(No Model.) 4 Sheets—Sheet 1.

R. D. O. SMITH.

WATER CLOSET.

No. 258,144. Patented May 16, 1882.

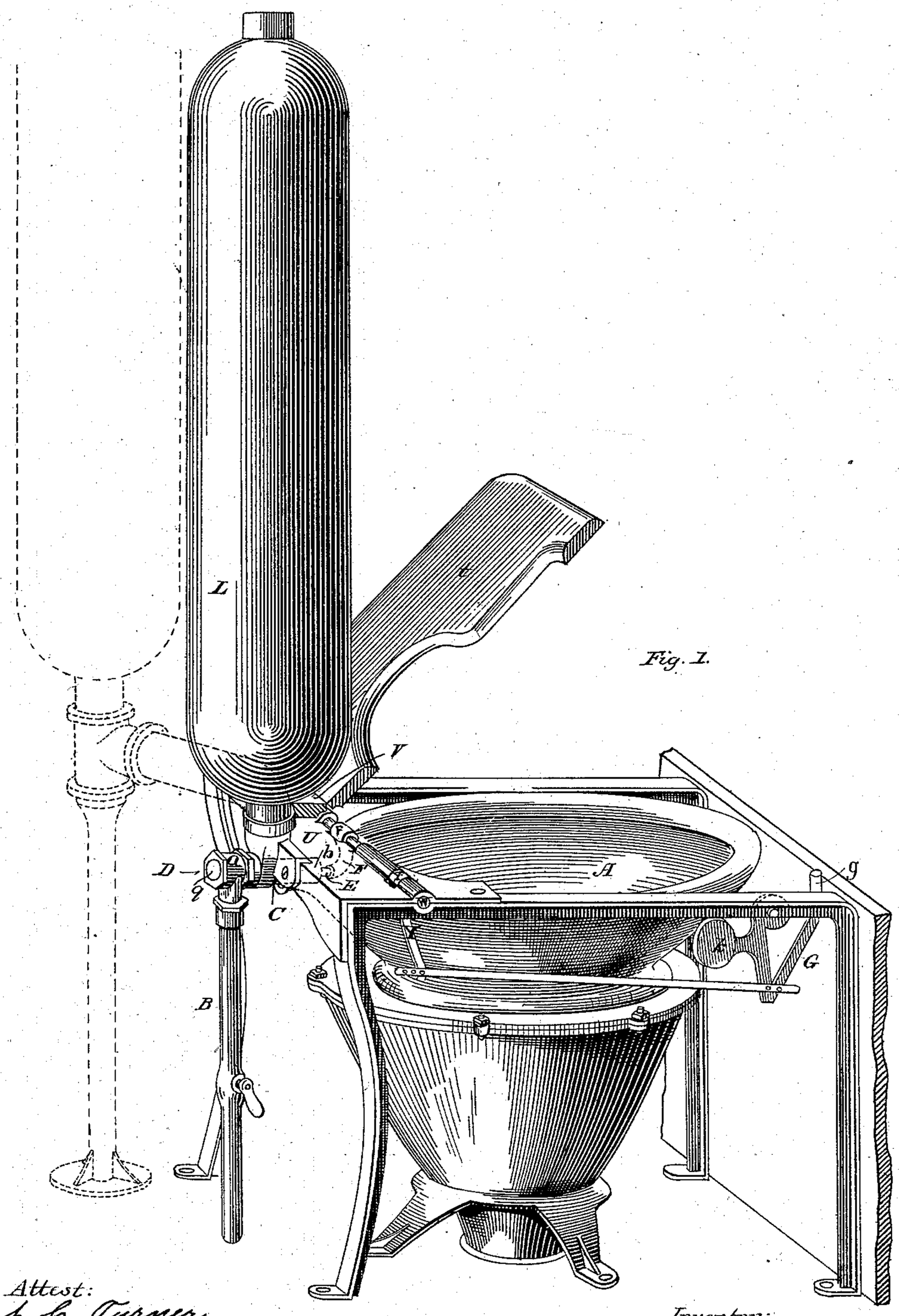

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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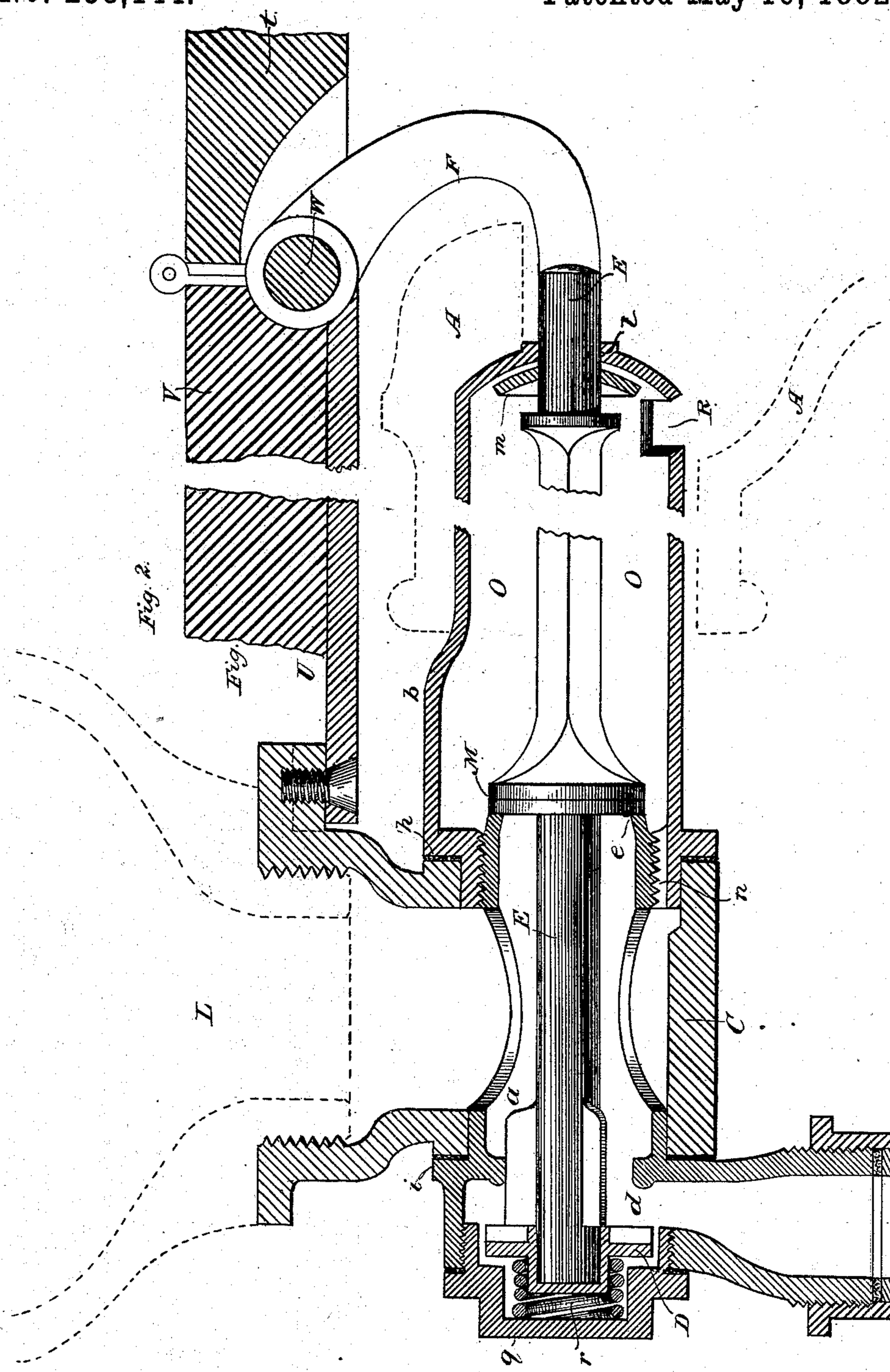
WATER CLOSET.

No. 258,144. Patented May 16, 1882.



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(No Model.)

4 Sheets—Sheet 3.

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WATER CLOSET.

No. 258,144. Patented May 16, 1882.

Fig. 4.

