(No Model.) 2 Sheets—Sheet 1.

J. E. BOYLE.

FLUSHING WATER CLOSETS.

No. 285,875. Patented Oct. 2, 1883.

Fig. 1.

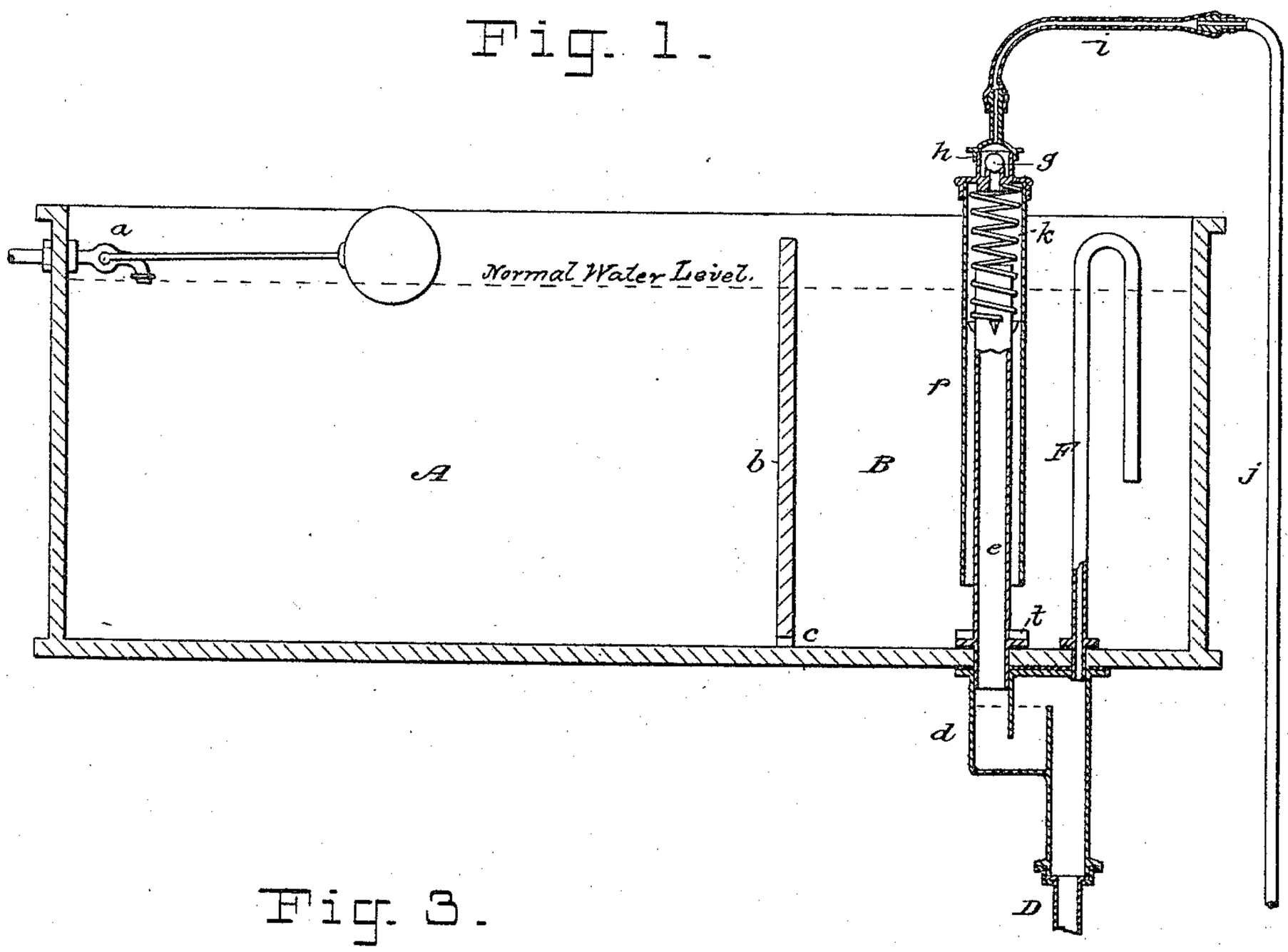


Fig. 3.

