

904,883.

J. T. LEMON.  
WATER SUPPLY SYSTEM.  
APPLICATION FILED JULY 10, 1908.

Patented Nov. 24, 1908.  
2 SHEETS—SHEET 1.

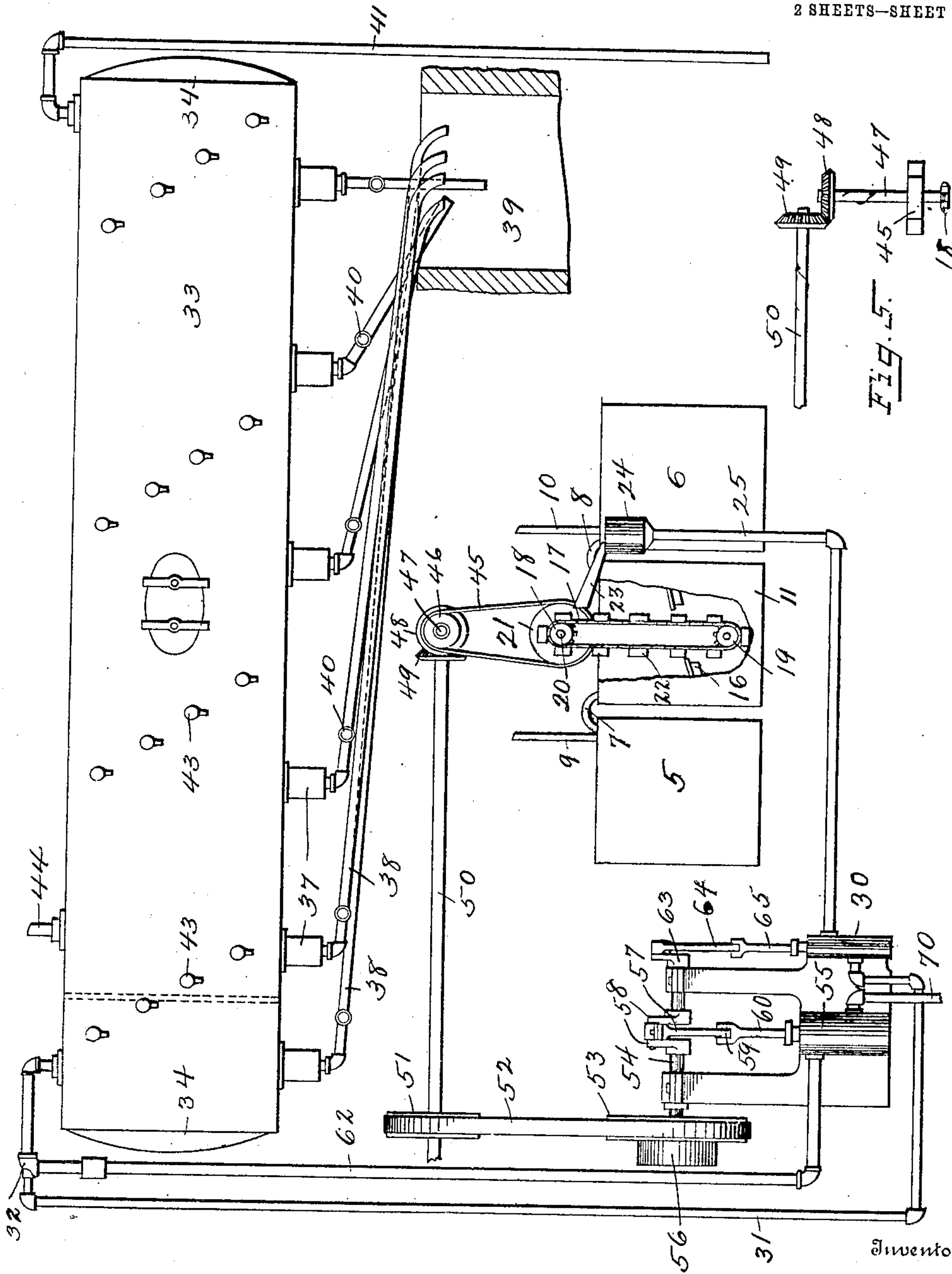


Fig. 5.

