

June 5, 1934.

J. A. VOGEL

1,961,313

FLUSHING APPARATUS

Filed July 30, 1932

2 Sheets-Sheet 1

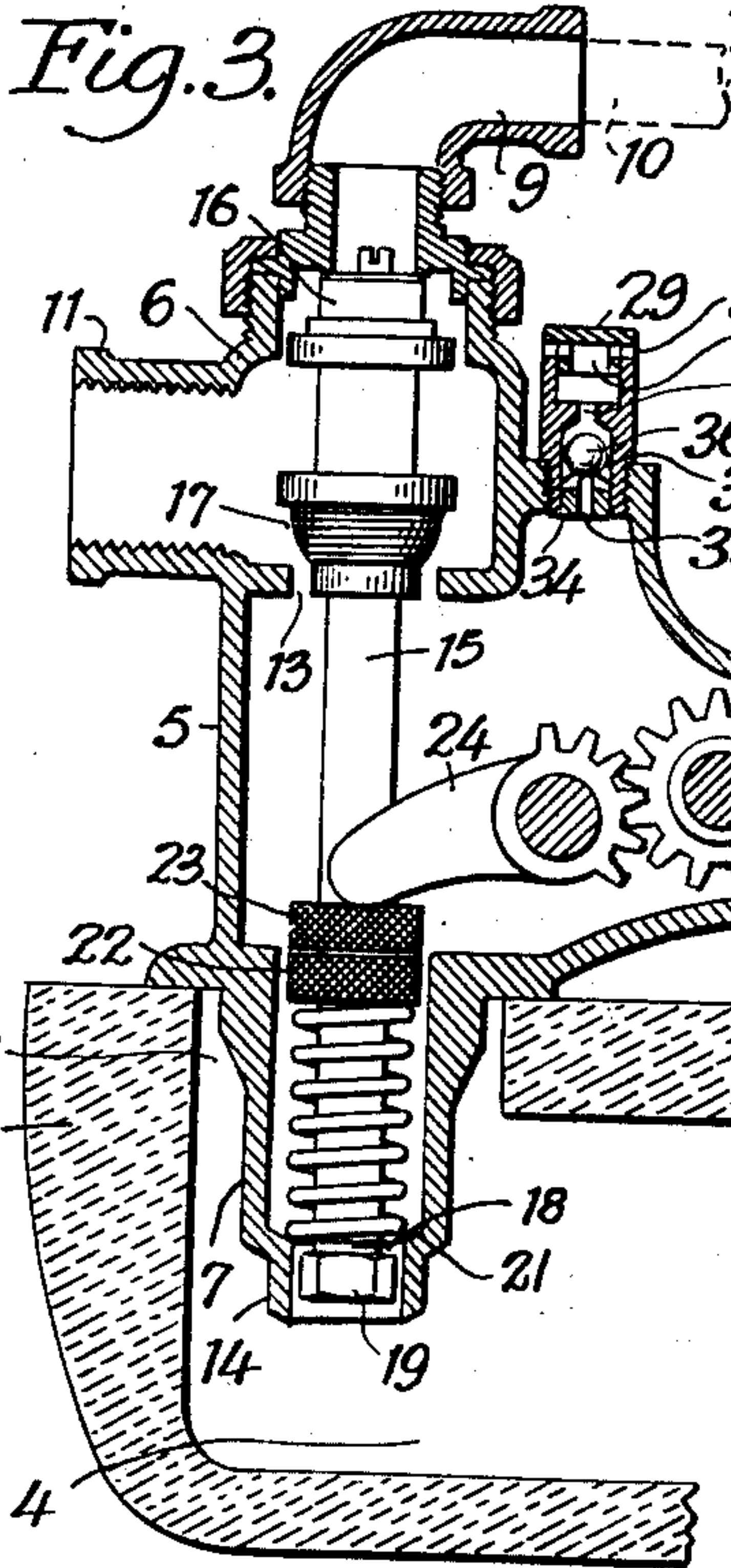
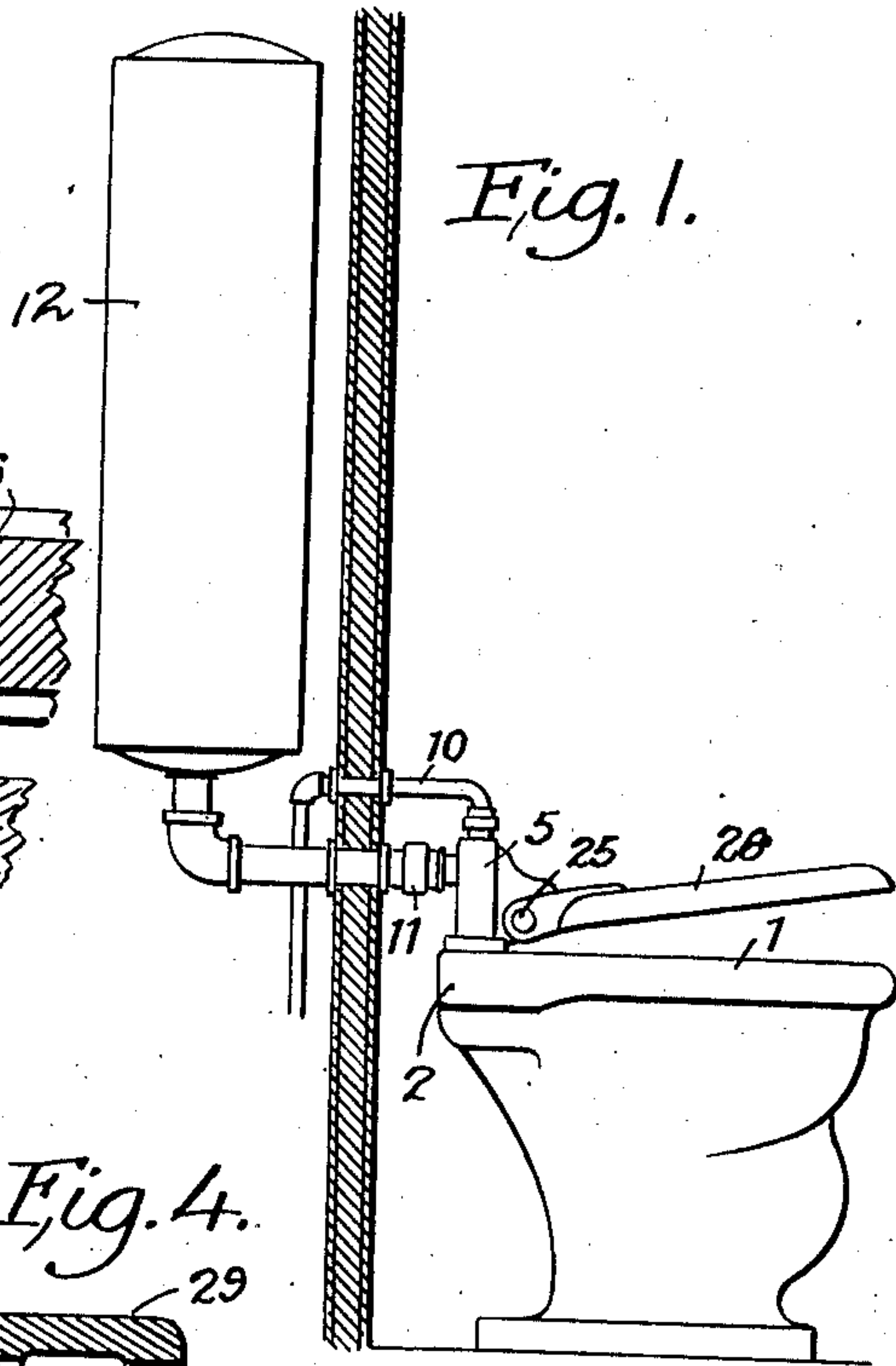
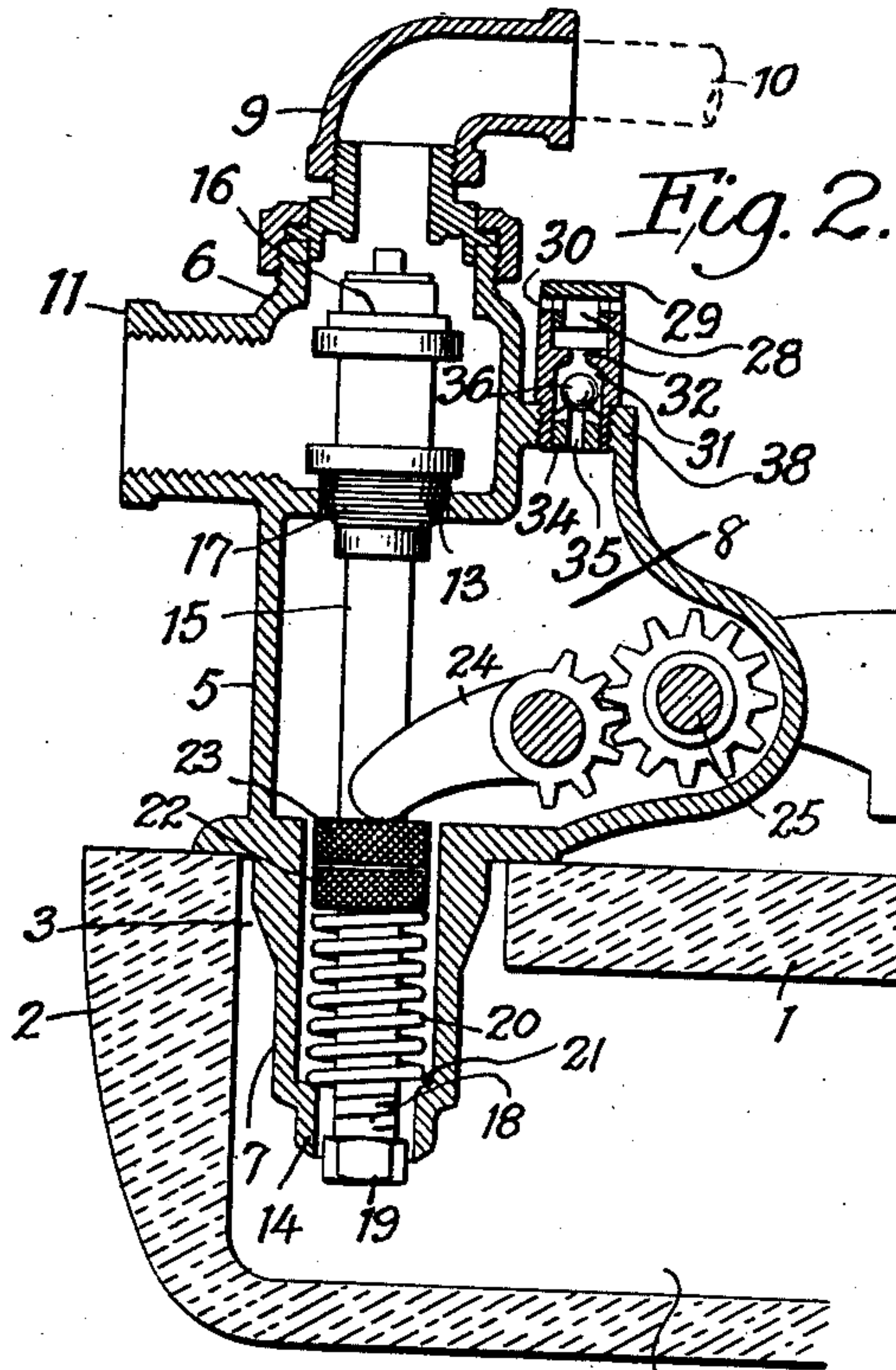