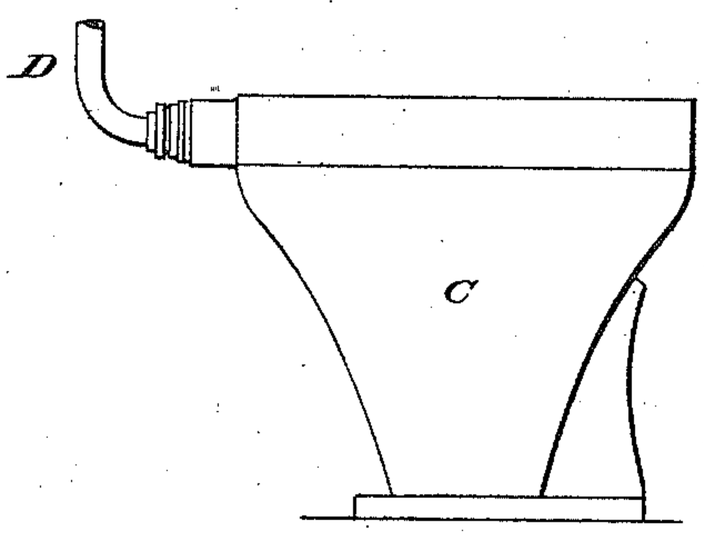
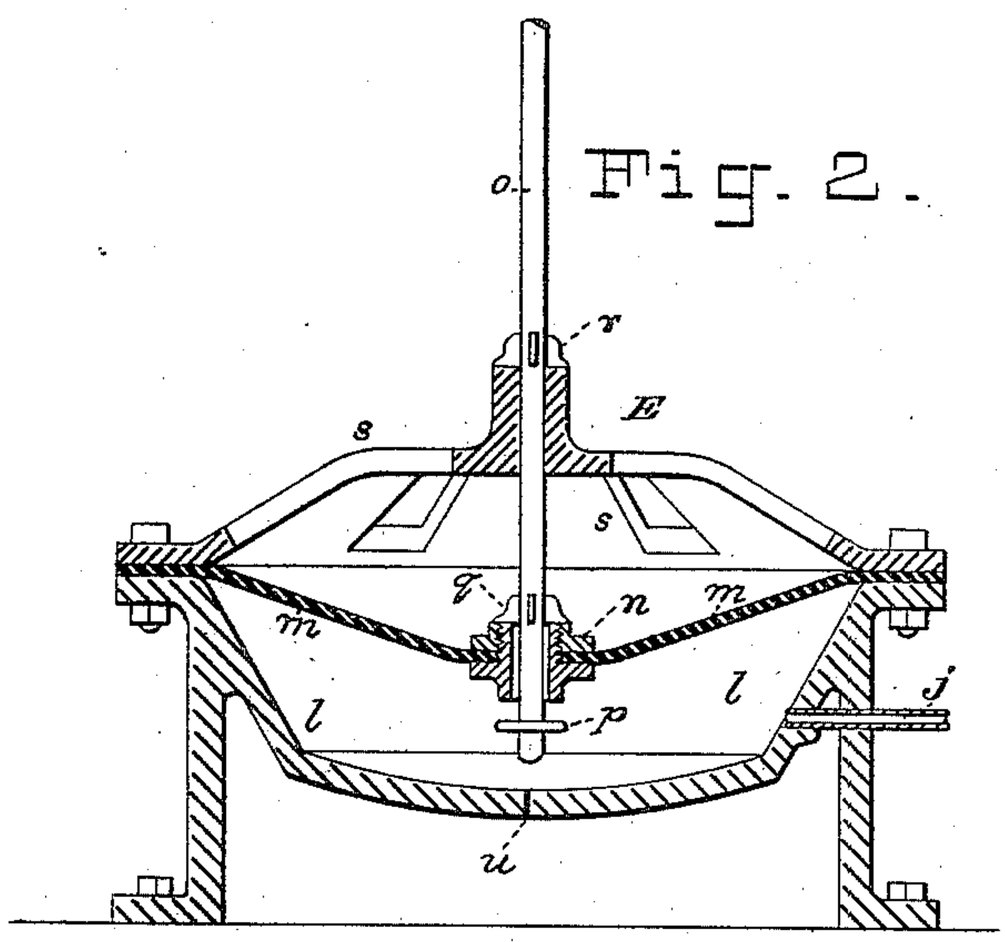


Fig. 2.



