No. 734,144. PATENTED JULY 21, 1903.

G. P. STOCKER.

VALVE MECHANISM FOR STEAM TRAPS.

APPLICATION FILED JAN. 21, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

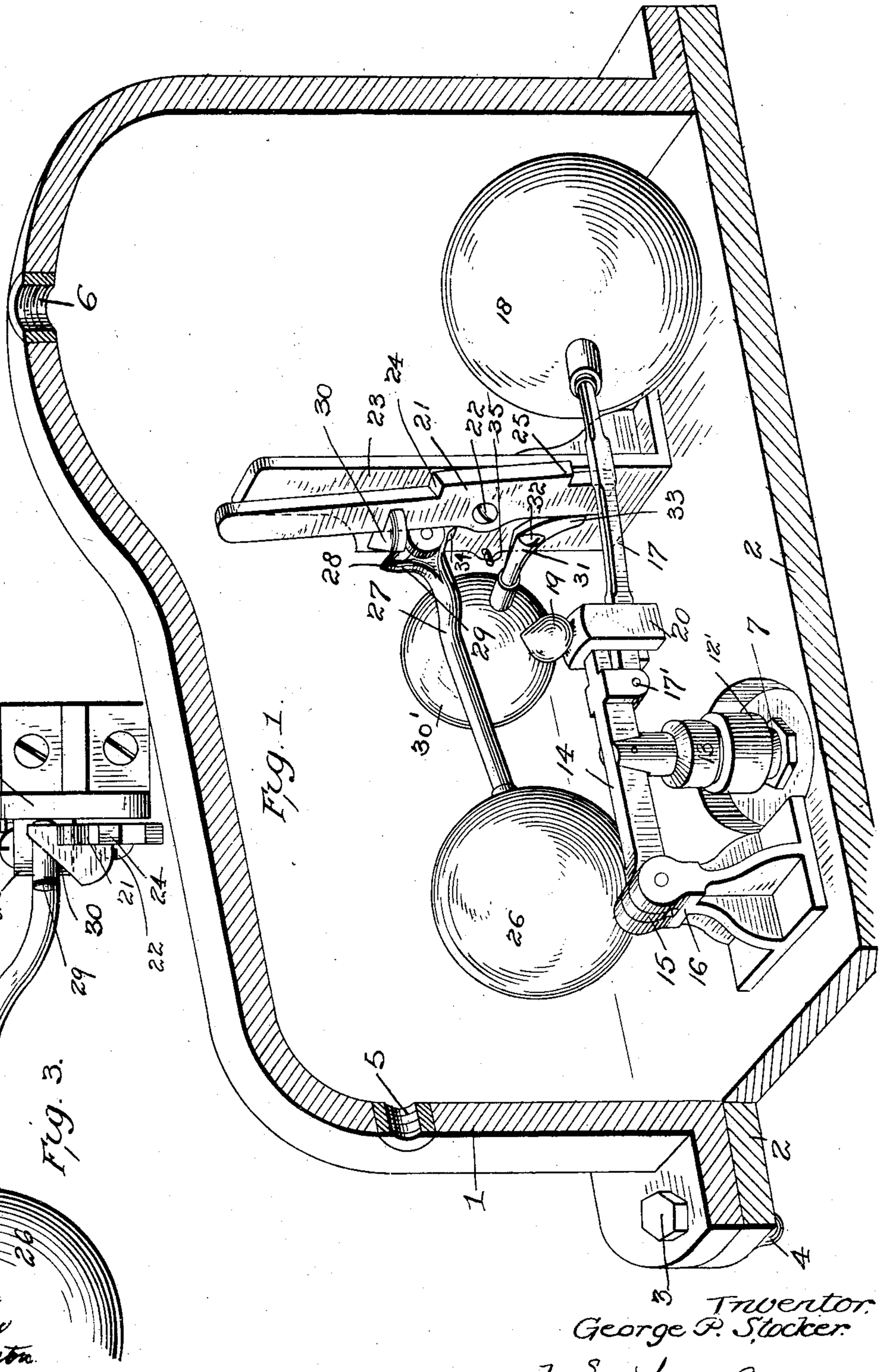

Fig. 1.

Fig. 3.

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NO MODEL. 3 SHEETS—SHEET 2.

