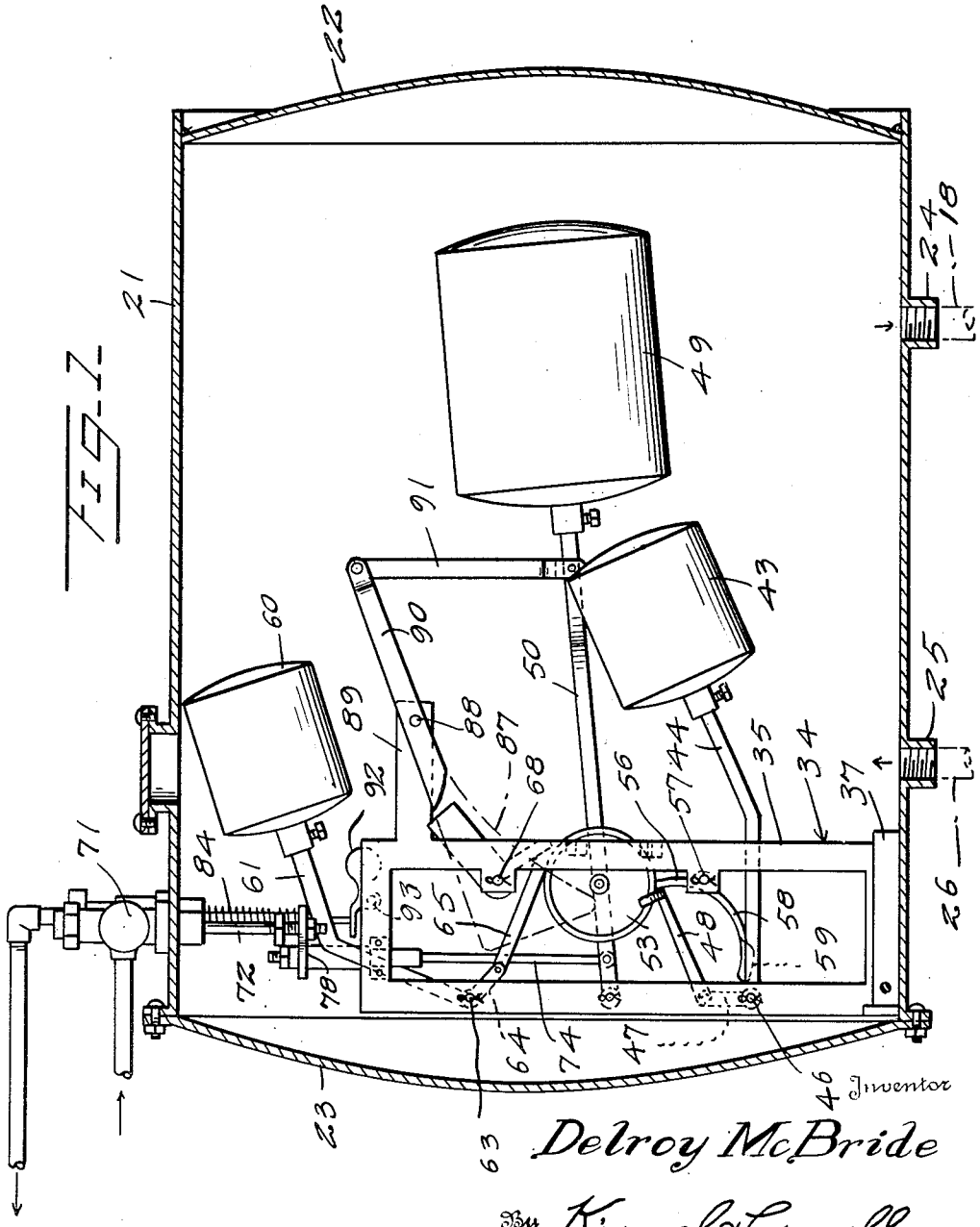
Nov. 6, 1951 D. McBRIDE 2,574,341

BOILER FEED TRAP

Filed Feb. 19, 1947 4 Sheets-Sheet 1



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BOILER FEED TRAP

