

D. GOFF.
BOILER FEED.

APPLICATION FILED JAN. 19, 1910.

985,409.

Patented Feb. 28, 1911.

4 SHEETS—SHEET 1.

Fig. 1.

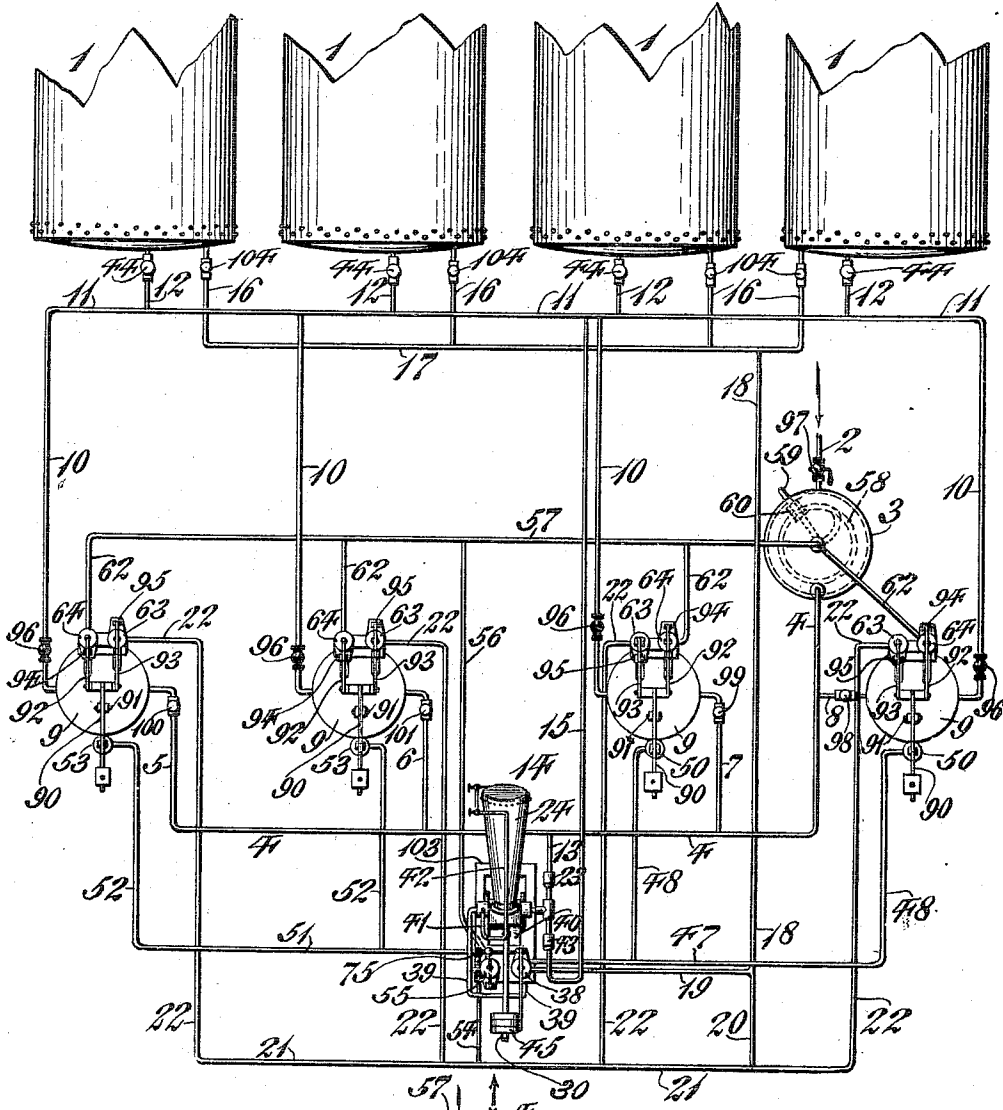
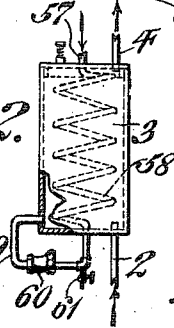


Fig. 2.



WITNESSES

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INVENTOR

Daniel Goff
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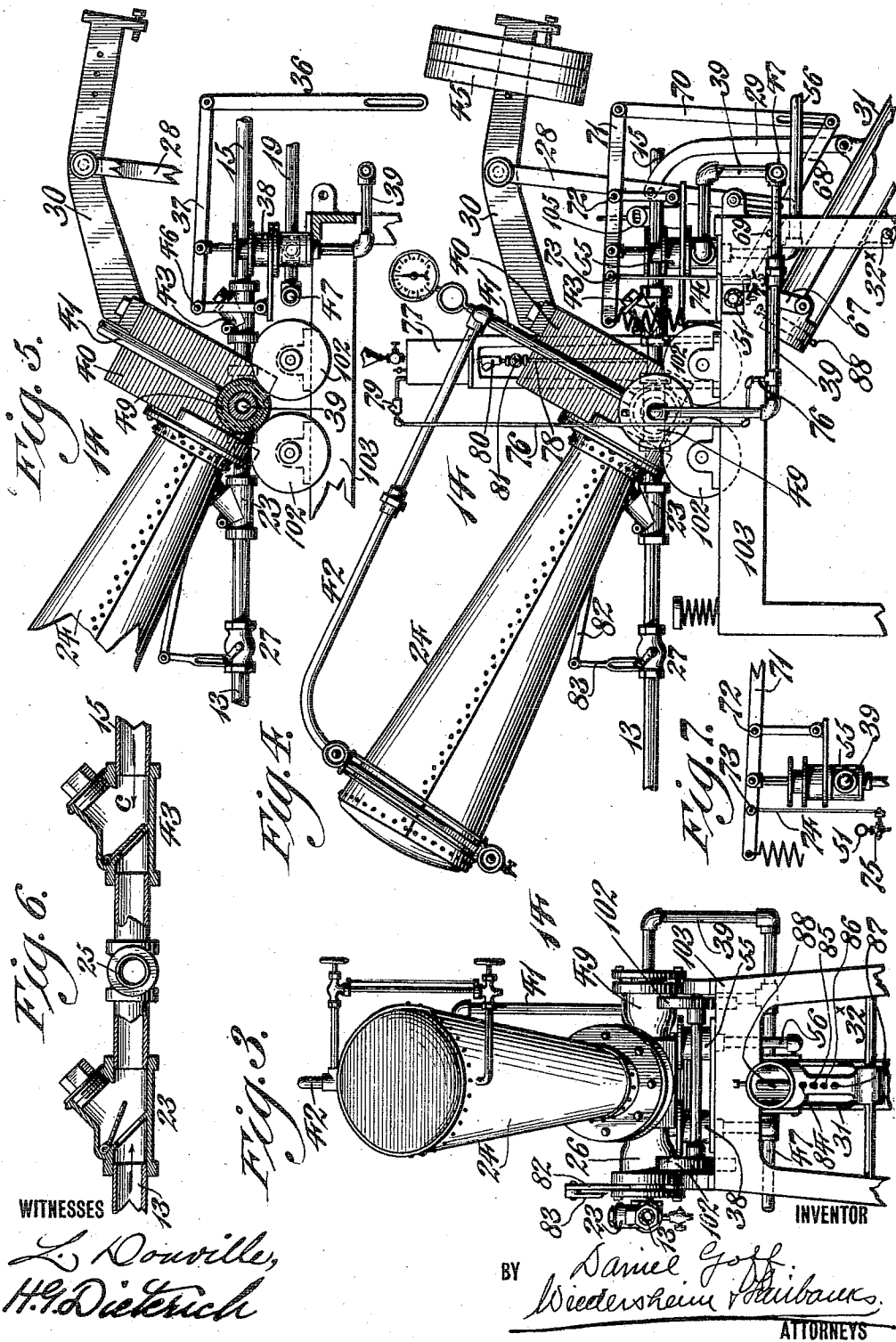
ATTORNEYS

