No. 731,468. PATENTED JUNE 23, 1903.

F. B. LEOPOLD.

APPARATUS FOR SOFTENING OR OTHERWISE CHEMICALLY TREATING, FILTERING, AND STORING WATER.

APPLICATION FILED JAN. 10, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

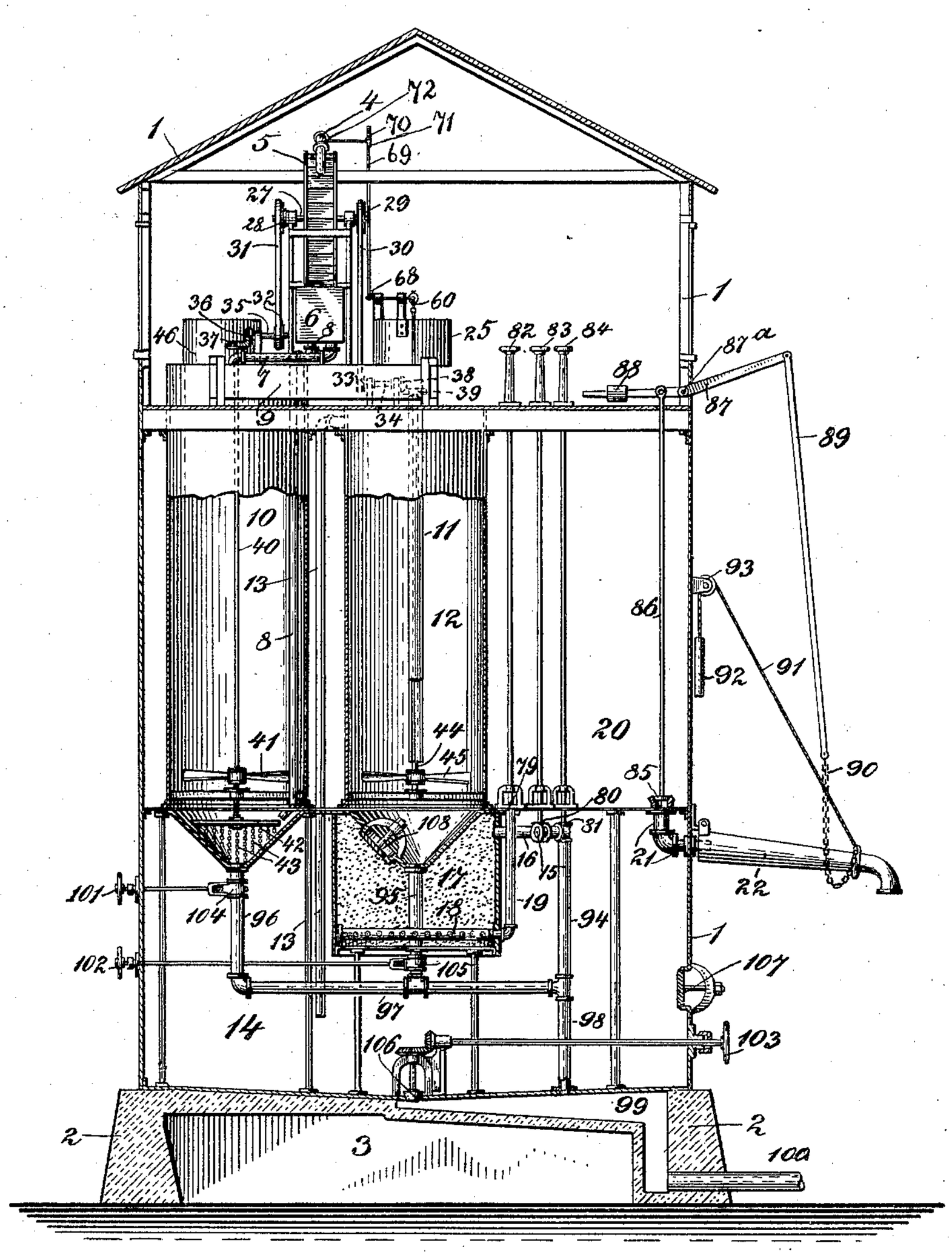

Fig. 1.