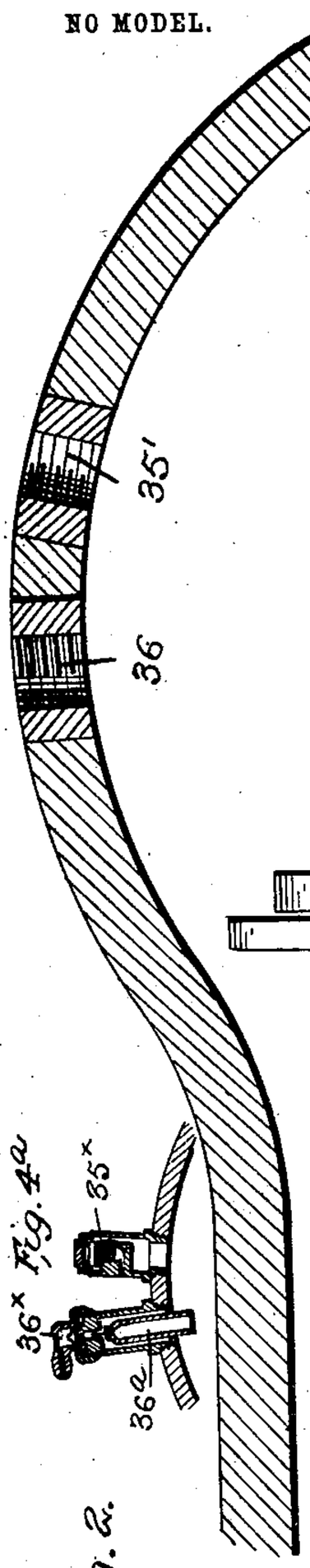
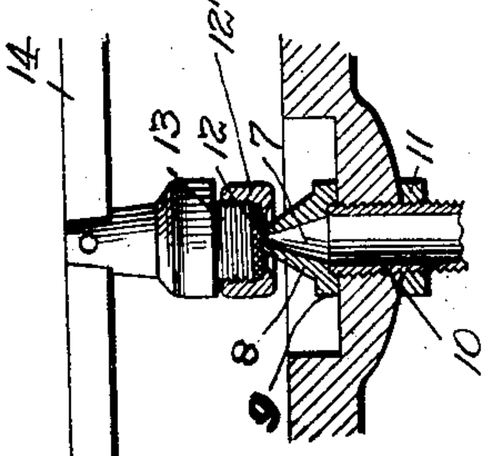


Fig. 2.



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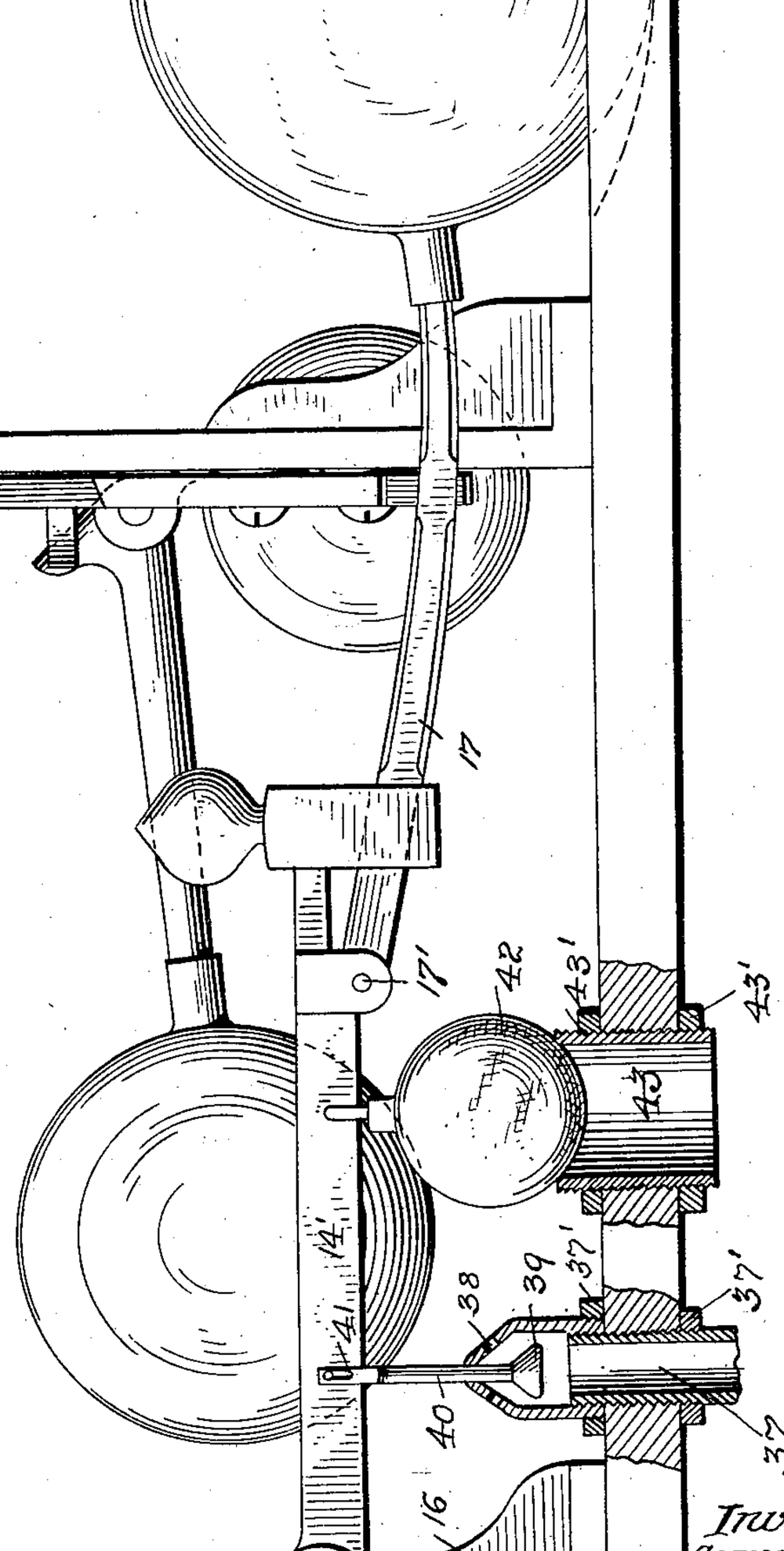