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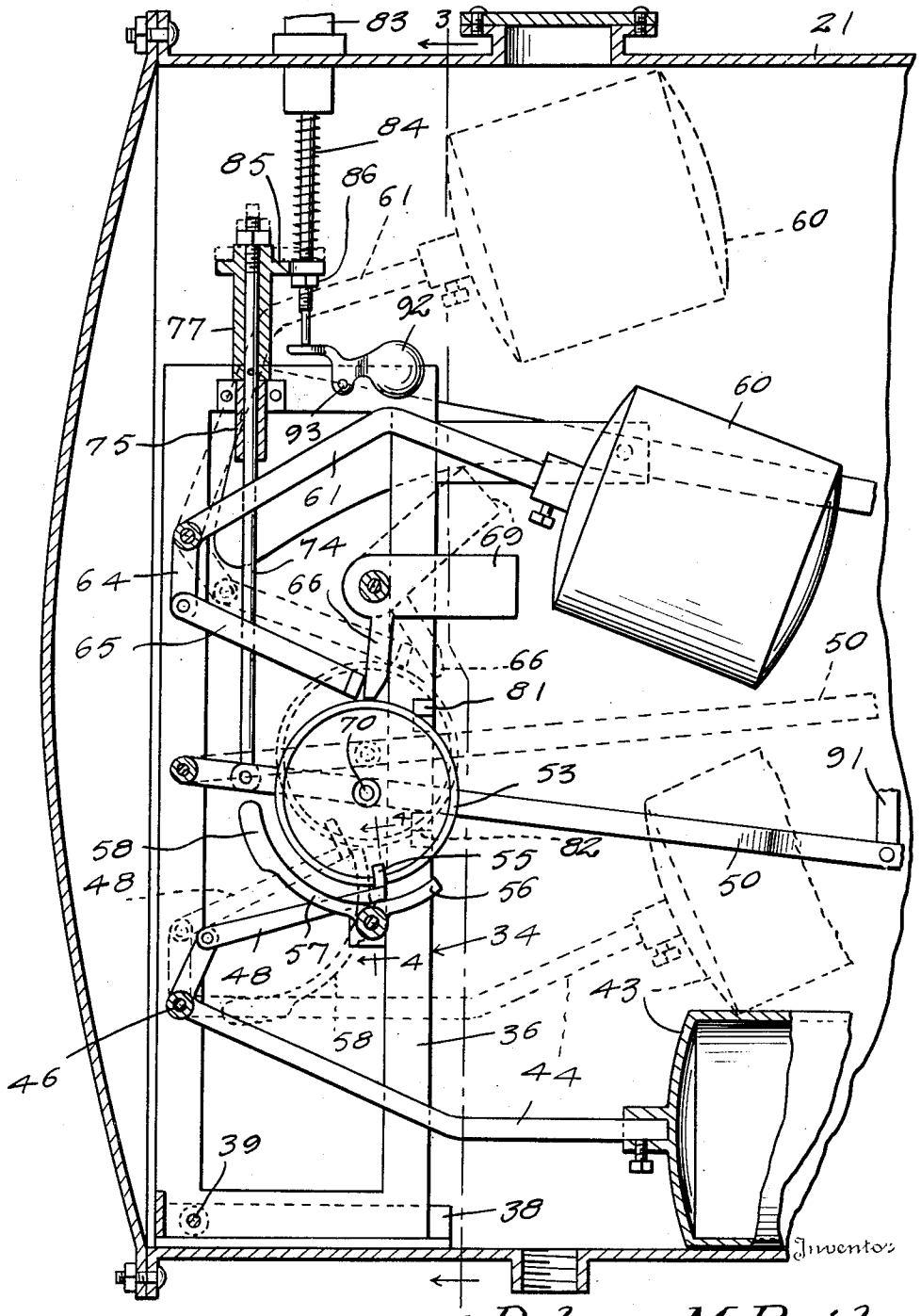

FIG. 2.

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Fig. 3.

