No. 804,827. PATENTED NOV. 21, 1905.

H. S. CORBITT.

BOILER FEEDER.

APPLICATION FILED JUNE 29, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

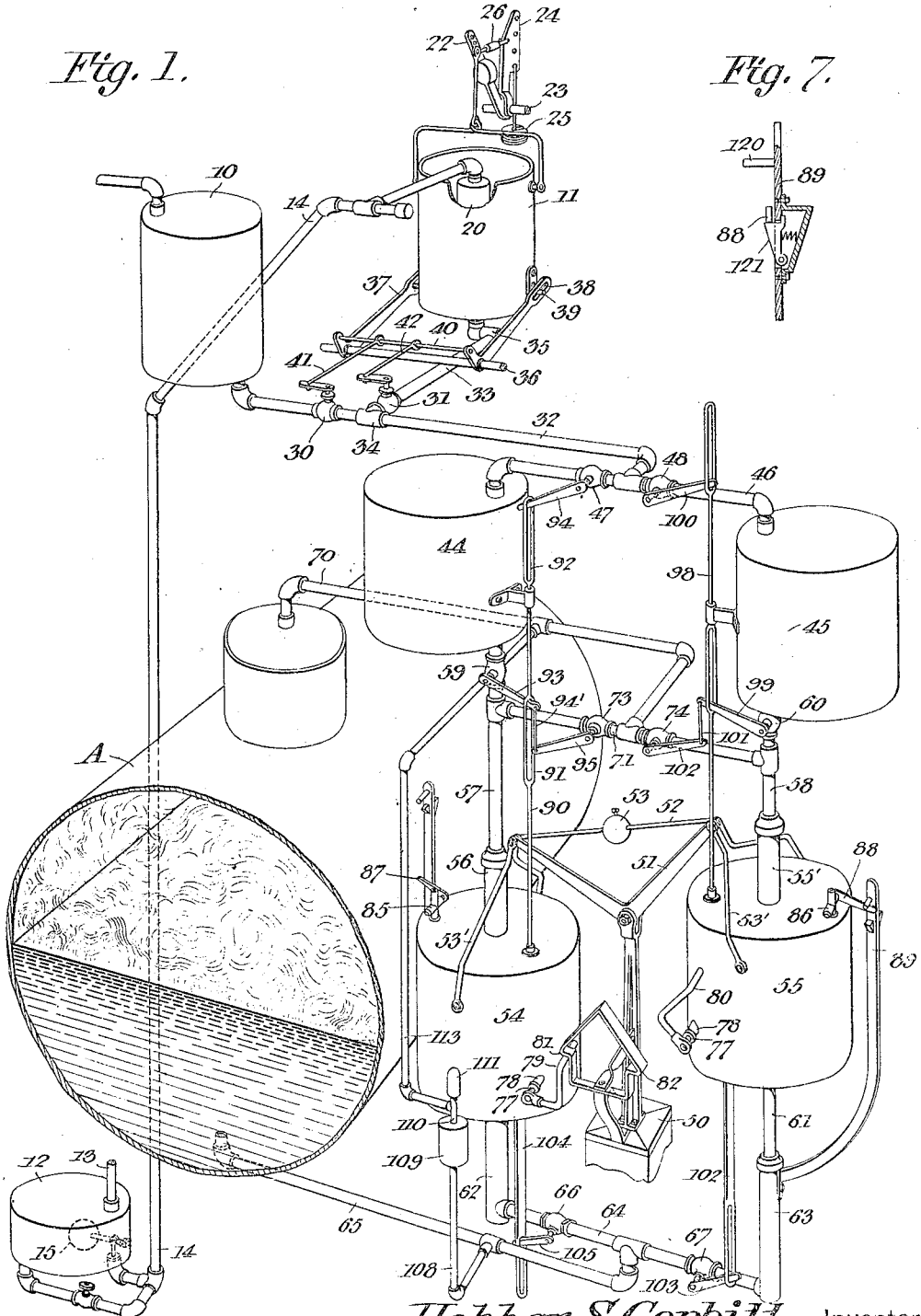

Fig. 7.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

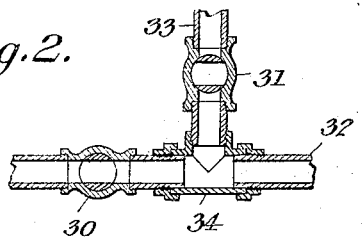


Fig. 4.

