J. JOHNSON.

AUTOMATIC WATER SUPPLY SYSTEM.

APPLICATION FILED JULY 1, 1905.

898,480.

Patented Sept. 15, 1908

3 SHEETS—SHEET 1

Fig. 1.

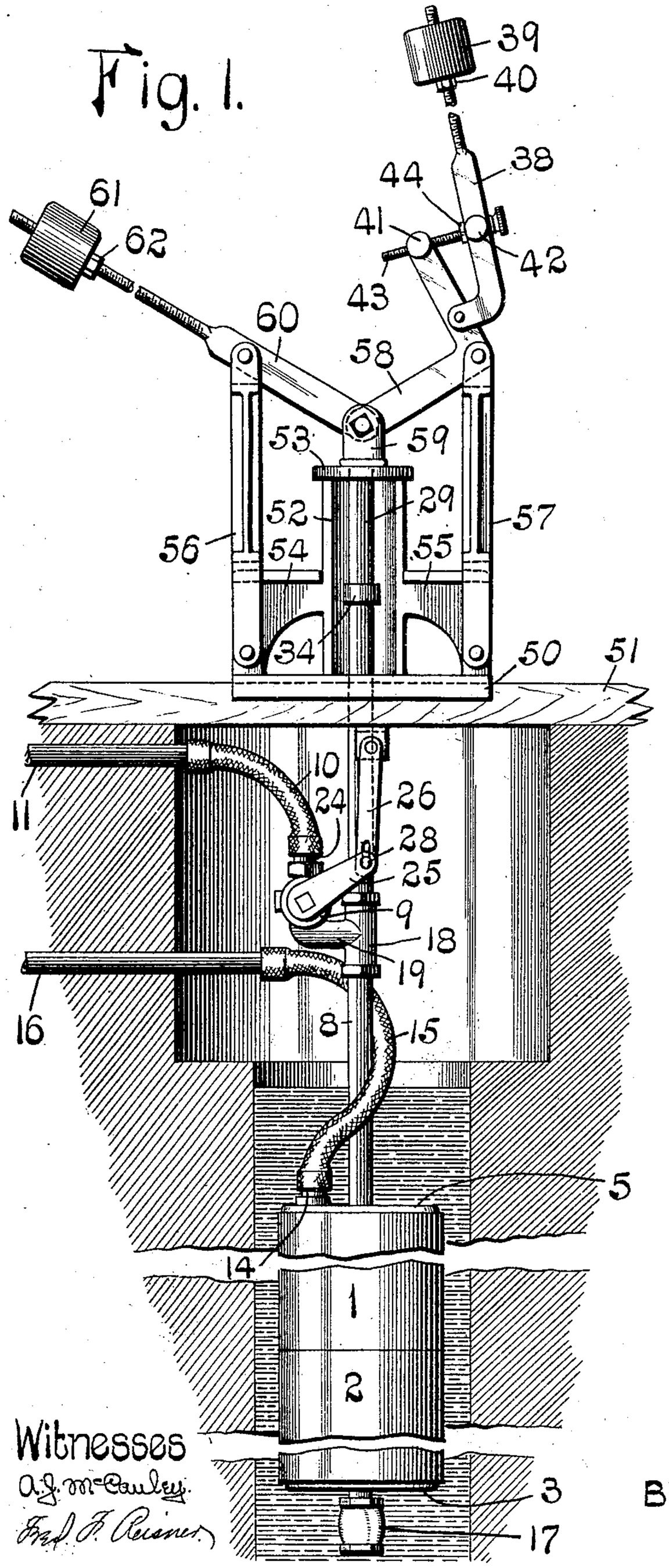
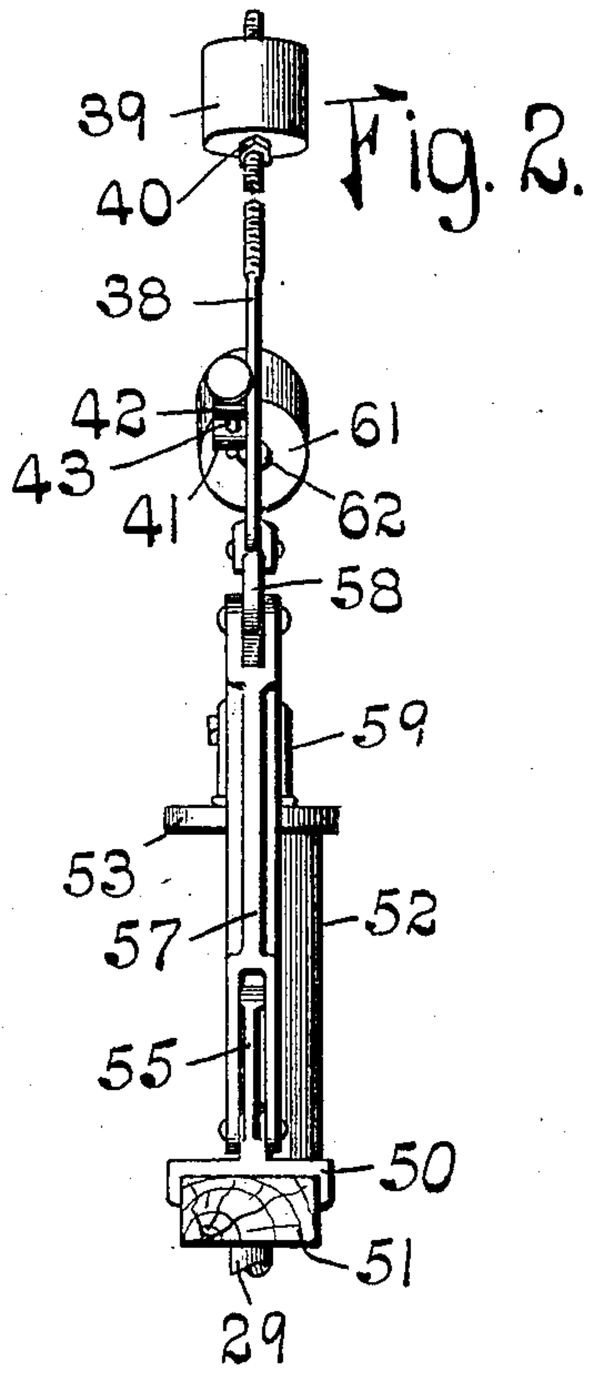