Fig. 4.

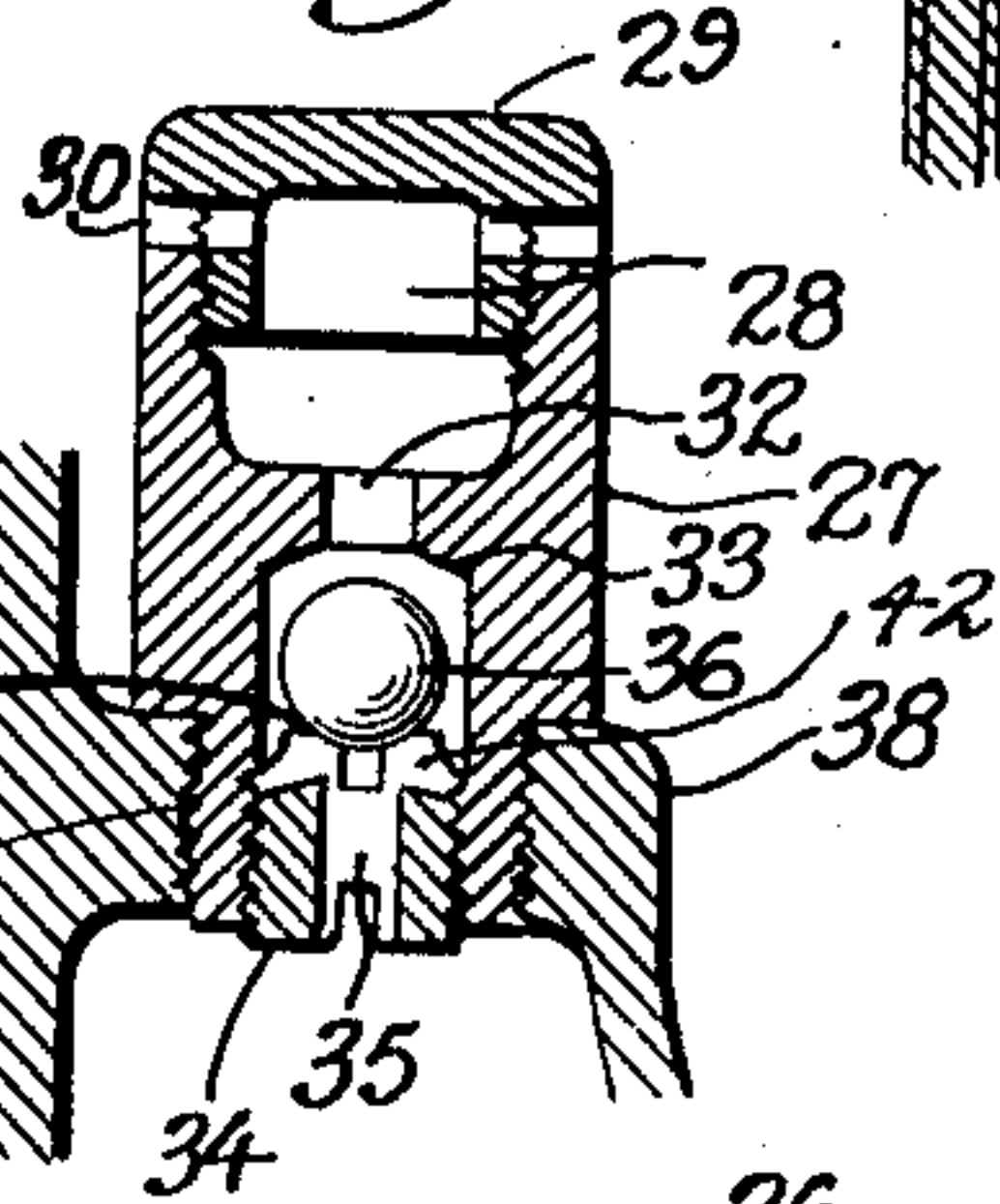


Fig. 5.

