No. 686,913. Patented Nov. 19, 1901.

W. S. SHIELDS.

FLUID CONTROLLER.

(Application filed Dec. 17, 1900.)

(No Model.) 3 Sheets—Sheet 1.

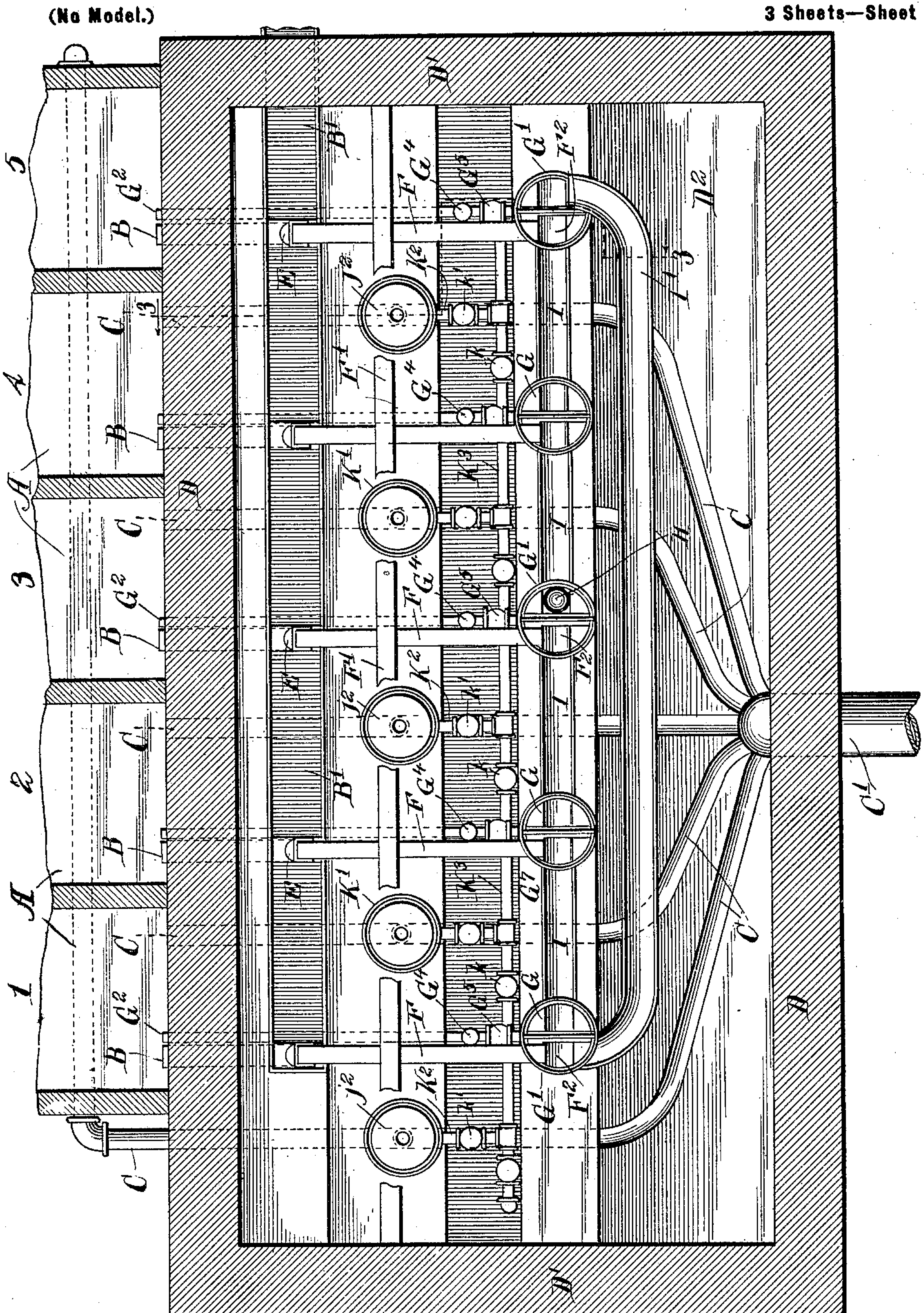

Fig. 1

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Inventor:
William S. Shields
by Poole & Brown
his Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 3 Sheets—Sheet 2.