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4 SHEETS—SHEET 3.

Fig. 9.

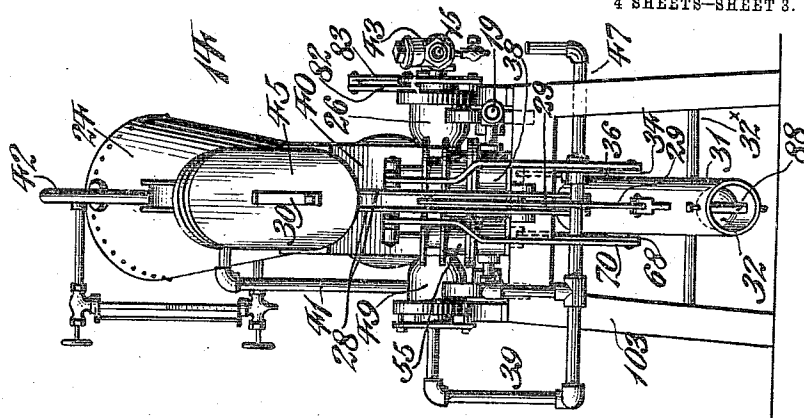


Fig. 8.

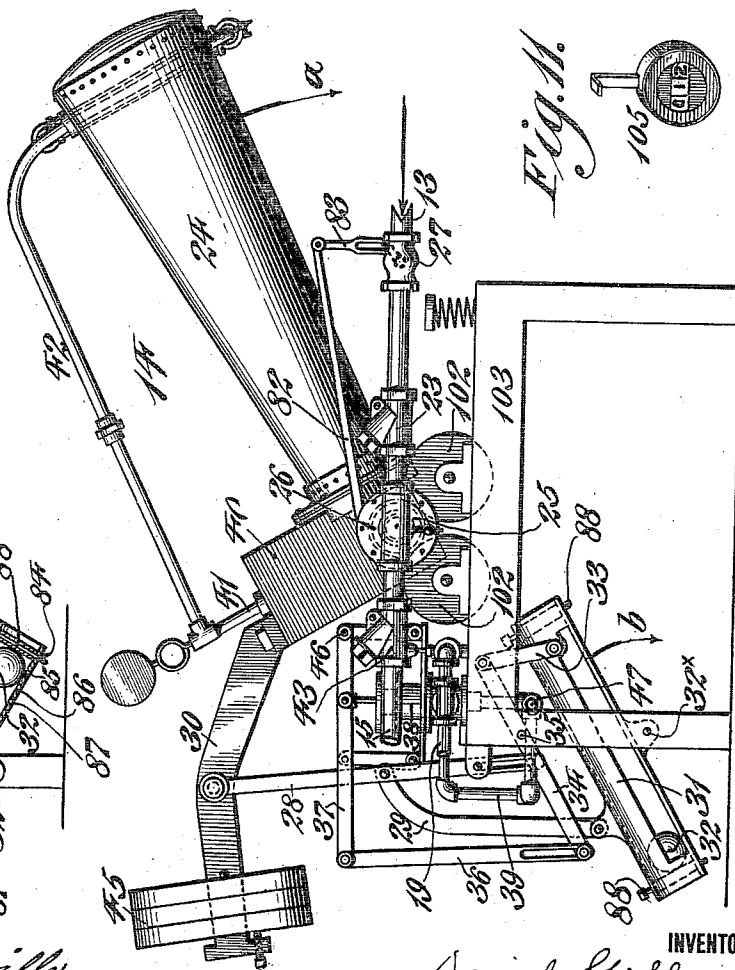
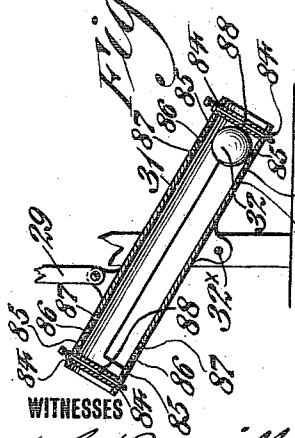


Fig. 10.



WITNESSES

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Fig. 11.