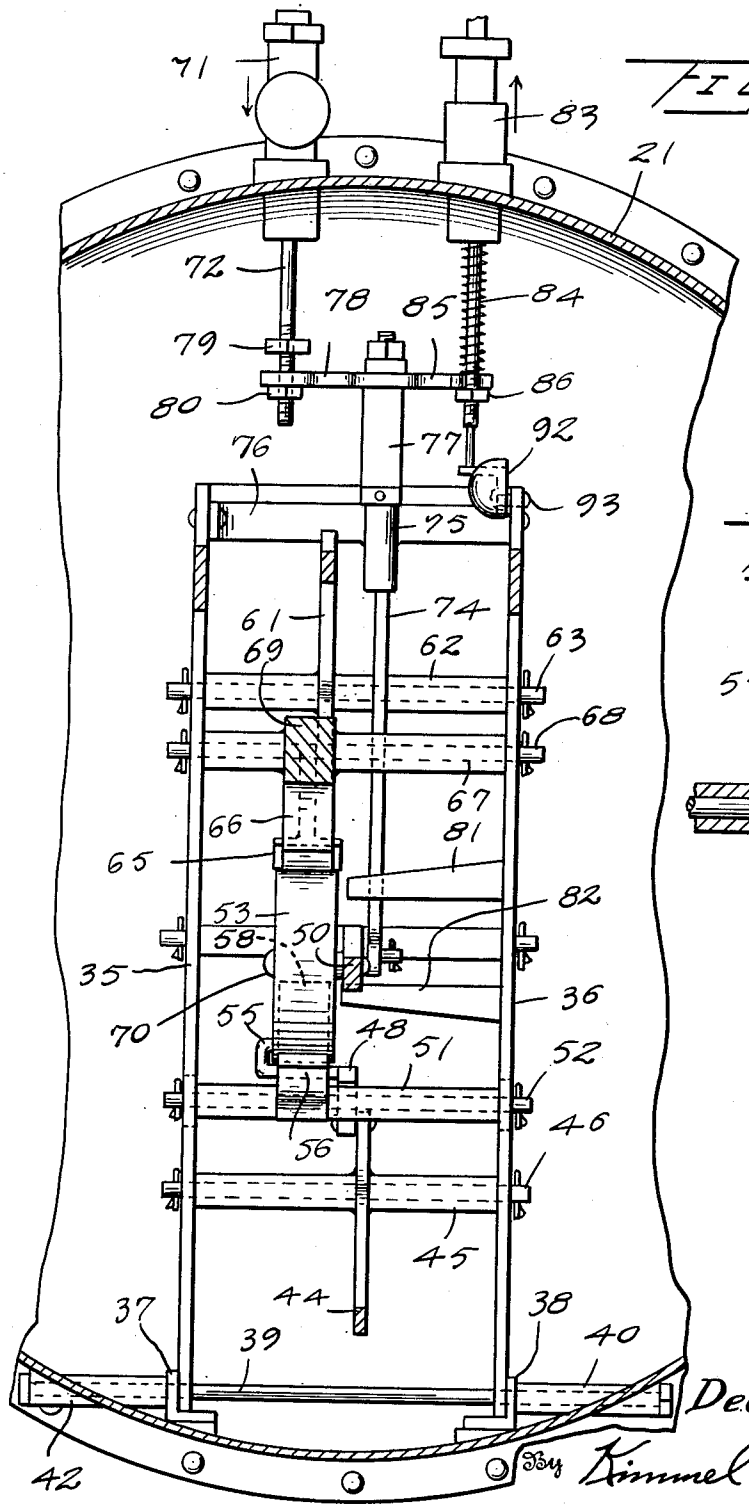
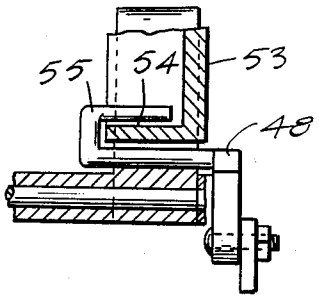


Fig. 4.