WITNESSES:

E. B. Bolton

Geo. Bainson

INVENTOR:

James E. Boyle

By his Attorneys,

Burke, Fraser & Bennett

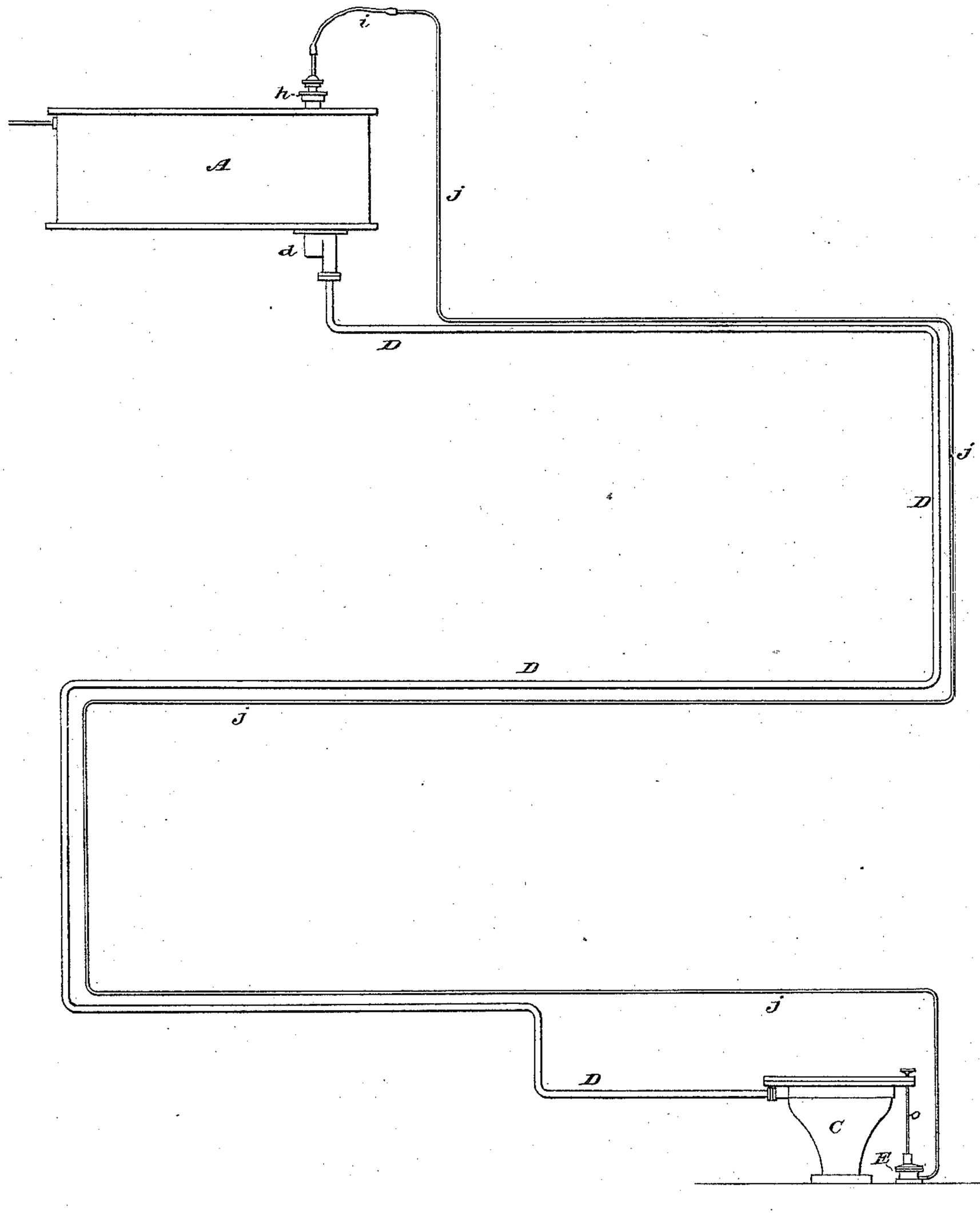
(No Model.) 2 Sheets—Sheet 2.

J. E. BOYLE.

FLUSHING WATER CLOSETS.

No. 285,875. Patented Oct. 2, 1883.

Fig. 4.



