(No Model.) 2 Sheets—Sheet 1.

J. W. HALE.

REFILL FOR CISTERNS.

No. 580,860. Patented Apr. 20, 1897.

Fig. 1.

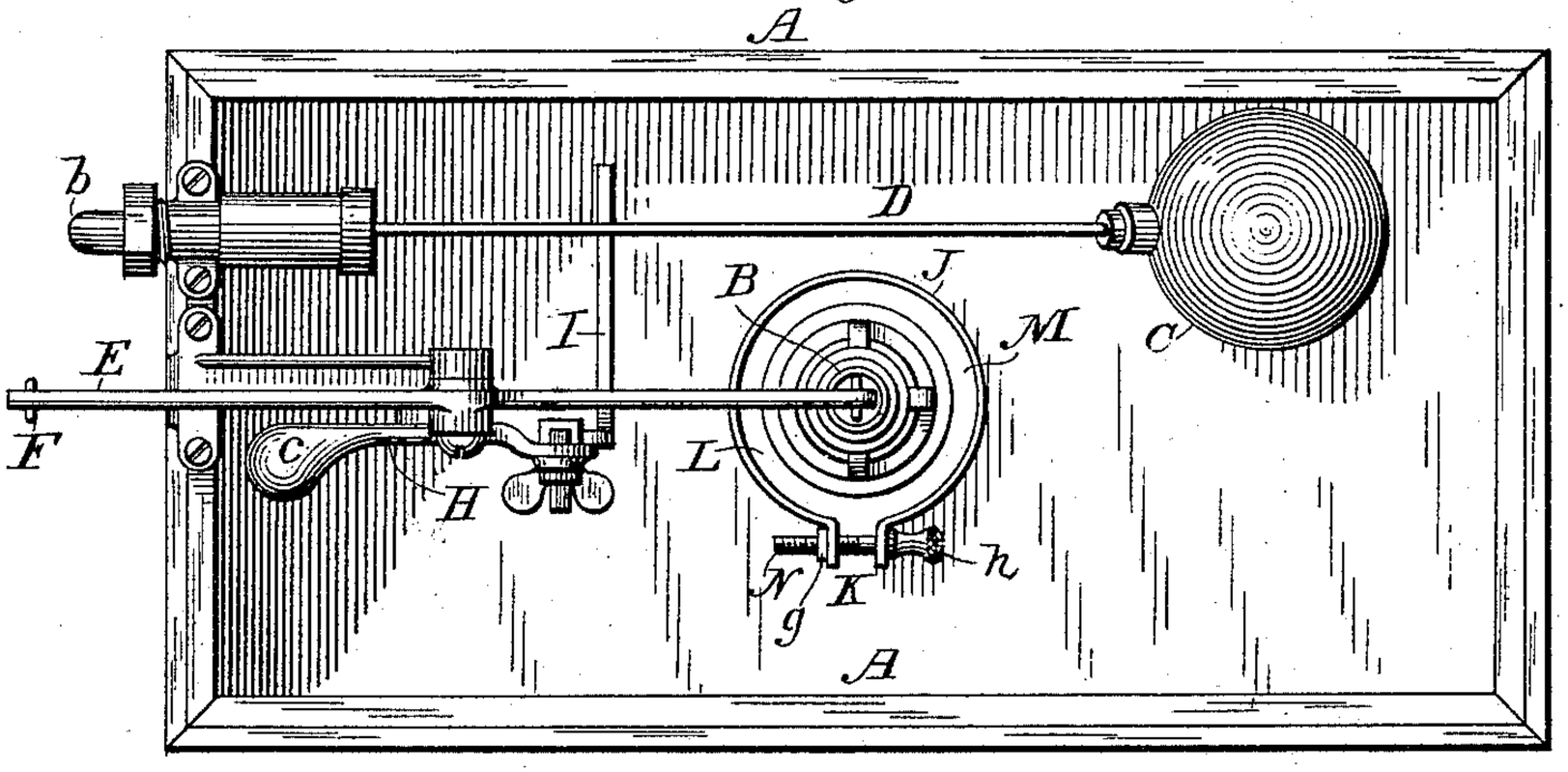
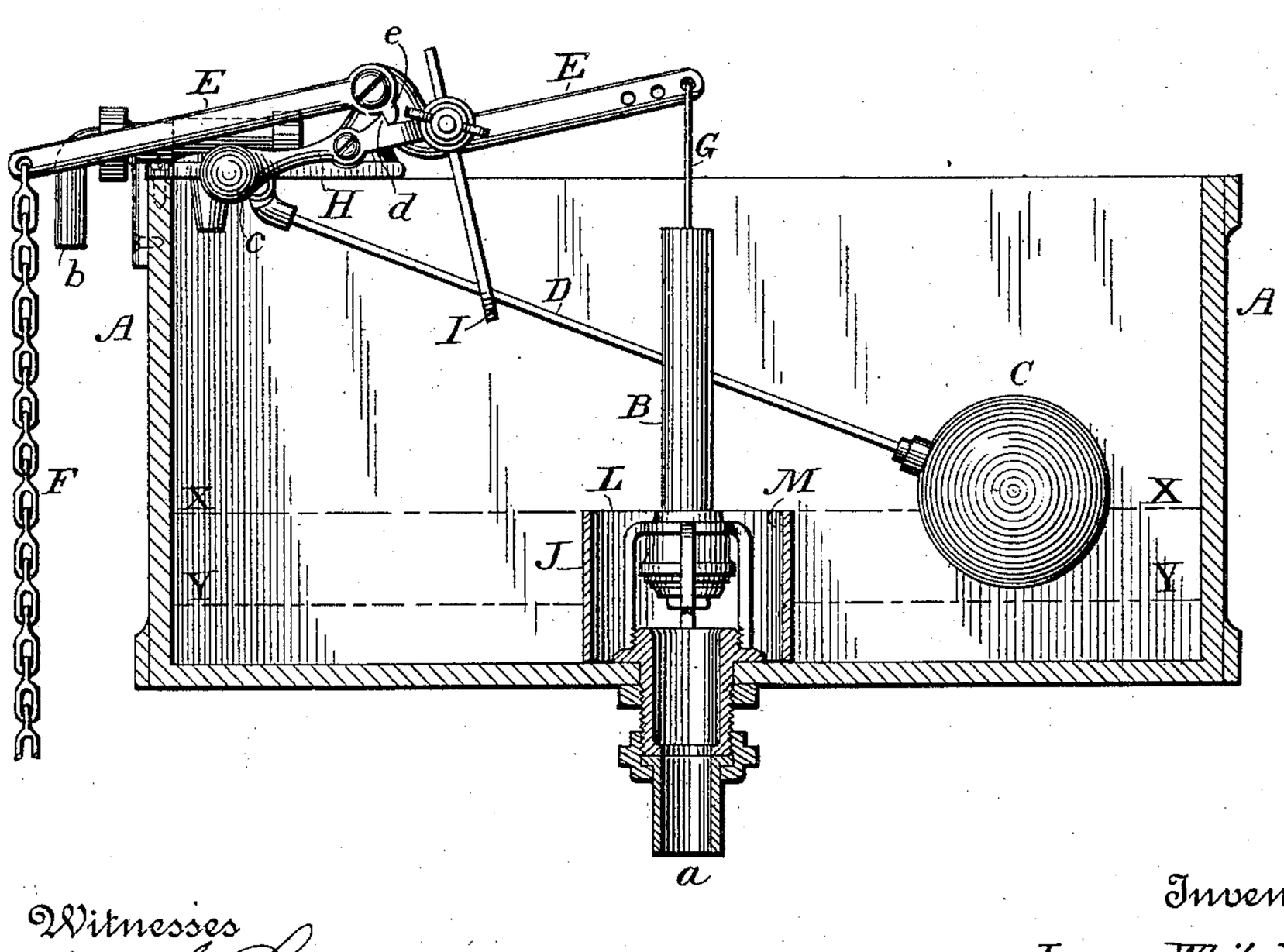