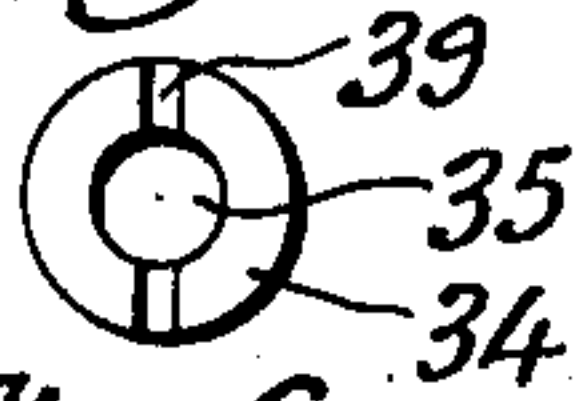
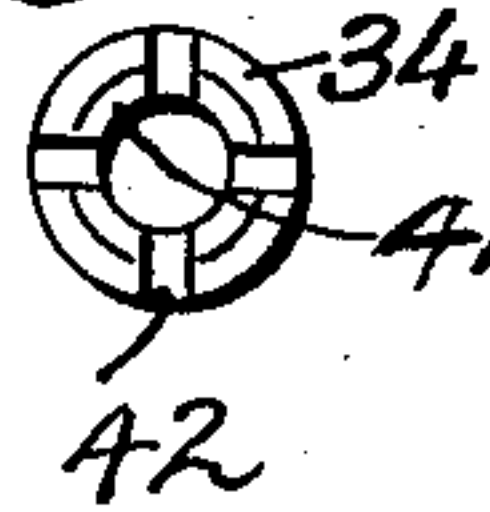


Fig. 6.



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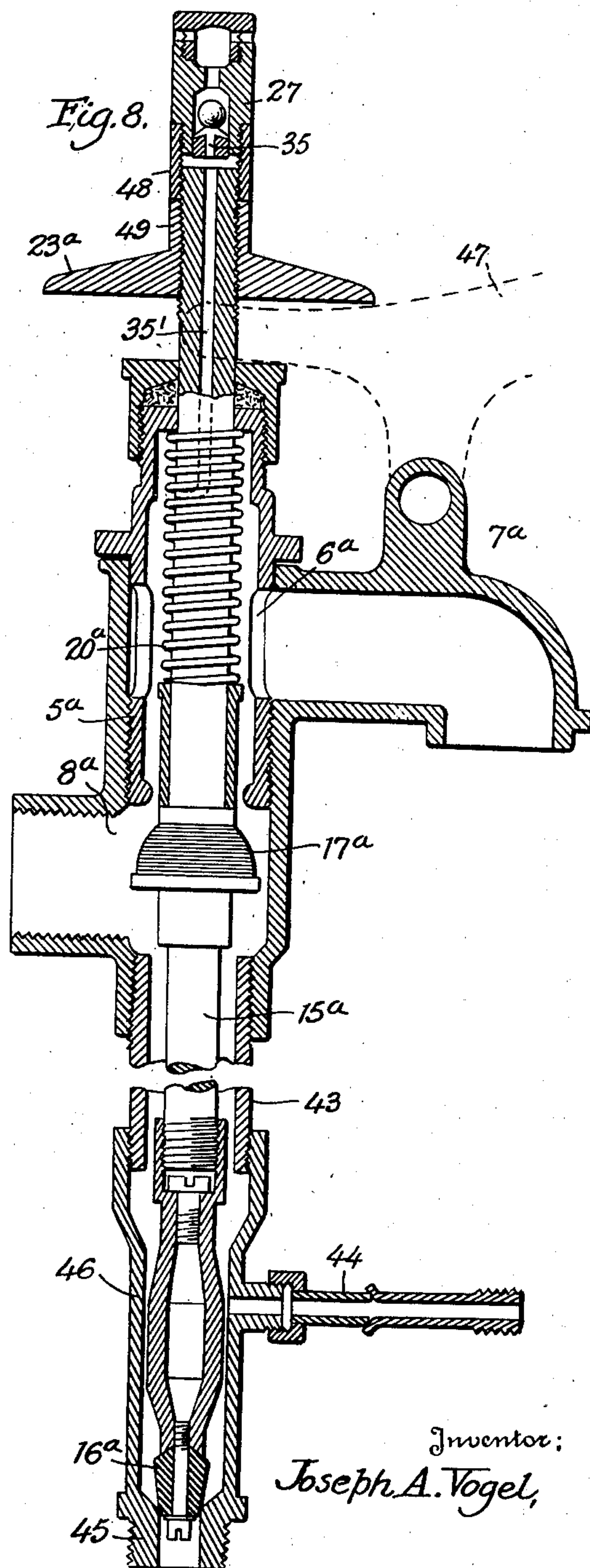
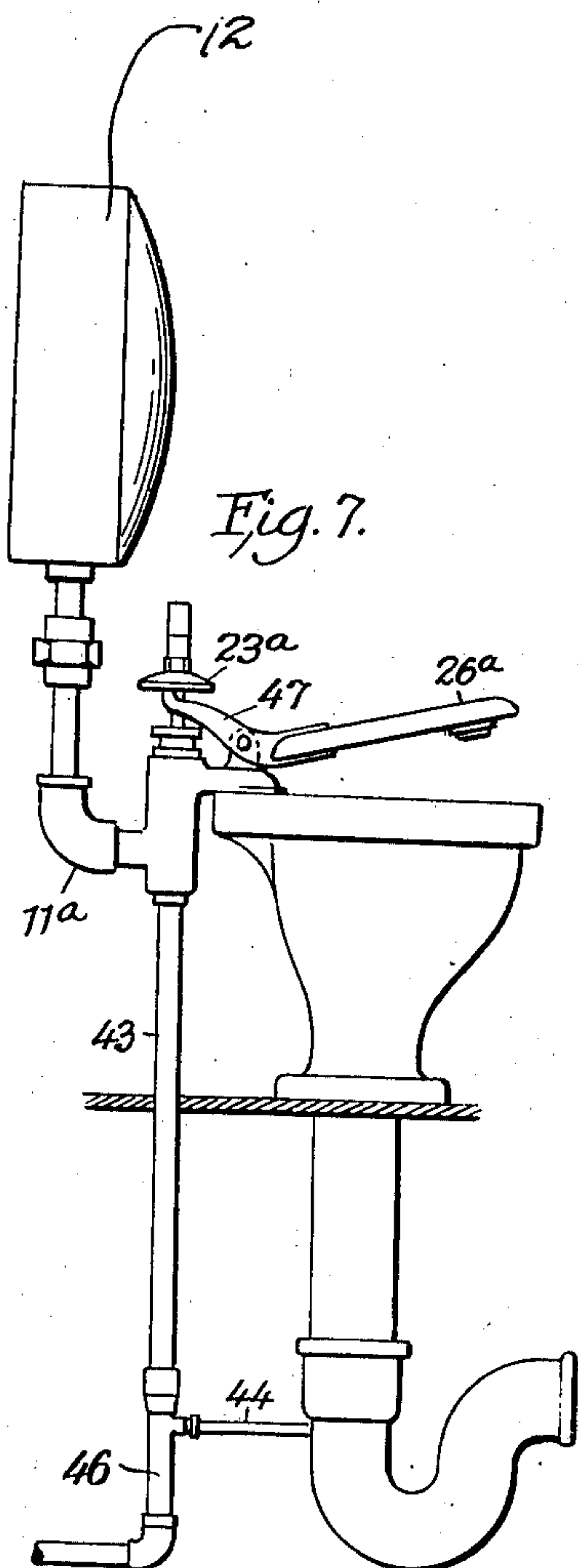
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