Witnesses  
Carl Stoughton  
F. J. Campbell

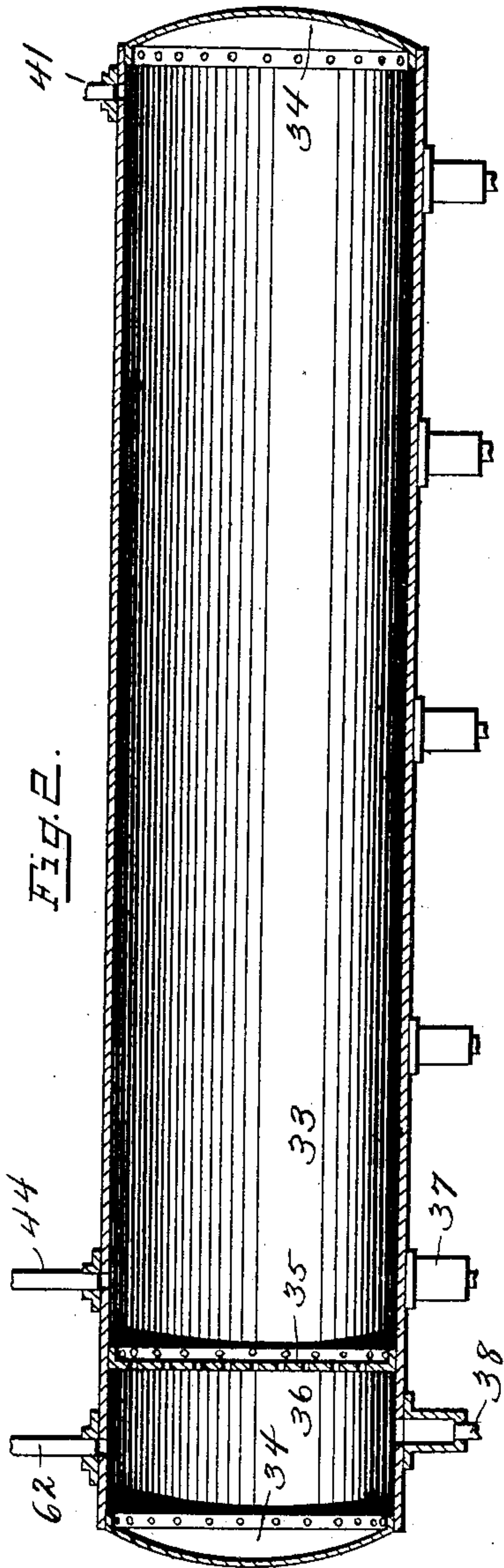
By Fig. 1.

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2 SHEETS—SHEET 2.