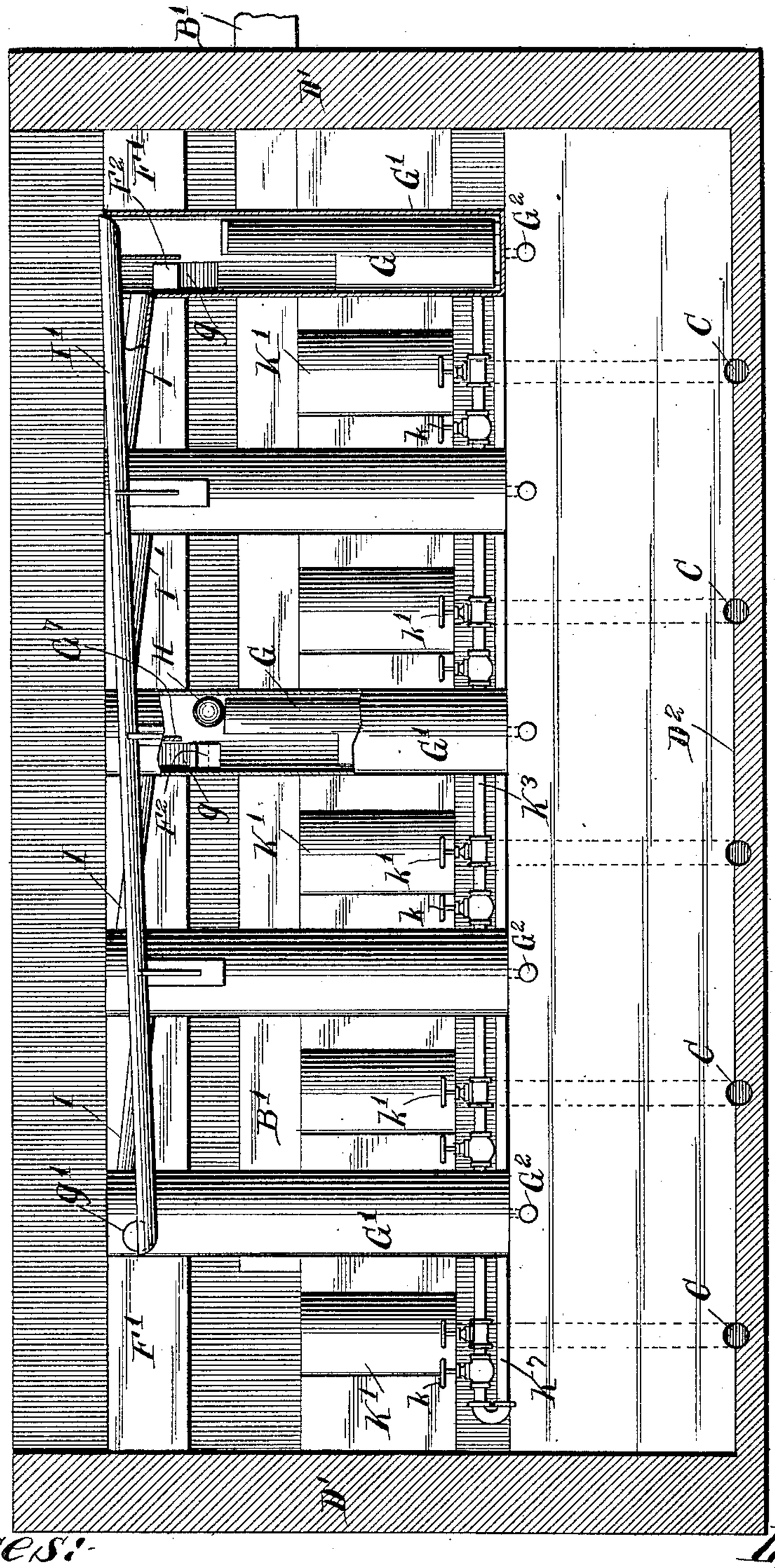

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

Fig 3

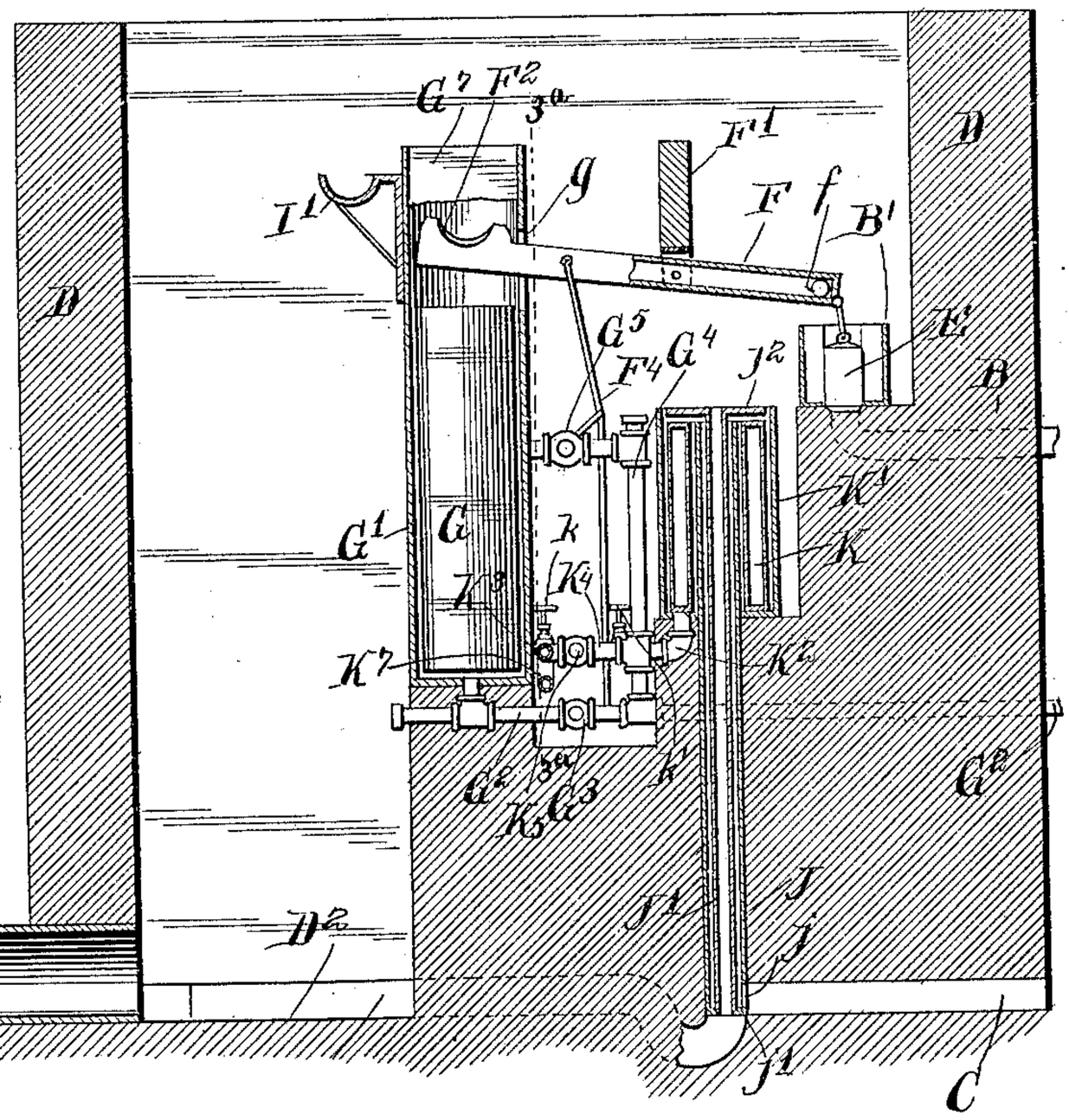


Fig 3a

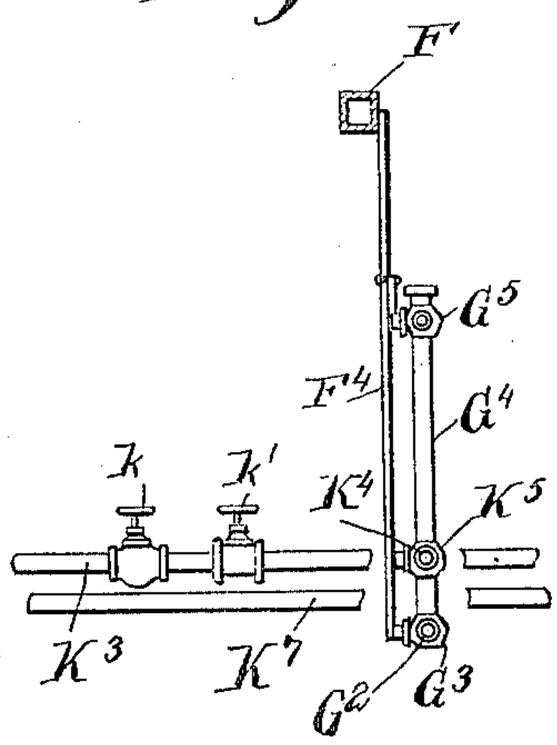