1,961,313

FLUSHING APPARATUS

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Application July 30, 1932, Serial No. 626,813

12 Claims. (Cl. 4—70)

This invention relates to flushing apparatus for water closet and like systems employing a duplex or multiple valve device controlling the flow of water from a supply pipe to a closed tank wherein the air is compressed, and from thence to a hopper or bowl for the flushing action.

The object of my invention is to provide a novel construction and arrangement of a controlling valve or device associated with the flush valve in such manner as to permit air to enter the flush valve casing and tank during the operation of the flush valve, while preventing exhaust of air, water or sewage from the flush valve casing to the exterior or to the water supply pipe, thus preventing either siphonage and pollution of the water in the water supply line therefrom or water-logging in the water tank due to dead air or lack of elastic air in sufficient quantity to secure a proper flushing action.

In the accompanying drawings,—

Fig. 1 is a view in side elevation showing the application of the invention to a Vogel type of self-flushing water closet having a conventional arrangement of flush valve disposed above the rear portion of the bowl.

Figs. 2 and 3 are vertical front-to-rear sections through the bowl and flush valve casing, showing the flush valve in normal and flushing positions, respectively.

Fig. 4 is an enlarged vertical section through the air inlet or control valve.

Figs. 5 and 6 are respectively top and bottom plan views of the control valve seat member.

Fig. 7 is a view similar to Fig. 1 showing the application of the invention to a Vogel frost-proof type of flush valve, showing the valve members in normal position.

Fig. 8 is a section through the upper end of the valve stem and the flush valve casing thereof.

Referring now more particularly to Figs. 1 to 6, inclusive, of the drawings, 1 designates a closet bowl provided at its upper rear portion with an extension 2 having an opening 3 in its top and constructed to form a passage 4 communicating with the bowl.

Disposed above the bowl extension 2 is a valve casing 5 formed with an upper flush valve chamber 6, a lower depending flush discharge outlet 7 and an intermediate flush chamber 8. The valve chamber 6 is provided at its upper end with a water inlet connection 9 for attachment to a water supply pipe 10, is also provided with a lateral port 11 for connection with an air-tight or closed pressure tank 12, and is further

provided with a port 13 in its bottom wall, which port connects the valve chamber 6 with the upper rear portion of the flush chamber 8. The discharge outlet 7 is of generally tubular form and terminates at its lower end in a reduced guide portion 14. The casing 5 is suitably constructed for fastening attachment to the bowl 1 to hold it in rigid connection therewith.

Disposed vertically in the valve chamber 6, flush chamber 8 and the discharge outlet 7, and extending through port 13, is a vertically movable valve stem 15. At its upper end within the top of the valve chamber 6 this stem carries an inlet valve 16 controlling the admission of water thereinto through the water supply connection 9, and carried also by the stem and disposed in the lower portion of the valve chamber 6 is a flush valve 17 which is movable with the valve 16 and operates to open and close the port 13. At its lower end the valve stem is provided with a threaded surface 18 and a retaining nut 19, which nut 19 is movable in the guide portion 14. A coiled spring 20 surrounds the lower end of the stem within the outlet 7 and rests at its lower end upon a shoulder 21 at the lower end of the outlet. At its upper end the spring bears against a lock nut 22 adapted for holding in adjusted position a contact nut 23.