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NO MODEL. 4 SHEETS—SHEET 2.

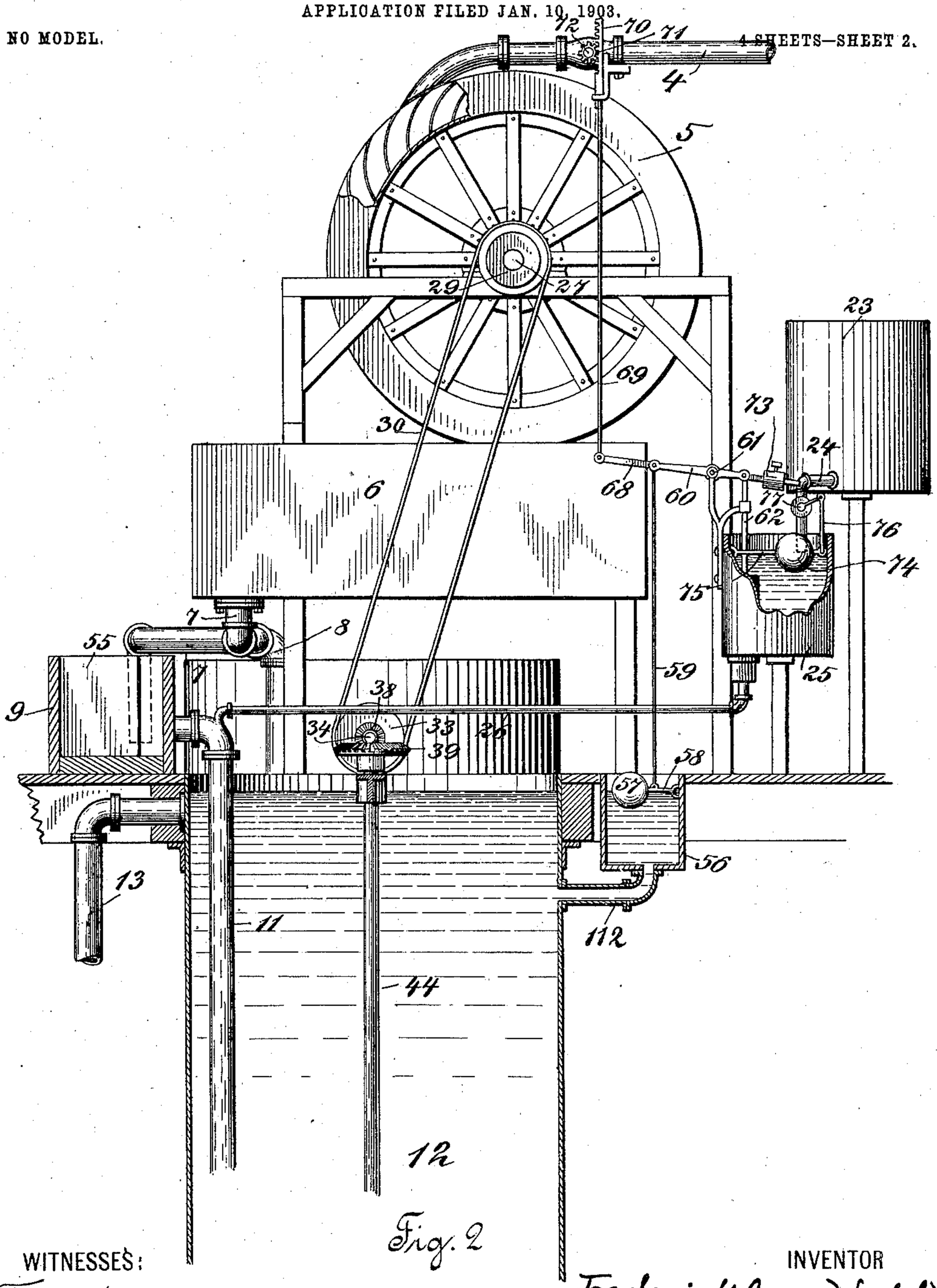

Fig. 2.