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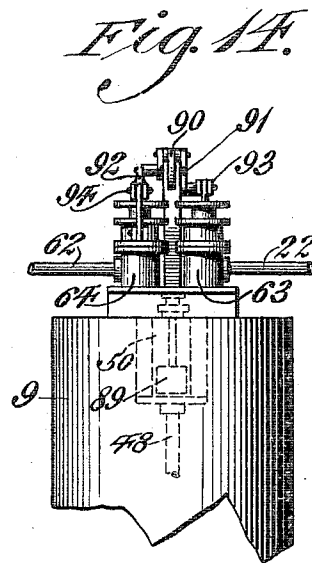
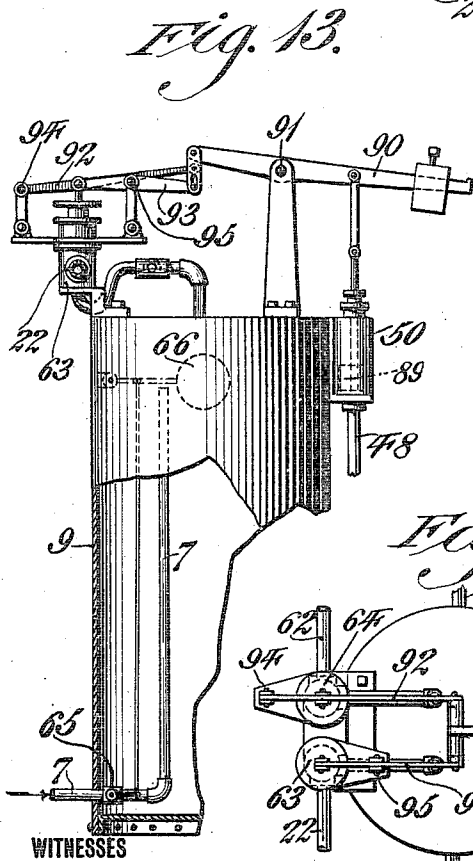
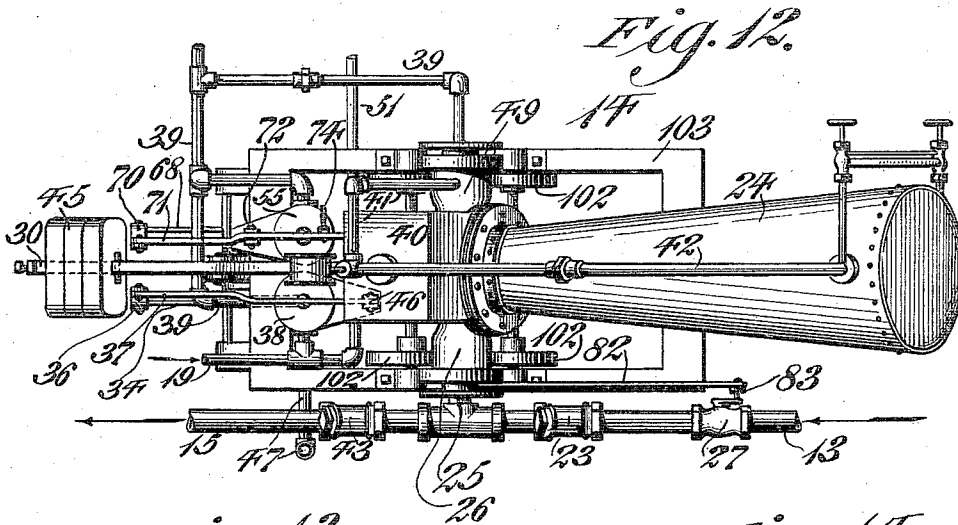
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4 SHEETS—SHEET 4.

985,409.



UNITED STATES PATENT OFFICE.

DANIEL GOFF, OF MILLVILLE, NEW JERSEY, ASSIGNOR TO GOFF GRAVITY BOILER FEED COMPANY, A CORPORATION OF NEW JERSEY.

BOILER-FEED.

985,409.

Specification of Letters Patent.

Patented Feb. 28, 1911.

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To all whom it may concern:

Be it known that I, DANIEL GOFF, a citizen of the United States, residing at Millville, county of Camden, State of New Jersey, have invented a new and useful Boiler-Feed, of which the following is a specification.

My invention relates to a boiler feed, and consists of means for supplying water to boilers and utilizing the steam from the boilers to force the water thereinto.

It further consists of a novel controller which is adapted to be suitably actuated to allow the water to enter tanks or reservoirs and to supply steam from the boilers into said tanks to force the water therefrom into the boiler.

It further consists in providing valves, which are suitably actuated in order to permit the entrance of steam into the tanks for forcing the water therefrom and after the water has been forced therefrom, to permit exhaust of the steam from the tanks.

It further consists in providing a condenser for the exhaust steam.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

Figure 1 represents a diagrammatic view of a plurality of boilers and the boiler feed in connection therewith. Fig. 2 represents an elevation partly broken away of the condenser employed. Fig. 3 represents an end elevation of the controller, with some of the pipes connected therewith. Fig. 4 represents a side elevation thereof. Fig. 5 represents a side elevation of some of the parts shown in Fig. 4 partly broken away. Fig. 6 represents, on an enlarged scale, a pipe for supplying the water to the controller, showing the check valves therein. Fig. 7 represents a side elevation in detached position of one of the valves employed on the controller and showing an auxiliary valve which is used. Fig. 8 represents a side elevation of the controller taken from the other side from that shown in Fig. 4. Fig. 9 represents an end elevation of the controller taken from the opposite end from that shown in Fig. 3. Fig. 10 represents a sectional view, showing a movable weight which is employed. Fig. 11 represents an elevation of a counter which is employed. Fig. 12 represents a plan view of the controller. Fig. 13 represents a side elevation

of a portion of one of the tanks employed with a portion of the same broken away. Fig. 14 represents an elevation, showing the two valves on one of the tanks. Fig. 15 represents a plan view of one of the tanks employed.

I have found in practice that it is essential to have water properly fed to boilers and in the drawings I have shown a construction of a boiler feed which I have found operates successfully in practice and as showing an embodiment of my invention, but I desire it understood that changes may be made in the construction, the arrangement of the parts may be varied and other instrumentalities may be employed, which will come within the scope of my invention, and I do not therefore desire to be limited in every instance to the exact form as heretofore shown and described, but desire to make such changes as may be necessary.

As previously stated, I desire to supply water to a plurality of tanks or reservoirs, the supply of water being controlled by valves in each tank, so that supply of water will be cut off at the proper time. I also desire to employ the steam from the boiler to force the water from these tanks into the boilers and I have provided on each of the tanks valves which are suitably actuated by a controller, in order that the steam will be directed or conducted into the tanks, at the proper time, to force the water therefrom and will then be cut off and exhausted from the tanks.

I have provided a controller which is supplied with water from the same source as the tanks, the supply of water being properly controlled and I also conduct the steam from the boilers to the controller in order to force the water from the controller suitably directing the steam to actuate the valves of the tanks to permit the steam to enter the said tanks.

In the construction shown in Fig. 1, I have shown four boilers and four tanks, it being understood that the two tanks on one side, that is the right of the figure, are arranged to be supplied with water, while the two tanks on the left of the figure are being supplied with steam to force the water therefrom, although this may not be necessary in every instance and I may employ a single tank or any number, as may be desired.

1 designates a plurality of boilers in the

present instance, although one or any other number may be employed and I desire to utilize the steam from the boilers to force water from a suitable supply into the boilers.

2 2 designates a supply pipe leading from any suitable source through which water is fed in a suitable condenser or heater 3.

4 designates a pipe leading from the condenser through which the water passes from the condenser, said pipe 4 having a branch 5 leading therefrom, a branch 6 leading therefrom, a branch 7 leading therefrom and a branch 8 leading therefrom, said branches each communicating with a tank 15 or receptacle 9 whereby it will be understood that water will pass through pipe 4 and through the various branches into the said tanks at the proper time. Leading from each of the tanks is a pipe 10 which communicates with the pipe 11 suitably connected by branches 12 with each of the boilers. Also communicating with the pipe 4 is a branch or water inlet pipe 13 which carries the water to a suitable controller 14 as will be hereinafter described, it being understood, however, that a pipe 15 is in suitable connection with said controller and is adapted to conduct water therefrom back to the pipe 11 and thence into the boilers at the proper time. In order to conduct the steam from the boilers, to force the water from the tanks 9 and controller 14 I provide a branch 16 leading from each of the boilers which branches communicate with a pipe 17, from which leads a pipe 18, which, by means of a pipe 19 communicates with the controller 14 as will be hereinafter described, and which pipe 19 is provided with a branch 20 leading therefrom and connecting with a pipe 21, from which leads branches 22 each of which communicate with the interior of a tank 9, which branches 22 are properly controlled by valve mechanism as will be hereinafter described whereby it will be understood that as steam passes through the branches 16 into pipe 17 it will be directed into the pipe 18 and through pipe 19 into the controller and will also pass through the branch 20 into the pipe 21 from thence it will pass through the branches or pipes 22 to properly enter the tanks 9, it being understood that the controller provides for the proper admission of the steam into the tanks 9, in order to force the water therefrom through the branches 10, pipe 11 and branches 12 into the boilers.