Fig. 4.

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NO MODEL. 3 SHEETS—SHEET 3.

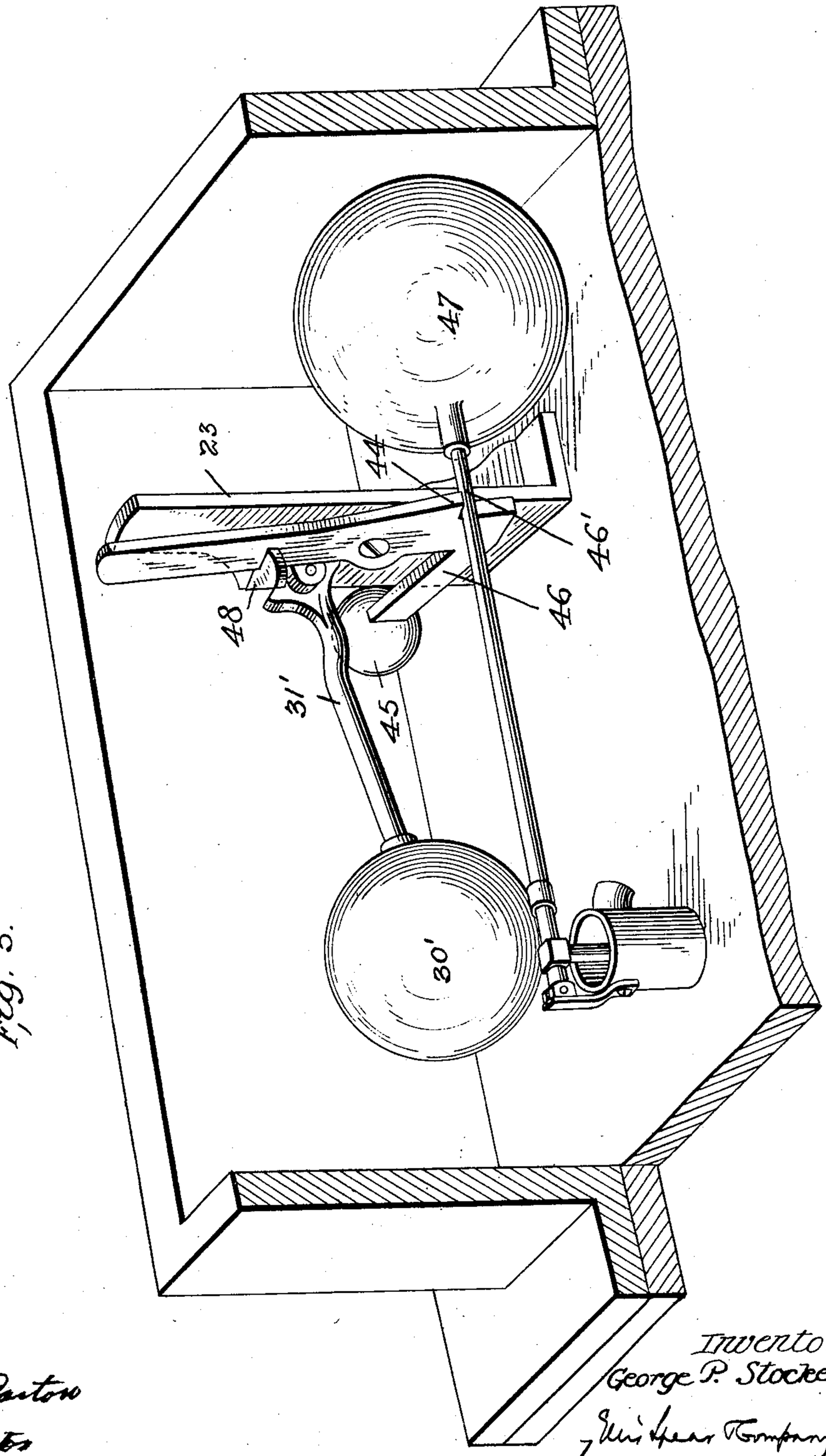

Fig. 5.

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No. 734,144. Patented July 21, 1903.

UNITED STATES PATENT OFFICE.

GEORGE P. STOCKER, OF EVANSVILLE, INDIANA.

VALVE MECHANISM FOR STEAM-TRAPS.

SPECIFICATION forming part of Letters Patent No. 734,144, dated July 21, 1903.

Application filed January 21, 1903. Serial No. 139,978. (No model.)

To all whom it may concern:

Be it known that I, GEORGE P. STOCKER, a citizen of the United States, residing at Evansville, Vanderburg county, Indiana, have invented certain new and useful Improvements in Valve Mechanism for Steam-Traps and the Like, of which the following is a specification.

My invention relates to valve mechanism adapted for use in steam-traps, hydraulic pumps, water-closets, steam-separators, and the like, and has reference particularly to means for controlling the operation of the outlet-valve, inlet-valve, or both, so that the said valve or valves will be held against gradual operation while the conditions within the trap pumping-chamber, or flushing-tank, as the case may be, are gradually changing, and when the predetermined point in the changing conditions is reached the valve mechanism will be released to change its relation quickly. For instance, as applied to a steam-trap my invention is to hold the outlet-valve closed until the water of condensation has reached the predetermined upper level, when the outlet-valve automatically opens and is held positively and immovably in this open position until the water has passed out from the trap and the predetermined lower level has been reached, when the valve will be