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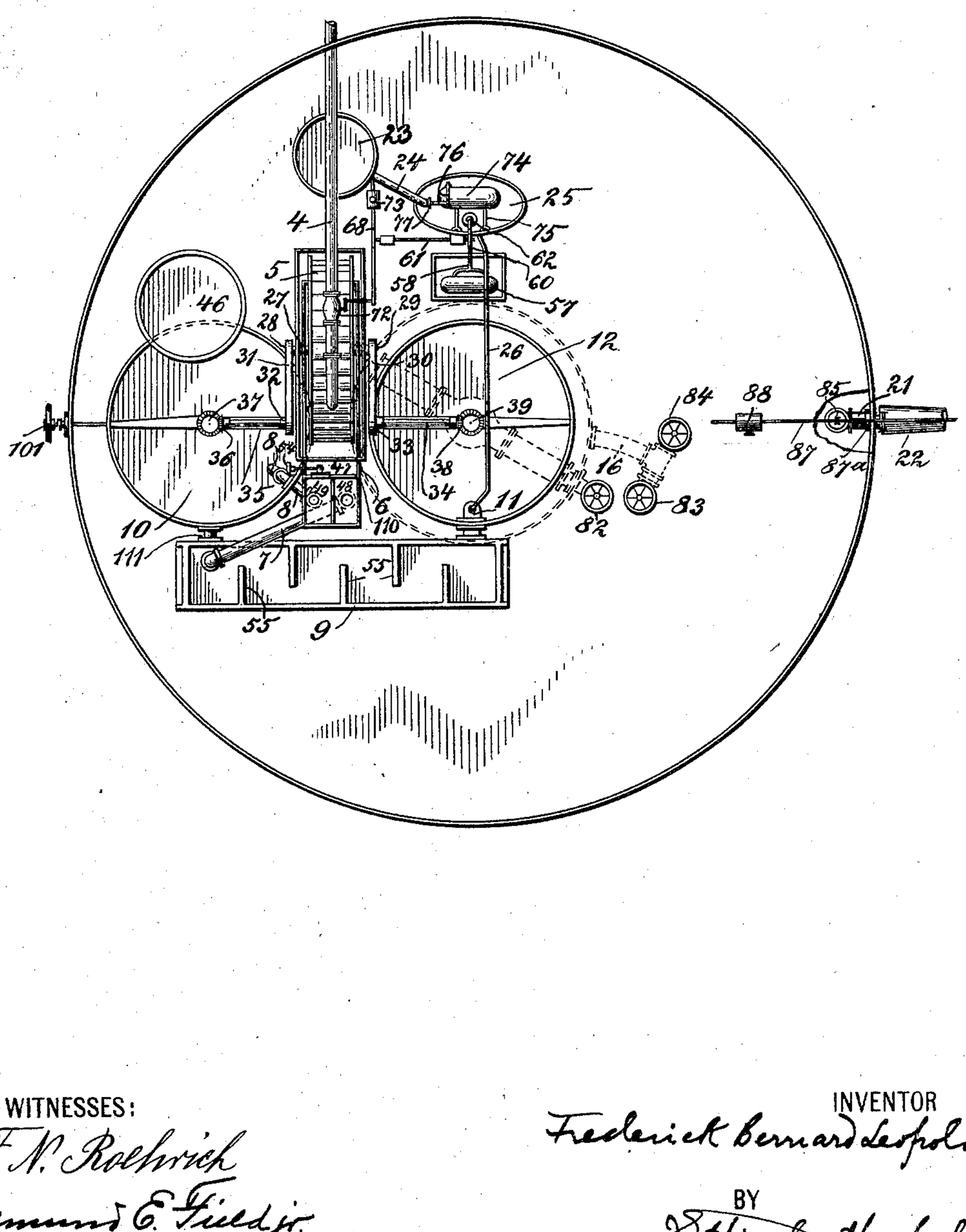
NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 4

