

No. 754,953.

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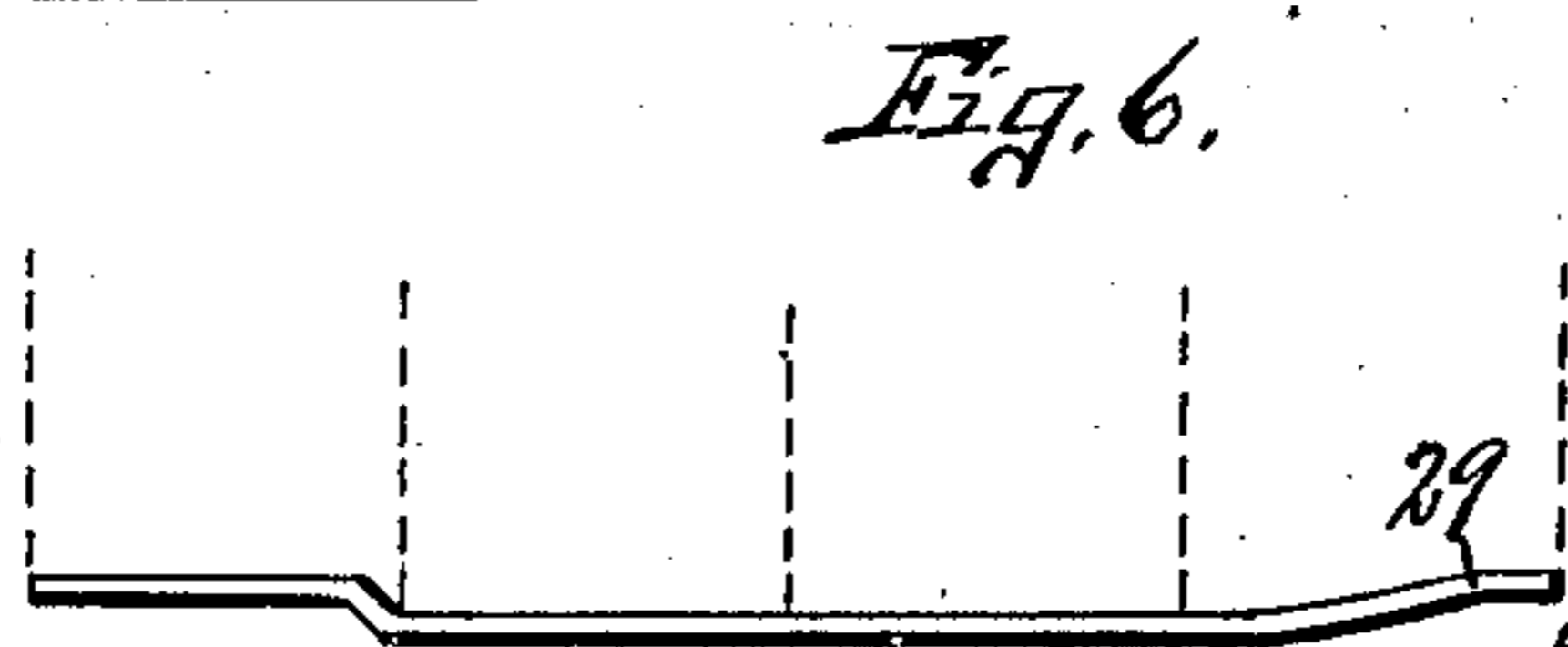