The water from the condenser 3 is directed through the pipe 4 and into the pipe 13 which is provided with a suitable check valve 23, see Fig. 6, so positioned as to allow the passage of the water therethrough in the direction indicated by the arrow in Fig. 6 and the water will pass through the pipe 25 which is in suitable connection with the pipe 13 and will be directed into a tank 24

which forms part of the controller and which is pivotally mounted to oscillate, as will be hereinafter described, it being noted that the said pipe 25, in the present instance communicates with the interior of the tank 24 through the trunnion 26, see Fig. 12, on one side of the tank 24. The pipe 13 is also provided with a valve 27 which is in suitable connection with the tank 24 in order to be opened and closed by the rocking thereof, as will be hereinafter described, and said valve 27 is open when the tank 24 is in its elevated position, as seen in Figs. 3 and 4, 8 and 9. After a sufficient quantity of water has been received in the tank 24 the weight of the water therein will overcome the weights 45 which are suitably connected with said tank 24 at which time the lever will turn with its trunnions 26 and 49 that are in suitable communication therewith in the direction indicated by the arrow *a* in Fig. 8. At the same time the valve 27 which is in suitable communication with the tank 24 by means of the lever 82 and link 83 will be closed and thus cuts off a further supply of water to the tank 24. Suitably connected with the tank 24 is an arm 30 which in the present instance serves to support the weights 45 and connected with the arm 30 is a link 28 to which is suitably connected a link 29 the lower end of which is pivotally connected to the cylinder 31 upon one side of its pivot 32^x, whereby it will be understood that as the tank 24 lowers, the end of the cylinder 31, with which the link 29 is connected, will be elevated by reason of the elevation of the arm 30 and the opposite end of the cylinder 31 will be lowered in the direction indicated by the arrow *b* in Fig. 8.

32 designates a weight or ball freely movable in the said cylinder 31 and as the cylinder 31 is rocked by the movement of the tank 24, the ball will be caused to move from its position seen in Fig. 8 to that seen in Fig. 10 and thus insure the proper rocking movement of the tank 24. Connected with the cylinder 31 upon the opposite side of its pivotal point 32^x is a link 33 which is connected with a lever 34 on one side of its fulcrum 35 the opposite end of said lever 34 having a link 36 connected therewith which is connected with the lever 37, which is pivoted at 46 to a suitable stationary point, while connected to said lever 37 is a valve 38 which controls or is suitably situated in the pipe 19, in order to control the passage of steam from said pipe into the controller and as the position of the cylinder 31 is changed from that seen in Fig. 8, it will be understood that through the medium of the link 33, lever 34, link 36 and lever 37, the valve 38 will be opened and steam from the boilers 1 flowing through pipes 16, 18 and 19 is directed through the valve 38 into the pipe 39 and then through the trunnion 49 and

through pipe 41 into the casing 40 which is in communication with the tank 24 and steam will also pass through pipe 42 and be directed into the upper end of the tank 24 whereby it will be understood that suitable steam pressure is exerted on the water within the tank 24 and casing 40 to force water therefrom. As the tank 24 and its adjuncts are located above the boilers, it will be understood in addition to pressure of the steam within the tank and casing, the force of gravity or weight of the water flowing from the tank and casing, overcomes the pressure in the boilers 1 and opens the valve 43, see Fig. 5, which is situated in the pipe 15, which leads from the pipe 25 and communicates with the pipe 11 which is in communication with the branches 12, so that the water will pass through these pipes into the boilers against the back pressure of steam from said boilers, it being understood that the valve 43 in the pipe 15 is closed under normal conditions by steam pressure from the boilers 81 which is exerted in the direction indicated by the arrow *c* in Fig. 6. It will be noted that the branches 12 are each provided with a check valve 44 to prevent backward flow of water from said boilers 1 but which permit passage of water into the boilers. When the valve 43 is opened the pressure of the water from the tank 24 and casing 40 will serve to hold the valve 23 in the pipe 13 closed so that water cannot pass in that direction but must flow to the boilers. From the above it will be understood that I have directed water from the condenser 3 into the tank 24 in order to lower the same and have conducted steam from the boiler into said tank 24 to force the water therefrom into the boiler 1, it being of course understood that water in the meantime has been fed into the two tanks 9 at the right, as seen in Fig. 1 and I now desire to introduce steam from the boilers into these two tanks 9 in order to exert a pressure therein to force the water therefrom. When the valve 38 is opened as hereinbefore described, in addition to directing the steam from the boilers 1 into the casing 40 and tank 24 it will be understood that some of the steam is directed through pipe 47, which is in communication with the pipe 39 into the branch pipes 48, each of which discharges into a suitable cylinder 50, carried by the tanks 9 in any suitable manner, as will be best understood from Figs. 1 and 13, and will operate the piston 89 in each of said cylinders to elevate the same. The piston 89 is connected with the weighted lever 90 pivoted at 91 to a suitable stationary point, the other side of said lever being connected with a lever 93 which is in suitable communication with a valve 63 which controls the pipe 22 which it will be understood is in communication with the boilers 1 and is conducting

steam therefrom. When the piston 89 is elevated the valve 63 is opened and steam is permitted to enter the two tanks 9 to the right as seen in Fig. 1 and forces the water therefrom through pipes 10 into the pipe 11 and through branches 12 into the boilers 1. 64 designates a second valve adjacent the first valve 63 which is in suitable connection with a lever 92, pivotally supported at 94 and which is in suitable connection with the weighted lever 90 in such a manner that the said valve 64 is closed when the valve 63 is opened and vice versa.