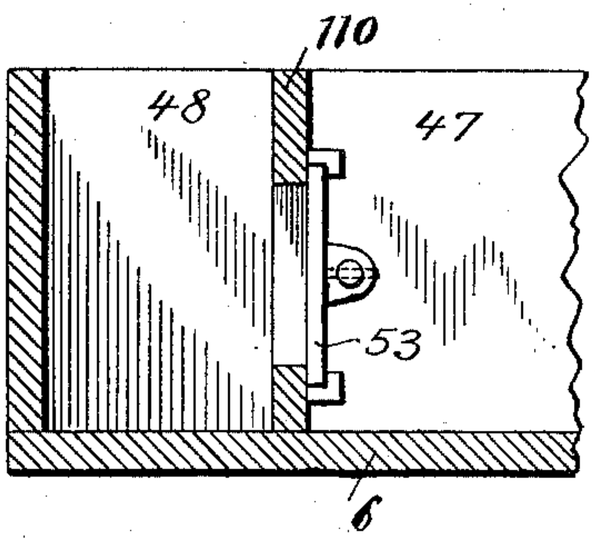


Fig. 5.

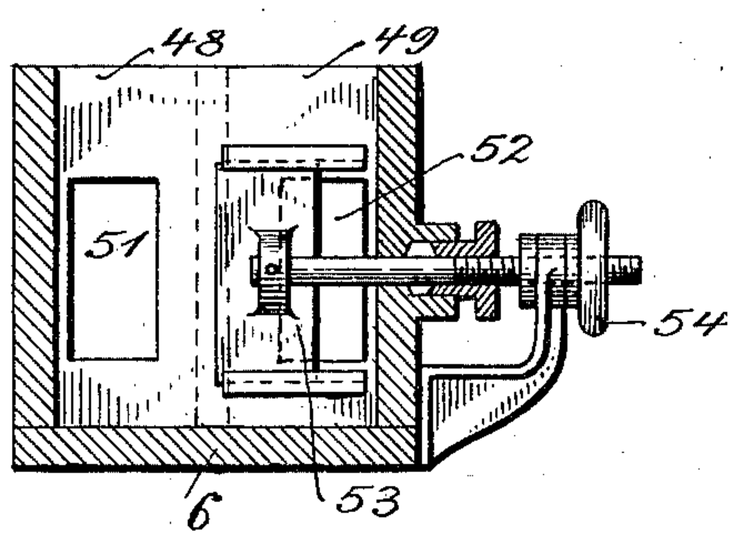


Fig. 6.