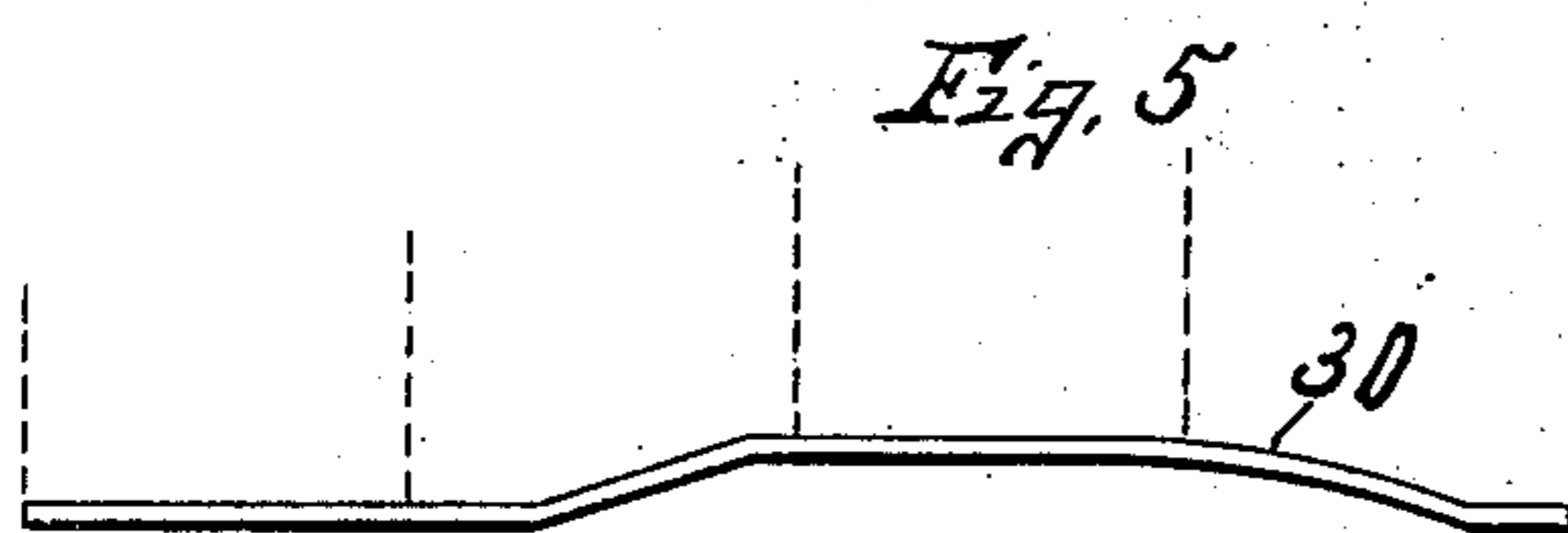
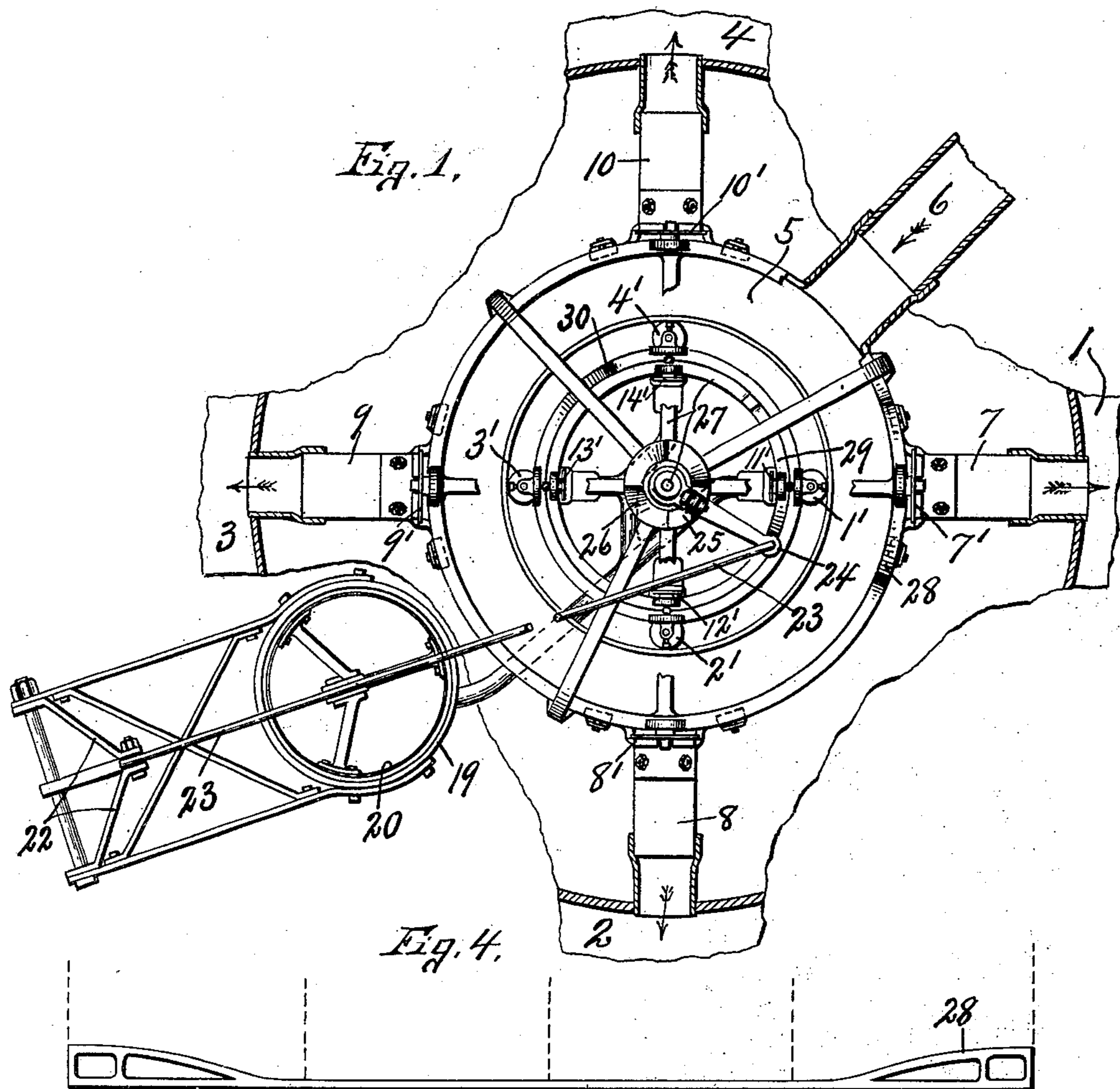
R. B. WILLIAMS, JR. & E. B. WHITMAN.