Fig. 2.



a

Witnesses
Jos. S. Latimer
Theo. T. Snell.

Inventor
James White Hale
by Arthur P. Browne
his Attorney

(No Model.) 2 Sheets—Sheet 2.

J. W. HALE.

REFILL FOR CISTERNS.

No. 580,860. Patented Apr. 20, 1897.

Fig. 3.

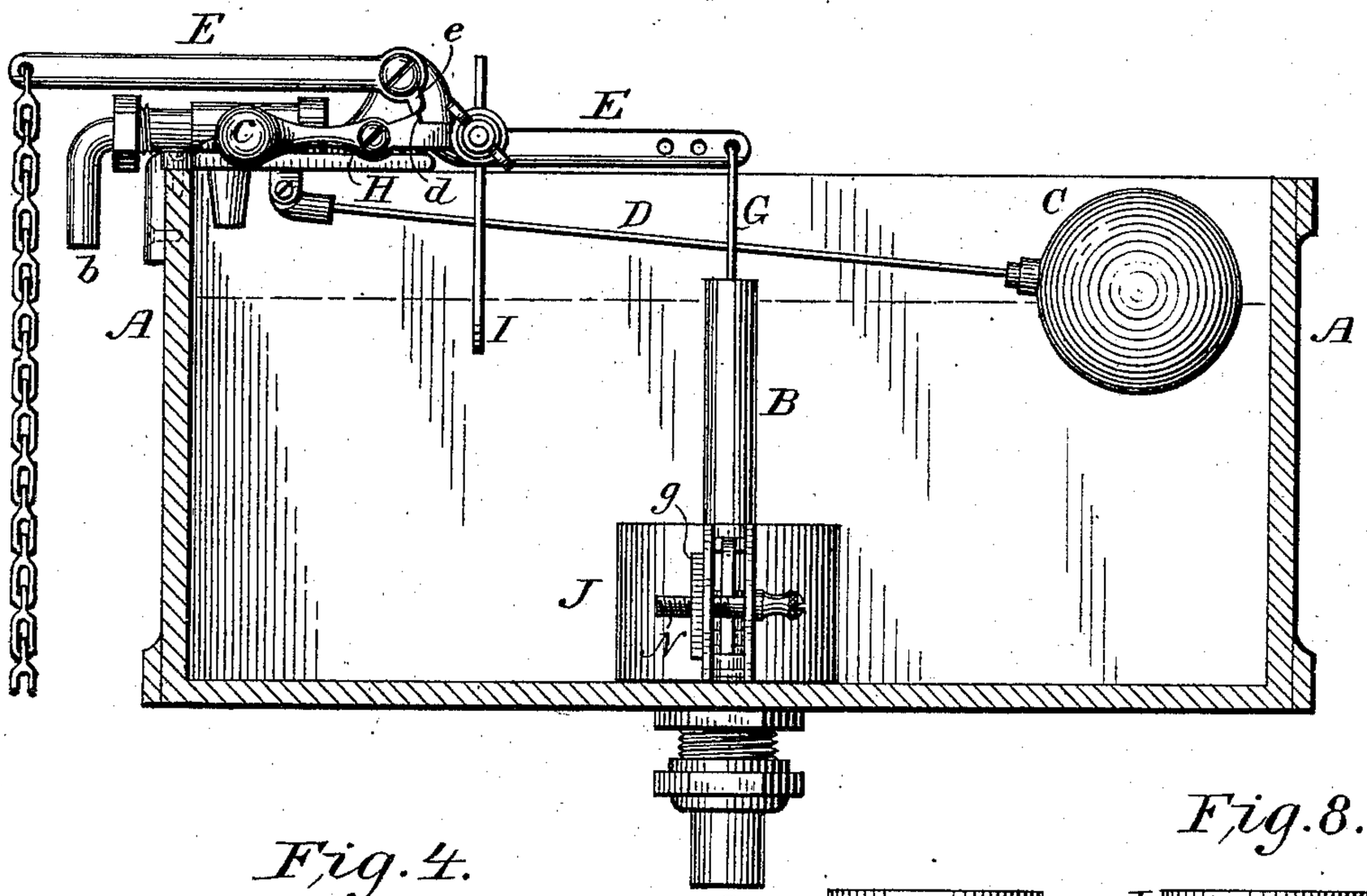


Fig. 4.