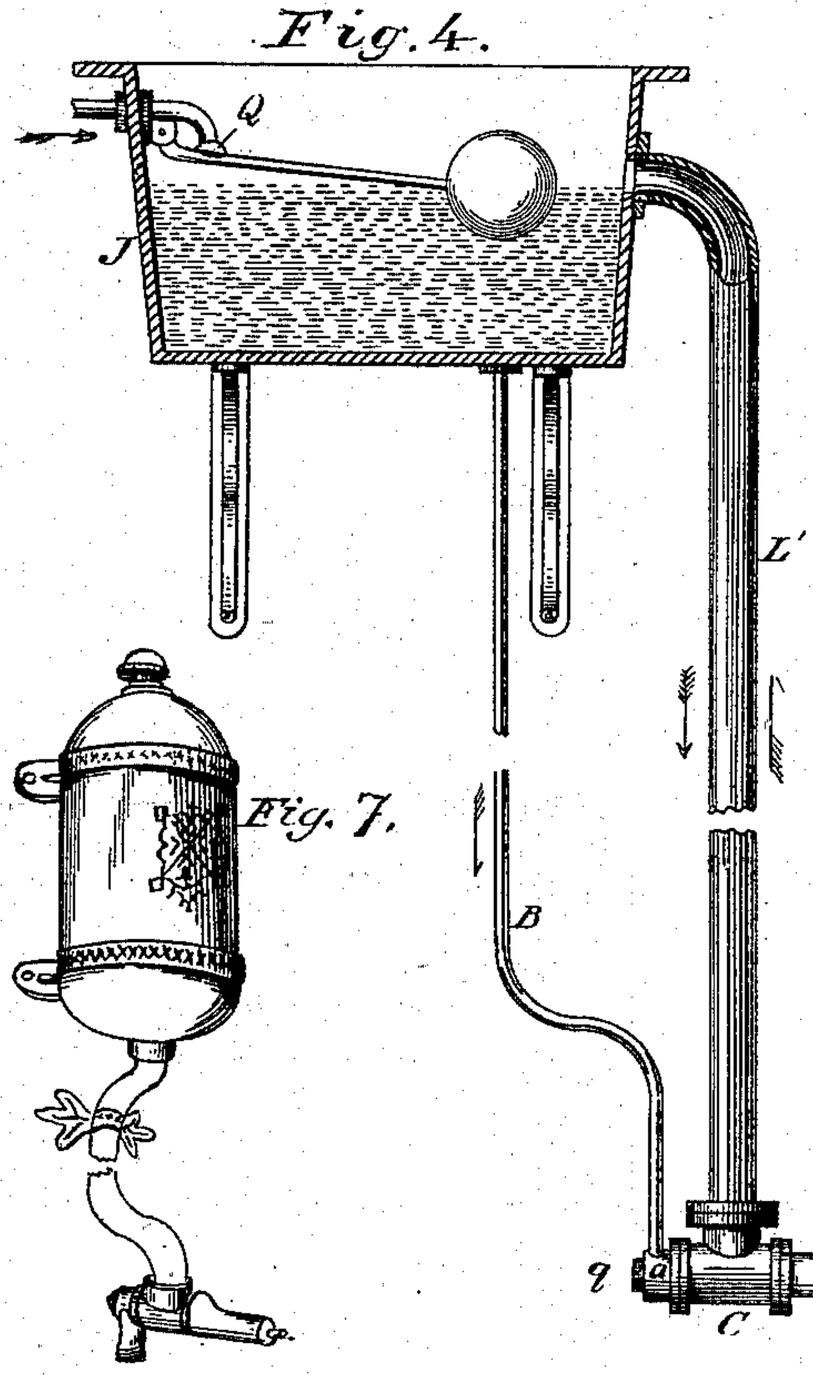


Fig. 3.

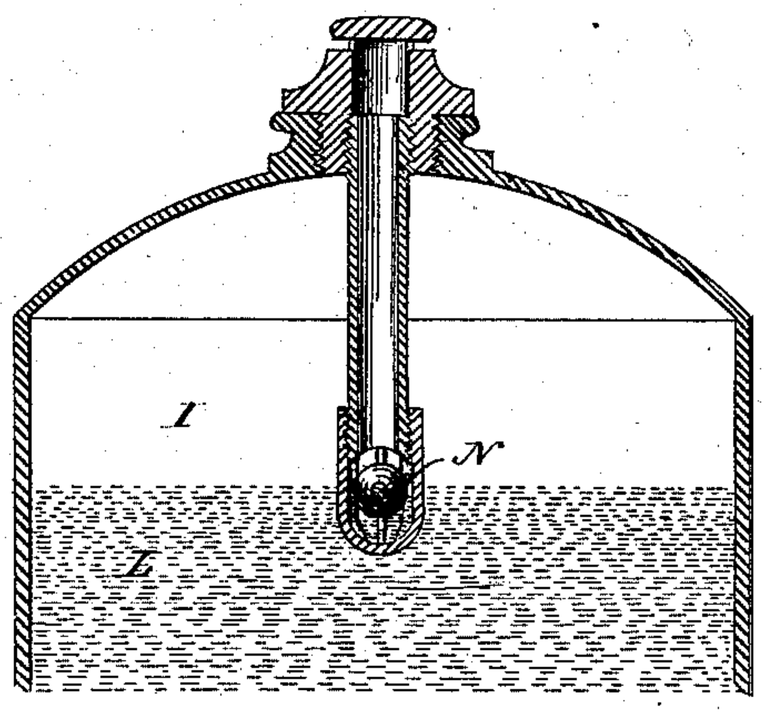