WITNESSES:

E. B. Bolton

Geo. Bainson

INVENTOR:

James E. Boyle

By his Attorneys,

Burke, Fraser & Connett

UNITED STATES PATENT OFFICE.

JAMES E. BOYLE, OF BROOKLYN, NEW YORK.

FLUSHING WATER-CLOSETS.

SPECIFICATION forming part of Letters Patent No. 285,875, dated October 2, 1883.

Application filed October 21, 1882. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. BOYLE, a citizen of the United States, residing at Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Flushing Water-Closets, of which the following is a specification.

This invention relates to means and arrangements for flushing a closet from a tank situated at any distance therefrom and in any direction, the connections being merely by means of fixed pipes.

My improvements are mainly intended to apply to closets which are so situated that the water for flushing, if kept near them, and for sealing them, will freeze in cold weather; and in order to avoid this difficulty, I provide a closet without a pan or seal, and having a trap arranged below the level of the ground deep enough to prevent its freezing in the coldest weather. This closet I flush from a tank arranged at any point in the house where the temperature always remains above the freezing-point of water. The tank is connected with the closet by a pipe which is always empty except when the closet is being flushed, and the flushing is effected by means of an air-exhausting device at the closet, connected with the tank by an air-pipe. Thus I provide a substantially dry closet, which cannot freeze, and to which only a predetermined amount of flush-water is furnished at one pull of the flushing-handle. This latter is very important, as it prevents waste of water by pulling up the handle and fastening it in that position, as is commonly practiced with pan-closets, and such as are flushed directly from the service-pipe.

In the drawings which serve to illustrate one mode of carrying out my invention, Figure 1 is a sectional elevation of the tank and flushing apparatus; Fig. 2, a vertical mid-section of the pneumatic air-exhausting device at the closet for starting the flush, and Fig. 3 a side elevation of the preferred form of panless closet. Fig. 4 is a general view of the several elements connected together, drawn to a small scale, and designed to illustrate how the tank may be placed at any distance from the closet without in the least affecting its perfect operation.

Referring now to Fig. 1, A is a tank supplied by a float-valve or ball-cock, *a*, of any well-known construction. This tank is separated by a partition, *b*, from a lesser tank, B, which is designed to supply the proper amount of water for one flush. There is a small aperture, *c*, at the bottom of the partition *b*, which permits the water to flow slowly from the tank A into the tank B, and thus maintain the same level in both normally. I speak of B as a separate tank, as it might be entirely separate and be connected by a small tube or pipe with the larger tank; but I find it more convenient to construct them in the manner described.

To the bottom of the tank B is secured an ordinary trap, *d*, from which a flush-pipe, D, leads to the closet C, as shown in Fig. 4. Erected in the tank B, with its lower end screwed down into the trap *d*, so as to form a tight joint, is a stand-pipe, *e*, which rises a little—say one-fourth of an inch—above the normal level of the water in the tank, as indicated in Fig. 1. Over the top of pipe *e* is placed an inverted-cup-like pipe, *f*, having a diameter somewhat greater than that of pipe *e*, and provided with a valve-aperture in its top, closed normally by a valve, *g*, which opens upward or outward. This valve is arranged in a chamber, *h*, which is connected by a rubber or other flexible tube, *i*, with a small pipe or tube, *j*, which need not have a bore of more than one-eighth of an inch, extending, as shown in Fig. 4, to the pneumatic device E for starting the flush, which will be described more minutely hereinafter. The inverted cup-pipe *f* is supported on a coil-spring, *k*, which rests on brackets on the stand-pipe *e*.

F is a siphon-pipe, the longer leg of which depends into the outer or discharge chamber of the trap *d*. The purpose of this will be described more fully hereinafter.

Referring now to Fig. 2, which illustrates the pneumatic device for starting the flush, *l* is a chamber into which the end of air-pipe *j* enters, and *m* is a flexible diaphragm which covers said chamber. At the center of the diaphragm is fixed a tubular bearing, *n*, through which passes loosely the stem *o* of the closet-pull. This stem has a little free play endwise through the diaphragm, and is pro-

vided with devices in the nature of stop-collars, whereby it is enabled to take against and flex the diaphragm when it is raised and dropped. The lower stop, *p*, which takes under and lifts the diaphragm, is in the nature of a disk-valve, and is arranged to close the central aperture in the diaphragm (around stem *o*) completely when the stem is pulled up. The upper stop, *q*, consists of two or more brackets or projections on the stem, which do not close the aperture in the diaphragm when the stem is let fall or pressed down. A stop, *r*, on the stem is also provided to rest upon the slotted or perforated diaphragm-cover *s*, so as to limit the downward distention of the diaphragm and relieve it from strain.