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

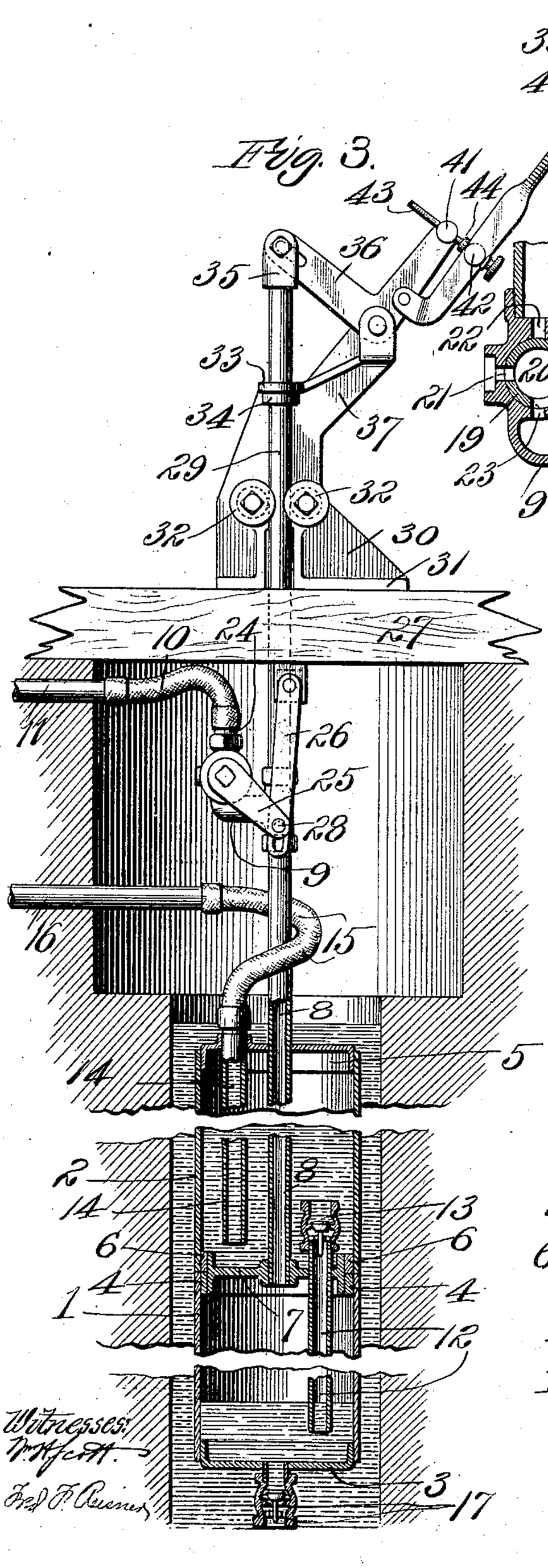

Fig. 6.

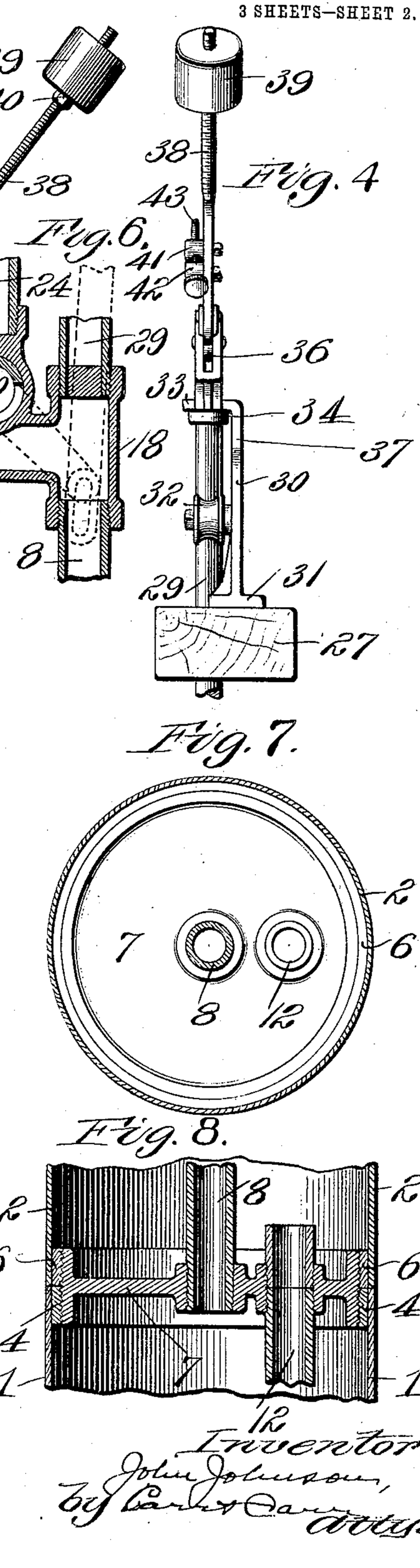

Fig. 4

Fig. 7.

Fig. 8.