Fig. 7.

Fig. 5.

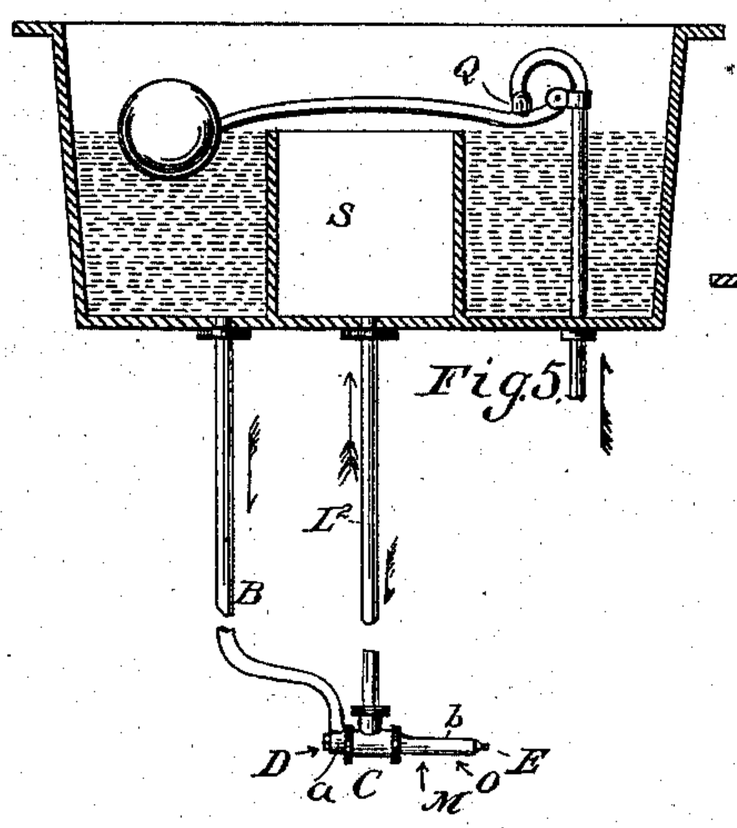
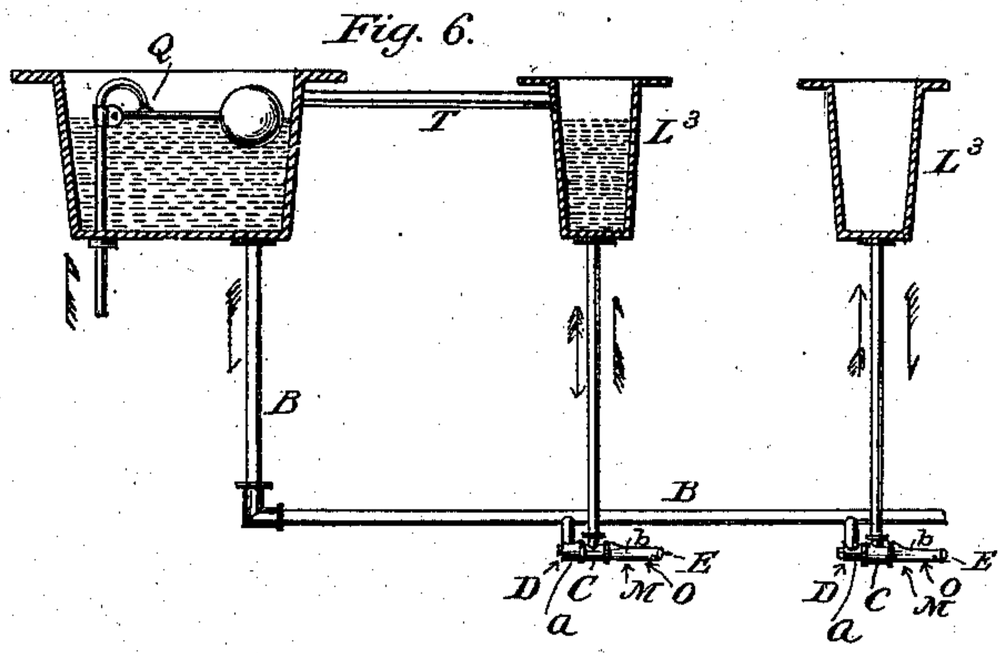