The spring 20 normally holds the valve stem elevated with the valve 16 in closed position and the valve 17 in open position, which position is the cut off position of the valve member 16 and the flush position of valve member 17, in which positions of the valve members the admission of water from pipe 10 to the flushing apparatus is cut off by valve 16, while valve 17 is in position to establish communication through port 13 between the valve and flush chambers 6 and 8 and between the valve chamber 6 and the pressure tank 12. The valve stem is adapted to be depressed against the resistance of the spring 20, to reverse the positions of the valves 16 and 17, that is, to open valve 16 and close valve 17, by means of a forked rocker arm 24 mounted on a shaft which is in gear with an actuating rock shaft 25 which is connected to the closet seat 26 so as to be actuated and controlled thereby. The gearing connection between parts 24 and 25 may be the same or similar to that shown in Patent No. 1,695,621, dated December 18, 1928, and the parts of the flushing apparatus thus far described may correspond generally to the parts disclosed in said patent, or be of any other analogous or suitable construction. With this understanding it will be apparent that spring

20 while holding valve 16 closed and valve 17 open acts on the arm 24 through the gear connection between it and shaft 25 to hold the seat 26 in a somewhat elevated position above the bowl, in which position the supply of water to the tank and bowl is cut off and the tank is empty but in open communication with the valve chamber 6 and flush chamber 8. When the seat 26 is depressed the stem 15 is moved downward to open valve 16 and close valve 17, thus closing communication between the chambers 6 and 8 and opening communication between the supply pipe 10 and the tank 12, so that a charge of water will flow into the tank and compress the air therein. When the seat 26 is subsequently released and elevated to normal position by spring 20, the valve 16 is returned to closed position, thus cutting off the flow of water and the valve 17 is opened for the discharge of the water from the tank through the port 13 into the flush chamber 8 and through the outlet 7 from the flush chamber to the bowl for a flushing action.

The present invention has for its object to provide a control or relief valve so arranged as to automatically supply air to the chamber 8 and chamber 6 to break up any siphoning action in said casings, and thus prevent any backflow of sewage from the bowl into the chambers and possibly into the supply pipe 10, and also to admit air to the tank to automatically replenish the supply of live or elastic air therein when needed and to thereby maintain a proper quantity and elasticity of the air in the tank to produce a proper flushing action in the bowl and to prevent the tank from becoming water-logged.

The means provided for these purposes comprises a control or relief valve, preferably of ball type, and consisting of a casing 27 having at its upper end an air chamber 28 internally threaded to receive the correspondingly threaded flange of a cap 29 having a suitable number and arrangement of air openings 30 therein. At its lower end the casing 27 is provided with a valve chamber 31 communicating with the air chamber 28 through a passage 32, said chamber 31 being formed at its upper end with a valve seat 33 and being internally threaded at its lower end to receive a closure plug and valve retainer 34 having an air passage 35 extending to and through its upper and lower faces. This plug 34, besides closing the lower end of the valve chamber 31, serves as a seat support for a ball valve 36 which normally rests thereon and, as hereinafter described, to a certain extent closes the port 35, and which is adapted under upward pressure from below and acting thereon through the passage 35, to move upwardly against the seat 33 and close communication between the valve chamber 31 and the air chamber 28. The plug 34 is fitted within a reduced stem portion 37 of the casing 27 which fits within an internally threaded opening in a control valve seat or support 38 arranged upon the valve casing 5 below the level of the water inlet to the casing 6 and above the port 13 and at a suitable level between the water inlet level and the port 13. The plug 34 is provided in its underside with a niche 39 so that it may be conveniently applied and removed by a screwdriver or like tool, and the upper surface of said plug is tapered or conoidally shaped outwardly and downwardly, as at 40, from a central seat 41 for the ball 36 overlying the passage 35. The ball thus seats upon a restricted central portion constituting the apex of the conoidal surface 40, which surface 40 is provided with a

suitable number and arrangement of air passages or grooves 42. These passages or grooves provide restricted communication between the chamber 31 and the passage 35 about the ball when the latter is resting on the seat 41, so that the ball in such position suitably restricts the flow of air through the casing 27 to the chamber 8, while permitting, through the grooves 42, flow of a suitable quantity of air at all times for a relief action under suction in the chamber 8.

It will thus be understood that if at any time, during or after a flushing action, a partial vacuum or reduction of air pressure exists in the chamber 8 or in said chamber together with the chamber 6 and the tank 12, whereby a suction action is instituted, air will enter the chamber 27 and pass around the valve 26 and through the grooves 42 and passage 35 into the chamber 8, thus relieving any reduction of pressure and breaking up any siphoning action therein. The breaking up of the reduction of pressure and any siphoning action will prevent any back-flow of sewage from the bowl upwardly into the valve chamber in the event of stoppage from any cause, and thus prevent any possibility of the pollution of the water in the supply pipe. The control or relief valve is arranged in an effective position on the casing 5 for this purpose and also in such position as to further perform a relief action to replenish the tank 8 with the proper supply of live or elastic fresh air to take the place of dead or inelastic air in the tank, which may occur through depletion of air supplied or absorption of air under certain conditions, and thus prevent water-logging of the tank and its attendant objections. It will of course be understood that the valve 36 is movable upwardly against the seat 33 to prevent the exhaust of air from the chamber 8 as well as to prevent the exhaust of water or sewage. The function of the control or relief valve in performing not only an anti-siphonage action but an anti-water-logging action is believed to be novel with me in this connection.