Witnesses  
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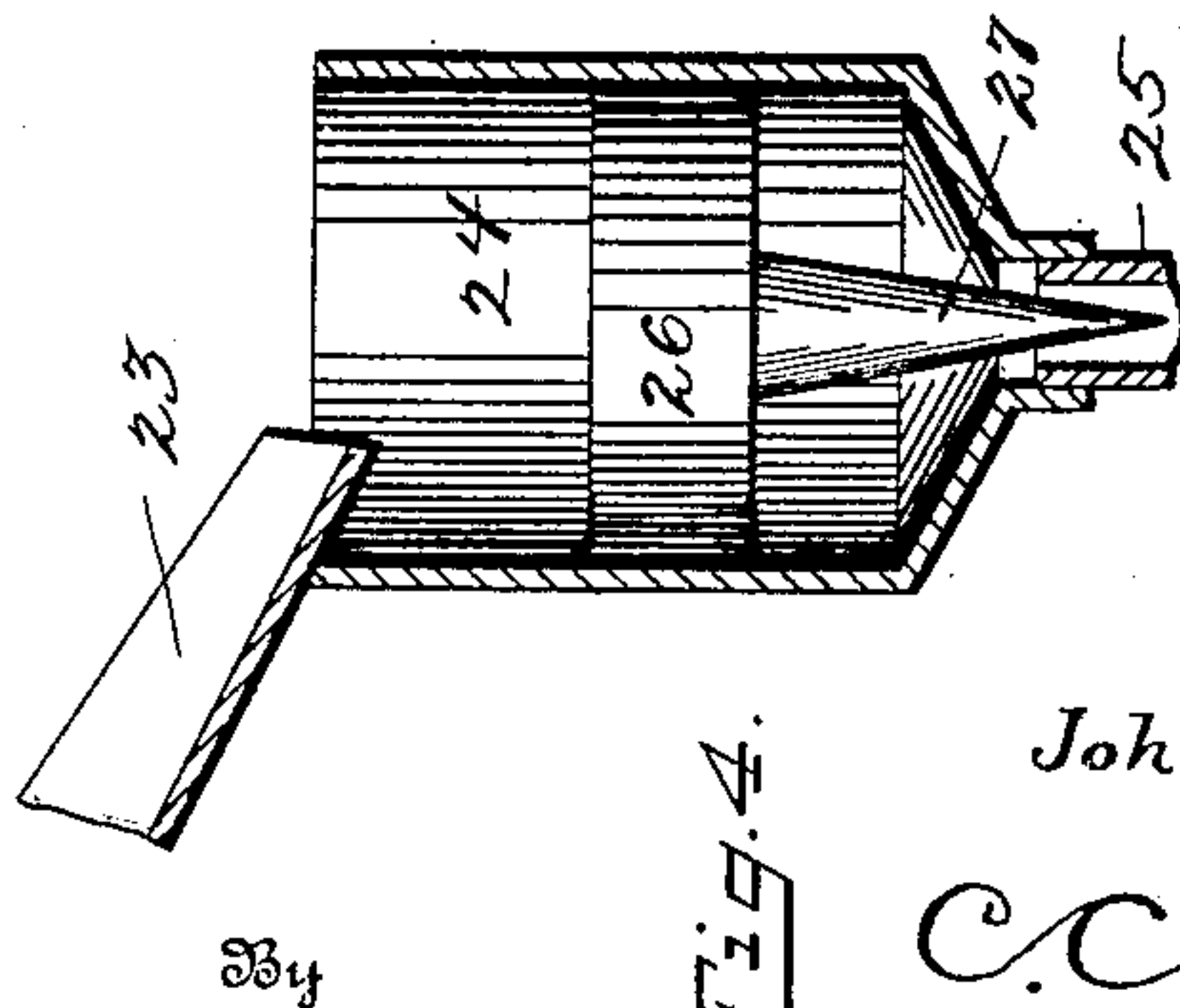
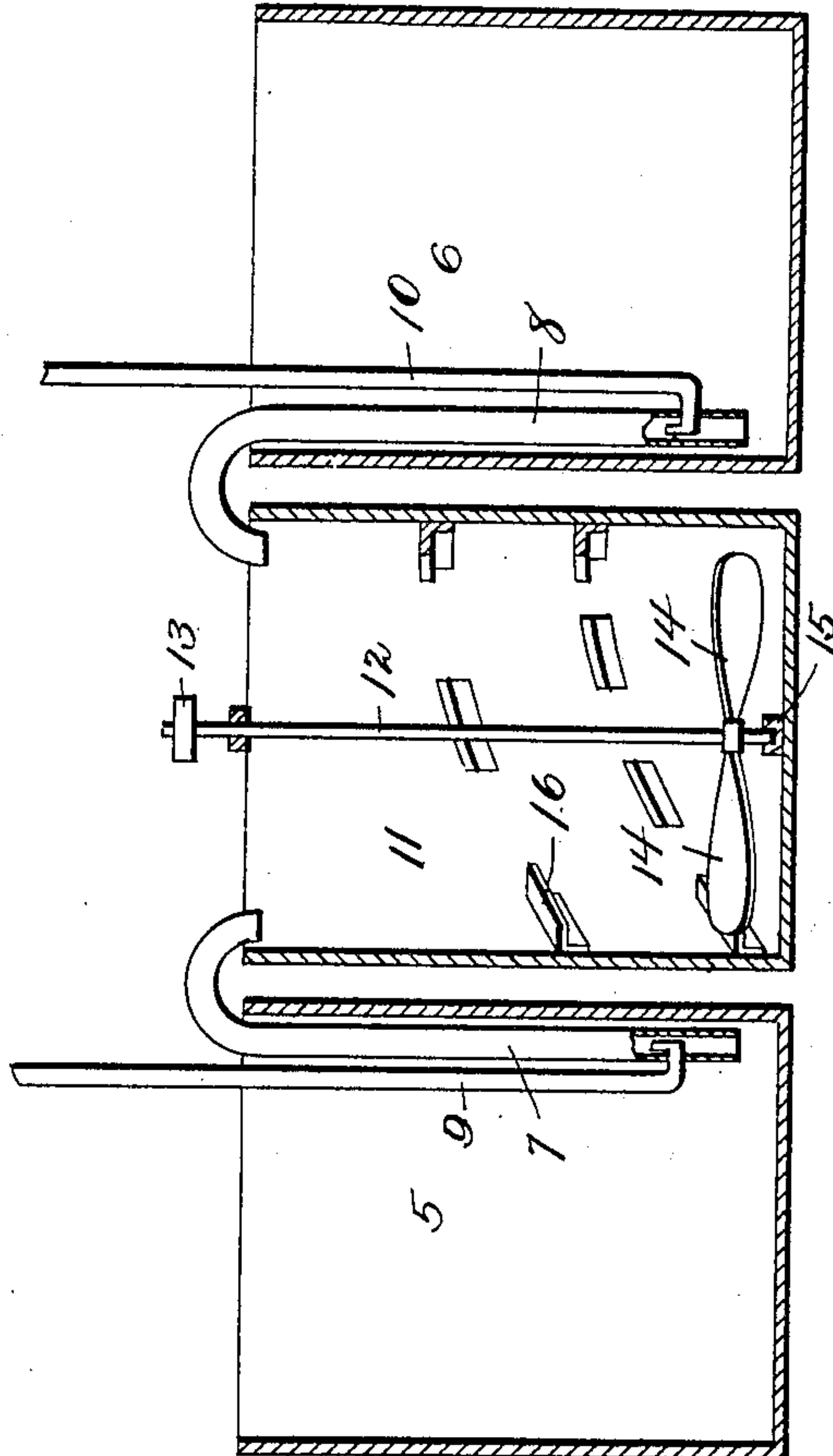