Fig 4

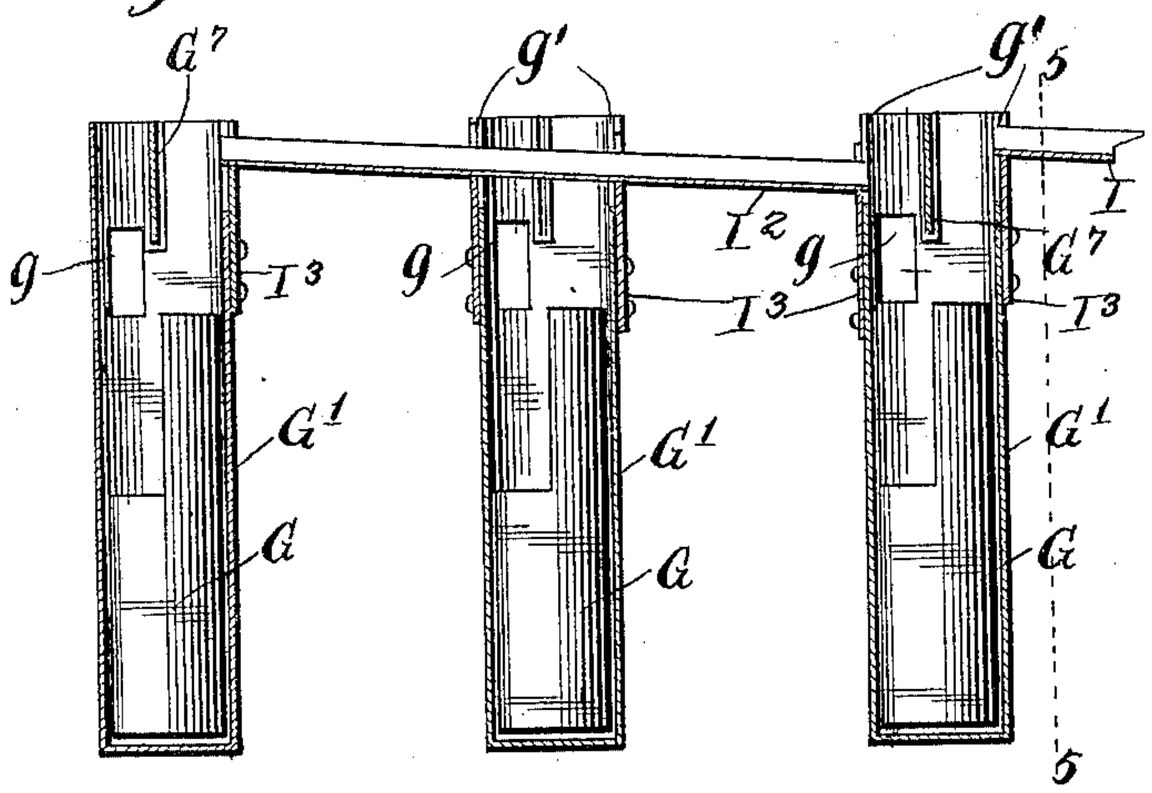
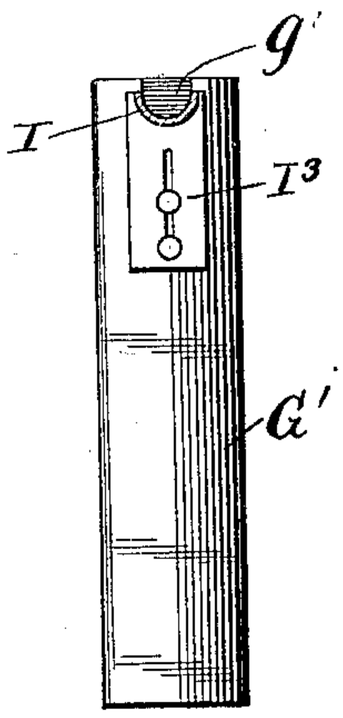


Fig 5



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UNITED STATES PATENT OFFICE.