The operation of the device is as follows: When it is desired to flush the closet, the stem *o* is pulled up. This lifts the diaphragm *m*, by reason of the disk-like stop *p* taking under it, and at the same time closing its central aperture. The raising of the diaphragm creates a vacuum in the chamber *l*, which acts through the slender pipe *j* to lift the valve *g* (see Fig. 1) and rarefy the air in pipes *e* and *f*. This causes the greater atmospheric pressure on the water in the tank to raise the water in the annular space between said pipes *e* and *f* until it overflows into the stand-pipe *e* and down into pipe D through trap *d*, forming a siphon. This I call the "main" siphon. The water flows out of tank B to the closet much faster than it can flow in at the aperture *c*, connecting with tank A, and when the level falls below the open end of cup-pipe *f* the air enters and breaks the siphon. The action of the flowing water, by creating a vacuum in the upper part of cup-pipe *f*, causes the latter to draw down, compressing the light spring *k*. This of course carries the lower end of the cup-pipe down toward the bottom of the tank B, and would tend to stop or throttle pipe *e;* but before it can descend so far its lower end strikes some suitable stop, *t*. The water then continues to flow until the level of said stop is reached, when the air enters and breaks the siphon, as before stated. The spring at this moment throws or lifts the pipe *f* to its normal position. The purpose of this is to lift the pipe *f* quickly before the inflowing water can rise high enough to keep its lower end submerged; otherwise the descending column of water in pipe D (which will sometimes be very long) would continue to draw the water from the tank indefinitely, the supply being kept up by the cock *a*. Where the pipe D is not so long, it will empty itself before the water rises high enough in tank B to submerge the lower end of pipe *f*, and consequently the flush will stop, even though the pull at the closet be held up. When the pull is let go, the diaphragm *m* drops to the position shown in Fig. 2, the air under it escaping upward through the central aperture around stem *o*.

In cases where the pipe D is very long, and there is liability of the water rising in the tank high enough to submerge the lower end of pipe *f* before the tank D is discharged, I provide a siphon-pipe, F, hereinbefore mentioned. The short leg of this auxiliary siphon descends only about half-way to the bottom of the tank, and stops a considerable distance above the normal level of the bottom of pipe *f*. Consequently when the siphon is started through the trap *d*, this siphon F also discharges until its lower end is exposed by the fall of water. It will then admit air to the pipe D, but cannot interfere with the flow through pipe *e*, as the longer leg of the main siphon extends below its longer leg. If, however, when the main siphon breaks, from the sudden rise of pipe *f*, the water should afterward rise high enough to submerge the lower end of pipe *f* before pipe D is discharged, the siphon F will prevent the improper siphoning of the tank, as the main siphon cannot operate until the short leg of the auxiliary siphon F is submerged, and this will not take place until the pipe D is fully discharged.

I may shorten the shorter leg of siphon F to any desired extent, depending somewhat on the length of pipe D; but I prefer to arrange it about as shown, keeping its bend at the level of the top of the stand-pipe *e*, or higher, and its shorter leg always submerged normally to prevent the escape of gases arising from the closet.

In lieu of supplying the tank B from a larger tank, A, through the aperture *c*, I might use only the tank B, and provide it with a ball-cock adapted to supply only a small stream, as required.

In lieu of the rubber pipe or tube *i*, I might also employ a jointed metal pipe or other similar device; but the construction shown is preferred for its cheapness and simplicity.

In lieu of the perforated cover *s* (see Fig. 2) of the diaphragm, I may employ an unperforated cover, and allow the air to escape, when the diaphragm is lifted, around the stem *o*. This would prevent water from getting into the chamber above the diaphragm; or a small tube might be tapped into cover *s* and carried over the side and turned down, which would serve the purpose equally well.

As watery vapor may sometimes collect in pipe *j* and flow into the chamber *l*, I prefer to provide the latter with a small drip-aperture, *u* (see Fig. 2) at its lowest point. This will be too small, ordinarily, to effect the operation of the diaphragm in producing a vacuum; but if it should, it may be trapped or valved or omitted entirely.