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4.

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WATER CLOSET.

No. 258,144. Patented May 16, 1882.

Fig. 8

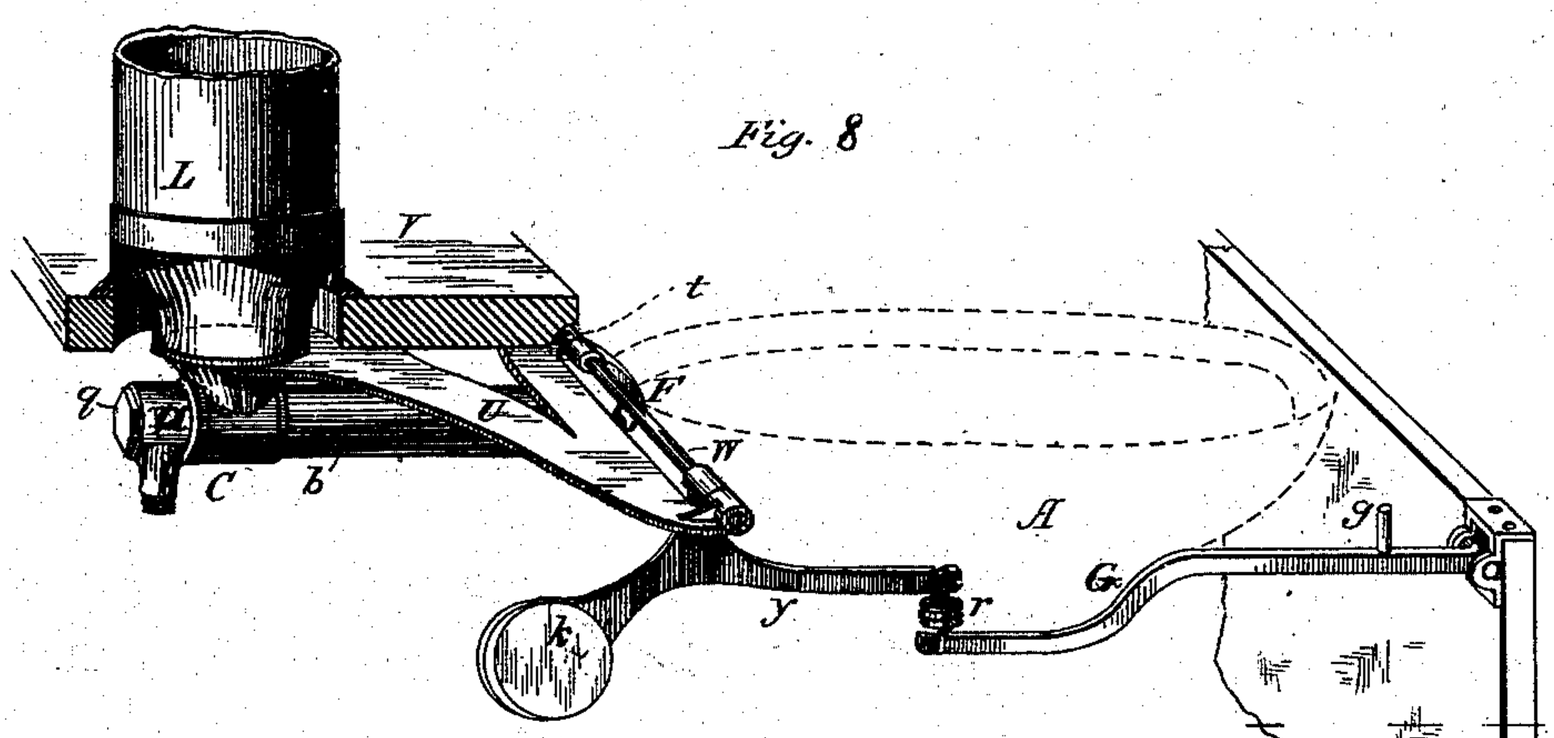
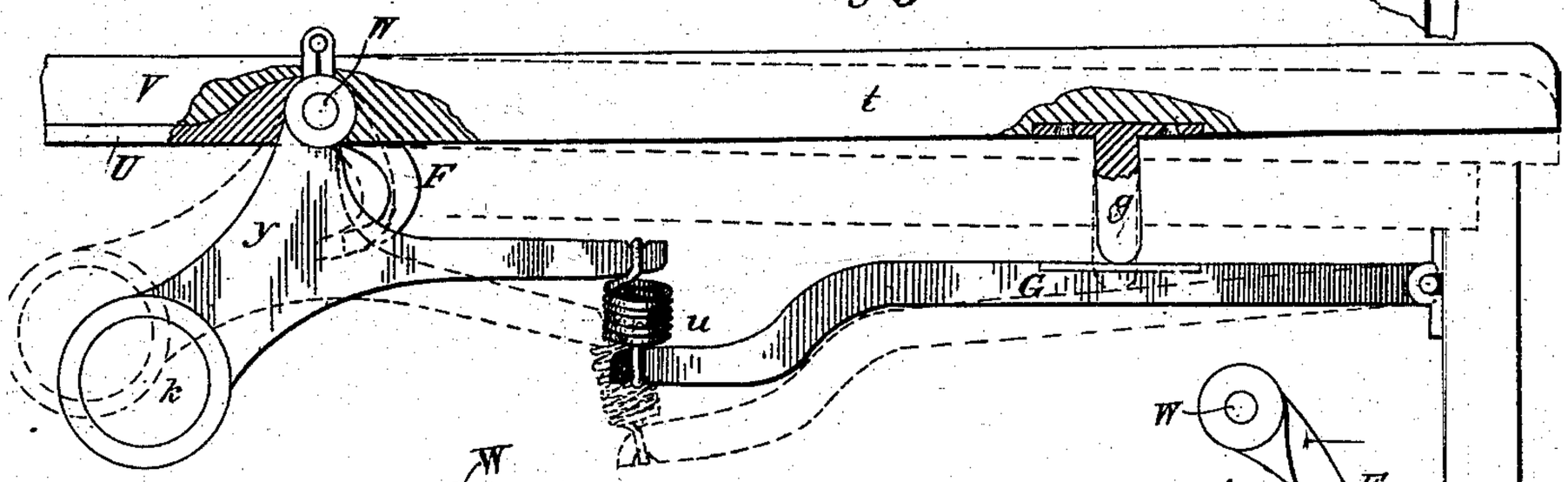