WILLIAM S. SHIELDS, OF EVANSTON, ILLINOIS.

FLUID-CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 686,913, dated November 19, 1901.

Application filed December 17, 1900. Serial No. 40,146. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. SHIELDS, of Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Fluid-Controllers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel apparatus in the nature of a liquid-controller and designed for successively charging and discharging or separately charging or discharging a series of tanks or receptacles in a certain or desired rotation. An apparatus made in accordance with my invention is designed to automatically effect such charging and discharging or separate charging or discharging of tanks or receptacles in a predetermined rotation, and the apparatus is so constructed and arranged that the operation thereof when begun will continue in definite cycles until the apparatus is adjusted for a different sequence of rotation or its operation is discontinued.

An apparatus made in accordance with my invention may be employed wherever it is desired to successively charge or discharge a series of tanks or receptacles or charge and discharge the same—such, for instance, as the filter-bed tanks of a sewage-purifying plant, the settling-tanks of a sedimentary water-purifying system, and many other purposes which will suggest themselves to persons familiar with this and analogous arts.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a plan view of one form of automatic controlling apparatus embodying my invention. Fig. 2 is a side elevation of the apparatus, showing some of the parts in section. Fig. 3 is a transverse section on the indirect line 3 3 of Fig. 1. Fig. 3^a is a fragmentary detail section on line 3^a 3^a of Fig. 3. Fig. 4 is a detached view of some of the parts shown in Fig. 3 and illustrating means for changing the order of rotation in charging and discharging the tanks. Fig. 5 is a vertical section on line 5 5 of Fig. 4.

The construction herein shown, in which my invention is embodied, embraces, generally, in combination with a series of tanks and inlet and outlet channels therefor, valves for severally controlling said inlet and outlet channels, means common to all of said inlet-valves for severally opening the same, and means operated by the rise of the liquid in the tanks for separately closing the valves of the inlet-channels and at the same time to severally open the valves of the outlet-channels of the tanks which have been previously filled. Other means may, however, be employed for discharging the tanks, and my invention may be operated only to successively fill the tanks in the desired sequence of rotation. Means are also provided for cutting one or more of the tanks out of or bringing the same into communication with the operative series without disturbing the operation of the apparatus as a whole, whereby one or more of said tanks may remain empty or filled, as desired, for a longer period than that afforded in the usual cycle of operation of the apparatus.

As shown in said drawings, five tanks A are indicated and numbered 1 to 5 from left to right. Each of said tanks is provided with an inlet-channel B, which delivers liquid to the tank near the top thereof, and an outlet-channel C, leading from the bottom thereof. The mechanism of the controlling apparatus is shown as inclosed by side and end walls D D′, which will preferably be of masonry construction, and the parts of the apparatus are supported upon and in a masonry foundation D^2, as shown in Figs. 2 and 3. The inlet and outlet channels extend from the tanks into the inclosure, and the outlet-channels of all the tanks are joined to a common outlet-channel C′, which is adapted to lead to a place for the disposal of the liquid. The inlet-channels have communication with a conduit B′, leading from a source of supply of the liquid to be treated, said conduit being common to all said channels. Passage of liquid from said conduit to each inlet-channel is controlled by a valve E, which engages a seat formed in the outer end of said channel at

the bottom of the conduit. Said valves are each pivotally connected to one end of a lever F, which latter is pivoted between its ends to a bracket affixed to a beam F′, extending transversely of the levers and sustained in the inclosing walls in any suitable manner. The outer or free ends of said valve-actuating levers are elevated above the other ends thereof when the valves are closed and are located in line with each other and adapted to be severally depressed to lift said inlet-valves by means of a traveling weight which passes successively from one to the other of the levers or in other rotation, as desired. The outer ends of said levers are adapted to be lifted after being depressed in the manner stated to open the inlet-valves and the connected inlet-valves thereby closed through the medium of floats G, contained within float-chambers G′, located one beneath each lever. The outer ends of the valve-actuating levers project through openings *g* in the inner walls of the float-chambers and are provided within said chambers with pockets F^2 to receive said traveling weight. Each float-chamber is connected with the tank the inlet-valve of which it is designed to control by means of a pipe G^2, opening into the bottom of said chamber and provided with a branch G^4, opening into the chamber at the level of the inlet-pipe B or at other suitable flow-level of the associated tank A. Said pipe and branch are provided with cut-off valves G^3 and G^5, respectively, one of which is adapted to be open while the other is closed.

The weight herein shown for depressing the valve-levers consists of a spherical roller or ball H, which rolls in a track or race made up of a plurality of short inclined sections I, which extend between the upper ends of the float-chambers G′, and a single longer section I′, which extends from the float-chamber belonging to the tank No. 5 to that belonging to the tank No. 1. The shorter sections of the race or track, as herein shown, are inclined from left to right and have communication with the interiors of the float-chambers through openings *g′* in the side walls of the chambers, as shown in Figs. 4 and 5, and the weight passes transversely through the upper ends of said chambers. As herein shown, said float-chambers are located at the same general level, so that the weight after it has been delivered into each chamber and has depressed the associate lever F comes to a rest below the level of the section of the race, which directs it to the next succeeding chamber. While passing transversely through each chamber, therefore, the weight must be lifted to bring it to the level of the receiving end of said next succeeding section of the race. Such lifting of the weight is effected by the rising of the float at the time said float raises to elevate the outer end of the lever F to close the inlet-valve E. As herein shown, the weight drops from the pocket of each lever F upon an upward extension of the float formed at one side of the float to receive the weight, so that said float acts to directly raise the weight. The weight may, however, be otherwise raised. The upper end of the extension of the float is inclined toward the side wall thereof with which the next succeeding section of the track or race is connected, so that when the float rises to return the lever to its position to close the valve E and the weight thereby lifted to the level of the next succeeding section of the track said weight will move off said float to said section and pass on to the next float-chamber, where a like operation will be repeated to open and close the inlet-valves belonging to the next succeeding tank. The bottom of the pocket F^2 of each lever is also inclined toward said extension of the float, as shown in Fig. 3, so that the weight when resting in said pocket tends to move toward said extended part of the float. In order to prevent the weight from immediately passing to its position on the float before time is given to actuate the lever F, each chamber is provided with a vertical transverse partition G^7, which extends at its lower end to or below the level of said pocket when the latter is in its upper position. The longer section of the track or race comprises an unbroken inclined plane and serves to return the weight to the float-chamber belonging to tank No. 1 after it has passed through all the float-chambers and has actuated all the valve-levers F. In some instances the float-chambers may be arranged in a uniform unbroken circuit, in which event the race will be made up entirely of the shorter sections.