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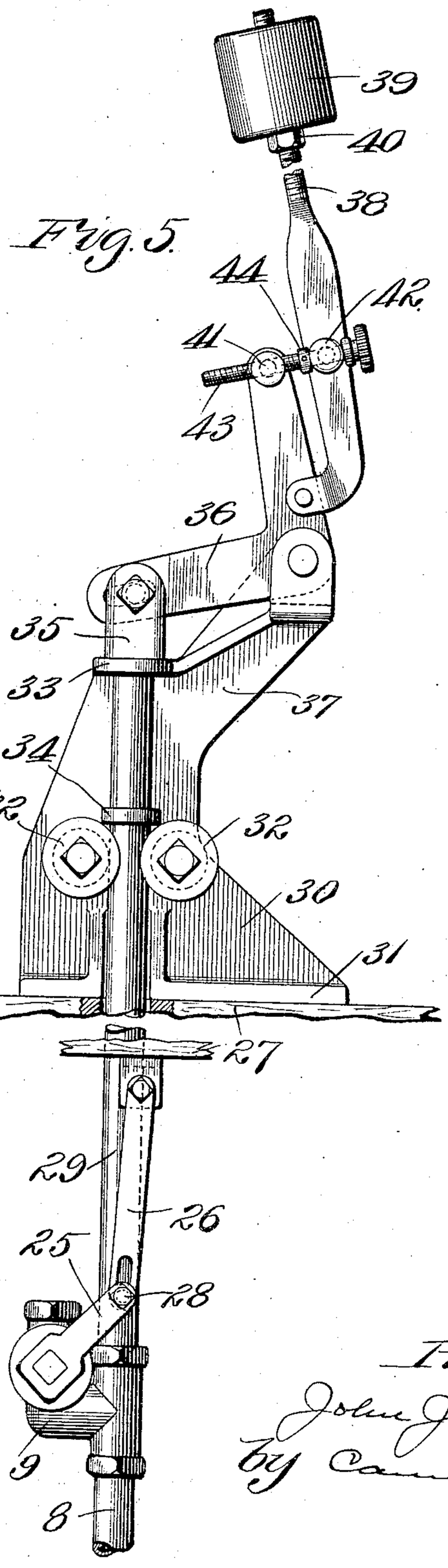
3 SHEETS—SHEET 3.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC WATER-SUPPLY SYSTEM.

No. 898,480. Specification of Letters Patent. Patented Sept. 15, 1908.

Application filed July 1, 1905. Serial No. 267,909.

To all whom it may concern:

Be it known that I, JOHN JOHNSON, a citizen of the United States, and a resident of Overland Park, county of St. Louis, and State of Missouri, have invented a new and useful Improvement in Automatic Water-Supply Systems, of which the following is a specification.

My invention relates to systems of water distribution employing tanks to be wholly or partly submerged in the water or the liquid to be raised and distributed and compressed to force the water from the tank and through the mains.

It has for its principal objects to furnish a supply of water or other liquid uninterrupted during the period during which the tank is filling; to provide a tank having two chambers one of which empties into the other; to provide a system which is applicable to drilled or bored wells; to provide a controlling mechanism which will oppose a greater resistance to movement of the tank in one direction than the other; to provide a controlling mechanism which is capable of adjustment to vary the ratio of the resistance to movement of the tank in one direction to the resistance to movement in the opposite direction; to provide an air cock or valve which will not be distorted and rendered leaky by the thrust of the upward movement of the tank.

My invention consists in the parts and in the combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings forming a part of this specification and wherein like symbols refer to like parts wherever they occur, Figure 1 is a broken sectional view through a bored well showing my apparatus in place in the well, the parts being shown in the position assumed when the tank is filled and ready to deliver water; Fig. 2 is a side elevational view of the controlling mechanism; Fig. 3 is a broken sectional view through a bored well showing my apparatus in place in the well, with a modified form of control mechanism, the tank being shown in section and the parts being in the position assumed when the tank is filling; Fig. 4 is a side elevational view of the controlling mechanism of Fig. 3; Fig. 5 is a front elevational view on an enlarged scale of the modified form of controlling mechanism in the position assumed when the tank has been filled; Fig. 6 is a vertical sectional view through the air cock or valve; Fig. 7 is a transverse sectional view through the tank; Fig. 8 is a fragmentary vertical sectional view through the connection between the two chambers of the tank.