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BOILER FEED TRAP

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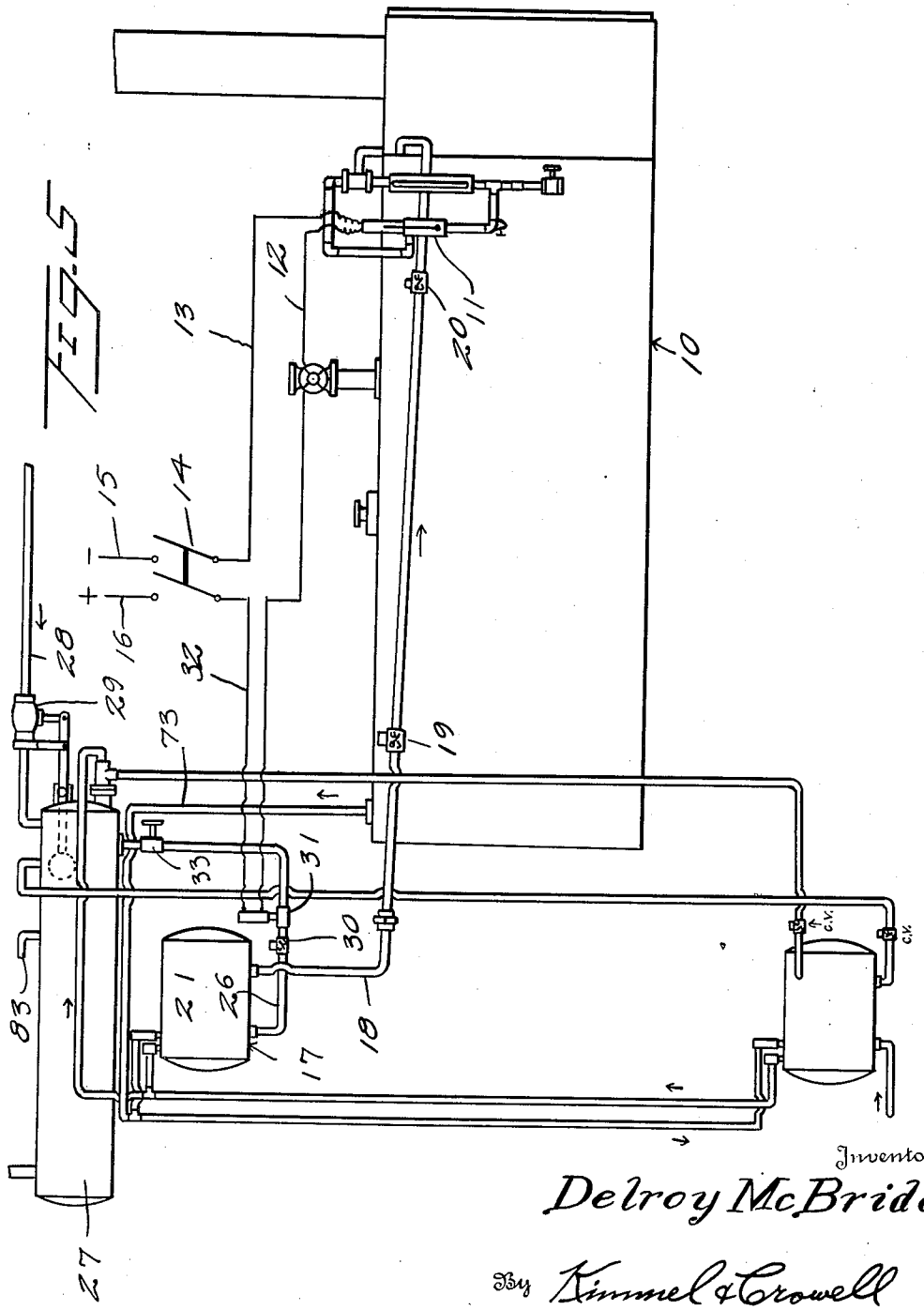

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UNITED STATES PATENT OFFICE

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BOILER FEED TRAP

Delroy McBride, Twin Falls, Idaho

Application February 19, 1947, Serial No. 729,626

2 Claims. (Cl. 137—101)

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This invention relates to boiler feeding devices and is an improvement over the boiler feeding construction embodied in my copending application, No. 680,047, filed June 28, 1946, for Boiler Feed Devices, now Patent No. 2,570,961 of Oct. 9, 1951.

An object of this invention is to provide an improved automatic feeding means for maintaining a predetermined water level in a boiler which eliminates all forms of packing glands and pumps or other means of forcing the water into the boiler.

Another object of this invention is to provide a water feeding means for a boiler wherein the water which is to be discharged into the boiler is placed under boiler pressure so that the water can flow by gravity into the boiler.

A further object of this invention is to provide in a boiler construction of this kind, an electrically operated control valve associated with the water gauge, for controlling the operation of the water feeding means in accordance with the level of water in the boiler.

A further object of this invention is to provide a feeding means of this kind wherein a series of floats are mounted on a frame which is insertable through one end of the water tank, the end of the tank being closed normally by a removable plate.