Fig. 9.



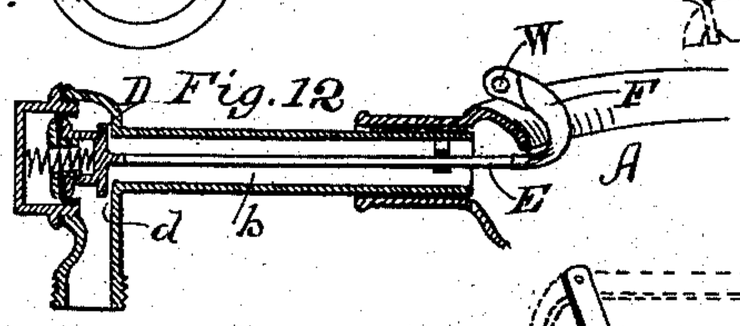


Fig. 12

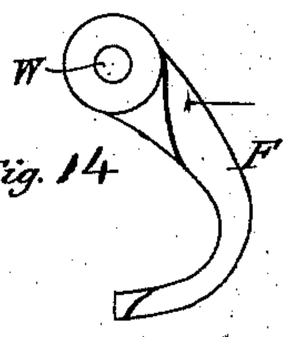


Fig. 14

Fig. 10.

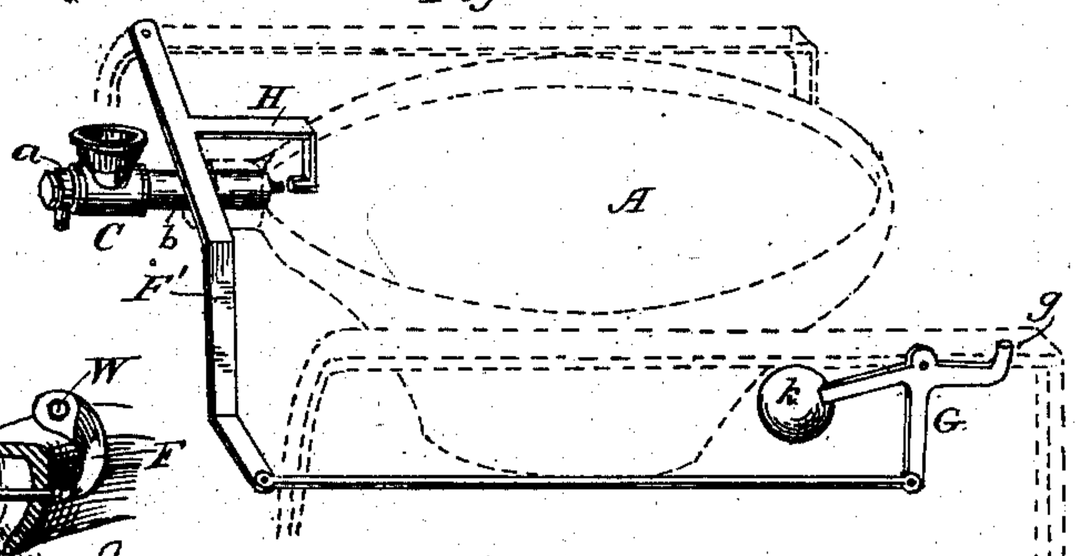


Fig. 13.