Fig. 4.

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# UNITED STATES PATENT OFFICE.

JOHN T. LEMON, OF COLUMBUS, OHIO, ASSIGNOR OF ONE-HALF TO HARRY M. FRECK, OF COLUMBUS, OHIO.

## WATER-SUPPLY SYSTEM.

No. 904,883.

Specification of Letters Patent.

Patented Nov. 24, 1908.

Application filed July 10, 1908. Serial No. 442,886.

*To all whom it may concern:*

Be it known that I, JOHN T. LEMON, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Water-Supply Systems, of which the following is a specification.

My invention relates to a water supply system and particularly to means for softening the water in its passage through said system and while under pressure.

The objects of the invention are the provision of improved means for supplying a predetermined amount of chemical reagents to the water for the purpose of precipitating the lime, magnesia or other ingredients held in suspension in said water and which render the water hard, and to provide other improvements the details of which will be pointed out hereinafter.

Further objects and advantages of the invention will be set forth in the detailed description which now follows.

In the accompanying drawings: Figure 1 is a diagrammatic view of a water supply system constructed in accordance with the invention, the agitator shaft of the mixing tank being omitted for clearness in illustration, Fig. 2 is a longitudinal vertical section of a settling tank hereinafter described, Fig. 3 is a longitudinal vertical section of a mixing apparatus hereinafter described, Fig. 4 is a vertical section of a valve which I employ in the manner hereinafter set forth, and, Fig. 5 is a detail view of a portion of the mixing mechanism.

Like numerals designate corresponding parts in all of the figures of the drawing.

Referring to the drawings, the numerals 5 and 6 designate tanks adapted to receive suitable water softening ingredients such as soda-ash and lime respectively. Ejector tubes 7 and 8, to the interior of which steam is supplied through steam pipes 9 and 10, are adapted to eject the contents of the tanks 5 and 6 therefrom and to discharge said contents into a mixing tank 11.

An agitator shaft 12 to which power may be applied through a pulley 13, has agitating paddles 14 secured upon the lower end thereof, the lower end of said shaft being journaled as at 15 in the bottom of the tank 11. Inclined ribs 16 are secured to the inner wall

of the tank 11 and serve a purpose which will be hereinafter described. In Fig. 1 the agitator shaft has been removed to illustrate the mechanism for removing the mixed soda-ash and lime from the tank 11. By referring to said Fig. 1, it will be seen that this mechanism comprises a sprocket chain 17 which passes over sprocket wheels 18 and 19. The sprocket wheel 18 is driven from a shaft 20 to which power may be applied through a pulley 21.

Buckets 22 are secured to the sprocket chain and are adapted to dip up the contents of the tank and also control the flow of the softening ingredients which are discharged into a trough 23, the outer end of which overlies a cup 24. A pipe 25 is in communication with the bottom of this cup and said cup contains a float valve 26. This float valve has a depending tapering stem 27 which closes the mouth of the pipe except when the fluid contained in the cup 24 is of sufficient volume to lift the valve 26. The pipe 25 forms the suction or supply pipe of an auxiliary pump 30, which must have a greater capacity than the supply of softening ingredients. The particular construction of this pump has no bearing upon the present invention, as any style of pump may be used.

The discharge pipe 31 of the pump communicates at 32 with the discharge pipe 62 of the main pump, which in turn discharges into a settling tank 33. This settling tank is best illustrated in Fig. 2 and by referring to said figure, it will be seen that it comprises a hollow shell which is closed at each end by heads 34. A perforated plate 35 spans this shell and forms a chamber 36 into which the water from the pump is discharged. Settling cups 37 are secured to the bottom of the tank and sludge pipes 38 lead from said settling cups to a sewer 39. Valves 40 are located in these pipes. The outlet pipe 41 may lead from the settling tank to a suitable filter or to any desired outlet.

Cocks 43 which are somewhat similar to ordinary gage cocks are located at intervals in the sides of the settling tank and provide means for determining the condition of the water in said tank at all times. If desired, live steam or exhaust steam may be admitted to the tank through a pipe 44 to aid in softening the water.



The pulley 21 is driven by a bolt 45 which passes over said pulley and over a pulley 46 upon a shaft 47. This shaft carries a bevel pinion 48 which meshes with a bevel pinion 49, carried by a shaft 50. A pulley 51 which is mounted upon this shaft is connected by a belt 52 with a pulley 53. The pulley 53 is mounted upon a drive shaft 54 of a main pump 55. A smaller pulley 56 is also secured to this shaft and power may be applied to this pulley 56 from any desired source. A connecting rod 57 is connected to cranks 58 of the shaft 54, the opposite end of said connecting rod being connected at 59 to the plunger 60 of a main pump 55. The auxiliary pump 30 is also driven from the shaft 54 by means of a crank 63 and connecting rod 64, said connecting rod being connected by the plunger 65 of the auxiliary pump. It will therefore be seen that the movement of the auxiliary pump is in predetermined relation to the movement of the main pump. It will also be seen that the amount of settling reagents discharged into the cup 24 is in predetermined relation to the speed of the main pump.