A further object of this invention is to provide, in a device of this kind, an improved means for holding the lowermost floats against movement during the filling of the water tank until the tank has reached a predetermined level, whereupon the lower floats are automatically released by an upper float and at the same time a pressure-equalizing valve is moved to open position for equalizing the pressure on the upper side of the water within the tank to a point equal to the boiler pressure so that the water in the tank can gravitatingly flow to the boiler.

A further object of this invention is to provide a boiler feeding means of this kind which is positive in its operation and which can be made out of relatively strong and simply constructed elements in order that the moving parts will not be unduly damaged by corrosion.

With the above and other objects in view, my invention consists in the arrangement, combination and details of construction disclosed in the drawings and specification, and then more particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a longitudinal section taken through a boiler feeding means constructed according to

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an embodiment of this invention, showing the positions of the parts when the water tank is filled with water,

Figure 2 is an enlarged fragmentary vertical section of the device showing in full lines the positions of the parts when the water tank is in substantially empty position, and showing in dotted lines the positions of the parts when the tank is filled,

Figure 3 is a fragmentary sectional view taken on the line 3—3 of Figure 2,

Figure 4 is a fragmentary sectional view taken on the line 4—4 of Figure 2,

Figure 5 is a diagrammatic view showing the system with which the feeding device is connected to the boiler.

Referring to the drawings and first to Figure 5, the numeral 10 designates generally a boiler of conventional construction which has associated therewith a water level actuated switch 11. The switch 11 is interposed in a pair of electrical conductors 12 and 13 and these are connected as will be hereinafter described to a controlling switch 14 connected to a source 15 and 16 of electric current supply.

The water in the boiler 10 is adapted to be maintained at a predetermined level by means of a feeding tank generally designated as 17. The tank 17 is disposed on a level above the top of the boiler 10 and is connected to the boiler 10 by means of a pipe 18. The pipe 18 is connected to the bottom of the water feeding means 17 and extends downwardly and forwardly, having interposed therein a pair of check valves 19 and 20. The boiler feeding means 17 includes a cylindrical tank 21, having one head 22 fixedly secured as by welding or the like to the cylindrical wall thereof, and the other end of the tank 21 is closed by a removable head 23.

The water conducting pipe 18 is connected to a bushing 24 fixed to the cylindrical wall of the tank 21, and the cylindrical wall of the tank also has a second bushing or nipple 25 fixed thereto with which a water intake pipe 26 is connected. The pipe 26 extends upwardly from the tank 21 and is connected to the bottom of an upper supply tank 27. The supply tank 27 is connected to a water supply source by means of a pipe 28, having a float operated valve 29 interposed therein.

The water pipe 26 has interposed therein a check valve 30 opening in the direction of the tank 21 and an electrically operated valve 31 is also interposed in the pipe 26 and is connected at one side to a conductor 12, and at the other

side by conductor 32 to switch 14. A manually operated valve 33 is also interposed in the pipe 26 so that if desired the flow of water from the pressure tank 27 may be manually regulated.

The tank 21 has mounted therein a removable frame structure 34 which includes a pair of vertically disposed side frame members 35 and 36 which engage on L-shaped guides or tracks 37 and 38 fixed as by welding or the like on the inside of the tank 21 adjacent the end head 23. A frame locking bolt 39 is adapted to extend through bushings 40 fixed to the tank 21, and the bushings 40 are extended outwardly through the tank 21 as indicated at 42 so that the bolt 39 may be removed or inserted through the bushings 40 from the outside of the tank.

The bolt 39 extends through the angled guides 37, 38, and through the lower outer portions of the frame members 35 and 36 as shown in Figures 1 and 2. The frame 34 has swingably mounted between the side members 35 and 36 thereof a lower float 43 which is carried by an obtusely angled arm 44. The arm 44 is fixed to a sleeve 45 which is rockably mounted on a shaft 46 extending across the frame members 35 and 36. The lever arm 44 has extending angularly from the outer end thereof a short lever arm 47 which is disposed at substantially right angles to the outer portion of the arm 44, and the arm 47 has pivotally secured thereto one end of a releasing link 48.