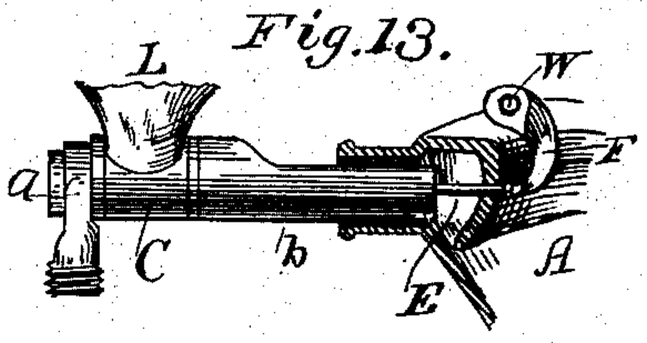
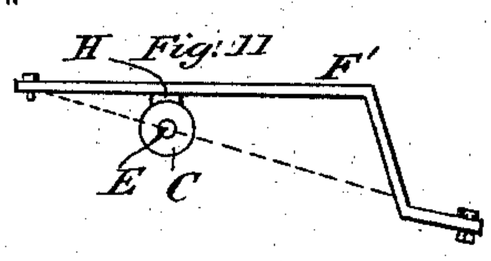


Fig. 11



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UNITED STATES PATENT OFFICE.

ROBERT D. O. SMITH, OF WASHINGTON, DISTRICT OF COLUMBIA.

WATER-CLOSET.

SPECIFICATION forming part of Letters Patent No. 258,144, dated May 16, 1882.

Application filed August 1, 1881. (No model.)

To all whom it may concern:

Be it known that I, ROBERT D. O. SMITH, of Washington, in the District of Columbia, have invented new and useful Improvements in Water-Closets; and I do hereby declare that the following is a full and accurate description of the same.

The water-closets heretofore in use may be grouped in two characteristic classes: first, those which employ a small quantity of water and generally admit the same by means of an automatically slow-closing cock; and, second, those which employ a large quantity of water discharged in a short space of time. These last are flushing-closets; and my invention relates particularly to closets of that class, although one part of it may be employed with a slow-closing cock. Sometimes the flush-water is contained within the closet and sometimes it is contained in a cistern hung to the wall overhead. The first-named system is objected to because the flow of water is not sufficient to cleanse the trap below the closets, and the second is objectionable because of the machinery required to operate the valves; and, in case the reservoir is within the closet, it is objectionable because of the presence of a body of water so close to the person, because the bowl cannot be adequately ventilated under such circumstances, and because of the foul accumulation about the valve and in the hidden places within the closet.

My improvement obviates all of these objections. With it there is no leakage to be guarded against. The water is discharged from a reservoir adjacent to but not a part of the closet with as great rapidity as may be possible without danger of overflowing the bowl. The ordinary machinery is entirely dispensed with, and its substitute is a single rock-shaft operated by the weight of the user and one valve-stem provided with two valves. The valve-stem is located entirely within the waterway of the discharge-tube, and no stuffing is required to prevent leakage. If any leakage occurs, the drip will be into the bowl. There is no body of water resting within the closet to deposit sediment or filth of any kind around the valve or in the hidden recesses of the closet.

Among other advantages of my closet are the following: With a small service-pipe a flush of any desired quantity may be obtained at the service-pressure without the machinery required to operate the valves in an elevated cistern. If in any locality the water-service is intermittent, a single ordinary suspended cistern may be employed for any number of closets without employing any of the ordinary machinery for operating valves in elevated reservoirs. My valves are all below the level of the seat, while the reservoir for water is above that point, and the force required to eject the water with required velocity is obtained by gravity alone or by gravity and expansion of compressed air combined.

That others may fully understand my invention, I will more particularly describe it, having reference to the accompanying drawings, wherein—

Figure 1 is a perspective view of my invention. Fig. 2 is a longitudinal section of the valve-case and valves. Fig. 3 is a vertical section of the air-chamber, showing how an air-valve may be inserted for use with either very low or very high pressure. Figs. 4, 5, and 6 illustrate the manner of using a cistern when water-service is intermittent. Fig. 7 represents the reservoir hung on the wall. Figs. 8 and 9 represent the preferred mechanism for operating the valve-stem. Figs. 10 and 11 illustrate a modification of the device for moving the valve-rod. Fig. 12 shows a common method of causing the valve to close slowly, adapted to my valve. Fig. 13 illustrates the method of applying my improvement for that style of bowls known as "flush-rim." Fig. 14 is a side view of the lever which actuates the valve-rod.

A is the bowl or hopper of a water-closet, discharging into a soil pipe or receptacle, as usual.

B is the service water-pipe, and R is the place where the water-pipe discharges into the bowl A.

D is the inlet-valve in the service-pipe B. One object of my invention is to operate this valve D without resort to connection therewith outside of the hopper or bowl A, so that if for any reason whatever there should be leakage in or about the valve the drip therefrom will

run into the hopper A instead of running upon the floor. I therefore operate the valve D from within the water-way by a stem, E, which extends through the discharge-opening within the bowl, where it may be operated by a lever, F, or other mechanism attached to or operated by the seat automatically, or by a pull, if the automatic action is not desirable. The modes of operating said lever F so as to actuate the rod E to open the valve are various, and while I show and claim that mode which I deem to be most desirable under general circumstances I do not wish to restrict myself thereto, for the reason that the advantage of dispensing with outside connection with the valve is quite independent of the kind of device employed to operate the inside connection. When the power to actuate the valve is derived from the depression of the seat it is desirable that the movement of the seat at its front end shall not exceed one-half inch, or thereabout, and the movement of the valve D ought to be from one-fourth to one-half of an inch. It is therefore necessary to employ some intermediate device which shall transmit motion with a varying rate. The simplest arrangement of the inlet-valve D is that shown in Fig. 2—viz., in line with the axis of the inlet and therefore operated directly by the valve-stem E—and to accommodate that simple arrangement I place the transmitting device between the end of said valve-stem and the seat *t*, and the same may consist of a compound lever, of which a simple and efficient form is shown in Figs. 1, 8, and 9, wherein the seat rests upon one member, G, and the levers Y F constitute the other member.

