 1 and 2, is purely automatic and that the tank will be intermittently discharged at intervals represented by the time required to fill it and empty it.

The apparatus described in Figs. 1 and 2 of the drawings might very readily be converted into an apparatus operating on the "hand-pull" principle by simply leaving off the primary ball-float N^2 and its stem N′, and locating upon the lower end of the releasing-lever a weight *l*, (shown by broken lines in the said figures,) and furnished with a perforated ear *l*′, for the attachment of a cord or chain, terminating at its opposite end in a handle, or some other connection for its operation by hand, so that by pulling the chain the lower end of the lever would be thrown outward, and the arm L′ and roller L withdrawn from over the upper end of the valve-float.

In Fig. 3 of the drawings I have shown a construction similar to that first described, except for the provision for releasing the valve-float. In this construction I employ instead of the primary ball-valve which operates the apparatus automatically, or in place of a handle connected to a chain or cord attached to the lower end of the releasing-lever, a seat attachment connected with the closet-seat in such a manner that the seat operates the apparatus. Under this construction I provide the releasing-lever L^2 with a laterally-projecting downwardly-inclined operating-finger O, and with a laterally-projecting longer upwardly-turned guide-finger O′, between the end of which and the end of the operating-finger O there is a sufficient opening to receive a downwardly-inclined trip-finger O^2, carried by a vertically-movable trip-bar O^3, playing in horizontally-arranged guides O^4 and O^5, secured to the adjacent member of the two uprights M. The trip-bar O^3 is secured to a trip-rod O^6, having at its upper end an eye O^7 for connection with the seat through any desired instrumentalities, not necessary to describe, but sufficiently made known by the statement that they may correspond to the seat connections shown in Fig. 4 of the drawings. Normally the seat will be lifted a little, and in this position of it the trip-finger O^2 will occupy a position just a little above the operating-finger O. When, however, the seat is depressed, the trip-bar will descend and the trip-finger O^2 engage with the upper face of the operating-finger, which will deflect it outwardly into the space between the ends of the operating and guide fingers, after which the bar will operate by its weight to cause the trip-finger O′ to take a position under the operating-finger O. Then when the seat is allowed to lift again the bar will be lifted and the inclined upper face of the trip-finger O′ engaged with the under face of the operating-finger, at which time the operating-finger, and hence the releasing-lever, will be swung outward for a distance sufficient to clear the roller L from the valve-float. In this construction the lower end of the releasing-lever is provided with a weight L^4.

It will be observed by reference to Fig. 3^a of the drawings that the guides O^3 and O^4 are constructed so as to permit the lateral play of the trip bar and rod required for getting the trip-finger into position under the operating-finger. Other than as just specified, the construction shown by Fig. 3 corresponds to that shown by Figs. 1 and 2, and the only object of the operating-guide and trip-fingers is to release the float to permit it to act.

In the construction shown by Figs. 4, 4^a, and 4^b I have shown a modified form of my improved apparatus, for while the valve-float in the apparatus shown in the other figures performs the work of overcoming the suction of the tank-valve, as well as lifting the same and its stem, the float in the construction now to be described has power enough only to maintain the valve in an elevated position after it has been lifted by other means. In this construction the float, which comprises a body P and a tube P′, is made on the same principle, but shorter than the float already described and therefore is less buoyant. Its tube P′ is extended above it for engagement with a lifting-collar Q, secured to the valve-stem C′ of the valve C, the said collar being vertically adjustable on the valve-stem and having formed with it a vertical post Q′, provided at its upper and lower ends, respectively, with a downwardly-inclined bowed operating-finger Q^2 and an upwardly-inclined guide-finger Q^3, there being a space formed between the fingers to permit the passage between them of a trip-finger Q^4, carried by a trip-bar Q^5 secured to the lower end of a trip-rod Q^6, which plays up and down through a guide Q^7, carried near the upper end of an upright Q^8 secured at its lower end to the body of the cup. A vertical guide-frame R, secured to the upright Q^8 and wider at its upper than at its lower end, co-operates with the guide-finger Q^3 before mentioned. The upper end of the trip-rod Q^6 is furnished with an eye Q^9, by means of which it is attached to the weighted end of a trip lever S, mounted in a bracket S′ secured to the top of the tank, the opposite end of the said lever being connected by a long vertical rod S^2 with the outer end of a horizontal lever S^3, carrying a weight S^4 pivoted, as at S^5, to a bracket S^6 secured to the seat-frame S^7. The extreme forward end of the lever S^3 is connected at S^8 with the seat-lever T, which is hung, as at T′, to the opposite end of the bracket S^6, the forward end of the seat-lever T extending under the seat S^9 and provided with an antifriction-roll T^2. In the operation of this form of my improved apparatus the tank-valve C is normally closed and the trip-finger Q^4 normally stands above the operating-finger O^2, as shown in Fig. 4 of the drawings. When the seat is depressed