When the tank 24 and casing 40 are emptied of water, as previously described, the weights 45 will act to raise the tank 24 and by reason of this the links 28 and 29 are lowered and also the end of the cylinder 31 in the position seen in Fig. 8 which thus through the medium of the links 33, lever 34, link 36 and lever 37 actuates the valve 38 to close the same thus cutting off the supply of steam which is exerted beneath the piston 89, and the weighted end of the lever 90 always will fall, closing the valve 63, on the two tanks to the right in Fig. 1 and opening the valves 64, immediately upon which the steam in the two tanks can exhaust from the pipe 62 in communication with the valve 64 and will be directed into the pipe 57 which is in communication with the coil 58 in the condenser 3 and will pass through pipe 59 and be directed into the interior of the condenser 3, as will be understood from Fig. 2, it being noted that the pipe 59 is provided with the check valve 60 to prevent water in the condenser from entering the coil pipes 58, while the pet cock 61 is provided, which, when opened, will permit the condensed steam in the coil to escape therefrom. Also connected with the cylinder 31 is a link 67 which is connected with a lever 68 pivoted at 69, which is in suitable connection with a link 70 connected with one end of the lever 71 pivoted at 72, said lever being in suitable communication with a valve 55, suitably positioned with respect to the valve 38 and connected in such a manner by reason of the pivotal point of the lever 71, that when the cylinder 31 is rocked when one valve is opened the other is closed, whereby it will be understood that as the tank 24 is elevated after having been emptied of water the cylinder 31 is rocked in order to open the valve 55 and the steam from the interior of the tank 24 and casing 40 will exhaust through the pipe 39 and valve 55 into the pipe 56 which is controlled by said valve and will be directed into the pipe 57 and thus into the coil 58 as previously described with respect to the exhaust from the two tanks 9, while the steam from the pipes 47 and 48 and the cylinders will likewise exhaust as the pipe 47 is in communication with the pipe 39. Connected with

the lever 71 at 73 is a bar or rod 74, which is connected with a two-way valve 75 which controls the pipe 51 which is in communication with the branch pipe 54 leading from the pipe 21, said pipe 51 having branches 52 therefrom, each communicating with a cylinder 53 similar to the cylinders 50, said cylinders 53 being respectively mounted on the tanks 9 at the left of Fig. 1 and said cylinders 53 each having a piston 89 similar to that already described, the rest of the operating parts being the same as that described with respect to the two tanks at the right of Fig. 1 and it is deemed unnecessary to describe these tanks and operating parts, it being understood that as the lever 71 is operated to open the valve 55 it will at the same time operate the valve 75 to open the pipe 51 to the pipe 54, whereupon as steam passes through the pipe 51 and branches 52 to the cylinders 53 of the two tanks to the left in Fig. 1, so that the pistons 89 thereof are properly actuated to open the valves 63 on said tanks and steam from the pipes or branches 22 will pass into these tanks and force the water therefrom through pipes 10 into the pipes 11 and through the branches 12 into the boilers 1 whereby it will be understood that these tanks will be emptied. It will be understood that as soon as the tank 24 is rocked again the lever 71 is operated to close the valve 75 so that the steam from the cylinders 53 and pipes 51 and 52 can exhaust, at which time the valves 63 are closed and the valves 64 opened, on the tanks on the left hand of Fig. 1 so that the steam therefrom can exhaust through the pipes 62 and 57 into the coil 58 to the condenser 3. In the meantime, water has been permitted to flow into the tanks 9 at the right of Fig. 1, the amount of water in each of the tanks being controlled by a float 66, each of the tanks 9 being supplied with a float and each of which is in suitable communication with a valve 65, each of the branches 5, 6, 7 and 8, through which water is conducted, being provided with a valve, so that when the float 66 is elevated to the proper level in a tank 9 the further supply of water is cut off. Immediately that the tank 24 is elevated the valve 27 is opened again and water is again permitted to flow into the tank 24 as previously described and lower the same again, the operation of the parts being similar to that already set forth as above. In order to prevent the steam in the tanks 9 from forcing water back through the various branches in the condenser 3, I have provided the branch 8 and check valve 98 in branch 6 and check valve 101 and in the branch 5, check valve 100 which will serve to prevent improper movement of the water. I also provide suitable check valves 96 in the branches 10 to prevent the water from coming from the boilers back into the tanks

9 and I provide check valves 104 in the branch pipe 16 to prevent steam from returning to the boilers after it is passed therefrom. I preferably desire to supply the water which is fed to the boilers with suitable boiler compound and I have shown in Fig. 4 a tank 77 which is adapted to receive the compound. Leading from the steam supply pipe 39 is a pipe 76 which conducts steam from said pipe 39 and discharges the same into the upper portion of the tank 77, a suitable valve 79 being situated in pipe 76 to prevent steam from backing up.

78 designates a pipe leading from the tank 77 and communicating with pipe 15 so that the boiler compound will be discharged into the water as it passes through pipe 15 and is directed into the boilers. In said pipe 78 I provide a valve 81 which can be suitably regulated to supply the requisite amount of boiler compound to the water and I also provide a valve 80 which will prevent water from backing up and being forced into the tank 77 as will be evident. I desire it understood that the parts may be supported in any desired or suitable manner and in the drawings I have shown rollers 102 which support the trunnions 26 and 49 of the tank 24 and its adjuncts, said rollers in the present instance being supported on the frame 103, which supports the controller.

The operation is as follows:—Assuming the several parts of this device to be in the positions indicated in the drawings, water from a suitable source of supply flows through the pipe 2 and passing through the cock 97 enters the condenser or heater 3 and passes therefrom through the pipe 4 and is directed thereby to the branch pipe 8 and passing through the check valve 98 enters the tank 9 at the right hand end of the series of tanks 9 seen in Fig. 1, until the float 66 in said tank is raised to close the valve 65. The water in the pipe 4 also enters the branch pipe 7 and passing through the check valve 99 enters the tank 9, that is, in communication with the branch 7 until the proper height of water is reached. The water in the pipe 4 also enters the branch pipe 13 and passing through the check valve 23 enters the tank 24 and the water from the pipe 4 also enters the branches 5 and 6 and passing through their respective check valves 100 and 101 enters the tanks 9 to the proper height.

When the weight of the water within the tank 24, as fed thereto from the condenser 3, exceeds that of the weights 45 and the ball 32 said tank turns on its trunnions 26 and 49 and in the direction indicated by the arrow *a* in Fig. 8.

The tank 24 in moving in the direction indicated by the arrow *a* depresses the arm 82 and link 83, thus closing the valve 27 and

shutting off the supply of water from the condenser 3 to the tank 24.

The downward movement of the tank 24 elevates the arm 30, links 28 and 29, causing the cylinder 31 to move in the direction indicated by arrow *b* in Fig. 8, which opens the valve 38 and closes the valve 55.

Steam from the boilers passes through the branches 16, pipe 17 and pipe 18, to the pipe 20 and 21 and through the branches 22 is stopped by the valves 63 until opened, as hereinafter described. Steam is also in the pipe 19 and when the valve 38 is opened as described, the steam passes thence to the pipes 39, 41 and 42 and discharges into the tank 24 and casing 40 so as to exert a downward pressure on the water within said tank causing it to flow therefrom through check valve 43 and pipes 15, 11 and 12 and check valves 44 and discharge into the boilers 1. It is to be understood that the water as forced through the pipes 11 and 10 by the controller 14 cannot enter the tanks 9 on account of the check valves 96. Steam from the boilers 1 passing through the open valve 38 also flows through the pipes 39, 47 and 48 and enters the cylinders 50 thus elevating the piston 89 therein so as to turn the lever 90 on its fulcrum 91 as will be understood from Figs. 1 and 13.