The valve G^5 associated with each float-chamber is adapted to be opened when the inlet-valve of its associated tank is opened, whereby when the liquid in the tank reaches the level of the opening in the float-chamber through which the branch G^4 communicates therewith the liquid will enter said float-chamber, cause the float to rise and act upon the lever to close the inlet-valve of said tank, and at the same time cause the traveling weight to be directed to the inlet-valve-actuating mechanism of the next succeeding bed. Furthermore, when the float has thus been lifted and the inlet-valve closed the valve G^3 is adapted to be opened to permit the contents of the chamber to be drained, so that the float may drop down out of the way of the lever F in the next succeeding operation thereof and in position to receive the weight after it has next acted upon said lever. As herein shown, said valves G^3 and G^5 are actuated from the lever F, said lever being connected by a jointed connecting-rod F^4 with the actuating-arms of the valves G^3 G^5, with the former at its lower end and with the latter at its joint. When the outer end of the lever F is depressed, therefore, the valve G^5 is opened and the valve G^3 simultaneously closed, and vice versa. The levers F for operating the inlet-valves have been illustrated merely as one convenient means of transmit-

ting motion from the weight to open the valves; but it is evident that such mechanism may be widely varied, and I do not wish to be limited to the construction illustrated.

The apparatus thus far described constitutes an operative apparatus to automatically fill the tanks, and such apparatus may for this purpose be employed alone where the tanks are adapted to be emptied by independently-actuated means.

The operation herein described embraces automatic discharging means which are operatively connected with the charging means so as to be actuated thereby. Said discharging means and connections are made as follows: Each of the outlet or drain channels of the tanks is provided with a controlling-valve. (Shown in Fig. 3 of the drawings.) Said valve consists of an outer casing or pipe J, the lower end of which intersects the drain-channel C and communicates therewith through an opening *j*. Said casing is provided at its lower end with an annular valve-seat *j'*, which is engaged by a closure formed on the lower end of a stem J', which for the sake of lightness is made hollow. Said valve is seated by its weight and is adapted to be lifted to open the valve by means of a float K, contained in a float-chamber K', located above the channel C, the connection between said stem and float consisting of a radial annular flange j^2, which overlaps the upper end of said float. The valve-casing J extends to the top of said float-chamber to prevent the liquid overflowing the same. The chambers for controlling the discharge-valves of the tanks are arranged in a line parallel with the inlet-float chambers and between the latter and the tanks.

The outlet-chambers have communication with the tanks through pipe connections as follows: K^2 K^2, Fig. 3, designate a plurality of pipes which enter the lower ends of said outlet-float chambers and are connected at their outer ends with a pipe K^3, which extends from one end of the line of outlet-float chambers to the other. Said pipe K^3 is connected with each of the pipes G^4 by a pipe K^4, which is controlled by a valve K^5. The actuating-arm of the valve K^5 is connected with the jointed connecting-rod F^4 and therethrough operated when the valve-actuating lever F is elevated or depressed. The valve K^5 is so arranged as to be opened when the valve G^3 is opened, and therefore closed when the valve G^5 is opened. The pipe K^3 is provided with a plurality of hand-actuated cut-off valves *k*, located one between each two adjacent pipes K^2, and each pipe K^2 is provided between its associated float-chamber and the pipe K^3 with a like valve *k'*. The valves *k* are normally closed, while the valves *k'* are normally open. When one of the inlet-valve-actuating levers F is actuated to open its connected valve and which at the same time opens the valve G^5 and closes the valve G^3, the valve K^5 is closed. When the lever F is actuated to close its valve, the valves G^3 and K^5 are opened and the valve G^5 closed. The opening of the valve K^5 permits the liquid to pass from the overflow-pipe G^2 through the vertical pipe G^4, the pipe K^4, and the pipe K^3 to that one of the pipes K^2 which is open to that particular part of the pipe K^3, and thence to the float-chamber connected with said pipe K^2. The entrance of the liquid into said chamber causes the float to rise and the outlet-valve controlled thereby to be opened to permit the tank to which said valve belongs to be discharged. As shown herein, the valves *k* are so arranged that the actuation of the lever F belonging to one of the tanks to close the inlet-valve of said tank operates through the mechanism described to open the outlet-valve of the tank next in rear of the tank which has just been charged, and the outlet-valve mechanism belonging to the tank just filled will be actuated to discharge said tank upon the complete filling of the tank next in advance thereof. With this arrangement during the continuous operation of the apparatus one tank is always standing filled, the one next in rear discharging, and the one next in advance being filled. This arrangement is due to the fact that the valves *k* are interposed in the pipe K^3 between the inlet-float chamber of each tank and the outlet-float chamber thereof. Said pipe connections may be arranged, however, to fill and discharge the tanks in other rotation than herein shown.