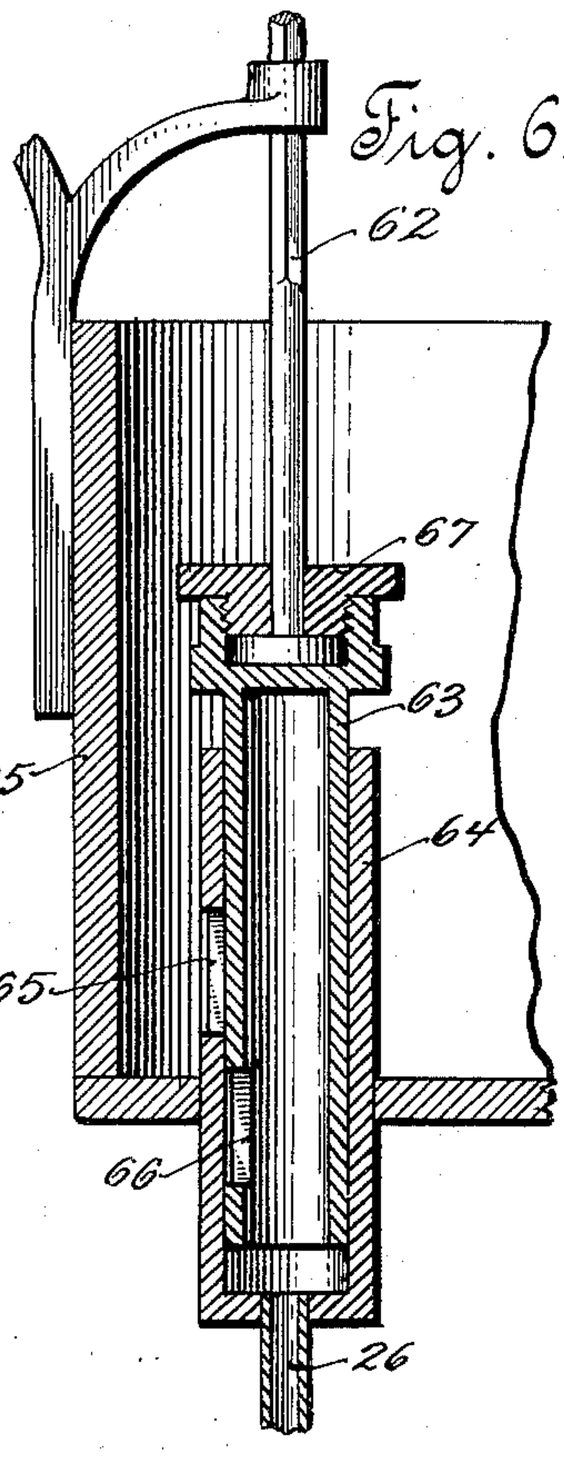
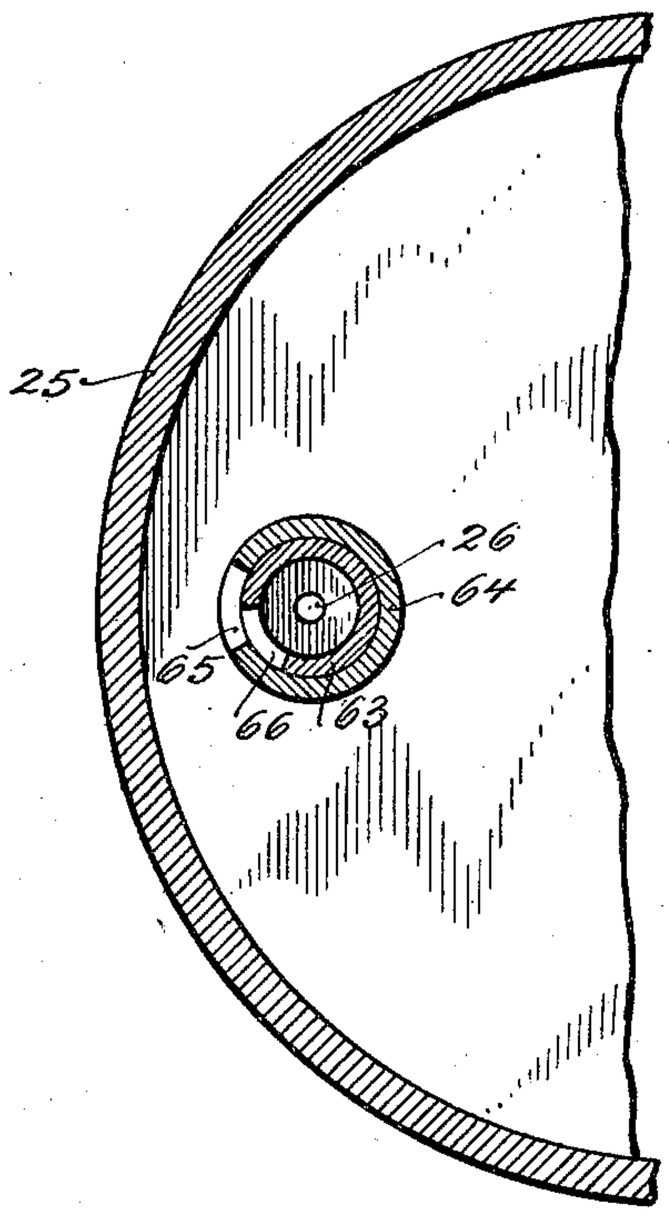


Fig. 7.