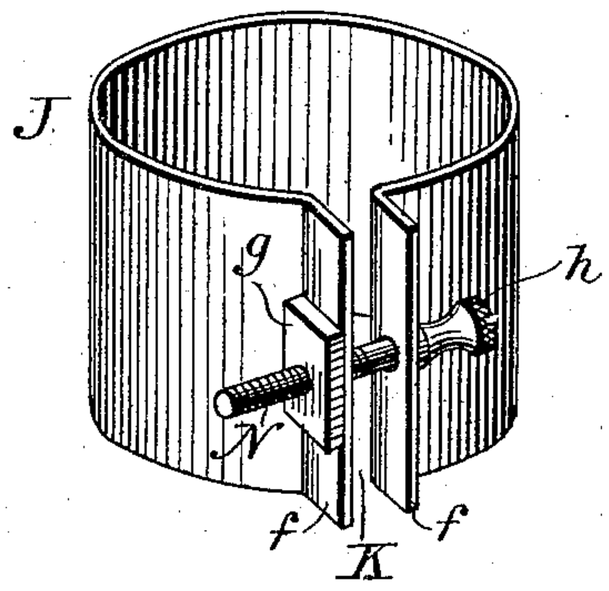


Fig. 5.

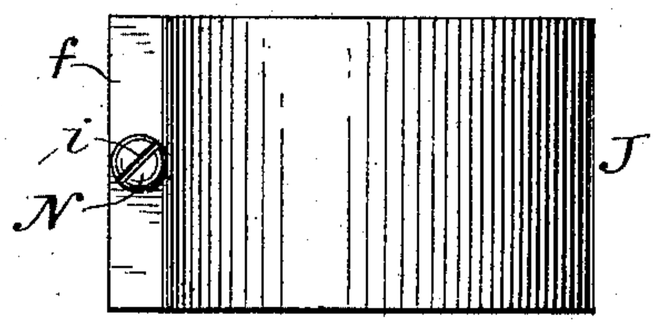


Fig. 6.

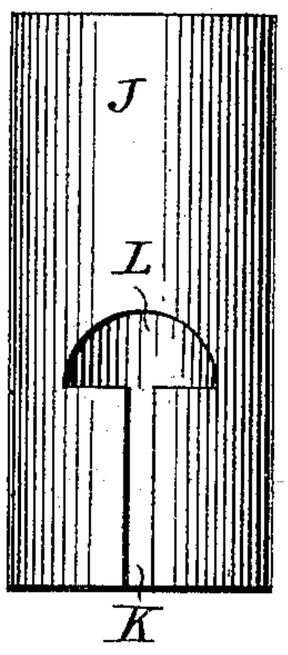


Fig. 7.

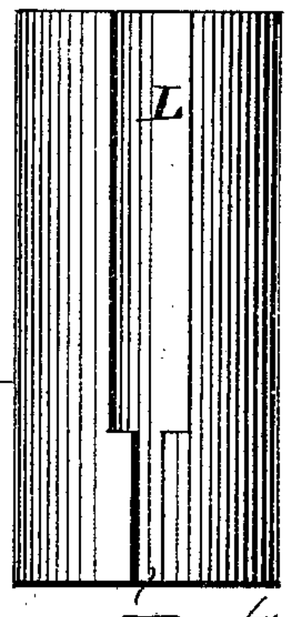


Fig. 8.

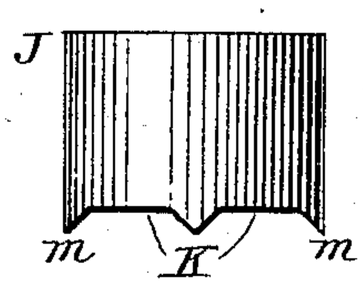
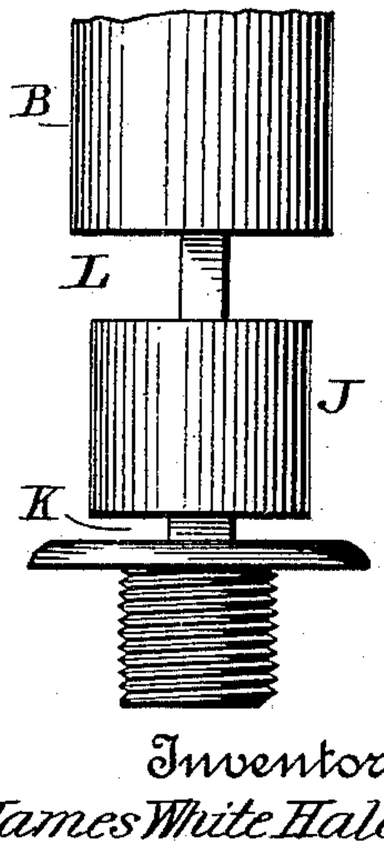