The operation of the device is as follows: The tank 5 having been filled with a softening ingredient such as soda-ash and the tank 6 having been filled with another ingredient such as slaked lime, steam is admitted through the pipes 9 and 10 and discharged into the tank 11. The paddles 14 which are revolved by power being applied to the pulley 13, prevent settling of the lime and together with the inclined ribs 16 keep up a constant circulation in the tank, the inclination of said ribs directing the fluid upwardly about the walls of said tank, said fluid descending again to the paddles about the shaft 12. From the tank 11 the mixed softening solution is discharged, through the mechanism described, into the cup 24. When a sufficient quantity of liquid accumulates in this tank, the float 26 lifts and said liquid is permitted to pass to the suction line of the auxiliary pump and by which it is discharged into the settling tank. When this chemically charged mixture reaches the tank, the soda-ash and lime causes a precipitation of the magnesia, lime, and other ingredients which have been held in suspension in the water and the presence of which render said water hard. Water in this condition is unfit for washing purposes, or for use in steam boilers, the lime, magnesia and other ingredients forming a scale in said boilers which tends to clog the flues and interfere with the steaming qualities of said boiler. The matter precipitated, collects along the bottom of the tank and in the cups 37, from whence it may be discharged into the sewer 39 through the sludge pipes 38 by opening the valves 40.

Tests made have shown that while the wa-

ter at the lower part of the tank contains some of the lime, that at the upper part of the tank and particularly at the end nearest the discharge pipe 41, is perfectly clear and free of impurities. The provision of the perforated plate 35 prevents a current from being set up in the tank as the water flows into said tank through the pipe 32. It is obvious that a current in said tank will keep the lime and soda-ash stirred up instead of permitting it to settle. If desired, steam may be admitted through a steam pipe 44 as has hereinbefore been set forth. This will only be done when the temperature of the water may be increased without prejudice to the purpose for which it is being used. When this is done, the impurities held in suspension will be more readily precipitated by the chemicals.

From the foregoing description, it will be seen that a system such as has been herein set forth, is adapted to soften and purify water in a continuous operation. In other words, the supply of chemicals used to cause the precipitation of the impurities in the water are supplied in predetermined relation to the amount of water pumped, and the settling tank is located in the discharge line of the main pump. This renders it possible to purify the water under pressure and without interrupting the supply. Assume for instance, that the suction pipe of the main pump, indicated at 70, leads from a well, and that the pipe 41 leads to the filters which supply a building. It will now be seen that the necessary water pressure to supply the building may be maintained by the main pump in the settling tank, and yet the water may be continuously softened as it passes through said tank. By this operation, the necessity of employing a second pump to impart pressure to the softened water, is obviated.

While the elements shown and described are well adapted to serve the purposes for which they are intended, it is to be understood that the invention is not limited to the precise construction set forth, but includes within its purview such changes as may be made within the scope of the appended claims.

What I claim is:—

In a device of the character described, the combination with a settling tank, of a perforated baffle plate located therein near one end thereof, a service pipe leading from the opposite end thereof, a mixing mechanism comprising a soda-ash tank and a lime tank, a mixing tank, ejectors for discharging the contents of the first named tanks into said mixing tank, an agitator in said mixing tank, a bucket elevator in said mixing tank, a trough into which said bucket elevator discharges, a cup into which said trough discharges, a float valve in said cup, a main

pump, an auxiliary pump, a pipe leading from said cup to the suction line of the auxiliary pump, means for conducting chemicals from the discharge of the auxiliary pump to the tank, means for conducting water from the main pump to a point within the tank between the baffle plate and the adjacent end of the tank, and means for driving both of said pumps and the lifting mechanism from a common source of power. 10

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

JOHN T. LEMON.

Witnesses:

L. CARL STOUGHTON,

A. L. PHELPS.