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No. 731,468. Patented June 23, 1903.

UNITED STATES PATENT OFFICE.

FREDERICK BERNARD LEOPOLD, OF CINCINNATI, OHIO, ASSIGNOR TO THE NEW YORK CONTINENTAL JEWEL FILTRATION COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

APPARATUS FOR SOFTENING OR OTHERWISE CHEMICALLY TREATING, FILTERING, AND STORING WATER.

SPECIFICATION forming part of Letters Patent No. 731,468, dated June 23, 1903.

Application filed January 10, 1903. Serial No. 138,458. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK BERNARD LEOPOLD, of Cincinnati, in the county of Hamilton, State of Ohio, have invented new and useful Improvements in Apparatus for Softening or Otherwise Chemically Treating, Filtering, and Storing Water; and I do hereby declare that the following is a full, clear, and exact description, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, in which similar characters refer to similar parts throughout the several views.

The objects of my invention are to produce in one structure an apparatus wherein all the valves are controlled from the upper platform (hereinafter described) except those utilized for blowing off the sediment and sludge which accumulate in the bottom of the several compartments used in the process of purification, in which the controlling-float is so arranged that with a continuous supply of water the apparatus will automatically stop when the storage-tank is filled and start again as the water is used from it, the automatic feed (after once being regulated) of the chosen chemical reagents to be mixed with the raw water, the provision of a settling-tank for the heavy impurities in the water, and the filtration and storage of the treated water, thereby economizing space in the installation, cost in construction, and labor in operation.

My apparatus is primarily designed for the treatment and storage of water to be utilized in railroad-locomotives, though it is obvious that the water can be used for other purposes.

Described briefly, my apparatus comprises a large outside shell of the general diameter of a standard railroad storage-tank, which can be built either of wood or steel, as may be desired. This shell is of such height as may be necessary to give the required amount of storage capacity above the point at which the outlet for supplying the water to the engine is located. The shell is divided horizontally by a solid diaphragm at a point just above the outlet, the upper compartment being of the size required for the storage of the amount of water needed. The lower compartment constitutes the settling or precipitating chamber for the treated water. In this lower compartment are located the filter and various pipe connections. Two vertical tanks of small diameter, comprising the mixing and large solution tanks, are placed in the upper compartment. Supported on a platform above the top of the upper compartment are located the small solution-tank, the tank for slaking the lime, the mixing-trough, the water-wheel which furnishes the power for the moving parts, and the regulating apparatus which properly controls the supply of water to the water-wheel and the supply of the solutions of the reagents required in treating the water. The top of the upper compartment is inclosed by a waterproof covering or roof of such height as to completely protect from the elements all of the operating parts, pipe connections and valves, and the operator or attendant.

Referring to the drawings, Figure 1 is a vertical elevation in section and perspective of the apparatus as a whole. Fig. 2 is a vertical elevation in section and perspective of a side view of the main supply-pipe, water-wheel, water-receiving compartment, mixing-trough, solution-tanks, float-valves, and mixing-tank. Fig. 3 is a top plan view of the apparatus. Figs. 4 and 5 are detailed views in section of portions of the mixing-trough and the weirs contained therein. Figs. 6 and 7 are longitudinal and cross sections, respectively, of the valve which regulates the flow of the soda or other chemical solution to be mixed with the water.

For purposes of illustration I will suppose that the water is to be treated with solutions of lime and soda.