In Figs. 7 and 8 of the drawings I have shown the application of the invention to a Vogel frost-proof type of flushing apparatus employing a water inlet valve and a drain valve below frost level. As shown, the valve casing 5a here is provided at its lower end with a flush chamber 6a and below the same with a flush valve chamber 8a, which chamber 6a communicates with an outlet 7a leading to the bowl, while the chamber 8a is provided with a lateral connection 11a for communication through a suitable pipe connection with the tank 12a. Projecting downwardly from the lower end of the casing is a conducting extension 43 connected above its lower end with a drain outlet 44 and having at its lower end a water inlet 45 for connection with the water supply pipe. Arranged within the casing 5a and the extension 43 is a valve stem 15a carrying within the casing 8a a flushing valve 17a movable to open and close communication between the chambers 6a and 8a. At its lower end the valve stem carries a valve 16a controlling the water supply inlet 45 and a valve 46 controlling the drain outlet 44, portions of the valve stem above and below the plane of the drain valve 46 being of openwork construction or provided with passages to allow water to flow between the extension 43 above the level of the drain valve and the drain outlet 44 or water inlet 45 in the different positions of the valve members 16a and 46. A spring 20a associated with the upper end of the valve acts, in conjunction with gravity, to maintain the valve device in a position in

which valve 16 closes inlet 45, valve 46 is open and connects that part of the extension 43 above the drain valve with the drain outlet 44, and the valve member 17 is open so that chambers 6a and 8a and the closet and tank are in open communication. A forked arm 47 carried by the seat 26a engages under the head 23a and operates thereon to lift the valve when the seat is depressed. On depression of the seat the valve stem is raised to close valve 17a and cut off communication between the extension 43 and the bowl and to move valve 46 to a position in which it closes drain 44 and simultaneously moves valve 16 to open position, for the upflow of water to the tank 12a from the water supply line. The tank will thereupon be filled with water and the air therein compressed until the pressure equals or exceeds that in the supply line, at which the flow of water will be cut off. When the seat 26a is released spring 20a moves the valve stem downward to close valve 16a and to open valve 17a to establish communication between the tank and bowl for the flushing action and to simultaneously open communication between the lower end of extension 43 and the drain outlet 44 for the subsequent drainage off of the residual water remaining in the flushing connection at the end of the flushing action.

In this form of the invention shown in Figs. 7 and 8 the relief or control valve is mounted upon the upper end of the valve stem 15a. As shown, the upper end of the stem is formed with a relief or air feed passage 35' communicating with the flush chamber 6a at its lower end and opening through its upper extremity and communicating with the opening 35 in the plug of the valve which is mounted upon a supporting tube 48 engaging the upper threaded end of the valve stem, which tube serves as a check nut for a retaining nut 49 which holds the head 23a in position. The control or relief valve here is of the same construction as that previously described and operates in the same manner in the functioning of the flush valve mechanism to prevent siphonage of the waste material over from the bowl into the flush valve chamber and also to prevent water-logging of the water tank in the manners previously set forth. In this construction, as in that shown in Figs. 1 to 4, inclusive, the control or air relief valve is arranged at such level and communicates with the flush chamber in such relation to the tank and bowl connections as to perform the double function of an anti-siphonage and anti-water-logging valve in a thoroughly reliable and efficient manner and without the use of auxiliary parts of any kind. It is, of course, to be understood that the relief valve may be used in connection with flushing apparatus of this character varying in details of construction to serve specifically different applications, without departing from the spirit or sacrificing any of the advantages of the invention. Also it will be understood that, while the structural organization herein described and claimed is preferred, changes in the form, construction and arrangement of parts falling within the scope of the appended claims may be made without departing from the scope of the invention as set forth therein.

What I claim is:—

1. In a flushing apparatus, a bowl, a closed tank, a valve casing having a valve chamber and a flush chamber, said valve chamber having a water inlet connection and a water outlet connection, the latter leading to the tank, and said flush chamber having an inlet from the valve chamber and an

outlet leading to the bowl, a water inlet valve for opening and closing communication between the valve chamber and the water inlet, a flush valve for opening and closing communication between the valve chamber and tank and the flush chamber, means for simultaneously operating said valves to cause the water inlet valve to open the water inlet for flow of water to the tank and to cause the flush valve to close communication between the valve chamber and the flush chamber, or vice versa, and valve controlled air admission means effective to admit air into the flush chamber and therethrough to the water tank on a suction action in said chamber to prevent siphonage in said chamber or water-logging in said tank.

2. In a flushing apparatus, a bowl, a closed tank, a valve casing having a valve chamber and a flush chamber, said valve chamber having a water inlet connection and a water outlet connection, the latter leading to the tank, and said flush chamber having an inlet from the valve chamber and an outlet leading to the bowl, a water inlet valve for opening and closing communication between the valve chamber and the water inlet, a flush valve for opening and closing communication between the valve chamber and tank and the flush chamber, means for simultaneously operating said valves to cause the water inlet valve to open the water inlet for flow of water to the tank and to cause the flush valve to close communication between the valve chamber and the flush chamber, or vice versa, and air admission means normally operating to permit air to enter the flush chamber on a reduction of pressure therein and to prevent discharge of air from the chamber on a rise of pressure therein.

3. In a flushing apparatus, a bowl, a closed tank, a valve casing having a valve chamber and a flush chamber, said valve chamber having a water inlet connection and a water outlet connection, the latter leading to the tank, and said flush chamber having an inlet from the valve chamber and an outlet leading to the bowl, a water inlet valve for opening and closing communication between the valve chamber and the water inlet, a flush valve for opening and closing communication between the valve chamber and tank and the flush chamber, means for simultaneously operating said valves to cause the water inlet valve to open the water inlet for flow of water to the tank and to cause the flush valve to close communication between the valve chamber and the flush chamber, or vice versa, and a check valve to admit air into the flush chamber upon a reduction of pressure therein.