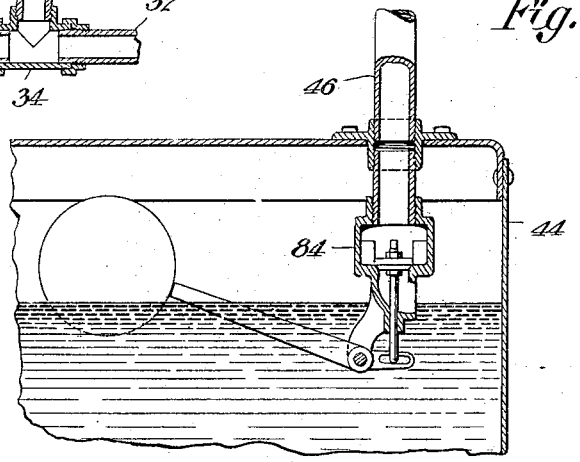


Fig. 3.

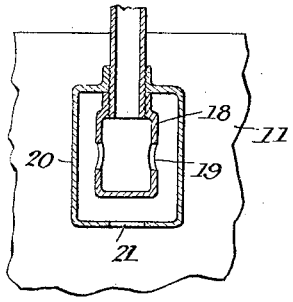


Fig. 6.

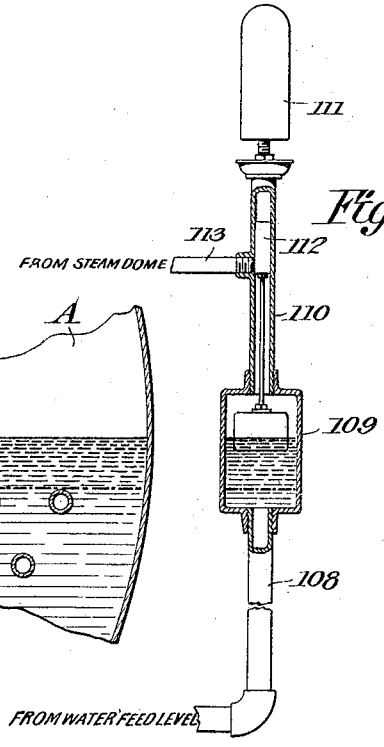
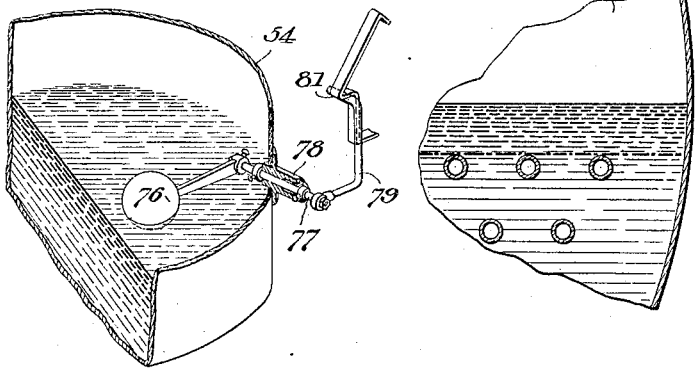


Fig. 5.



Witnesses

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HEBBER S. CORBITT, OF AYDEN, NORTH CAROLINA.

BOILER-FEEDER.

No. 804,827. Specification of Letters Patent. Patented Nov. 21, 1905.

Application filed June 29, 1905. Serial No. 267,602.

To all whom it may concern:

Be it known that I, HEBBER S. CORBITT, a citizen of the United States, residing at Ayden, in the county of Pitt and State of North Carolina, have invented a new and useful Boiler-Feeder, of which the following is a specification.

This invention relates to feeding devices for steam-boilers, and has for its principal object to provide an automatic means for maintaining a constant level of water in the boiler.

A further object of the invention is to provide means for returning to the boiler the water of condensation from a steam heating or drying system, and, further, to provide an arrangement of such character that the water of condensation will be continuously supplied to the boiler so long as there is sufficient for the purpose; but in the event of failure of the supply the apparatus will be cut off from the steam-heating system and water will be delivered from an auxiliary tank to the boiler.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in the novel construction and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a general perspective view of a boiler-feeding apparatus constructed in accordance with the invention. Fig. 2 is a sectional plan view showing the arrangement of the valves leading from the initial tanks, one of said valves being open while the other is closed. Fig. 3 is a detail sectional view of the upper portion of one of the initial feed-tanks. Fig. 4 is a sectional elevation of the upper portion of one of the measuring-tanks, drawn to an enlarged scale and illustrating the float-valve in shutting off the flow of water when the tank is filled. Fig. 5 is a detail perspective view of the lower portion of one of the vertically-movable filling-tanks, showing the arrangement of its float-controlled lock. Fig. 6 is a detail sectional view illustrating the low-water alarm. Fig. 7 is a detail view of one of the mechanisms for actuating the air-cock.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The boiler A is of any ordinary type and may be employed for heating or power, and at a point above the level of the boiler is a supply-tank 10, which is preferably kept filled with water from any suitable source of supply, the water from this tank being utilized for the filling of the boiler in case the supply of condensed steam from the power or heating system is insufficient. The condensed steam is conducted to a tank 11, also arranged above the level of the boiler, and it is not until the contents of this tank are exhausted that the water from tank 10 is utilized.