The construction and operation of the device are as follows: Having reference to Fig. 1, the roof and casing 1 rest upon the foundation 2, having the cellar 3. The raw water from the source of supply enters the apparatus through the pipe 4, the supply being automatically regulated by the valve 72, hereinafter described. The incoming raw water engages the water-wheel 5, causing it to revolve, and thus by means of the pulleys 28 and 29, mounted on the axle 27, belts 31 and 30, pulleys 32 and 33,

shafts 35 and 34, and gearings 36 and 37 and 38 and 39, respectively, cause the spindles or rods 40 and 44, contained in the cylinders 10 and 12, respectively, to revolve with their mountings thereon. These details are shown on a larger scale in Fig. 2. After leaving the water-wheel 5 the raw water enters the box 6, which is divided transversely by the partition 110, Figs. 1 and 3, into a large compartment 47, which first receives the water, and a smaller compartment. This smaller compartment is again longitudinally divided into two smaller compartments 48 and 49, Figs. 1 and 5, into which the water passes through the valves 51 and 52, Fig. 5, respectively. Thus the divided stream passes in two divisions, the main division through the valve 51, Fig. 5, into compartment 48 and thence through pipe 7 into the mixing-trough 9, Figs. 1, 2, and 3, and the other division through the valve 52 into compartment 49 and thence through the pipe 8 into the lime-tank 10, Figs. 1 and 3. The smaller of the valves 52 is on the same level as the larger one and of the same height; but the width of its opening is adjustable by means of a tight-fitting sliding wing or door 53, operated by a hand-wheel and screw 54, Figs. 4 and 5, to enable the operator to so proportion the flow of water through valve 52 as to meet the requirements of the water to be treated.

Above the lime-tank 10 is a tank 46, Figs. 1 and 3, where the lime is slaked and whence it passes through an exit (not shown) into the lime-tank 10. Here it falls through the water admitted to this tank through the valve 52 and is mixed with this water by the action of the chains 43, depending from the revolving wheel, or a bar 42 (to stir up any sediment) and the propeller-blades 41, mounted on and revolving with the rod or shaft 40, Fig. 1. When the lime-tank 10 is filled with lime-water of the desired strength, the lime-water overflows through the pipe 111, Fig. 3, into the mixing-trough 9, where it meets the raw water entering this trough through the pipe 7, Figs. 1, 2, and 3, and is mixed with it by means of the baffles 55, Figs. 2 and 3, which stir up the mingled waters flowing through the mixing-trough 9 to and through the pipe 11, leading out of the mixing-trough and down and into the large mixing-tank 12, Figs. 1, 2, and 3, where it is introduced near the bottom of said tank.

If the water is to be treated with another chemical substance, such as soda, this substance may be introduced directly into the tank 12 and dissolve in the water therein; but preferably such chemical substance is prepared in a separate solution and introduced by the means illustrated in Figs. 1, 2, 3, 6, and 7. Referring more especially to Fig. 2, the stock solution of the required strength is stored in the tank 23. From thence it passes through the pipe 24 into the tank 25, in which it is maintained at a constant head and pressure by means of the ordinary ball-float 74, valve 77, lever 75, and connecting-rod 76. From the tank 25 the soda solution passes through the pipe 26 into the pipe 11, where it mingles with the mixture of raw water and lime-water. In order to regulate the quantity of soda or other solution to be admitted to the treated water, I provide a suitable valve situated in the tank 25. Such a form of valve is illustrated in Figs. 6 and 7, though other forms of valves may be used, if desired. In the form illustrated the pipe 26 is fitted into the bottom of a sleeve or socket 64, which is provided with a slot 65. Within this socket 64 is fitted a sliding and rotatable tube 63, provided with the slot 66, which can thus be brought into any required position with relation to the slot 65, so as to regulate the flow of solution to the desired point. By means of the binding screw-nut 67, mounted upon the square-ended rod 62, the tube 63 can be held in the desired position. The water thus having received the lime and soda solutions and having passed into the large mixing-tank 12 near the bottom is further gently stirred and mixed by the revolving blades 45, mounted upon the rod 44, revolved by the water-wheel 5. When the mixing-tank 12 is full, the treated water overflows out and through the pipe 13, Figs. 1 and 2, into the settling-tank 14, Fig. 1, where the insoluble heavier particles settle out, while the water rises until it enters the pipe 16 through the valve 15, and thence it passes into the filter-chamber 17, containing sand or other filtering material, which is introduced through the manhole 108, Fig. 1. The filtered water flows from the filter-chamber out through the screen and perforated pipes constituting the filter-bed 18 into the pipe 19 and thence through the valve 79 into the storage-tank 20, where it is stored for use as needed.