A second float 49 is disposed within the tank 21, being secured to an elongated lever arm 50 which is secured to a sleeve 51 rockably mounted on a shaft 52 extending between the frame members 35 and 36. The float lever 50 has fixed thereto at a point inwardly from the outer end thereof a flanged disk 53 formed with an annular flange 54 with which a hook 55 carried by the link 48 is adapted to engage. The hook 55 loosely engages about the flange 54 and this flange provides a guide for the hook 55 and prevents the inner free end of the link 48 from dropping downwardly.

When the float lever 50 is in its raised position, this lever is locked in the raised position by means of a pivoted locking member 56 which is pivotally mounted on a shaft 57. The locking member 56 includes a longitudinally curved lever 58 having a weight 59 on its outer end. The concave side of the lever 58 is adapted to confront the flanged disk 53 at the time the float 49 is in its lowermost position, as shown in Figure 2.

A third or upper float 60 is fixed to an obtusely angled float lever 61 which is fixed to a sleeve 62 rockably mounted on a shaft 63, extending between the frame members 35 and 36. The float lever 61 also includes an angled lever extension 64, extending from the rear or outer end thereof, which has pivotally connected thereto a releasing link 65. The releasing link 65 extends downwardly and inwardly and is adapted to slidingly engage the upper peripheral side of the flange 54.

A weighted intermediate float locking member 66 is carried by a sleeve 67 loosely mounted on a shaft 68, extending between the frame members 35 and 36, and the locking member 66 is gravitatingly urged downward to locking position by means of a weight 69 extending substantially at right angles to the length of the locking member 66. When the locking member 66 is in locked position it will be slightly to the left of the vertical plane passing through the axis of the securing member 70 for the flanged disk 53 so that the locking member 66 will not accidentally be moved forwardly upon pressure exerted on the flanged disk 53 by upward movement of the float 49.

In order to provide for equalizing the pressure on the upper side of the water in the tank 21 when the floats 53, 59 and 60 are in their uppermost positions, I have provided a steam valve 71 which is secured to the top of the tank 21 and has a weighted stem 72 normally biasing valve 71 to a closed position. The valve 71 is connected to a steam supply pipe 73 which is connected to the top of the boiler 10.

In order to provide for the opening of the valve 71 when the intermediate float 49 is released for upward movement, I have provided a valve operating rod 74 which is connected at its lower end to the float lever 50 adjacent the outer end portion thereof. The rod 74 is slidable through a guide 75 fixed to the upper portion of the frame 34, being secured to a cross bar 76 extending between the upper portions of the frame members 35 and 36. The upper portion of the rod 74 has a sleeve 77 fixed thereto and the sleeve 77 has extending horizontally therefrom a valve operating arm 78. The stem 72 extends through the arm 78, and preferably a pair of spaced nuts 79 and 80 are threaded on the stem 72 so that the stem 72 will not be moved upwardly to valve opening position until the intermediate valve operating float 49 has moved upwardly to substantially the limit of its upward movement. The intermediate float 49 is limited to its upward movement by means of the upper stop 81 fixed to the frame member 36 and is limited as to its downward movement by means of a second stop 82 also fixed to the frame member 36 at a point spaced downwardly from the upper stop 81. At the time the floats are in their lowermost positions, and assuming that water is entering the tank 21, the tank 21 is exhausted above the level of the water entering the tank through an exhaust valve 83.

The valve 83 is normally urged to a closed position by a pivoted weight 92 carried by the frame, and includes a stem 84 which is connected to a second valve operating arm 85 carried by the sleeve or bushing 77. A lower nut 86 is threaded on the stem 84 so that the valve 83 may be accurately adjusted to provide for the opening thereof at the time the arm 85 is in substantially its lowermost position.

The intermediate float 49 which is the largest of the three floats is substantially balanced in its vertical movement by means of a weight 87 rockably mounted on a pivot 88 extending through a supporting arm 89 carried by the frame 34. The weight 87 includes a lever 90 having one end of a link 91 pivotally connected thereto. The other end of the link 91 is pivotally connected to the float lever 50 at a point closely adjacent the outer end of the float 49. The system with which the feeding means 17 is connected is identical with the system shown and described in my copending application supra, and it is believed that a further detailed description of this system is not necessary in this application.