The tank which is preferably used in the present system comprises two chambers into one of which the water is admitted from without and from which the water is forced by compressed air into the second chamber from which latter the water passes to the mains. The two chambers are in effect two tanks rigidly connected together.

The tank is made, preferably, of sheet metal sections 1, 2. The lower section 1 has a head 3 at its lower end and at its opposite end is provided with an internally screw-threaded ring 4. The upper section 2 has a head 5 at its upper end and an internally screw-threaded ring 6 at its lower end. A plate 7 having externally screw-threaded flanges extending upon its opposite sides is screwed into said internally screw-threaded rings 4, 6, secures the two sections firmly together and constitutes a wall between them. Thus a long tank having two chambers is provided. This tank may be as long as may be necessary to give the required capacity and the diameter of the tank may be small enough to permit its insertion in wells of the smallest sizes customarily drilled or bored.

A pipe 8 extends centrally through the upper chamber of the tank, through the wall 7 and opens into the upper part of the lower chamber. This pipe extends upwardly to near the top of the well where it is connected to an air cock or valve 9 through which communication may be had with a flexible tube 10 connected to a pipe 11 leading to a source of supply of compressed air.

A pipe 12 extends from near the bottom of the lower chamber of the tank and the lower portion of the upper chamber. A check valve 13 is mounted on the end of said pipe. When the pressure in the lower chamber exceeds that in the upper chamber, water will be forced into the upper chamber. When the pressure in the lower chamber is less than that in the upper chamber the check valve will close and prevent a flow of water out of the upper chamber into the lower chamber.

A pipe 14 extends through the head 5 of the tank and downwardly to near the bottom of the upper chamber. It is connected by means of a flexible tube 15 with a water

main 16 through which the water is to be forced. A check valve 17 is mounted at the bottom of the lower chamber of the tank to permit ingress of water but to prevent egress thereof.

The air cock or valve 9 comprises a tubular part 18 which is internally screw-threaded at both ends. The part 19, provided with the seating and the plug or valve 20, is offset from said tubular part and in communication therewith. The part 19 has a vent 21 and ducts 22, 23. It is screw-threaded for connection with the pipe 24 by means of which the flexible pipe 10 is connected. The plug or valve 9 is so arranged that it will give communication between the lower chamber and the source of supply of compressed air; and by a turn of approximately 90° will close such communication and open communication between the chamber and the atmosphere. The valve or cock 9 moves vertically with the tank and is automatically operated in consequence. An arm 25 is rigidly connected to the plug or valve 20. A link 26 is pivotally mounted on a beam of a platform 27. At its lower end the link is provided with a slot and is connected to the arm 25 by means of a bolt 28 loosely passing through the slot. When the tank rises the valve is turned so as to open communication between the lower chamber and the atmosphere. When the tank descends the valve is turned so as to open communication between the source of supply of compressed air and the lower chamber.

A closed pipe or solid rod 29 is connected to the upper end of the tubular portion of the valve 9. By this arrangement the thrust upon the valve is taken up by the tubular portion and no thrust is applied to the portion carrying the plug. Consequently, the portion carrying the plug will not be distorted by the thrust and the valve will remain true and air-tight indefinitely. The rod 29 extends upwardly through the platform to the controlling mechanism.

To prevent a gradual ascent and descent of the tank as it is gradually emptied or filled, controlling mechanism is provided. This controlling mechanism can be so arranged and adjusted that the tendency to ascend or descend will only become effective when the lower chamber of the tank is substantially empty or substantially full, respectively, and then the tank will instantly ascend or descend.