LIQUID DISTRIBUTING SYSTEM.

APPLICATION FILED MAY 15, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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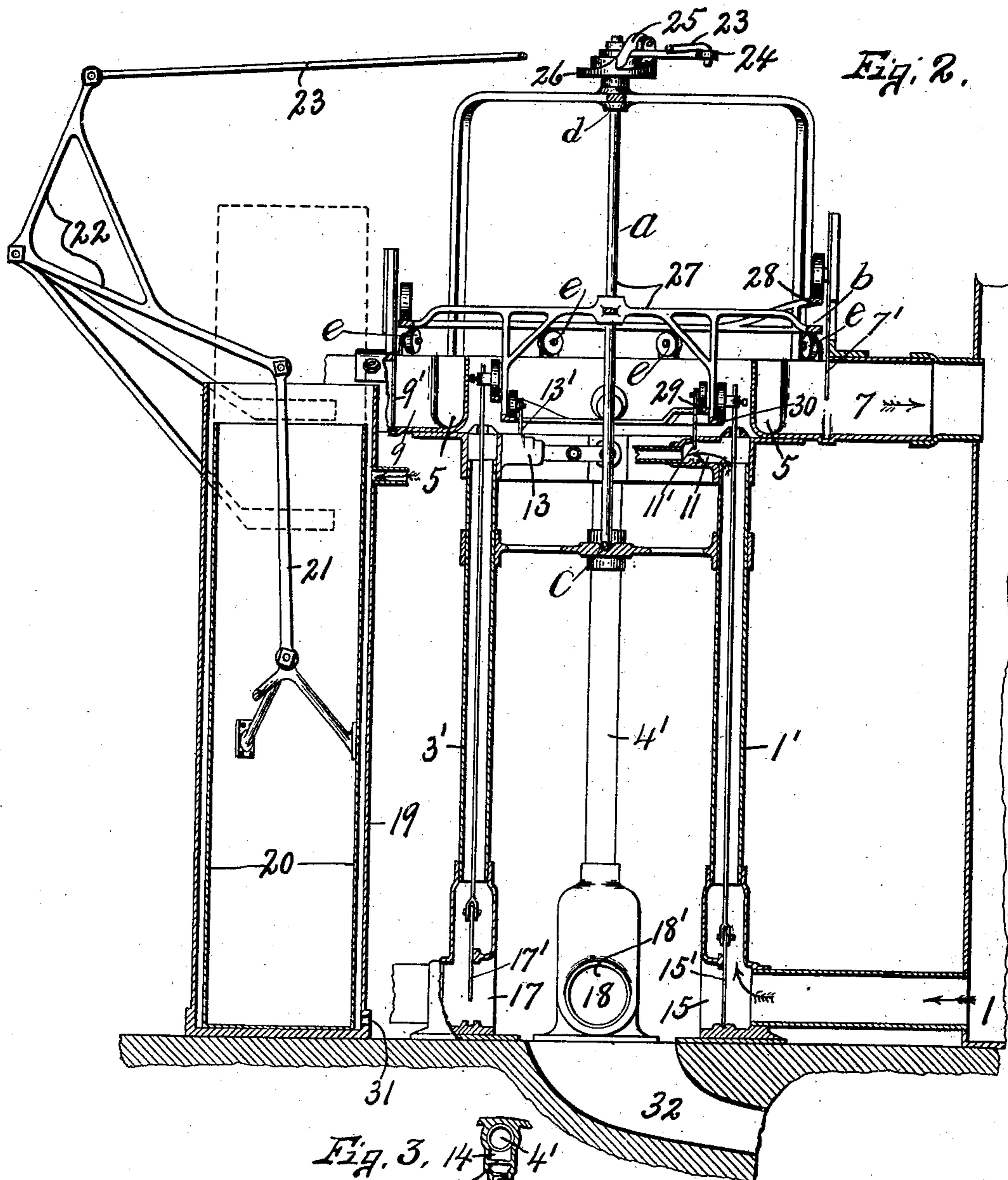
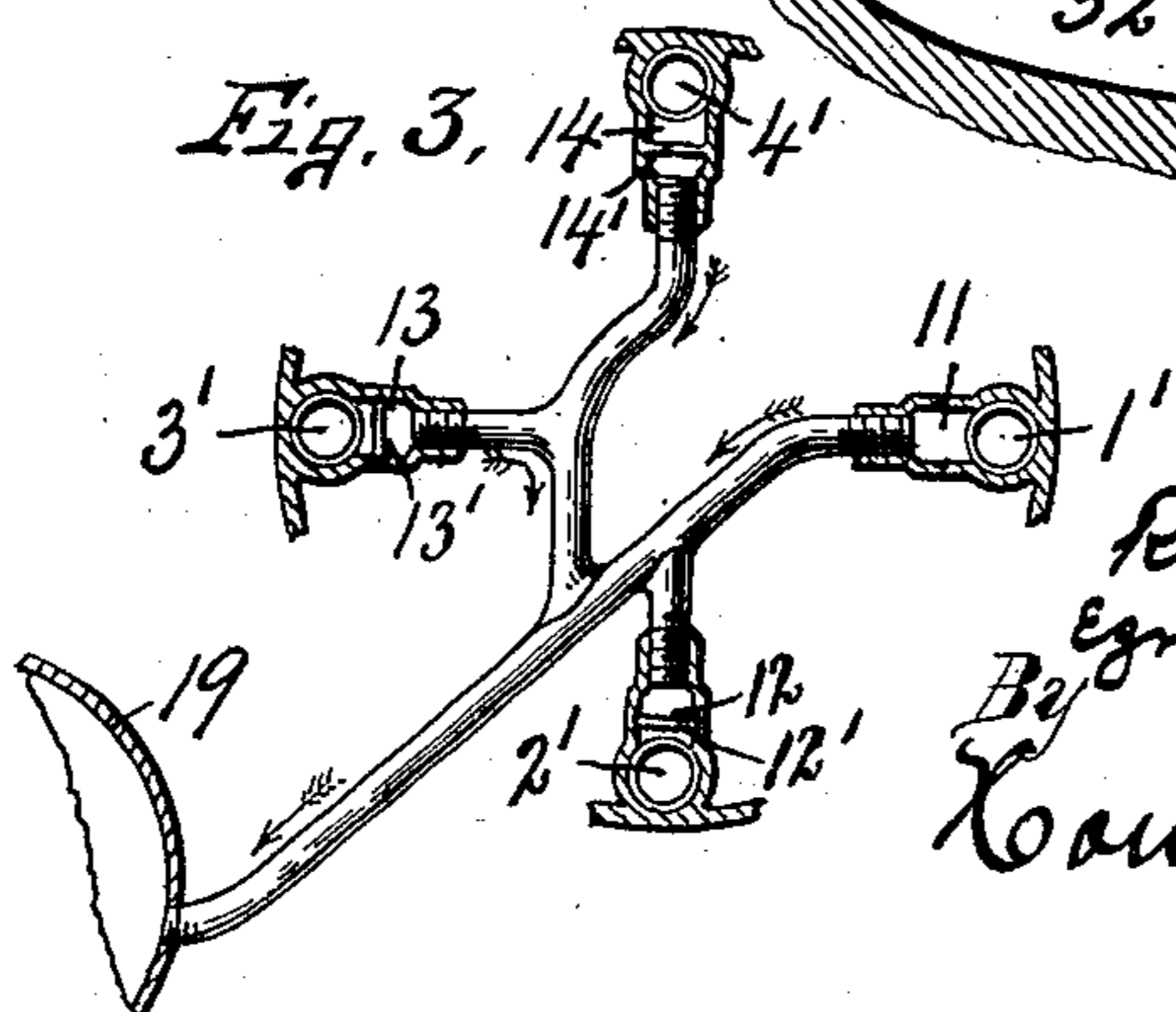