In the use and operation of this boiler feeding means, the flow of water from the supply tank 27 to the feeding tank 21 is electrically regulated by the float operated switch 11. This switch is connected to the electrical valve 31 which upon drop of the water level in the boiler 10 will open the valve 31 and permit water from the supply tank 27 to flow through the pipe 26 into the

tank 21. Assuming that the tank 21 is substantially empty, the several floats will be in the full line positions shown in Figure 2. The lower float 43 will be substantially in contact with the bottom of the tank 21 and the float lever 50 will be in engagement with the lower stop 82.

At this time the locking member 66 will be gravitatingly held in its locking position with respect to the intermediate float and the releasing link 65 will be in the position shown in Figure 2. The lower float may rise to a limited extent when the water level initially rises, the lower float being held against extreme upward movement by rearward pull on the releasing link 48 which is positioned between the lever 57 and the flange 54. As the hook 55 carried by the link 48 moves rearwardly, the locking member 66 will be rocked upwardly toward the flange 54 and the lever 57 will bind the hook 55 with respect to the flange 54.

After the water level passes above the lower float 43, it will rise above the locked intermediate valve operating float 49 which is locked in its lower position by the weighted locking member 56. The water level will thereupon rise until the upper float 60 is engaged. This upper float 60 will then move upwardly and as float 60 rises, releasing link 65 will be pushed downwardly and inwardly, thereby forcing locking member 66 inwardly past the center of the flanged disk 53 so that the valve operating float 49 can now move upwardly to steam valve opening position. With float 49 in the upper position which is limited by the stop 81, valve 71 will be open and steam will enter the tank 21 on the top of the water, thereby equalizing the steam pressure on the upper side of the water so that the water can now gravitatingly flow past the downwardly opening check valves 19 and 20 into the boiler.

When the intermediate float 49 is in its uppermost steam valve opening position, the holding or locking member 56 will be in its locked position as shown in Figure 1, wherein the float lever 50 is locked in its upper position. As the water level drops in the tank 21, the steam valve 71 is held in its open position until the water has been substantially discharged from the tank. After the water level drops below the lower float 43, this float will swing downwardly and upon downward swinging of this float, releasing link 48 will be moved inwardly thereby pushing holding member 56 inwardly to released position. When holding member 56 is in released position, the float 49 can gravitatingly swing downwardly and steam valve 71 will be spring-pressed to its normal closed position. When valve 71 is in its closed position, exhaust valve 83 will be in its open position so that the tank 21 is again ready for its feeding cycle.

I do not mean to confine myself to the exact details of construction herein disclosed, but claim all variations falling within the purview of the appended claims.

What I claim is:

1. A water feeding means for a steam boiler comprising a tank including a removable head, a float supporting frame in said tank, means removably securing said frame in said tank, a steam valve carried by said tank and connected to said boiler, said valve being normally biased to closed position, an exhaust valve normally biased to an opposite open position, a valve operating float rockably carried by said frame, means connecting said float with said valves whereby upon upward movement of said float said steam valve will be moved to open position, and said exhaust valve simultaneously will be moved to closed position, gravity actuated locking means carried by said frame for locking said float against upward movement, and float operated releasing means carried by said frame correlated with said locking means to thereby move the latter to released position when the water level in said tank reaches a predetermined height, and means connecting said tank with said boiler whereby the water in said tank will gravitate to said boiler at the time said steam valve is open and the pressure in said tank is equal to the boiler pressure.

2. A water feeding means for a steam boiler comprising a tank including a removable head, a float supporting frame in said tank, means removably securing said frame in said tank, a steam valve carried by said tank and connected to said boiler, said valve being normally biased to closed position, an exhaust valve normally biased to an opposite open position, a valve operating float rockably carried by said frame, means connecting said float with said valves whereby upon upward movement of said float said steam valve will be moved to open position, and said exhaust valve will be simultaneously moved to a closed position, gravity actuated locking means carried by said frame for locking said float against upward movement, float operated releasing means carried by said frame correlated with said locking means to thereby move the latter to released position when the water level in said tank reaches a predetermined height, means connecting said tank with said boiler whereby the water in said tank will gravitate to said boiler at the time said steam valve is open and the pressure in said tank is equal to the boiler pressure, a second gravity actuated locking means for locking said float in its upper valve opening position, and a second float actuated releasing means correlated with said second locking means for releasing the latter to thereby permit said float to swing downwardly when the water level in said tank drops to a predetermined point.

DELROY McBRIDE.

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