automatically released and the outlet will be closed, as before. This same principle I carry out in connection with a hydraulic air-pump, in which embodiment of my invention, however, the outlet-valve is held closed and the inlet-valve for the water is held open until the water forced under pressure into the hydraulic air-pump chamber through the inlet-valve reaches the desired upper level, when the mechanism operates to automatically open the outlet-valve and close the inlet water-valve until the water in the hydraulic air-pump reaches the desired lower level, when the outlet water-valve is automatically closed and the inlet water-valve is automatically opened, air being drawn into the pump-chamber through an air-inlet valve as the water runs out from the said chamber and said air being forced out through an air-outlet valve as the water is forced into the hydraulic air-pump chamber. In the case of a flushing-tank for water-closets I control the inlet-valve for the water, so as to hold the same open or against gradual closing movement until the water has reached the desired upper level, when the inlet-valve is released and closes quickly, so as to avoid the noise incident to the gradual closing of such valves.

In the accompanying drawings, Figure 1 is a perspective view of my invention as embodied in a steam-trap, parts of the casing being broken away. Fig. 2 is a sectional view of the outlet-valve. Fig. 3 is a detail plan view. Fig. 4 is a view of the invention as embodied in a hydraulic air-pump, said view showing the casing or chamber in section with parts in side elevation. Fig. 4ª is a detail of valves used on the pump. Fig. 5 is a perspective view of the invention as applied to a flushing-tank for water-closets.