The controlling mechanism comprises a frame having a channeled base 50 adapted to embrace a beam 51 extending over the top of the well. From the center of said base rises a vertical semi-cylindrical column 52 terminating in a circular disk 53. Said disk and said base have vertically alined holes through which the rod 29 extends. Wings 54, 55 extend laterally from said column in substantially the center line of said base. Links 56, 57 are pivotally mounted near the lower outer corners of said wings. The lower ends of said links are bifurcated and straddle and are guided by said wings. The links are thus maintained in substantially the same vertical plane. The upper ends of the links 56, 57 are also bifurcated.

A bell-crank lever 58 is fulcrumed in the link 57. At one end it is pivotally connected to a bifurcated head 59 on the rod 29. Upon the other arm of the bell-crank lever, an arm 38 is pivotally mounted near the fulcrum of said bell-crank. This arm is screw-threaded at its upper end and carries a poise 39 which can be secured in any desired position by a set-nut 40. An eye 41 is pivotally mounted on the free end of the arm of the bell-crank lever 58. An eye 42 is pivotally mounted on said arm 38. Said eyes have holes in alinement with each other, the hole in the eye 41 being screw-threaded. A screw 43 extends through said eyes, the eye 42 being embraced between a collar 44 and the head of the screw. It is obvious that the angle between the arm of the bell-crank lever and the arm 38 can be varied at will and thus the effective movement of the weight 39 can be varied at will. By this means the bell-crank can be adjusted so that it will offer a less resistance to upward movement of the tank than the downward movement thereof.

For large tanks or very deep wells the dead weight of the tank and connections may be large in proportion to the weight of water displaced by the tank. To counterbalance the same or a definite portion of the same a lever 60 is pivoted on the link 56 and is connected to the head 59 of the rod 29. The free end of the lever is screw-threaded and a poise 61 is adjustably mounted thereon, a set-nut 62 being provided to hold said poise in any desired position of adjustment. For small installations, the link 56, counterbalancing lever 60, and poise 61 may be dispensed with, the bell-crank lever 58 being able to control the rise and fall of the tank. The upward movement of the tank is limited by a collar 34 on the rod 29 which will engage the disk 53 at the top of the column 52 when the tank has reached its uppermost position.

A modification of the control mechanism is shown in Figs. 3, 4 and 5. It differs from the preferred form of control mechanism in having a fixed fulcrum for the bell-crank lever and in dispensing with the counterbalancing lever. This controlling mechanism comprises a frame-plate 30 having flanges 31 at its lower edge by means of which it is secured to the platform 27. Rollers 32 are mounted on the face of the frame plate to guide the rod 29. The rod is also loosely guided by a flange 33 at the upper side of the frame plate. The rod 29 is provided with a collar 34 below the flange 33 and an enlarged end 35 above the flange 33. These parts serve as

stops to limit the up-and-down movement of the rod and consequently of the tank.

The rod 29 is connected at its upper end to the slotted end of one arm of a bell-crank lever 36 pivotally mounted upon an arm 37 of the frame plate. Upon the other arm of the bell-crank lever, an arm 38 is pivotally mounted near the pivot of the bell-crank lever. Said arm 38 is screw-threaded at its upper end and carries an adjustable poise 39 and a set nut 40. An internally screw-threaded eye 41 is pivotally mounted at the end of the arm of the bell-crank lever and an eye 42 is pivotally mounted on the arm 38 at a corresponding distance from the point of pivotal connection of said arm 38 with the bell-crank lever. A screw 43 passes through said eye 42 and has screw-threaded engagement with the eye 41. Longitudinal movement of said screw with respect to the eye 42 is prevented by the head of the screw and a collar 44. In view of this organization it will be seen that the arm 38 constitutes, in effect, a part of the bell-crank lever, being rigidly although adjustably secured thereto. Thus, in effect, a compound bell-crank lever, the angle of which is adjustable, is provided. It is obvious that a bell-crank lever having adjustably connected instead of rigidly connected arms, could be substituted for the compound bell crank lever shown.