The outlet-valve mechanism of tank No. 5 of the series is controlled by the inlet-valve mechanism of tank No. 1, and it is therefore desirable for convenience of arrangement that the float-chamber of the outlet-valve mechanism of tank No. 5 occupy the same relative position to the inlet-float chamber of tank No. 1 as the outlet-float chambers of the other tanks occupy to their actuating float-chambers—to wit, at the left side thereof. The direction of the outlet-channel C of said last tank of the series therefore is modified to correspond with the changed location of its controlling-valve and actuating mechanism, as indicated in dotted lines in Fig. 1.

It will be understood that the relative locations of the several parts of the apparatus may be greatly varied to suit the requirements of each particular instance without departing from the spirit of the invention. For instance, the outlet-valves and actuating mechanism may be located at a greater distance from the inlet-valves and their mechanisms, it only being necessary to preserve the proper connections between said parts by modifying the courses of the connecting-pipes.

The operation of the apparatus as a whole may be briefly stated as follows: It is assumed that tank No. 2 of the series has just been filled and that the float G in the chamber G' belonging to the inlet-valve mechanism of said tank has been raised to close the valve of said tank. The raising of said float

has caused the weight H to be moved to the next float-chamber in advance belonging to tank No. 3 of the series, as shown in Fig. 3, said weight having depressed the outer end of the lever F belonging to tank No. 3 and having been deposited on the upper end of the extension of the float belonging to said tank, as shown in Fig. 2. The depression of the outer end of said lever acts to open the inlet-valve of tank No. 3, and said tank begins filling from the conduit B'. The depression of the lever F also acts to open the valve G^5 and to close the valves G^3 K^5. Prior to the closing of the inlet-valve of tank No. 2 tank No. 1 has been standing filled with both inlet and outlet valves closed. Upon the closing of the inlet-valve of tank No. 2, as aforesaid, the valve G^5 associated with tank No. 2 is closed and valves G^3 and K^5 are opened. The opening of said valve K^5 permits the liquid to pass from the pipe G^2 belonging to tank No. 2 through pipes G^4, K^4, K^3, and K^2 to the outlet-float chamber of tank No. 1. Said outlet-float No. 1 is thereby raised and the outlet-valve actuated thereby unseated, which permits tank No. 1 to be discharged. Said valve K^5 belonging to tank No. 2 remains open until one complete operation of the apparatus is terminated and the lever F connected therewith again actuated to open the inlet-valve of said tank No. 2. While the tank No. 1 is thus being discharged tank No. 2 is standing filled and tank No. 3 is being filled. When said tank No. 3 is completely filled, the float G belonging thereto is elevated to actuate the associated lever F and close the inlet-valve of said tank. The actuation of the lever F belonging to tank No. 3 to close said tank in a like manner before described actuates the discharge-valve mechanism of tank No. 2 to discharge the latter, and the weight H is advanced to actuate the inlet-valve mechanism of tank No. 4 to open the inlet-valve thereof. In the continuous use of the apparatus these operations are repeated in their proper rotation until such rotation is varied, as hereinafter explained, or until the operation of the apparatus is discontinued.

It is desirable in some instances in the use of apparatus of this character to disconnect one or more of the tanks of the series from the other tanks at stated intervals, and said tank or tanks may be thus isolated when empty or filled as occasion may require. Such isolation of the tanks enables the same to be cleaned or repaired if the tanks be used in a water-settling system or if used to contain the filter-bed of a sewage-purifying apparatus permits the required access of the oxygen of the air to the beds, which is required for the best results. For this purpose means are provided for carrying the traveling weight past one or more of the inlet-float chambers, and the connecting-pipes between the outlet-float chambers and inlet-valve mechanism are such that each inlet-valve mechanism may actuate either of the outlet-valve mechanisms. As one means of directing the weight past one or more of the inlet-float chambers the inclined sections I of the track or way for the weight H may be detachably connected with the float-chambers, and when a tank is to be isolated the two sections of the track connected with the inlet-float chamber of said tank are removed and supplanted by a longer section I^2, (shown in Fig. 5,) which bridges between two alternate chambers and cuts out the intermediate chamber. The section may be made longer than shown and cut out two or more tanks. Said intermediate float-chamber, or the one belonging to the tank which it is desired to isolate, is provided at its upper end with an upwardly-opening notch to receive the middle portion of said elongated track-section I^2. In this construction also the partitions G^7 are removable, said partitions engaging at their side edges grooves in the opposite walls of the chamber, which permit them to be removed upwardly out of the chambers. The sections I may be supported on vertically-shiftable brackets I^3, mounted on the outer walls of the float-chambers, so as to be depressed out of the way of the longer section I^2 when employed. In order that the tank next in rear of the tank cut out of the series may be emptied by the valve mechanism of the second tank in advance thereof, the valve *k'* belonging to the outlet-valve mechanism of the tank which is to remain empty is closed and the adjacent valve *k*, or that next in rear thereof in the pipe K^3, is opened. It will be seen, therefore, that the inlet-valve mechanism belonging to the tank next in advance of the tank to remain empty will have the same effect to empty said tank next in rear of the tank to remain empty as the usual actuating mechanism therefor. In other words, the liquid in the pipe K^3, which is directed thereinto by the opening of the valve K^5 belonging to the tank which has just been filled, will pass the outlet-float chamber, the valve *k'* of which is closed, and by reason of the adjacent or next rear valve *k* being open said liquid will be directed to the float-chamber next in rear of the float-chamber belonging to the tank which is to remain empty and acts on the float therein to discharge the associated tank. If it is desired to cut out two or more tanks of the series, the valves *k'* belonging to the float-chamber of said tanks are closed and the corresponding valves *k* in the pipe K^3 are opened, and the liquid in the pipe K^3 will be directed to the first float-chamber whose valve *k'* is opened and acts on said float to discharge the associated tank. The modification of the track or way for the weight H described affords means for cutting out the intermediate tanks of a series. The end tanks of the series may be similarly cut out by a slight modification of the uninterrupted section of the inclined track. For instance, said part may be made of a plurality of interchangeable sections, whereby the sec-