Fig. 9.



Witnesses
Jos. S. Latimer
Theo. T. Snell.

Inventor
James White Hale
by William A. Browne
his Attorney

UNITED STATES PATENT OFFICE.

JAMES WHITE HALE, OF NEWBURYPORT, MASSACHUSETTS.

REFILL FOR CISTERNS.

SPECIFICATION forming part of Letters Patent No. 580,860, dated April 20, 1897.

Application filed February 18, 1897. Serial No. 623,931. (No model.)

To all whom it may concern:

Be it known that I, JAMES WHITE HALE, of Newburyport, county of Essex, and State of Massachusetts, have invented a new and Improved Refill for Cisterns, of which the following is a specification.

The most generally-approved water-closets of the present day are such as normally, when not in operation, hold quite a considerable volume of water. This is particularly the case with "deep-seal" bowls and those wherein the contents are discharged by siphonic or jet action. Such closets are ordinarily supplied with flushing-water from an overhead cistern, and in order to efficiently flush and discharge such closets it is necessary that the flushing-water shall flow into the closet with sufficient volume and copiousness to thoroughly wash out the closet. With such closets it is not only necessary that flushing-water should be supplied thereto in sufficient volume and rapidity to efficiently wash out the same, but it is also necessary after the flushing operation proper has ceased to supply water for the purpose of refilling the closet with sufficient water to restore it to its normal condition when not in use, so as to be ready for the next flushing operation. If the water flowing from the cistern to the closet continues to flow in uniform volume until the cessation of the flow, then the siphonic or wash-out action continues to the end, and consequently the result is that after the cessation of the operation the closet does not contain its normal volume of water ready for the next operation. In order, therefore, that the closet may act efficiently, it is necessary to provide means for refilling the closet with water, and the water for this purpose should be supplied to the closet in a diminished stream, so that during the refilling operation the water is not supplied with sufficient copiousness to continue the siphonic or wash-out action.

The object of the present invention is to provide a "refill" mechanism for the purpose of supplying a diminished stream of water to refill the closet after the siphonic or wash-out action has ceased.

More specifically, the object of the present invention is to provide such a refill mechanism as shall be certain in its operation, simple and inexpensive in construction, and one which shall be applicable to certain existing closet-cisterns without necessitating any alteration or reconstruction thereof.

In the accompanying drawings the present refill mechanism is shown as applied to one well-known form of closet-cistern.

In said drawings, Figure 1 is a plan view of a closet-cistern provided with the present improvements. Fig. 2 is a vertical section of said cistern. Fig. 3 is a vertical section of the cistern, showing a front view of the refill mechanism. Fig. 4 is a perspective view of the refill-ring detached and on a larger scale. Fig. 5 is a side view of the refill-ring on an enlarged scale. Figs. 6, 7, 8, and 9 are front views of modified constructions of the refill mechanism.

Referring first to Figs. 1 and 2, the features of a well-known cistern will be described. A is the cistern itself, having outlet *a* and supply-pipe *b*. The outlet is controlled by a vertically-movable overflow-valve B, of a well-known construction. The supply of water to the cistern from the supply-pipe *b* is automatically controlled in the usual manner by a ball-cock comprising the float C and the rod D, connecting the float with the supply-valve. The outlet-valve B is lifted to discharge the contents of the cistern in the usual manner by a lever E, pivoted to a bracket on the top of the tank, said lever being operated by a pull-chain F and being connected to the outlet-valve by a rod G. Coöperating with the said lever E is a pivoted trip H, having a weight *c* at the end and a detent *d* near the other end, which coöperates with a lip *e* on the valve-operating lever E. Said trip H carries at its inner end opposite the weight *c* a rod I, which extends beneath the float-rod D. As is usual, the capacity of the outlet is in excess of the capacity of the supply-valve, so that the water is discharged from the cistern to the closet much more rapidly than it is supplied to the cistern by the supply-pipe. All of these features of construction are old and well known.