The turning of the lever 90, due to the upward movement of the piston 89, operates the levers 92 and 93 so as to open the valves 63 and close the valves 64 that cooperate with the tanks 9 that are supplied with water through the branch pipes 7 and 8, that is the two tanks 9 to the right in Fig. 1.

Steam from the boilers 1 after passing through the pipes 16, 18, 20, 21 and 22 reaches the valves 63 and since said valves 63 that cooperate with the tanks 9 are supplied with water by the pipes 7 and 8 are open, as hereinbefore described, live steam passes through the same and enters their respective tanks 9 so as to exert a downward pressure on the water within said tanks and force the water therefrom through the valves 96 and pipes 10 to the pipes 11 and 12 and finally through the check valves 44 into the boilers 1.

It is to be understood that steam in branches 22 cannot pass through the valves 63 that cooperate with the tanks 9 as supplied with water through the branches 5 and 6, that is the two tanks to the left in Fig. 1, on account of their being closed when the tank 24 is in its lowered position.

When the water has been discharged from the tank 24 the weights 45 return said tank to its elevated position as seen in Fig. 8, it being understood that in doing this said tank 24 turns with its trunnions 26 and 49 on the rollers 102 and in a direction opposite to that indicated by the arrow *a*. The upward movement of the tank 24 closes the

valve 38 and shuts off the supply of steam to said tank 24 and also to the cylinders 50 that cooperate with the tanks 9 fed with water through the branches 7 and 8.

As soon as the pressure is released in the cylinders 50 the pistons 89 fall or lower carrying with them the end of the lever 90 which actuates the lever 93 to close the valve 63 so that no further steam is permitted to enter the tanks 9 to the right of Fig. 1 and the valve 64, however, is opened permitting the exhaust of the steam from these tanks 9 through pipes 62 back into the condenser. In the meantime, the water having been forced from said tanks 9 the float valves 66 therein are lowered in order to open the valves 65 and the water will again be directed in these tanks to the proper height.

When the tank 24 has reached its elevated or normal position seen in Fig. 7, it opens the valve 55 by reason of the lowering of the arm 30 that cooperates with the link 28, link 29, cylinder 31, link 67, lever 68, link 70 and lever 71, connected with said valve as will be understood from Fig. 4.

As soon as the valve 55 is opened the steam within the tank 24 escapes therefrom through the pipes 42, 41, 39 and valve 55 and passing through the pipes 56 and 57 enters the coil 58 as exhaust steam and discharges through the pipe 59 into the condenser 3.

When the tank 24 is in its elevated position, in addition to opening the valve 55 it also opens the valve 75 which as hereinbefore described is a two-way valve. The opening of the valve 75 is accomplished through the lever 71 and rod 74, as will be understood from Fig. 7.

When the valve 75 is open the steam from the pipe 21 passes through the pipe 54 to the pipe 51 and to the cylinders 53 and thus on the underside of the piston 89, which elevates the pistons therein and so opens the valves 63 and the steam from the pipes 22 passes into the tanks 9 at the left in Fig. 1 and forces the water into the boilers 1. When the tank 24 lowers again, the valve 75 is actuated to close the communication with the pipe 54 and open the pipe 51 to exhaust to the atmosphere. This causes the piston 89 to lower and in so doing operates the levers 90, 92 and 93 so as to close the valves 63 and open the valves 64 that cooperate with the tanks 9 as supplied with water by the branch pipes 7 and 8. When said valves 63 are closed the supply of steam to their receptive tanks 9 is shut off while at the same time the opening of the valves 64 permits the steam within said tanks to escape therethrough and flowing through the pipes 62 and 57 enters the coil of pipe 58 in the condenser 3.

It is apparent from the foregoing description that when the two tanks 9 on the

right of the controller 14 in Fig. 1 are filling with water, the two tanks 9 on the left of said controller 14 are discharging water into the boilers 1 and vice versa.

5 The controller 14 is provided with a registering device 105 of any well known description, seen in Figs. 4 and 11, that is adapted to indicate the number of oscillations of the tank 24 in a given time, it being observed that said registering device is operated by the lever 71.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

15 1. In a device of the character stated, a plurality of boilers, a plurality of tanks each in communication with each of said boilers, means for conducting water into said tanks, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, and a controller for opening and closing said valves whereby the steam is admitted at the proper time into said tanks for forcing water therefrom into said boilers.

25 2. In a device of the character stated, a plurality of boilers, a plurality of tanks each in communication with each of said boilers, means for conducting water into said tanks, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, a controller for opening and closing said valves whereby the steam is admitted at the proper time into said tanks for forcing water therefrom into said boilers, and means for exhausting the steam from said tanks when the valves are closed.

40 3. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting water into said tanks, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, a controller for opening and closing said valves whereby the steam is admitted at the proper time into said tanks for forcing water therefrom into said boilers, means for exhausting the steam from said tanks when the valves are closed, and a condenser into which the exhaust steam is directed.

50 4. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting water into said tanks, means for conducting steam from said boilers into said tanks, a valve controlling the steam conducting means for each tank, a controller for opening and closing said valves whereby steam is admitted at the proper time into said tanks for forcing water therefrom into said boilers, means for exhausting the steam from said tank when the valves are closed, a condenser, and means for conducting exhaust steam from said tanks into said condenser.

5. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting water into said tanks, means for controlling the supply of water to the tanks, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, means for conducting the water from said tanks into each of said boilers, and a controller for opening and closing said valves whereby steam is introduced at the proper time into said tanks to force the water therefrom into the boilers.

6. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting water into said tanks, means for controlling the supply of water to said tanks, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, a controller for opening and closing said valves, whereby steam is introduced at the proper time into said tanks, means for intermittently supplying water to said controller, and means for conducting steam from the boiler into said controller at the proper time for forcing the water therefrom into said boilers.

7. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting water into said tanks, means for controlling the supply of water to said tanks, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, a controller for opening and closing said valves, whereby steam is introduced at the proper time into said tanks, means for intermittently supplying water to said controller, means for conducting steam from the boiler into said controller at the proper time for forcing the water therefrom into said boilers, and means for exhausting the steam from the tanks and controller.

8. In a device of the character stated, a plurality of boilers, a plurality of tanks mounted to operate in pairs, means for conducting water into said tanks, means for controlling the supply of water, means for conducting steam from said boilers into said tanks, valves for controlling said water conducting means, and a controller adapted to be actuated to open the valves of one pair of tanks at one time and the valves of another pair of tanks at another time, whereby steam is admitted alternately into the pairs of tanks for forcing the water therefrom into the boilers.

9. In a device of the character stated, a plurality of boilers, a plurality of tanks a connection between each of said tanks and each of said boilers, means for conducting water into said tanks, means for controlling the supply of water, means for conducting steam from said boilers into said tanks,

valves for controlling said steam conducting means, a controller, means for supplying water thereto, means for controlling said water supply, means for introducing steam into said controller from the boilers, and means for conducting steam from the controller to actuate the valves at the proper time whereby steam will be admitted into the tanks in order to force the water therefrom into the boilers.