tions having thereon the elbows by which the weight is directed to and from the race, respectively, may when it is desired to cut out either end tank be connected with the next adjacent float-chamber. The opposite ends of the pipe K^3 are connected by a pipe K^7, whereby communication is afforded between the outlet-float chamber of tank No. 4 of the series and the inlet-float chamber of the tank No. 1 when tank No. 5 of said series is cut out. In this event the valve *k'* in the pipe K^2 associated with said outlet-valve chamber of tank No. 5 of the series is closed and the adjacent valve *k* is opened, so as to open, communication through the left end of the pipe K^3 and through pipe K^7 to said outlet-valve chamber to tank No. 4.

Many changes may be made in the details of the construction here shown other than those specifically mentioned without departing from the spirit of my invention, and I do not wish to be limited to such details, except as hereinafter made the subject of specific claims. For instance, instead of using a ball to actuate the valve mechanism I may employ a body of liquid and modify the coacting parts to correspond with such change in the character of the weight. In plants where large volumes of water must be passed other and different forms of inlet and outlet valves may be employed and actuated by the weight through other forms of mechanism. Moreover, the invention, as hereinbefore suggested, may be adapted to empty a series of tanks which are filled through other means than herein shown.

What I claim as new is—

1. The combination with a series of tanks or compartments and the valve mechanisms therefor, of a movable part adapted to be transferred from one mechanism to the others to severally actuate the valves.

2. The combination with a series of tanks or compartments and the valve mechanisms thereof, of a movable part adapted to be transferred from one mechanism to the others to severally actuate the valves, and means for cutting out the valve mechanism of one of said tanks from the operative series.

3. Means for successively actuating the valve mechanisms of a series of fluid tanks or compartments consisting of a traveling weight which travels in a race or track, the parts of which lead, respectively, to and from said valve mechanisms.

4. Means for successively actuating the inlet and outlet valve mechanisms of a series of fluid tanks or compartments consisting of a traveling weight which travels in a race or track, the parts of which lead, respectively, to and from the individual mechanisms of one set of valves, whereby said valve mechanisms are severally actuated and the other sets of valve mechanisms being severally actuated through the medium of the initially-actuated valve mechanisms.

5. Means for successively actuating the valve mechanisms of a series of fluid tanks or compartments consisting of a traveling weight which travels in a track or race, the parts of which lead, respectively, to and from said valve mechanisms, said weight being carried by gravity from one valve mechanism to the other, and, after actuating each mechanism, being elevated by the action of the liquid which the valve controls to the level of the part of the race which directs it to the next succeeding valve mechanism.

6. Means for successively actuating the valve mechanisms of a series of fluid tanks or compartments consisting of a traveling weight which travels in a track or race, the parts of which lead, respectively, to and from said valve mechanisms, and means for directing said weight past one or more of the mechanisms without actuating the same.

7. The combination with a plurality of tanks, of means for controlling the charging and discharging thereof comprising a traveling weight which acts successively on the valve mechanisms of said tanks.

8. The combination with a plurality of tanks or compartments and the inlet-valves therefor, of a weight, common to all and acting to severally open said valves, and a float mechanism associated with each tank and operated by the liquid in said tank to close its associated valve.

9. The combination with a plurality of tanks or compartments and the inlet-valve mechanisms therefor, of a weight, common to all and, acting to severally open said valves, and a float mechanism associated with each tank and operated by the liquid in said tank to close its associated valve and to direct the weight to the next succeeding valve mechanism.

10. The combination with a plurality of tanks or compartments and the valve mechanisms, of a weight, common to all and, acting to severally open said valves, a float associated with each valve mechanism for closing its valve, a chamber containing said float, a lever connected with each valve mechanism and extending into its associated float-chamber, inclined track-sections extending between said chambers to direct the weight to the parts of said levers within the chambers to depress the levers to open the valves, said weight dropping off each lever when the latter is depressed upon the adjacent float, and being lifted by said float to direct it to the next succeeding float-chamber.

11. The combination with a plurality of tanks or compartments and the valve mechanisms therefor, of a weight common to all and, acting to severally open said valves, a float associated with each valve mechanism for closing its valve, a chamber containing said float, a lever connected with each valve mechanism and extending into its associated float-chamber, inclined track-sections extending between and opening into the opposite sides of said chambers to direct the weight to

the parts of the levers within said chambers to depress the levers to open said valves, a partition in the upper part of each chamber to hold the weight engaged with the lever until the lever is depressed, said weight, when the lever is depressed, dropping off the lever upon the adjacent float, and being lifted by said float to direct it to the next succeeding float-chamber.

12. The combination with a plurality of tanks or compartments and the controlling-valves and valve mechanisms therefor, of a movable part adapted to be transferred from one mechanism to the others to severally actuate the mechanisms of the inlet-valves, the outlet-valve mechanisms being connected with the inlet-valve mechanisms in a manner to be actuated upon the actuation of the inlet-valves.

13. The combination with a plurality of tanks or compartments and the controlling-valves and valve mechanisms therefor, of a movable part adapted to be transferred from one mechanism to the others to severally actuate the mechanisms of the inlet-valves, the inlet-valve mechanisms being connected with the mechanisms of the outlet-valves whereby the actuation of either of the inlet-valves serves to open one of the outlet-valves belonging to a tank in rear of the tank to which the aforesaid inlet-valve belongs.