In order to flush the closet, the pull-chain F is pulled upon, thereby tilting the lever E, whereby the outlet-valve B is lifted to permit the discharge of flushing-water to the closet. At the same time the weighted trip H automatically causes its detent *d* to engage

the lip *e* on the valve-lever E, whereby the outlet-valve B is maintained in its upper position without necessitating holding onto the pull-chain. Accordingly the water flows out through the outlet in sufficient copiousness to flush the closet, and since the capacity of the outlet exceeds that of the inlet the water-level in the cistern falls, and consequently the float C descends. When the cistern has discharged sufficient water to efficiently flush the closet, the level of the water in the cistern has been so far lowered that the rod D, connecting the float C with the supply-valve, encounters the rod I, carried by the trip H, so that the weight of the float is then partly borne by said rod I on said trip, whereby the inner end of said trip is lowered, thus disengaging the detent *d* from the lip *e* on the valve-lever E, and hence the discharge-valve is free to drop by gravity to its seat, thus cutting off the discharge of flushing-water from the cistern to the closet. Thereupon the supply of water from the supply-pipe continues filling the cistern until the elevation of the float closes the supply-valve. This operation is that common to this well-known cistern.

It will be observed that with such a cistern the flushing-water is discharged with substantially uniform copiousness from the initial opening to the final closing of the outlet-valve, and consequently the flushing action continues with equal intensity during the entire discharge of water from the cistern to the closet, and therefore the siphonic or wash-out action continues until the water ceases to flow. Hence such a cistern is inefficient when used in connection with a closet in which a considerable volume of water should be maintained during its periods of inactivity.

The improved refill mechanism, which constitutes in itself and in its relation to the cistern my invention, is shown as applied to the operating mechanism of such a cistern.

As shown in Figs. 1, 2, and 3, the additional mechanism which, when added to the cistern, gives to the latter an efficient refilling function is exceedingly simple. It consists in a ring J, of metal, having a narrow vertical slit or opening K along one side. This ring is simply slipped over the outlet-valve and rests on the bottom of the cistern, surrounding said valve and its outlet. When thus in position, there is provided a refill-chamber M, in communication with the outlet of the cistern, provided with two openings K and L, the first opening being that provided by the narrow slit in the side wall of the ring and constituting a refill-opening, and the latter being provided by the open top of said ring and constituting a flushing-opening. These two openings are of certain areas and capacities as compared with the cistern-supply and the cistern-outlet. The flushing-opening L into the refill-chamber has a capacity equal to or greater than the capacity of the cistern-outlet. The refill-opening K into the refill-chamber has a capacity which is considerably less than the capacity of the cistern-outlet and which at the same time is considerably greater than the capacity of the cistern-supply.

The flushing-opening from the cistern into the refill-chamber is at such a height above the bottom of the cistern that the water contained in the lower part of the cistern between said flushing-opening and the level of the water at which the outlet-valve closes is sufficient in volume to provide the water required for refilling the closet.

The refill-chamber M is a channel through which both the flushing and the refill water pass from the cistern to the cistern-outlet. The float occupies a position exterior to the refill-chamber.