10. In a device of the character stated, a boiler, a tank, pipe connection between said tank and said boiler, means for supplying water to said tank, a steam connection between said boiler and said tank, a valve controlling said steam connection, a controller, a connection between said controller and said valve, means for introducing water into said controller for actuating the same, means for introducing steam from the boiler into said controller, and means for conducting steam from the boiler to actuate said tank valve for opening the same whereby steam is admitted into said tank to force the water therefrom into said boiler.

11. In a device of the character stated, a boiler, a tank, water connection between said tank and said boiler, means for supplying water to said tank, a steam connection between said tank and said boiler, a valve controlling said steam connection, a plunger suitably connected with said valve, a rocking tank, means for introducing water into said rocking tank for actuating the same, means for introducing steam from the boiler into said rocking tank and means controlled by said rocking tank for admitting steam from said boiler to actuate said plunger to open said valve whereby steam from the boiler will be admitted into said tank to force water therefrom into said boiler, and means for cutting off the supply of steam whereby said plunger lowers and closes said valve.

12. In a device of the character stated, a boiler, a tank, means for supplying water to said tank, a water connection between said boiler and tank, a steam connection between the boiler and tank, a valve controlling said steam connection, an exhaust valve, a lever suitably connected with said valves whereby when one valve is opened the other is closed, means for conducting steam from the boiler to actuate said lever in order to open and close the valves, a rocking tank for controlling said steam conducting means, means for introducing water into said rocking tank for actuating the same, and means for introducing steam from the boiler into said rocking tank.

13. In a device of the character stated, a boiler, a tank, a water connection between said tank and boiler, means for supplying water to said tank, means for controlling said water supply, a steam connection be-

tween said boiler and tank, a valve controlling said steam connection, an exhaust valve in said tank, connections between said valves whereby when one is opened the other is closed, a rocking tank for opening and closing said valves by steam from the boiler means for introducing water into said rocking tank for actuating the same, and means for introducing steam from the boiler into said rocking tank.

14. In a device of the character stated, a boiler, a tank, a water connection between said boiler and tank, a steam connection between said boiler and tank, a valve controlling said steam connection, an exhaust valve, connections between said valves whereby when one valve is opened the other is closed, a plunger secured to said connections, a rocking tank for actuating said plunger by the steam from the boiler for opening and closing the valves, means for supplying water to said tank to actuate the same, means for introducing steam from the boiler into said tank, and means for controlling the water supply.

15. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting water into said tanks, means for controlling the supply of water, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, a rocking tank, a pipe for conducting water from a suitable source into said rocking tank, a valve for controlling said water pipe and adapted to be closed when the rocking tank lowers, means for normally holding said rocking tank in elevated position, a steam connection between said rocking tank and each of said boilers, a valve for controlling said steam connection and adapted to be opened when said rocking tank is lowered whereby steam will enter said rocking tank and force the water therefrom, and water connection between said rocking tank and each of said boilers through which the water passes from said rocking tank into said boilers and connections between said tanks and said boilers and between said rocking tank and said boilers for conducting the water from said tanks and said rocking tank into said boiler.

16. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting steam into said tanks, means for controlling the supply of water, means for conducting steam from said boilers into said tanks, valves for controlling said water conducting means, a rocking tank, a pipe for conducting water from a suitable source into said rocking tank, a valve for controlling said water pipe and adapted to be closed when the rocking tank lowers, means for normally holding said rocking tank in elevated position, a steam connection

between said rocking tank and to each of said boilers, a valve for controlling said steam connection and adapted to be opened when said rocking tank is lowered whereby steam will enter said rocking tank and force the water therefrom, water connection between said rocking tank and to each of said boilers through which the water passes from said rocking tank into said boilers, connections between said tanks and said boilers and between said rocking tank and said boilers for conducting the water from said tanks and said rocking tank into said boiler, and means for exhausting the steam from said rocking tank.

17. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting water into said tanks, means for controlling the supply of water, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, a rocking tank, a pipe for conducting water from a suitable source into said rocking tank, a valve for controlling said water pipe and adapted to be closed when the rocking tank lowers, means for normally holding said rocking tank in elevated position, a steam connection between said rocking tank and each of said boilers, a valve for controlling said steam connection and adapted to be opened when said rocking tank is lowered whereby steam will enter said rocking tank and force the water therefrom, water connection between said rocking tank and each of said boilers through which the water passes from said rocking tank into said boilers, connections between said tanks and said boiler and between said rocking tank and said boilers for conducting the water from said tank and said rocking tank into said boiler, means for exhausting steam from said rocking tank, and a condenser to which the exhaust steam is conducted.

18. In a device of the character stated, a boiler, a rocking tank suitably supported, a steam connection between said boiler and said rocking tank, a pipe for supplying water to said tank from a suitable source, a valve in said pipe adapted to be closed when said tank is lowered by the water therein in order to cut off the supply, a weight for normally holding said tank in elevated position and for returning the same thereto when the water has been discharged from said tank, a valve for controlling the steam connection to said tank and adapted to be opened when the tank lowers whereby steam from the boiler forces the water therefrom, a water connection between said rocking tank and said boiler, and a movable weight in suitable connection with the controlling valves and the tank and adapted to assist in the rocking of said tank.

19. In a device of the character stated, a

boiler, a rocking tank suitably supported, a steam connection between said boiler and said rocking tank, a pipe for supplying water to said tank from a suitable source, a valve in said pipe adapted to be closed when said tank is lowered by the water therein in order to cut off the supply, a weight for normally holding said tank in elevated position and for returning the same thereto when the water has been discharged from said tank, a valve for controlling the steam connection to said tank and adapted to be opened when the tank lowers whereby steam from the boiler forces the water therefrom, a water connection between said rocking tank and said boiler, a movable weight adapted to assist in the rocking of said tank, a cylinder in suitable connection with the controlling valves and said tank, and a freely movable weight in said cylinder adapted to insure the proper rocking of said tank.

20. In a device of the character stated, a boiler, a rocking tank, means for supplying water to said rocking tank, a water connection between said boiler and rocking tank, a steam connection between the boiler and rocking tank, a valve controlling said steam connection, an exhaust valve, means connected with said valves whereby when one valve is opened the other is closed, means in suitable connection with said rocking tank and with said valve connecting means whereby the movement of said rocking tanks actuates said valves in order to open and close the same, a cylinder, connections between said cylinder and said rocking tank whereby the cylinder will be rocked when the rocking tank is rocked, and a movable weight in said cylinder adapted to insure the proper rocking of the parts.