To avoid the curvilinear motion of the free end of the lever F, a slide, H, may be employed, as shown in Figs. 10 and 11, attached to and operated by a lever, F′.

The valve D may be a simple puppet-valve, which is opened and held open by depression of the seat; or it may be of that variety common in water-closets which, being pushed open, can only close again slowly, permitting the flow of water to continue during the time occupied in closing. It is apparent that one of the well-known devices for causing a valve to close slowly may be employed with valve D without further invention, as shown in Fig. 12.

It is considered highly desirable that when the closet has been used a large quantity of water, amounting to two or three gallons or more, shall be quickly discharged into the bowl, so as to forcibly sweep out the solid matters in the bowl or trap and cast them over into the soil-pipe. If this quantity of water is to be drawn directly from the service-pipe, a very large service-pipe must be provided, and as this is not generally practicable, some facility for storage must be provided, and for this, as before stated, two plans are in vogue: First, a cistern or tank, J, is suspended upon the wall from six to nine feet above the closet, from which the required flush may be drawn, an automatic inlet-valve, Q, being provided for said cistern, so that the water suddenly discharged is resupplied at leisure; second, the closet itself constitutes a cistern. In place of these, I place a reservoir, L′, in connection with the service-pipe between the valve D and the point of discharge into the bowl, and provide a second valve, M, upon the stem E, so that when the valve D is opened the valve M is closed by the same movement, and the water which flows through valve D therefore presses into said reservoir instead of passing into the bowl, and when (the valve-stem E being released) valve D closes and valve M opens the water in said reservoir escapes into the bowl. The orifice closed by valve M is of sufficient size to permit the discharge with the desired rapidity, and in this way the required flush may be obtained with a very small service-pipe, and without any objectionable features attending either the cistern upon the wall or the cistern within the bowl. When the service-pressure is adequate—say from eight to fifteen or twenty pounds per inch—the reservoir L is made of proper size, and closed at the top, so that the air is compresed in the top of said reservoir until the resistance of the compressed air equals the service-pressure, and then, when the valve M is opened, the inclosed water rushes out from the large orifice at M with a velocity due to said pressure. In this way the pressure-flush may be obtained without reference to the height or head of water within said reservoir; but in many localities the pressure may be either inadequate or excessive, and I then make the reservoir L taller, so as to secure a pressure from the height of water column, and a float-valve, N, is placed in or near the top of said reservoir, so that the air, instead of being compressed, will escape as the water rises in said reservoir until said valve closes, to prevent the water from overflowing.

By placing the valve N more or less near to the top of the reservoir the quantity of air compressed and the quantity of the consequent air-spring may be regulated, and a light air-pressure may be utilized to set the flush-water in motion quickly.

When the water in the reservoir L is under considerable pressure and the valve M is permitted to open suddenly the water nearest the valve will seek instant relief in a sudden and violent jet or spurt, whereas time is required to set the whole body of water in motion. This sudden jet is objectionable, because it makes a splash and spatter. To control this I set the valve M back from the outlet R, so that the first jet is expended in a chamber, O, and the splash is confined within said chamber.

When the service-pressure is excessive—say twenty-five pounds per inch and upward—the reservoir L, provided with the valve N, will fill and stand under that pressure until the instant of release, when the valve D closes and

valve M opens. Water, being practically non-compressible, does not expand when relieved from pressure, and therefore is instantly relieved from pressure when valve D closes and it commences to flow past valve M. Its velocity will then be due to its head only. In this way an air-valve, N, in the reservoir equalizes inadequate and excessive service-pressures, the only difference then being in the rapidity with which the reservoir will become filled.

In many localities the water-service is intermittent, as is the case generally upon upper floors of high houses and upon the higher levels in cities. In such places it is necessary to provide storage for such a supply of water as will tide over the periods of intermitted service. For water-closets this stored supply is usually contained in a cistern, J, hung upon the wall of the apartment; but said supply may be contained in a tank or cistern located elsewhere, if desired. If the storage-cistern is at a considerable height above the closet, then the reservoir L may be employed exactly as though the water was being derived from a public water-service; but if the immediate supply is contained in a cistern but a few feet above the closet, then the reservoir may be arranged as typically shown in Figs. 4, 5, 6.

In Fig. 4 the reservoir L is represented by the stand-pipe L′, which communicates at its top with the cistern J and serves as an overflow therefor, and is sufficiently large to contain the requisite quantity of flush-water. In such cases as this the valve N will not be required.

Fig. 5 represents a modification of Fig. 4, showing a service-box, S, within or attached to the cistern J, so as to serve also as an overflow, and a discharge-pipe, L^2, which differs from L′ in being smaller, the box S being large enough to contain the requisite quantity.

Fig. 6 shows how several closets may be supplied from one cistern, detached service-reservoirs L^3 being employed. These service-boxes are placed at the same elevation as cistern J, and they fill to the same water-level. In this case an overflow-pipe, T, may be caused to discharge into one of the boxes L^3, or elsewhere, as most convenient.