The operation of the refill-chamber is evident. As soon as the discharge or outlet valve is opened the water flows out from the cistern in the usual manner, the operation not being affected by the presence of the refill-chamber. As soon, however, as the level of the water descends below the flushing-opening into the refill-chamber, as shown by the dotted line X X in Fig. 2, the refill-chamber (which is of small capacity itself) almost empties immediately, because the capacity of the refill-opening from the cistern to the refill-chamber is small as compared with the capacity of the cistern-outlet, and thereupon the flushing operation proper ceases and the refill operation begins. During the refilling operation the water flows in a diminished stream from the lower portion of the cistern through the refill-opening into the refill-chamber and thence through the cistern-outlet to the closet, this diminished stream being insufficient to continue the siphonic or wash-out action of the closet, and thereupon the closet refills with water. The refilling action continues until the level of the water in the cistern descends sufficiently far to enable the float to release the outlet-valve and to permit it to descend to close the outlet, say to the level indicated by the dotted line Y Y in Fig. 2. It is hence important that the capacity of the refill-opening from the cistern to the refill-chamber should be considerably greater than the capacity of the cistern-supply, since otherwise the outlet-valve would not be closed. It is likewise important that the float should be exterior to the refill-chamber, since if the float was in the refill-chamber it would drop at once to its lowermost position as soon as the water-level descended below the flushing-opening into the refill-chamber.

The amount of the water which is in the cistern between the levels X X and Y Y (added to the volume supplied by the ball-cock during the fall from one to the other) constitutes the water which furnishes the refill.

The additional mechanism required to constitute the refill is of the simplest possible mechanical construction, consisting of a strip of sheet metal bent into any proper shape,

its vertical adjacent edges being left sufficiently separated to constitute the refill-opening. This strip of metal thus constitutes the partition between the refill-chamber and the cistern, and it is denominated herein as a "ring" simply to indicate that it surrounds the cistern-outlet, the word not being employed to designate exclusively a cylindrical shape. This ring can be applied to any existing cistern of this character without the aid of any tools. The flushing-opening being the open top of the ring, by making the ring of sufficient size so that said opening is under all conditions much larger than the area of the cistern-outlet no attention need be given to regulating the capacity of said flushing-opening.

It has heretofore been pointed out that the capacity of the flushing-opening into the refill-chamber should be at least sufficient to permit the passage of water in sufficient volume to efficiently flush the closet, and hence should have a capacity at least equal to the discharge-outlet from the cistern. In fixing this minimum limit it is to be borne in mind that, since the refill-opening to the refill-chamber is always open, it also constitutes a portion of the flushing-opening, as well as fulfilling its own distinctive function.

The capacity of the refill-opening can be adjusted with reference to the capacities of the cistern supply and outlet by simply bending the ring to restrict or enlarge the refill-opening. I prefer, however, to use the special adjusting means and construction indicated in Figs. 1 and 3 and particularly illustrated in Figs. 4 and 5. In accordance with this preference the refill-ring is composed of an elastic or resilient metal, such as brass, and is formed with two outwardly-projecting flanges *f f* along the margins of the refill-opening K. The resilience of the metal ring is such as to tend constantly to separate the flanges *f f*, and thus widen and enlarge the refill-opening. In order to adjust the capacity of the refill-opening and to maintain it when properly adjusted, nut *g* and screw N are provided. The shank of the screw N passes freely through suitable apertures provided for that purpose in the flanges *f f* and taps into the nut *g*. The adjusting-screw has a milled head *h* for manipulating it. The face of the nut *g* seats against the outer face of one of the flanges *f*, and the inner edge of the nut seats against the adjacent wall of the body of the refill-ring, so that said nut cannot rotate. The resilience of the metal of the refill-ring always maintains the flanges in contact with the nut and head *h*, respectively, thus maintaining an invariable size to the refill-opening when once properly obtained. To adjust the opening, it is merely necessary to turn the screw one way or the other, as desired. Ordinarily the milled or knurled head of the adjusting-screw suffices for turning the same. In case of need, however, as when rust or the accumulation of dirt and scale incase the refill-ring, the head *h* has also a nick *i* to receive a screw-driver, so that adequate force may then be applied to effect the adjustment.

The construction of the refill as illustrated in Figs. 1, 2, 3, 4, and 5 is the preferred construction. Modifications, however, of the construction of the refill are illustrated in the drawings. As shown in Fig. 6, the ring, shield, or partition J between the cistern and the refill-chamber extends up as high as the top of the overflow outlet-valve, and a special flushing-opening L is formed in said partition, the refill-opening K also being specially formed therein. There is no capacity for adjustment in this modified construction.