14. The combination with a plurality of tanks or compartments and the controlling-valves and valve mechanisms therefor, of a movable part adapted to be transferred from one mechanism to the others to severally actuate said inlet-valve mechanisms, and connections between said inlet and outlet valve mechanisms, whereby the actuation of one of said inlet-valve mechanisms to close its valve will operate to open the outlet-valve of one of the tanks or compartments previously filled, said connections being such that each inlet-valve mechanism may severally actuate more than one outlet-valve.

15. The combination with a plurality of tanks or compartments, and the controlling-valves and valve mechanisms therefor, of a weight, common to all and, acting to severally open the inlet-valves, a float mechanism associated with each tank and operated by the liquid in said tank to close its associated inlet-valve, and connections between said inlet and outlet valve mechanisms whereby the closing of either of the inlet-valves may act to open one of the outlet-valves.

16. The combination with a plurality of tanks or compartments and the controlling-valves and valve mechanisms therefor, of a weight, common to all and, acting to severally open the inlet-valves, a float mechanism associated with each tank and operated by the liquid in said tank to close its associated inlet-valve and to direct the weight toward the next inlet-valve mechanism, and connections between said inlet and outlet valve mechanisms, whereby the closing of either of the inlet-valves acts to open one of the outlet-valves.

17. The combination with a plurality of tanks or compartments and the controlling-valves and valve mechanisms therefor, of gravity-operated levers connected with said inlet-valves, a weight common to and adapted to depress all of said levers to open the valves, a float mechanism associated with each tank and operated by the liquid in said tank to close said inlet-valve, a shifting weight for each lever to hold the same in either of its positions, and connections between said levers and outlet-valve mechanisms whereby the closing of either of the inlet-valves acts to open the outlet-valve of one of the tanks previously filled.

18. The combination with a series of tanks or compartments, and the controlling-valves and valve mechanisms therefor, of means, common to and, constructed to severally actuate the mechanisms of the inlet-valves, means for isolating one or more of the tanks from the series, and connections between the inlet and outlet valve mechanisms, whereby the closing of either of the inlet-valves acts to open one of the outlet-valves, the connections being such that each inlet-valve mechanism may severally actuate more than one outlet-valve.

19. The combination with a plurality of tanks or compartments and the controlling-valves and valve mechanisms therefor, said inlet-valve mechanisms being actuated by a weight common to all said valves, a track or way for said weight to carry the same to and from the several inlet-valve mechanisms, means for carrying the weight past one or more of said mechanisms without actuating the same, and connections between said inlet and outlet valve mechanisms whereby the closing of either of the inlet-valves acts to open one of the outlet-valves, the connections being such that each inlet-valve mechanism may severally actuate more than one outlet-valve.

20. The combination with a plurality of tanks or compartments, and the controlling-valves and valve mechanisms therefor, of a traveling weight for severally actuating said inlet-valve mechanisms, said weight being carried by gravity from one inlet mechanism to the other, and, after actuating each mechanism, being elevated by the action of the liquid which the valve controls and directed to the next inlet mechanism, and connections between the inlet and outlet valve mechanisms whereby actuation of each of the inlet-valve mechanisms serves to open one of the outlet-valves.

21. The combination with a plurality of tanks or compartments, and the controlling-valves and valve mechanisms therefor, of a traveling weight for severally actuating said inlet-valve mechanisms, a track for said weight consisting of a series of track-sections inclined to the horizontal and extending from

one inlet-valve mechanism to the other, means for lifting the weight from the lower end of each track-section to the higher end of the next adjacent section, and connections between the inlet and outlet valve mechanisms whereby actuation of each of the inlet-valve mechanisms serves to open one of the outlet-valves.

22. The combination with a plurality of tanks or compartments, and the controlling-valves and valve mechanisms therefor, of a traveling weight for severally actuating said inlet-valve mechanisms, a track for said weight consisting of a plurality of track-sections extending from one inlet-valve mechanism to the other and inclined to the horizontal, a float actuated by the liquid which the valve controls for lifting the weight from the lower end of each track-section to the higher end of the next adjacent section, and connections between the inlet and outlet valve mechanisms whereby actuation of each of the inlet-valve mechanisms serves to open one of the outlet-valves.

23. The combination with a plurality of tanks or compartments, and the controlling-valves and valve mechanisms therefor, the inlet-valve mechanisms embracing rigid levers which are pivoted between their ends and with the inner ends of which the inlet-valves are connected, of a traveling weight adapted to successively depress the outer ends of the levers, and connections between the inlet and outlet valve mechanisms so constructed that when either of the inlet-valves is closed one of the outlet-valves is opened.

24. The combination with a series of tanks or compartments and the valve mechanisms therefor, of a weight, common to all and, acting to severally open said valves, a float associated with each valve mechanism for closing its valve, a chamber containing said float, a lever connected with each valve mechanism and extending into its associated float-chamber, and inclined track-sections extending between and detachably connected with said chambers, said weight being directed by said track-sections from one chamber to the other, and acting upon the levers in said chambers to open the valves, and the chambers being provided in their upper ends with upwardly-opening notches to permit a track-section to be extended between two alternate chambers.

25. The combination with a plurality of liquid tanks or compartments and the inlet and outlet controlling valves therefor, of means for actuating the inlet-valves to open and close the same, and a separate float mechanism for controlling each outlet-valve, one of said float mechanisms being actuated upon the closing of each inlet-valve.

26. The combination with a plurality of liquid tanks or compartments and the inlet and outlet controlling valves therefor, of means for actuating the inlet-valves to open and close the same, a separate float for opening each of the outlet-valves, a float-chamber for each float, and means operated by the actuating devices of each of the inlet-valves for directing liquid from one of the tanks previously filled to one of said float-chambers to open its associated outlet-valve.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 13th day of December, A. D. 1900.

WILLIAM S. SHIELDS.

Witnesses:
WILLIAM L. HALL,
TAYLOR E. BROWN.