When the treated water is to be drawn from the storage-tank for use in the locomotive, the spout 22, Figs. 1 and 3, is drawn down by the fireman, thus, by means of the chain 90, link 89, lever 87, fulcrum 87^a, stem 86, and valve 85, permitting the water to flow from the storage-tank 20 out through the spout 22. The weight 88 and lever 87, Fig. 1, act to close the valve 85 when the spout is released. The weight 92 counterbalances the weight of the spout 22. Of course other means for drawing the water from the storage-tank than those illustrated will readily suggest themselves to any mechanic.

In order to provide for the stoppage of the inflow of raw water to the apparatus and to cut off the supply of the soda or other solution when the storage-tank 20 is full, I provide the automatic cut-off illustrated in Figs. 1, 2, and 3. I connect a smaller chamber 56 by the pipe 112 with the large mixing-tank 12 near its top, and in this chamber 56 I place a ball-float secured to the end of a hinged lever 58. The rod 59 is connected at one end to the lever 58 and at the other end to the le-

ver 60 68, pivoted at 61. This lever is raised and lowered, therefore, by the rise and fall of the ball-float 57. The outer end of the lever 68 carries the rod 69, terminating in the rack 70, Fig. 2, and this rack engages with the pinion 71, fastened to the shaft of a valve 72, situated in the main supply-pipe 4. A counterbalance 73 is secured to the other end of the lever 68 60, intermediate between the pivot 61 and the counterweight 73 of the square-ended rod 62, which operates the slide-valve 63, 64, 65, and 66, Figs. 2, 6, and 7. When, therefore, the storage-tank 20, the large mixing-tank 12, and the chamber 56 are filled with treated water, the consequent rise of the float 57 closes the valve in the main supply-pipe 4 and at the same time closes the outlet-valve from the soda-solution tank 25. If desired, the float 57 may be placed directly either in the large mixing-tank 12 or in the storage-tank 20, with suitable connections to the valves 72 and 66 65, and such locations would be within my invention.

The lime-tank 10 is flushed by opening the valve 104, Figs. 1 and 3, by means of hand-wheel 101 through the pipes 96, 97, and 98, channel 99, and outlet 100. The large mixing-tank 12 is flushed by opening the valve 105 by means of hand-wheel 102, pipe 98, channel 99, and outlet 100. The settling-chamber 14 is flushed by opening the valve 106 by means of the hand-wheel 103, Fig. 1. The filter is washed or flushed by closing valve 80 and opening valves 79 and 81, whereupon the water passes through pipes 94 98, channel 99, and outlet 100. The valves 79, 80, and 81 are controlled, respectively, by the hand-wheels 82, 83, and 84 in the upper story of the structure. (All shown in Figs. 1 and 3.)

The manhole 107, Fig. 1, gives access for cleaning to the settling-chamber 14.

Of course, as above stated, the apparatus may be employed with the use of any chemical substances desired.

What I claim is—

A machine for the treatment of water which comprises a shell or housing, a pure-water-storage tank within the upper portion of said shell or housing, a platform above said storage-tank, a primary receiving-compartment upon said platform provided with two or more valves for the outflow of water, one or more tanks containing chemical substances in solution, a mixing-trough, a mixing-tank, a wheel actuating the moving parts, a settling-chamber, a filter, suitable connecting-pipes and valves, an outlet for the treated water, and means for operating all of the valves except the sediment-valves from the platform above the pure-water-storage tank.

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