4. In a flushing apparatus, a bowl, a closed tank, a valve casing having a valve chamber and a flush chamber, said valve chamber having a water inlet connection and a water outlet connection, the latter leading to the tank, and said flush chamber having an inlet from the valve chamber and an outlet leading to the bowl, a water inlet valve for opening and closing communication between the valve chamber and the water inlet, a flush valve for opening and closing communication between the valve chamber and tank and the flush chamber, means for simultaneously operating said valves to cause the water inlet valve to open the water inlet for flow of water to the tank and to cause the flush valve to close communication between the valve chamber and the flush chamber, or vice versa, and a check valve normally affording restricted communication between the flush chamber and the atmosphere and operating to permit air to enter the flush chamber upon a re-

duction of pressure therein and movable to a closed position to prevent discharge of air from the chamber to the atmosphere upon an augmentation of pressure therein.

5 5. In a flushing apparatus, a bowl, a closed tank, a valve casing having a valve chamber and a flush chamber, the said valve chamber having a water outlet connection with the tank and a water inlet, and the said flush chamber having an outlet to
10 the bowl and an inlet from the valve chamber, a valve device in said casing movable in one direction to open communication between the water inlet and the tank and to close communication between the valve chamber and flush chamber
15 and movable in a different direction to close communication between the water inlet and tank and open communication between the valve chamber and flush chamber, and a valve device having an air inlet passage and a valve member normally
20 partly closing the passage to permit entrance of air to the flush chamber on a reduction of pressure therein and adapted to close said passage to prevent escape of air or water from the flush chamber upon an increase of pressure therein.

25 6. In a flushing apparatus, a bowl, a closed tank, a valve casing having a valve chamber and a flush chamber, the said valve chamber having a water outlet connection with the tank and a water inlet, and the said flush chamber having
30 an outlet to the bowl and an inlet from the valve chamber, a valve device in said casing movable in one direction to open communication between the water inlet and the tank and to close communication between the valve chamber and flush chamber
35 and movable in a different direction to close communication between the water inlet and tank and open communication between the valve chamber and flush chamber, a relief valve casing communicating with the flush chamber, and a
40 valve in said casing and operative to admit air to the flush chamber on a reduction of pressure therein.

7. In a flushing apparatus, a bowl, a closed tank, a valve casing having a valve chamber and
45 a flush chamber, the said valve chamber having a water outlet connection with the tank and a water inlet, and the said flush chamber having an outlet to the bowl and an inlet from the valve chamber, a valve device in said casing movable in
50 one direction to open communication between the water inlet and the tank and to close communication between the valve chamber and flush chamber and movable in a different direction to close communication between the water inlet and
55 tank and open communication between the valve chamber and flush chamber, said valve device including a stem having a passage for connecting the flush chamber with the atmosphere, and a valve controlling said passage to permit entrance
60 of air to the flush chamber on a reduction of pressure therein and adapted to close said passage to prevent escape of air or water from the flush chamber upon an increase of pressure therein.

8. In a closet flushing system, a receptacle hav-

ing a water inlet and an outlet for communication respectively with a water supply pipe and a bowl, a valve normally closing said inlet, a valve normally open when the first-named valve is closed and closed when the first-named valve is open, and air intake means automatically operative to admit air from the atmosphere to the system to provide a vacuum break for preventing back flow from the bowl on a reduction of pressure in the system and to close communication
85 between the atmosphere and system upon an augmentation of pressure in the system.

9. In a flushing system closed to the atmosphere, embodying a bowl, a tank and a valve for admitting water to the tank and closing communication between the tank and bowl or cutting off the flow of water to the tank and allowing water to flow therefrom to the bowl, valve controlled means effective for admitting air to said system between the valve and bowl on a reduction of pressure therein to prevent water-logging of the tank and siphoning action from the bowl to the water supply source.

10. In a flushing system closed to the atmosphere, embodying a bowl, a tank, and a valve for admitting water to the tank and closing communication between the tank and bowl or cutting off the flow of water to the tank and allowing water to flow therefrom to the bowl, valve controlled means arranged above the level of the bowl and effective for admitting air to said system between the valve and bowl to provide a vacuum break to prevent back flow through said valve.

11. In a closet flushing system, a receptacle having a water inlet and an outlet for communication respectively with a water supply pipe and a bowl, a valve normally closing said inlet, a valve normally open when the first-named valve is closed and closed when the first-named valve is open, and air intake means automatically operative to admit air from the atmosphere to the system between the valve and bowl to provide a vacuum break for preventing back flow from the bowl on a reduction of pressure in the system and to close communication between the atmosphere and system upon an augmentation of pressure in the system.

12. In a flush system, a water receptacle having an inlet and an outlet, said inlet for communication with a water supply pipe and said outlet for communication with a waste receptacle, a valve controlling the inlet and outlet and normally closing said inlet and shiftable to open the inlet and close the outlet, and an air supply means including a valve member normally affording restricted communication between the system and the atmosphere for the introduction of air to provide a vacuum break when a vacuum is formed in the system, said member being shiftable to active position by back pressure in the system to close communication between the atmosphere and system.

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