Referring particularly to Figs. 1 and 2, 1 indicates the shell or casing of the steam-trap, having a bottom plate 2 secured thereto by bolts 3. The bottom plate is provided with legs 4, cast on its under side, to support the trap at a slight distance above the supporting-surface. The steam enters at the inlet-opening 5. 6 indicates an air-discharge opening, which may be provided with an ordinary air-cock, which is opened when the steam-trap is first put in service, so as to let out all air from the casing or chamber 1, after which the air-cock is closed. The outlet-opening for the water is shown at 7, it being formed through a nipple 8, which is formed with a nut 9, screwed onto the upper end of the outlet-pipe 10, which projects through and slightly above the bottom 2 of the trap, a lock-nut 11 on the under side of the bottom plate serving to hold the pipe in place.

The outlet-valve consists of a disk of rubber 12, held by a screw-cap 12′, as shown in Fig. 2, to a stem 13, pivotally connected to and depending from an arm 14, which in turn is pivoted at 15 to the upper end of a standard 16, screwed to the bottom plate 2. The valve is adapted to seat itself upon the upper end of the nipple 8, and thus close the outlet-opening 7. To the arm 14 at or near its free end is pivoted a long arm 17, the pivotal point 17′ being on the lower side of the arm 14, so that the long arm 17, which carries the large float 18, will be free to fall downwardly after the valve 12 is seated upon the

nipple 8 and the outlet-opening is closed. The end of the arm 14 carries a knob or weight 19, which is sufficiently heavy to insure the proper seating of the outlet-valve, and from this end of the short arm 14 guide-fingers 20 extend downwardly, so as to embrace the arm 17 forward of its pivotal point to sustain the same laterally. The long arm 17, with its float, is controlled by latch means, which is adapted to hold the said long arm in its extreme positions until certain predetermined conditions have been arrived at in the chamber or casing 1. As shown in Fig. 1, the long arm 17, with the large float 18, is in its lowermost position, and at this time the outlet-valve is closed. We will assume that the water of condensation arriving with the steam through the steam-inlet 5 is gradually filling the chamber. During this operation the float 18 has a tendency to rise and open the outlet-valve gradually; but this tendency is resisted by the latch means or controller, which comprises a lever or arm 21, pivoted at 22, about midway of its length, to a standard 23, secured to the bottom of the trap. The latch-lever extends substantially vertically, and it is provided with upper and lower catch-shoulders 24 25. In the position of the parts shown in Fig. 1 the lower catch-shoulder 25 is in the path of the long arm 17. The said long arm will be held down by the latch while the trap is gradually filling with water. When a predetermined upper level is reached, however, the latch will be operated and the arm 17 will be released, and its float being now free to rise will move so as to float on the surface of the water at its upper level, and this action will quickly open the outlet-valve for the discharge of the water from the trap. This release of the arm 17 upon the water reaching its upper travel is due to the action of a supplemental float 26, whose arm 27 is pivoted in ears 28 on the standard 23, the said arm having a projection 29 extending therefrom to engage a cam-shoulder or incline 30 on the latch, so that as the water reaches its upper level the supplemental float 26 will rise, causing the projection on the float-arm to work against the cam or incline on the latch, thus swinging the same on its pivot to withdraw the lower catch or shoulder 25 from the path of the arm 17, which now rises freely to its uppermost position. The change in the position of the latch just described not only releases the lower catch from the float-arm, but it also sets the upper catch or shoulder 24 of the said latch in position to engage the said arm 17 when the float 18 rises to thus hold the float up with the outlet-valve open until a predetermined lower level of the water is reached, when the arm 17 will be again released, so that it, with its float, will fall and the outlet-valve will close. This second release of the arm 17 and float from their uppermost position is caused by a second supplemental float 30′, the arm 31 of which is pivoted at 32 to the standard 23, the said arm having a projection 33 to bear on the latch as the float falls, and thus throw outward the lower end of the latch with its catch or shoulder 25 in position to obstruct the rise of the arm 17 from its lowermost position, in which the outlet-valve is closed. The upper supplemental float 26 is limited in its downward movement by a projection 34 on the end of its arm arranged to strike the face of the standard 23, while the lowermost float 30′ is limited in its rising movement by a projection 35, extending from the standard in the path of the float-arm. These floats, it will be noticed, act alternately to swing the latch—for instance, as the water rises in the trap the lower float will rise until it is limited by its stop-pin, and it will be now out of operation as against the latch. The continued rise of the water will elevate the upper float, and this alone will be effective against the latch. As the water falls and the upper float, falls correspondingly its projection will be withdrawn from the latch, and it will be stopped in a predetermined position by the stop projection 34 before mentioned. This upper float will now be out of action and will have no influence on the latch until the water again rises; but during the continued fall of the water the lower float will be thrown into action to swing the latch so as to engage and hold the long arm 17 and the float 18 in their lowermost position when they fall thereto.