In the description of the operation of the device which follows reference will be made to both forms of the controlling mechanism disclosed as their operations are very similar. Assume the parts in the position shown in Fig. 1. The lower chamber is in communication with the atmosphere and consequently pressure therein is relieved. The water will flow from the well through the check valve 17 into the lower chamber of the tank until the combined weight of the tank, the water therein and connected parts is sufficient to overcome the buoyant force due to the submersion of the tank and the resistance of the controlling mechanism. When this condition has been reached the tank will descend until the head 59 or 35 strikes the disk 53 or flange 33, the controlling mechanism will be thrown into the position shown in Figs. 1 and 3, and communication will be opened through the cock or valve 9 between the source of supply of compressed air and the lower chamber of the tank. The water in the lower chamber of the tank being put under pressure, the check valve 17 will be closed. The water will flow through the pipe 12 and check valve 13 into the upper chamber and will compress the air trapped therein until the pressures in the two chambers are equalized. From the upper chamber the water may pass through the pipe 14 and flexible tube 15 to the main 16. When so much water has been drawn off through the mains that the combined weight of the tank and connected parts, the water therein, and the force of resistance of the controlling mechanism is less than the buoyant force of the water in which the tank is submerged, the tank will rise until the collar 34 strikes the disk 53 or flange 33 and the pressure in the lower chamber will be relieved. This will permit the lower chamber to refill. At the same time the pressure in the lower chamber is lower than that in the upper chamber, and, consequently, the check valve 13 will be closed while the lower chamber is refilling. The water in the upper chamber, however, is under substantially the pressure of the source of supply of compressed air and the water can be delivered through the main during the entire time that the lower chamber is refilling. The upper chamber needs to be only large enough to contain the maximum amount of water which can be drawn off during the time the lower chamber is refilling.

The adjustment of the angle of the compound bell-crank lever will depend upon the relative weights of the tank and connected parts, and the weight of the volume of water displaced. On account of the considerable length of the tank and its small diameter, its weight is much greater in proportion to its displacement than would be the case for a tank of the same capacity but having a larger diameter and a shorter length. Consequently, when the lower chamber is empty, it is possible that the buoyancy of the water will not be sufficiently great to raise the tank. In such case, it would be necessary to so adjust the arm 28 that the controlling mechanism will always exert a force tending to raise the tank, such force being greater when the tank is up than when it is down. Fig. 3 illustrates a case in which the relation of weights of the tank to the buoyancy of the water is such that a force a little greater than is necessary to raise the tank is exerted. The controlling mechanism is capable of adjustment, by varying the position of the arm 38 so that controlling mechanism incorporating identical parts can be used for tanks of widely varying capacities and proportions.

Obviously, my invention is capable of considerable modification within the scope of my invention and, therefore, I do not wish to be limited to the specific construction shown and described.

What I claim as my invention and desire to secure by Letters Patent is:

1. An automatic water supply system comprising a vertically movable submerged tank having a chamber provided with means for admitting water and a chamber provided with means for the outflow of water from a point near the bottom, a pipe leading from a point near the bottom of one of said chambers to a point near the bottom of the other of said chambers and provided with a check valve, means automatically controlled by the

movement of said tank for admitting air under pressure to said first mentioned chamber, and means for controlling the movement of said tank.

2. An automatic water supply system comprising a vertically movable submerged tank having two sections, said sections being provided at the adjacent ends with internally threaded rings, an externally threaded flanged disk fitting in both of said rings and uniting said sections, and dividing said tank into two compartments, means for admitting water to one of said compartments, means automatically controlled by the movement of said tank for admitting air under pressure to said compartment, the other of said compartments being provided with means for the outflow of water, means for communication between said compartments, and means for controlling the movement of said tank.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses at St. Louis, Missouri, this 27th day of June, 1905.

JOHN JOHNSON.

Witnesses:

T. PERCY CARR,

J. B. MEGOWN.