In the modification shown in Fig. 7 the partition between the cistern and the refill-chamber is a slit ring or shield of approximately the same height as the overflow outlet-valve, having a large flushing-opening and a small refill-opening, said openings being one above the other and constituting a slit of varying dimensions between the vertical margins of the ring or partition. The partition in this modification has the capacity for adjustment, which may be effected by making it of pliable material, such as sheet-lead. This modification also illustrates the principle of the invention in one respect. It is manifest that the refill-opening K might be so far elongated that when the water-level fell just below its upper edge its capacity might still be sufficient to continue the siphonic or wash-out action of the closet, but thereafter, after the water-level fell a sufficient distance, the flushing action would cease and the refill action would begin. In such a case only the lower portion of the slit would constitute the refill-opening. Such an arrangement would be imperfect, but might be adopted in attempted evasion of this invention, and it is to be understood that the invention includes such arrangement in its scope.

In the modification shown in Fig. 8 the partition between the cistern and the refill-chamber is a complete ring having no slit, but standing upon feet *m m*, the spaces between said feet constituting the refill-opening. This modification indicates, what is sufficiently obvious, that a plurality of openings may be used for the refill and the flushing, provided that the combined capacities of said openings have the proper relation to the cistern-supply and cistern-outlet.

In the modification shown in Fig. 9 the refill-chamber is located inside the outlet-valve, but in other respects has a construction similar to that shown in Fig. 8.

In each of these several modifications, as in the case of the preferred construction, the refill-opening is at a lower level than the flushing-opening. Both openings are always open, and the level of the water at which the float trips the discharge-valve is below the upper part of the refill-opening.

I claim as my invention—

1. The cistern having a discharge-outlet and a water-supply, a float, a discharge-valve, means for holding said valve uplifted, and means automatically operated by the descent of the float to permit the closing of said valve, in combination with a refill-chamber surrounding said outlet and valve, said refill-chamber having a refill-opening from the cistern thereto of a capacity greater than that of the cistern-supply but less than that of the cistern-outlet, and having a flushing-opening from the cistern thereto, the joint capacity of the refill and flushing openings being at least equal to that of the cistern-outlet, substantially as set forth.

2. The cistern having a discharge-outlet and a water-supply, a float, a discharge-valve, and means for holding said valve uplifted, in combination with a refill-chamber surrounding said outlet and valve, said refill-chamber having a refill-opening from the cistern thereto of a capacity greater than that of the cistern-supply but less than that of the cistern-outlet, and having a flushing-opening from the cistern thereto, the joint capacity of the refill and flushing openings being at least equal to that of the cistern-outlet, said refill-opening being at a lower level than said flushing-opening; and means automatically operated by the descent of said float after the water-level has fallen below said flushing-opening to permit the automatic closing of said valve, substantially as set forth.

3. A cistern having a refill-chamber, the partition between said cistern and refill-chamber consisting of a strip of sheet metal bent into shape with its meeting edges separated to constitute a refill-opening from the cistern to said refill-chamber, substantially as set forth.

4. A cistern having a refill-chamber, the partition between said cistern and refill-chamber consisting of a strip of sheet metal bent into shape with its meeting edges separated to constitute a refill-opening from the cistern to said refill-chamber, said meeting edges being movable to and from each other to adjust the capacity of said refill-opening, in combination with means for adjusting said refill-opening, substantially as set forth.

5. A cistern having a refill-chamber, the partition between said cistern and chamber consisting of resilient sheet metal with meeting edges separated to constitute a refill-opening from the cistern to said refill-chamber, the resilience of said metal tending to separate said edges from each other, said metal partition having flanges at the said meeting edges, in combination with a nut seating against one of said flanges, and an adjusting headed screw the shank of which passes through said flanges and screws into said nut, substantially as set forth.

6. A cistern having a refill-chamber, the partition between said cistern and chamber consisting of resilient sheet metal with meeting edges separated to constitute a refill-opening from the cistern to said refill-chamber, the resilience of said metal tending to separate said edges from each other, said metal partition having flanges at the said meeting edges, in combination with a nut seating against one of said flanges, and an adjusting headed screw the shank of which passes through said flanges and screws into said nut, said adjusting-screw having a milled and nicked head, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES WHITE HALE.

Witnesses:

ETTA M. PETTINGELL,

CHARLOTTE ELIZABETH HALE.