Fig. 3.



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# UNITED STATES PATENT OFFICE.

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## LIQUID-DISTRIBUTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 754,953, dated March 15, 1904.

Application filed May 15, 1903. Serial No. 157,219. (No model.)

*To all whom it may concern:*

Be it known that we, ROGER B. WILLIAMS, Jr., and EZRA B. WHITMAN, of New York city, in the county of New York, in the State of New York, have invented new and useful Improvements in Liquid-Distributing Systems, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to an improved liquid-distributing system, and is particularly applicable for use in connection with certain forms of apparatus employed in the purification of sewage in which the liquid sewage is introduced into a suitable tank, where it is partially purified and is then distributed to a series of receptacles or contact-beds, similar to those set forth in our pending application, Serial No. 154,812, filed April 29, 1903. In both of these systems these receptacles or contact-beds are successively filled to a predetermined level or overflow-line and are also successively emptied, the action being recurrent and automatic, and therefore establishes two cycles of operation, one of which may be termed the "filling" cycle and the other the "emptying" cycle.

The object of our present invention is to control the distribution of the liquid to and from the contact-beds or other receptacles by means of a system of valves and suitable operating mechanism which is automatically brought into action at regular intervals by the overflowing liquid from said contact-beds or other receptacles, so that when one receptacle is filled to the point of overflow the overflowing liquid operates said mechanism to simultaneously close the supply and outlet valves of the receptacle and immediately thereafter to open the similar valves of another receptacle, thereby permitting the filling of another receptacle. In like manner any number of receptacles may be filled and the liquid-supply is finally diverted again into the first receptacle to complete the filling cycle; but before the filling cycle is completed the drainage-valve of the first-filled receptacle is opened by the same mechanism for the purpose of emptying the first-filled receptacle preparatory to refilling, the operation of emptying each receptacle being also recurrent and suc-

cessive and follows the order of filling to complete the emptying cycle.

In the drawings, Figure 1 is a top plan of our improved liquid-distributing apparatus, showing portions of a series of receptacles, such as contact-beds, into which the liquid is successively introduced and withdrawn. Fig. 2 is a transverse vertical section, partly in elevation, of the apparatus seen in Fig. 1. Fig. 3 is a top plan of the detached overflow-conduits, showing their connection with the stand-pipes and float-chamber. Figs. 4, 5, and 6 are detail views of the developed cams for operating the system of valves.

In order to demonstrate the practical utility of this invention, we have shown portions of a series of four receptacles or specially-prepared contact-beds 1, 2, 3, and 4, which are successively filled to a predetermined level and are then emptied and allowed to stand empty exposed to the air for a definite period of time in order that the bacteria may absorb a fresh supply of oxygen for oxidizing the deposit of the sewage.