21. In a device of the character stated, a boiler, a rocking tank, a weight for normally holding said tank in elevated position and returning the same thereto, a pipe for conducting water into said tank, a valve controlling said pipe adapted to close when said tank is lowered by the water therein, a steam connection between said tank and said boiler, a valve for controlling said steam connection and adapted to be opened when the tank is lowered, a cylinder pivotally supported and suitably connected with the controlling valves and said rocking tank, a freely movable weight in said cylinder adapted to insure proper rocking of said tank, and lever connections between said valve and said cylinder whereby said valve is actuated to admit steam and to cut off the supply at the proper time.

22. In a device of the character stated, a boiler, a rocking tank, a pipe for conducting water into said tank, a valve controlling said pipe and actuated by the movement of the rocking tank for opening and closing the same, a pipe for conducting water from the

tank into the boiler, a pipe for conducting steam from the boiler into said tank, a valve controlling said steam pipe, connections between said valve and said tank whereby said valve is opened when the tank lowers, a reservoir for containing a boiler compound and in suitable communication with the pipe for carrying the water from the tank to the boiler, and means for introducing steam into said reservoir intermittently in order to force a suitable amount of the compound therefrom into the water.

23. In a device of the character stated, a boiler, a rocking tank, a pipe for conducting water into said tank, a valve controlling said pipe and actuated by the movement of said tank for opening and closing the same, a pipe for conducting steam from the boiler to said rocking tank, a valve controlling said steam pipe, connections between said rocking tank and said valve for operating the latter whereby the same is opened when the tank is lowered, a reservoir for receiving a boiler compound, and a pipe leading from said steam pipe to the reservoir whereby steam will be admitted intermittently thereinto to force a suitable amount of the compound therefrom, and a connection between said reservoir and the pipe for conducting the water from the tank to the boiler whereby the water will be properly supplied with a boiler compound.

24. In a device of the character stated, a boiler, a tank, means for conducting water into said tank, means for controlling the water supply, a water pipe between said tank and said boiler, a steam pipe between said tank and boiler, a valve controlling said steam pipe, a rocking tank, a pipe for conducting water thereinto suitably controlled, a weight for holding said rocking tank in elevated position and adapted to return the same to its elevated position after being lowered by the water therein, a steam pipe between said rocking tank and said boiler, a valve controlling said steam pipe, connections between said valve and said rocking tank for actuating the valve whereby the same is opened when the tank is lowered, and a steam pipe adapted to conduct steam to actuate said tank valve for opening the same to permit steam from the boiler to enter said tank to force the water therefrom into said boiler.

25. In a device of the character stated, a boiler, a stationary tank, a pipe for conducting water from said stationary tank to said boiler, a pipe for conducting steam from said boiler to said stationary tank, a valve controlling said steam pipe, a pipe for conducting water to said stationary tank, a rocking tank, a pipe for conducting water thereinto, means for controlling the supply of water to said rocking tank, means for normally holding said rocking tank in ele-

vated position and for returning the same thereto, a pipe for conducting the water from said rocking tank to said boiler, a pipe for conducting steam from said boiler to said rocking tank, a valve for controlling said steam pipe, connections between said valve and said rocking tank whereby the valve is opened and closed, and a pipe for conducting steam from said rocking tank steam pipe to actuate said stationary tank valve whereby steam is admitted into said tank for forcing water therefrom into the boiler.

26. In a device of the character stated, a boiler, a stationary tank, a pipe for conveying water from said tank to said boiler, a pipe for conveying steam from the boiler to the tank, a valve controlling said steam pipe, a weighted lever connected with said valve, a piston connected with said weighted lever, a pipe for conducting water to said tank, a rocking tank, a pipe for conducting water to said rocking tank, means for cutting off the supply of water at the proper time, means for holding said rocking tank in elevated position and returning the same thereto, a pipe for conducting water from said rocking tank to said boiler, a pipe for conducting steam from said boiler to said rocking tank, a valve controlling said steam pipe, connections between said valve and said rocking tank whereby said valve is opened when the tank is lowered, and a pipe for conducting steam from the rocking tank steam pipe and directing the same to the piston for actuating the same in order to open and close said stationary tank valve whereby steam will be admitted into said tank for forcing the water therefrom.

27. In a device of the character stated, a boiler, a tank, means for supplying water thereto, a steam connection between said boiler and said tank, a valve controlling said steam connection, a rocking tank, a pipe for conducting water into said rocking tank, a valve for controlling said water pipe adapted to be closed when the rocking tank lowers, means for normally holding said rocking tank in elevated position, a steam connection between said rocking tank and said boiler, a valve controlling said steam connection, connections between said valve and said rocking tank whereby said valve is opened when the rocking tank is lowered, and means for conducting steam to said tank valve for opening the same whereby steam from the boiler enters said tank and forces the water therefrom into the boiler.

28. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting water into said tanks, a steam connection between said tanks and said boilers, a valve controlling each of said steam connections, a pipe from each tank forming a communication between its tank and the boilers, a rocking tank, means for

normally holding said rocking tank in elevated position and for returning the same thereto, means for supplying water to said tank, means for controlling said supply, a
 5 steam connection between said boilers and said rocking tank, a valve controlling said steam connection to the rocking tank and adapted to be actuated to open the same when the tank is lowered, a pipe in suitable
 10 communication with the rocking tank valve and with the valves of two of the stationary tanks for conducting steam to actuate the steam controlling valves of the two tanks, a
 15 pipe in suitable connection with the steam supply pipe of the rocking tank and adapted to conduct steam to actuate the steam controlling valves of the two other tanks, and a
 20 valve controlling this last mentioned pipe adapted to be properly actuated to open and close the same whereby steam will be directed to actuate the valves of two of the tanks at one time and two of the tanks at the other.

29. In a device of the character stated, a
 25 plurality of boilers, a plurality of tanks, means for conducting water into said tanks, means for controlling the supply of water to said tanks, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, a
 30 controller for opening and closing said valves, whereby steam is introduced at the proper time into said tanks, and means for conducting steam from the boiler into said controller

at the proper time for forcing the water therefrom into said boilers. 35

30. In a device of the character stated, a plurality of boilers, a plurality of tanks, means for conducting water into said tanks, means for controlling the supply of water to
 40 said tanks, means for conducting steam from said boilers into said tanks, valves for controlling said steam conducting means, a controller for opening and closing said valves, whereby steam is introduced at the proper
 45 time into said tanks, means for conducting steam from the boiler into said controller at the proper time for forcing the water therefrom into said boilers, and means for exhausting the steam from the tanks and controller. 50

31. In a device of the character stated, a boiler, a tank, water connection between said tank and said boiler, means for supplying
 55 water to said tank, a steam connection between said tank and said boiler, a valve controlling said steam connection, a plunger suitably connected with said valve, and means for admitting steam from said boiler to
 60 actuate said plunger to open said valve whereby steam from the boiler will be admitted into said tank to force water therefrom into said boiler.

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Witnesses:

WM. CANER WIEDERSEIM,
 C. D. McVAY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."