It is apparent that the source from which the water is derived is not an essential consideration in this case, and that the modifications of the reservoir L shown herein are simply for the purpose of adapting it to various common conditions of water-supply, and that they do not in any way modify the gist of my invention.

I will now describe particularly the arrangement of devices which I have found to operate satisfactorily in practice, without, however, designing to confine myself to the details of structure shown.

I provide a plate, U, which may be conveniently secured to the hanging strip V. It should also be rigidly secured to the shell C, which incloses the valve-case. At the front edge of the plate U, I provide bearings for a rock-shaft, W, upon which I mount the lever F, which actuates the valve-stem, and also the lever Y, whereby motion is communicated to the said rock-shaft.

A lever, G, is fulcrumed upon the seat-frame or upon the riser at the front, and its free end is coupled to the free end of lever Y. A stud, *g*, extends between the lever G and the seat, and may be loosely placed in a proper socket in the seat to retain it; or it may be attached to either the lever G or the seat, as most desirable. I prefer to attach it to the seat, because in that way it will not be liable to loss, and will have a longer radius of motion than if attached to the lever G. The coupling between levers G and Y is preferably an elastic one, and is composed of a wire stirrup having a portion of its center coiled, as shown at *u*. This will accommodate any difference in range of movement between the seat and valve-stem.

A counter-weight, *k*, may be applied to relieve the valve-stem from pressure when the user rises from the seat. The arrangement shown in Fig. 1 differs slightly in organization, but is the same in effect as that above described.

At the bottom of the reservoir the shell C is placed to receive the valve-case, which consists of two parts, *a* and *b*. The part *a* is provided at one end with the seat *d* for the inlet-valve D, and means for coupling the service-pipe B, and at its front end it is faced to constitute a seat, *e*, for the valve M. At the front end, also, it has an external screw-thread, and is thereby fitted to screw into the part *b*. Parts *a b* are provided with true shoulders *h i*, which match with corresponding faces of the shell C, so that when said parts *a b* are screwed together said shoulders *h i* are mutually forced back toward the corresponding faces of said shell, and if packing-rings are interposed tight joints are made there. The part *b* is provided at its front end with an outlet, R, and an orifice, *l*, for the passage of the valve-stem E. The escape of water around the valve-stem may be prevented, if desired, by a collar, *m*, of leather or rubber, which by the water-pressure will be forced against the inner surface of *b* around said stem. A small drainage-channel, *n*, is cut across the screw-threads in part *b*, and permits the water to drain out of the reservoir after each discharge, and thereby obviate any difficulties from freezing which might otherwise occur. With this arrangement of parts, if it shall become necessary to remove the valves at any time, such removal may be effected without disturbing the reservoir or the water-closet. It will be necessary only to uncouple the pipe B at its connection with part *a*, and the latter may then be unscrewed, taking out with it the valves and valve-stem and leaving part *b* remaining in place. This removal will, however, be seldom required, because tightness at valve M is not

necessary, and valve D may be removed for repacking by simply unscrewing the cap *q*. The valve D simply sets on the end of the valve-stem, like a hat, and may be taken off whenever required.

I employ a spring, *r*, behind the valve D, simply for the purpose of keeping said valve closed, if for any reason the water-pressure should be temporarily removed.

If contracted space renders it inconvenient to place the reservoir L immediately behind the closet, as shown in Fig. 1, it may be placed at one side or even outside the apartment entirely, as shown in dotted lines in Fig. 1, and it may be supported by a leg resting on the floor, by suspending from the wall, or by any other convenient way.

Having described my invention, what I claim as new is—

1. In a water-closet or other similar receptacle, a water-connection wherein the devices for operating the valve are entirely within the water-way, with the valve-stem projecting therefrom into the hopper and actuated from within the hopper itself, substantially as set forth.

2. A valve, D, in the service-pipe, combined with a controlling-stem, E, entirely within the water-way, and a lever, F, within the hopper to engage with and actuate said stem, and mechanism whereby said lever F may be actuated, substantially as set forth.

3. In a water-closet or other receptacle, the combination of a stem entirely within the water-way and actuating mechanism within the bowl, and a water-connection provided with a valve, D, and a valve, *m*, both mounted on and simultaneously operated by the same stem, and an intermediate reservoir exterior to the closet, as set forth.

4. In a water closet or other similar receptacle, a water-connection provided with valve D, combined with a valve, M, and an intermediate reservoir, closed at its top to form an air-chamber, and an air-valve which may be placed more or less near the top, substantially as and for the purpose set forth.

5. In a water-closet or other similar receptacle, a service-pipe provided with a valve, D, a valve, M, provided with a chamber, O, and a valve-stem, E, common to both of said valves, combined with a reservoir, L, intermediate between said valves, and a lever, F, actuated by suitable mechanism, as set forth.

6. In a water-closet or other similar receptacle, a water-service pipe provided with a valve, D, and its operative stem located entirely within the water-way, combined with the compound lever, whereof one member, F, is within the hopper A and the other member is outside of the same.

7. In a water-closet or other similar receptacle, a water-service pipe provided with a valve, N, and a valve, M, and a connecting operative device combined with a reservoir, L, intermediate as to said valves, and an air-valve, D, at the lower end of a tube depending in said reservoir, whereby the air-compression may be modified, as set forth.

8. A valve-stem having the valves D and M, controlled by said stem, and an interposed reservoir, L, combined with the lever T to engage with and actuate said stem at one extremity of the rock-shaft W and the lever Y at the other extremity, and coupled therewith the lever G, depressed by the weight of the user to operate said valves, as set forth.

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