The liquid-distributing apparatus which forms the subject-matter of this application may be used in connection with any form of receptacle or receiving tank where it is desired to successively fill and empty the same in continuous cycles of operation, and consists, essentially, of a fixed receiver, such as an annular trough 5, which receives the liquid to be distributed and treated through an inlet-conduit 6, and is provided with a series of valved outlets or channels 7, 8, 9, and 10, leading, respectively, to the upper ends of the receptacles 1, 2, 3, and 4 for conveying the liquid successively to the latter. These outlets are provided with valves or closures 7', 8', 9', and 10', which are guided in suitable ways in the walls of the channels and are adapted to be automatically opened and closed at regular intervals in a manner hereinafter described for regulating the flow of liquid to their respective receptacles 1, 2, 3, and 4, the essential requirement being that when one valve is open the remaining valves are closed, so that only one receptacle is filled at a time. The liquid thus introduced into the receptacles is allowed to rise to a predetermined level, which is regu-

lated by suitable overflow-openings, one for each receptacle, and this overflow is utilized to control the operation of the inlet and other valves in a manner presently described. This automatic control of the valves by the overflow is successively carried out by providing the receptacles with separate stand-pipes or vertical conduits 1', 2', 3', and 4', which permanently communicate with the bases of their respective receptacles and rise to a convenient height therefrom, the upper ends being formed with overflow-openings 11, 12, 13, and 14, which are disposed in substantially the same horizontal plane slightly beneath that of the channels 7, 8, 9, and 10, while the lower ends of the stand-pipes 1', 3', and 4' are provided with drainage-openings 15, 17, and 18, whereby the liquid may be drained from the receptacles or contact-beds and also from the stand-pipes, the stand-pipe 2' having a similar drainage-opening. (Not shown.)

The overflow-openings 11, 12, 13, and 14 are provided with valves or closures 11', 12', 13', and 14' and are connected by suitable conduits and discharge into an upright shell 19, which contains a float 20, so that the liquid overflowing from any one of the receptacles or contact-beds enters the shell 19 and operates to raise the float, the latter returning to its normal position by its own gravity or other means.

The drainage-openings 15, 17, and 18 extend through the inner walls of the bases of the stand-pipes in substantially the same plane as the bottoms of the receptacles or contact-beds and are provided with valves 15', 17', and 18', while the drainage-opening in the stand-pipe 2' is provided with a similar valve, (not shown,) which valves are adapted to be opened and closed automatically and successively for draining the liquid from their respective receptacles or contact-beds 1, 2, 3, and 4.

The float 20 is connected by a link 21 to a bell-crank lever 22, which in turn is connected by a link 23 to a rock-arm 24, carrying a pawl 25, and this pawl coacts with a ratchet-wheel 26 to impart a step-by-step movement to a revoluble frame 27, according to each successive elevation of the float 20. This rotary frame comprises an upright shaft *a* and a circular track *b*, the shaft *a* having its lower and upper ends journaled in fixed bearings *c* and *d* of a suitable supporting-frame, and the circular track *b* rides upon roller-bearings *e* on the supporting-frame and carries a series of cams 28, 29, and 30 for operating the valves previously described, the cam 28 being operatively connected to actuate each of the outlet-valves 7', 8', 9', and 10' once at each revolution, and the cam 29 is also adapted to actuate the valves 11', 12', 13', and 14' once at each revolution and at the same time that the corresponding valves 7', 8', 9', and 10' are operated.

The cam 30 is arranged to operate the valves 15', 17', and 18' successively and once at each revolution, but is so timed with reference to

the cams 28 and 29 that when any one of the former valves is open the corresponding valve of the latter series is closed and remains closed until some time before the completion of the filling cycle considered as beginning and ending with the receptacle corresponding with said open valve.

All of the valves preferably close by gravity or equivalent means, but are all opened by their respective cams and are provided with rollers which ride upon said cams to reduce friction.

Near the bottom of the float-chamber is a drainage-outlet 31, through which the liquid escapes to relieve the pressure and permit the float to descend to its normal position after each successive shift of the cams 28, 29, and 30.