the finger Q^4 engages with the downwardly-inclined upper edge of the finger Q^2 and moving laterally outward away from the tubular stem C′ glances, so to speak, off the operating-finger and then passes under the same through the passage formed between the same and the guide-finger. Now when the seat is released and raised by the weight S^4 the rod S^2 will be drawn downward and the trip-rod Q^6 and bar Q^5 will be raised, so as to bring the trip-finger Q^4 into engagement with the under face of the operating-finger Q^2. Then as the inclined upper face of the trip-finger pulls against the inclined lower face of the operating-finger, the tendency will be for the operating-finger to be pushed away from the trip-finger, and this would result except for the guide-finger, which is restrained by the guide-frame, except within narrow limits. The trip-finger therefore operates through the operating-finger to lift the tube C′ and raise the valve C from its seat. As the tubular stem C′ is raised the guide-finger gradually moves into the wider upper part of the guide-frame R, and as fast as the guide-frame gains in width, just so fast is the stem C′ rotated, and the operating-finger Q^2 and the trip-finger Q^4 cleared from each other. Finally, when the stem is lifted to its highest position, the fingers Q^2 and Q^4 disengage, leaving the latter free to take its normal position above the former. It will thus be seen that the lifting of the valve-stem, and hence the valve, has been done, not by the valve-float, but through the agency of the closet-seat. The buoyancy of the float now comes into play to sustain the tank-valve in its open position until the water contained in the tank has been discharged, for although the float is not sufficiently buoyant to overcome the suction upon the said valve, it is buoyant enough to hold the valve in an elevated position after the suction has been overcome. Then, when the water in the tank has been nearly drawn off, the ball-float K^3 effects the opening of the float-chamber valve J′, which lets the water out of the float-chamber G and permits the float to descend, and with it the tubular valve-stem C′ and valve C. As the valve-stem C^8 descends, the guide-finger Q^3 will engage with the inclined outer side of the guide-frame R, the said side of the frame then operating through the said finger to rotate the stem, and hence the valve, and bring the operating-finger Q^2 again into right position under the trip Q^4. It will thus be seen that while in the construction shown by Figs. 1, 2, and 3 the float is relied upon to lift the valve and maintain it in its elevated position while the contents of the tank are being discharged, in the construction shown by Fig. 4 the valve-float is relied upon only to maintain the valve in its elevated position after it has been lifted by other means. If desired, the lifting mechanism illustrated in Fig. 4 might be entirely done away with and replaced by a lifting-rod U, having its lower end connected with a perforated ear U′, formed upon the collar Q, as shown in broken lines in Fig. 4. It is understood that the upper end of this rod would be connected with a hand-pull of some suitable character not needing description.

I would call particular attention to the fact that by employing the two levers T and S^3, arranged and connected as shown and described, I am enabled to multiply, as it were, the slight movement of the closet-seat S^9 sufficiently to produce the required length of movement for the vertical play demanded of the trip-bar Q^5, the multiplication of movement resulting from connecting the lever S^3 with the lever T at a point close to but in front of the pivotal point S^5 of the lever S^3. It is apparent that it would be difficult to produce the same length of motion by employing one lever between the seat and the rod S^2.

In Fig. 4 I have shown another form of anti-suction valve for preventing the sucking of air through the upper end of the tubular valve-stem while the contents of the tank are being discharged. This valve V is a flat valve and pivotally connected with an arm V′, attached to the upper end of the upright Q^3.

In view of the changes suggested and of others which may obviously be made I would have it understood that I do not limit myself to the exact construction herein shown and described, but hold myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

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

1. The combination with the tank of a water-closet, of a valve through which the water in the tank is discharged, a float-chamber, a valve located in the said chamber for discharging the water contained therein, and a float located in the said chamber and arranged for co-action with the valve of the tank, substantially as described.

2. The combination with the tank of a water-closet, of a valve located therein, a tubular stem for the said valve, a cup located within the tank, concentric with the said stem and containing a float-chamber, a valve controlling the egress of the water from the bottom of the said chamber, and a float located in the said chamber and arranged to coact with the tubular valve-stem, substantially as described.

3. The combination with a tank, of a discharge valve located in the bottom thereof, a tubular stem for the said valve, a cup located within the tank concentric with said valve and its stem, and containing a float-chamber, a valve located in the bottom of the said float-chamber for emptying the same, a float for controlling the opening of the said float-chamber valve, a valve-float located in the said float-chamber, and arranged to co-act with the stem of the tank-valve, and means for normally holding the float in its depressed position, and for releasing it to permit it to coact with the said valve-stem in emptying the tank, substantially as described.

4. The combination with a tank, of a valve located in the bottom thereof, a vertically arranged tubular stem for the said valve, a cup located in the tank concentric with the said valve and stem, and containing in its upper portion a valve float-chamber, a valve located in the bottom of the said float-chamber for emptying the same, means for opening the said valve of the float-chamber, an annular valve-float located in the said chamber and co-acting with the valve-stem to lift it, and hence the valve, and means for maintaining the float in its normally depressed position, and for releasing it to lift the stem and valve, substantially as described.

5. The combination with a tank, of a valve located in the bottom thereof, a tubular stem for the said valve, a float coacting directly with the said stem to lift the said valve, a float chamber located in the tank and containing the said float, a valve for discharging the water contained in the float chamber and means for temporarily closing the upper end of the stem for preventing the suction of air through it during the emptying of the tank, substantially as described.

6. In a water-closet, the combination with a tank and means for discharging the same for flushing the closet, of a closet-seat, and mechanism between the seat and the said means for discharging the tank, including two horizontally arranged levers one of which is engaged at its forward end by the seat, and pivotally hung at its rear end, and the other of which is pivotally connected at its forward end with the lever first mentioned, and pivotally hung at a point close to, but in rear of its connection with the other lever, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN MENZIES.

Witnesses:
FRED C. EARLE,
LILLIAN D. KELSEY.