Briefly stated, the operation consists in positively holding the float 18 and its long arm down while the trap is filling with water, to thus allow the outlet-valve to remain fully closed during this time, and when the predetermined quantity of water is collected in the trap the large float 18, with its arm 17, is released, so that the same quickly rises to the upper water-level, and thus opens the outlet-valve quickly for the discharge of the water, and this valve will then be held open positively until the predetermined lower water-lever is reached, because the large float, with its arm 17, will now be held in its uppermost position positively by the latch, and when the lower water-level is reached these parts will be released and will fall, so as to allow the outlet-valve to close quickly.

One important feature of my invention relates to the joint connection between the arm 17 and the short arm 14. These parts may be regarded as one arm for the purpose of operating the outlet-valve, said arm having a joint intermediate of its length. The purpose of this joint is to insure the perfect closing of the outlet-valve, as it will be noticed that this valve is in a measure independent of the large float and its arm 17. In other words, the float and its arm 17 are allowed an excess of downward movement, or a movement beyond that which is necessary to seat the outlet-valve. The outlet-valve is seated by the weight of the arm 14 and its knob or weight 19.

It will be noticed that the arm of the upper supplemental float extends substantially parallel with the arm of the large float, while the arm of the lower supplemental float extends in a direction substantially transversely of the arms of the other float. By this arrangement each float has a field of action out of line with the other float, so that there is no interference.

In Fig. 4 I show the invention as applied to a hydraulic air-pump. This apparatus is like that just described in its general feature, differing mainly in having an inlet-valve for the pressure-water controlled by the large float and its arm 17, which controls also the outlet-valve. In this form of the invention the inlet for the air is shown at 35′, having an air-check valve $35^{\times}$ of any known form, which allows the air to enter the hydaulic air-pump to prevent its discharge through this port. 36 is the air-outlet opening, in which an air-check valve $36^{\times}$ of any known form is inserted to allow the air to pass from the pump-chamber, but prevents its passing back into the same. This air-check valve also has associated therewith a float-valve device 36^{a} of any known form, which closes automatically should the hydraulic air-pump fail to work properly and fill up entirely with water, thereby preventing any water from passing through the air-outlet opening in that event. These check and float valves form no part of my invention and are not, therefore, disclosed in detail. The inlet for the water under pressure is indicated at 37, it comprising a nipple secured to the bottom of the casing or chamber and having ports 38 for the inflow of the pressure-water. The nipple is held by the pipe 37 screwed into it, lock-nuts 37′ being used to complete the fastening. A conical valve 39 is carried by a stem 40, having a pin-and-slot connection 41 with the short arm 14′, which is pivoted to the standard 16 and is pivoted also at 17′ to the long arm 17 of the large float 18. The outlet-valve in this case is made up of a spherical rubber ball 42, connected to the arm 14′ and adapted to a seat on a nipple 43 at the outlet-opening held by lock-nuts 43′. The latch and floats controlling the same are similar in construction and arrangement in this form of the invention to that previously described and need no specific explanation further than to say that when the outlet-valve is closed the inlet-valve is open. The pressure-water rushing in through the inlet-valve will compress and force out the air through the air-outlet valve until the water reaches a certain height, when the large float and its arm 17 will be released and will rise from their lowermost position, thus quickly opening the discharge-valve and closing the inlet-valve. They will be held in their uppermost position while the outrush of water is taking place and while the air is rushing into the chamber through the air-inlet valve, when the large float and its arm will be released and will fall to their lowermost position, thus quickly closing the discharge-valve and opening the inlet-valve for the pressure-water.