The operation, briefly stated, is as follows: Assuming that the cams 28 and 29 are in position to hold the valves 7' and 11' of the receptacle or contact-bed 1 open, at which time the similar valves of the receptacles 2, 3, and 4 and also all but one of the drainage-valves are closed, the open drainage-valve being, for instance, the one corresponding to the receptacle 3, then the liquid will flow from the conduit 6 into the trough 5 and through the open channel 7 into the receptacle or contact-bed 1. The valve 15' being closed, the liquid will rise in the receptacle 1 and its stand-pipe 1' until it reaches the level of the overflow-opening 11 and overflows into the float-chamber 19. The inflow-conduit of the float-chamber is of considerably greater capacity than the drainage-passage 31, and therefore the liquid flows in much faster than it flows out and operates to raise the float and to thereby partially rotate the cams 28, 29, and 30 through the medium of the ratchet and pawl and its connections with the float and cams. A sufficient amount of water is permitted to enter the float-chamber to raise the float far enough to effect the movement of the points of the cams 28 and 29 from the valves 7' and 11' to the valves 8' and 12', or in this instance substantially a quarter-revolution, thereby opening the valves 8' and 12' and permitting the valves 7' and 11' to close and at the same time advancing the point of the cam 30 from the drainage-valve of the receptacle 3 to permit the latter valve to close and to open the succeeding drainage-valve of the receptacle 4. The receptacle 2 is now being filled, and at the same time the liquid is escaping from the float-chamber, and thus permitting the float to return, which operation returns the pawl to its starting position to again engage the ratchet. As soon as the liquid reaches the level of the open overflow 12 it passes into the float-chamber, and the operation of the float and cams connected thereto is repeated for stopping the flow to the receptacle 2 and through the overflow 12 and opening the similar valves of the receptacle 3. At this time (or it may be a step previous) the drainage-valve 15' is opened by

the cam 30 for emptying the receptacle, and it is evident that by the continued operations just described for filling and emptying the receptacles these receptacles are successively  
 5 and continuously filled and emptied at regular intervals as long as the liquid continues to flow into the annular trough 5, and the operation is entirely automatic. The liquid discharged from the drainage-outlets 15, 16, 17,  
 10 and 18 drains into a subconduit 32 and may be conducted to a waste-pipe or to any other locality desired.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a liquid-distributing apparatus, a liquid-receiver having a series of outlets and separate valves therefor, separate receptacles for the outlets having valved overflow-openings, a float-chamber receiving liquid from  
 20 the overflow-openings, a float actuated by the liquid, and means actuated by the float and operatively connected to successively open the valves of said receptacles.

2. In a liquid-distributing apparatus, a liquid-receiver having a series of outlets and separate valves therefor, separate receptacles receiving the liquid from the outlets and provided with overflow and drainage openings,  
 30 valves for said openings, a float-chamber connected to the overflow-openings, a float in said chamber and operatively connected to open the valves of the several receptacles one after another.

3. In a liquid-distributing system, a liquid-receiver having a series of outlets and separate valves therefor, separate receptacles for the outlets having valved overflow-openings and valved drainage-openings, and means controlled by the overflow from one receptacle  
 40 for opening the valves of another receptacle.

4. In a liquid-distributing apparatus, a conduit for the liquid having a valved outlet, a receptacle for the outlet, a stand-pipe leading  
 45 from the receptacle having an overflow-opening and a drainage-opening, separate valves for said openings and mechanism controlled by the overflow for operating said valves.

5. In a liquid-distributing system, a conduit for the liquid having outlets, separate receptacles for the outlets having stand-pipes provided with valved drainage-openings, and overflow-openings, and means controlled by the overflow of one receptacle for operating  
 55 the drainage-valve of another receptacle.

6. In a liquid-distributing system, a conduit having a valved outlet, a receptacle for the outlet having a stand-pipe provided with a valved overflow-opening, a float-chamber connected to the overflow, a float movable in the  
 60 chamber, and means actuated by the float and operatively connected to simultaneously open the valves as the float rises.

7. In a liquid-distributing system, a receptacle for the liquid, a stand-pipe having a  
 65 valved drainage-opening connected to the receptacle and provided with a valved overflow, a float-chamber connected to the overflow, a float in said chamber and means actuated by the float and operatively connected to open  
 70 and close said valves.

8. In a liquid-distributing system, a receptacle having a valved outlet, a stand-pipe connected to the receptacle and having separate drainage and overflow openings and separate  
 75 valves therefor, and means actuated by the overflow and operatively connected to successively operate said valves.

9. In a liquid-distributing system, a conduit having a plurality of outlets and separate  
 80 valves therefor, separate receptacles for the outlets having valved overflows, and means actuated by the overflow from one of the receptacles and operatively connected to close the valves of that receptacle and to open the similar valves of another receptacle whereby the  
 85 flow from the conduit is diverted from one receptacle to the other.

In witness whereof we have hereunto set our hands this 14th day of May, 1903.

ROGER B. WILLIAMS, JR.  
 EZRA B. WHITMAN.

Witnesses:

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 R. F. PROCTOR.