The pneumatic device for starting the flush may, however constructed, be arranged to be operated with a pull, as indicated in Fig. 4, or in any other manner desired—as, for example, the closet may have a spring-seat arranged to actuate the diaphragm when it rises.

It will be understood that the water flows into tank B at the same time that it flows out,

but in much less quantity. Consequently the water supplied at one flush will be greater than the capacity of the tank. This will of course be taken into consideration in constructing the tank. The size of the inlet-aperture *c* will also be controlled by the capacity of tank B and the amount of flush-water required.

I do not wish to limit myself to the precise construction herein shown, as this may be varied somewhat without departing from the leading characteristic of my invention, which is the non-freezing character of the closet—as, for example, the valve *g* might be arranged at any point in the pipe *j*; but I prefer to arrange it close to the main siphon.

I am aware that it has been proposed to connect an ordinary pan-closet with the flush-tank by an untrapped water-pipe, and by an air-pipe connecting an air-exhausting device at the closet with the valve in the tank, whereby the flush is started by means of atmospheric pressure. This closet, however, will freeze, just as any closet provided with a water-trap or seal will freeze when the pipe which supplies the water is not empty, as no pipe is provided at the junction of the water-supply pipe with the tank. I do not claim this. What I claim to be new is the panless closet supplied with flush-water through a pipe that is normally empty, whereby I am enabled to place the closet at a point where the temperature falls below the freezing-point without danger of freezing it up.

It will be observed that my closet is placed between the ordinary trap in the soil-pipe, which is usually buried too deep to be affected by the cold, and the trap *d* at the tank, which is placed at some point in the house where the temperature never falls to the freezing-point. Between these traps no water ever stands, and in flushing the flush-water runs immediately through from one trap to the other.

Having thus described my invention, I claim—

1. The combination, with a panless closet unprovided with a water-seal, of a flush-tank, a flush-pipe arranged to connect the tank with the closet, a trap in the flush-pipe at its junction with the tank, whereby said pipe may remain normally empty, a siphon constructed substantially as described, and arranged in the tank, an air-exhausting device arranged in the vicinity of the closet, and connected with the siphon at the tank, by means of which the flush may be started, and the said air-pipe, all arranged substantially as described, whereby the closet may be set at any point without danger of freezing, and be properly supplied with flush-water from a tank arranged at some point where the temperature never falls below the freezing-point, as set forth.

2. As a means of breaking the vacuum in a siphon for delivering liquids from a tank which is being constantly supplied, the combination, with the stand-pipe and the inverted-cup pipe, of the spring arranged to uphold the cup-pipe and to suddenly lift it when the level of the water falls below its lower open end, and the means of starting the siphon, substantially as set forth.

3. The combination, to form a siphon for emptying a tank which is being constantly supplied while being emptied, of the stand-pipe, the inverted-cup pipe provided with a valve-chamber and valve, the supporting-spring, and the flexible pipe or tube connecting the valve-chamber with the air-pipe, all arranged to operate substantially as set forth.

4. The combination, with a suitable air-exhausting device, of the air-pipe *j*, leading therefrom to the siphon at the tank, the said tank, the flush-pipe, trap *d*, stand-pipe *e*, cup-pipe *f*, provided with a valve-chamber and valve at its top, the spring *k*, and flexible pipe *i*, all arranged substantially as set forth.

5. The air-exhausting device E, comprising a diaphragm provided with a tubular bearing for the stem of the pull, which is arranged to play loosely through said bearing, and provided with stops above and below the diaphragm, that below being arranged to close the central aperture in the diaphragm when the latter is lifted, and the outer casing arranged to form a chamber below the diaphragm, substantially as set forth.

6. The combination, with the main siphon comprising the pipes *e f*, the trap, and the flush-pipe, of the auxiliary siphon F, constructed and arranged to operate substantially as set forth.

7. As an air-exhausting device for starting the flush, the combination of the chamber *l*, the air-pipe leading therefrom, the diaphragm *m*, the tubular bearing *n*, the stem *o*, arranged to play loosely therethrough, and provided with stops *p* and *q*, and the cover *s*, all arranged substantially as set forth.

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

JAMES E. BOYLE.

Witnesses:
HENRY CONNETT,
ARTHUR C. FRASER.