In Fig. 5 I show the adaptation of my invention to a flushing-tank for water-closets. In this figure the standard 23 is substantially the same as that before described; but the latch is of different form in that it is provided with a weight 45, attached rigidly by an arm 46, the said weight acting to swing the latch so that its catch or shoulder 44 will overlie the long arm 46′, which is connected with the inlet-valve and which has thereon the float 47. This latch has a cam or incline 48, similar to that before described, arranged to be operated by a projection on the arm 31′ of a float 30′, these parts being similar to those before described, so that when the water rushing in through the inlet-valve reaches the predetermined height the float 30′ will be raised to cause its projection to work against the cam of the latch and throw said latch from over the large float-arm, so that the same may quickly rise to close the inlet-valve.

I claim as my invention—

1. In combination, a valve, a main float connected thereto by a joint allowing independent movement of the main float after the valve has been seated, means for holding the main float with the valve in one position until a certain level of the liquid has been reached and a supplemental float for releasing the said main float from the holding means, said valve closing when the float falls, substantially as described.

2. In combination with a valve, a main float connected therewith by a jointed arm allowing independent movement of the float after the valve is seated, a latch for holding the main float with the valve in one position until a predetermined level of liquid has been reached and means for controlling the said latch to release the main float therefrom, said latch acting upon the section of the jointed arm which has the independent movement, said valve closing when the float falls, substantially as described.

3. In combination with a valve, a main float connected therewith, means for retaining said main float in either one of its two extreme positions and a pair of supplemental floats for controlling the said means and both acting thereon to move the same in opposite directions, said supplemental floats being arranged to operate at different heights, substantially as described.

4. In combination, a valve, a float, a single pivoted latch controlling the float in both of its upper and lower positions to retain the float with the valve in position until the water reaches a certain level and means for controlling the latch to swing the same, substantially as described.

5. In combination, a valve, a main float, a pivoted latch controlling the main float in both of its upper and lower positions to retain the float with the valve in position until the water reaches a certain level and means for

controlling the latch to swing the same, said means comprising a pair of supplemental floats, substantially as described.

6. In combination, a valve, a main float connected therewith, a controller for the said main float and a supplemental float supported independently of the said controller and arranged to operate the same when moved one way and means for limiting the movement of the said supplemental float in the opposite direction, said stop means arresting the float intermediate of the extreme levels of the liquid, substantially as described.

7. In combination, a valve, a main float connected therewith, a controller for the main float and a pair of supplemental floats supported independently of and operating the said controller alternately, substantially as described.

8. In combination, a valve, a main float connected therewith, a controller for the main float and a pair of supplemental floats supported independently of and operating the said controller alternately and stop means for each float to arrest the same in inoperative position, substantially as described.

9. In combination, a valve, a controller to hold the said valve in either its open or closed positions, and a pair of floats with means for operating the controller when the water reaches a predetermined level, substantially as described.

10. In combination, a valve, a single latch controlling the operation of the same, a float causing movement of the latch in one direction and means for moving the latch in the other direction, substantially as described.

11. In combination, a valve, a latch controlling the operation of the float both to open and close the valve and a pair of floats controlling the position of the latch, said floats operating at different water-levels, substantially as described.

12. In combination, a valve, a main float, a controller for the main float and a pair of supplemental floats, one of which extends with its arm substantially parallel with the main float and the other of which extends with its arm at right angles to that of the main float, said supplemental floats being arranged to operate the controller, substantially as described.

13. In combination, a valve, a main float, a latch having a cam-incline thereon and arranged to control the main float and a supplemental float having a portion to act against the said cam-incline, said latch and supplemental float having pivotal movement in planes at right angles to each other, substantially as described.

14. In combination with a valve, a float controlling the same, said valve closing when the float falls and a jointed connection between said float and valve allowing said float to have additional movement after the valve is seated, substantially as described.

15. In combination, a valve and a float connected therewith, said valve closing when the float falls, said float being adapted to have movement independently of the valve after the same is seated, and in the same direction in which the float moves for seating the valve, substantially as described.

16. In combination, a valve, a float controlling the same adapted to have independent movement after the valve is seated and means for controlling the operation of the float, said valve closing when the float falls, substantially as described.

17. In combination with a valve, a float having a jointed-arm connection between the same and the valve and means for controlling the float, said valve closing when the float falls, substantially as described.

18. In combination with a valve, a float, a jointed-arm connection between the float and valve whereby the float may have movement after the valve is seated, a latch for controlling the float and a float for operating the latch, said valve closing when the float falls, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE P. STOCKER.

Witnesses:
NICHOLAS KOHL,
HARRY J. SABEL.