At a suitable point below the lowermost pipe of the heating or power system is arranged a tank 12, with which communicates a drainage-pipe 13, leading from the system and through which the water formed by condensation of the steam will flow. From the lower end of this tank leads a pipe 14 to the elevated tank 11, a float-valve 15 being employed to cut off the supply when the water becomes low in said tank 12. The tank 12 is placed at a lower level than the tank 11, and the water is elevated by the pressure of steam from the power or heating system. To prevent the water issuing from the pipe 14 in a jet which would tend to depress the tank 11 by its impact, the end of the pipe 14 is provided with an enlarged head 18, having lateral openings 19, through which the water passes to a small casing 20, carried by the pipe, and said casing has a bottom discharge-opening 21, through which the water may flow into the tank, the object being to break the force of the stream and prevent accidental depression of the tank by the impact of the jet.

The tank 11 is suspended from one end of an arm 22, that is pivotally mounted on a spindle 23, adapted to suitable bearings in the frame of the apparatus, and said spindle serves also as a support for a second and somewhat longer arm 24, which in connection with a counterpoise 25 tends to balance the weight of the tank and its contents. The outer ends of the two arms are connected by an adjustable bolt 26, forming, together with the arms 22 and 24, a beam of such nature that the tank will be held elevated until it receives a predetermined quantity of water, and when this weight is reached the beam will be overbalanced and the tank will move down quickly and without hesitation, there being no bal-

ancing or oscillation of the beam, as is usually found in devices of this general class, the abrupt movement developing sufficient momentum to operate the valves necessary to control the flow of the contents of the tank in the direction of the boiler. The beam, moreover, is so constructed that when once overbalanced it will remain with the tank in the lowest position until all or practically all of the contents of the tank have been exhausted, and as soon as this occurs a second abrupt movement will take place and the tank will be instantly elevated, again operating the valves.

The two valves 30 and 31 are so arranged that when one is opened the other is closed, and these valves control the flow of water from the tanks 10 and 11 to a pipe 32, that leads toward the tank. The pipe 32 is connected to the lower portion of the tank 11 by a pipe 33, having two swing-joints 34 and 35 to permit vertical movement of the tank without interfering with the flow of water therefrom, and at a point above the pipe 33 is arranged a rock-shaft 36, that may be supported in suitable bearings in the frame. (Not shown.) To this rock-shaft is secured a pair of bell-crank levers 37, the longer arms of which are provided with slots 38 for the reception of pins 39, projecting from the sides of the tank 11. The shorter arms of the bell-crank lever form supports for a rod 40, that is connected by rods or links 41 42 to the stems of the valves 30 and 31, the arrangement being such that when the tank 11 is in elevated position and being filled with water the valve 31 will be closed and water will be flowing from tank 10 to the pipe 32 through the open valve 30. When the tank 11 is filled and in the depressed position, valve 31 is opened and valve 30 is closed, the object, as before stated, being to first utilize all of the water resulting from condensed steam and then to use water from the tank 10 as required.

Arranged in a horizontal plane below the pipe 32 are two measuring-tanks 44 and 45, which are connected by a pipe 46 to the pipe 32, and in said pipe 46 are two valves 47 and 48, one controlling the flow of water to the tank 44 and the other the flow to the tank 45. When one of these valves is opened, the other is closed.

In a horizontal plane below the two tanks 44 and 45 is arranged a standard 50, to which is pivoted a beam 51, the two arms of which are disposed obliquely to each other and are connected by a tension-bar 52, carrying an adjustable poise 53, which in moving from one side of the vertical plane of the pivot-point of the beam to the other side thereof will serve to hasten the movement of the beam in both directions—that is to say, as the beam moves in one direction the center of gravity of the weight or poise will be gradually moved toward the vertical plane of the pivot of beam 51, and after moving beyond such vertical plane the weight in descending will cause the beam to move quickly and without hesitation or oscillation.

To the opposite arms of the beam 51 are pivoted bails 53′, on which are suspended vertically-movable tanks 54 and 55, said tanks being movable in vertical planes, and when in the lowest position the bottom of each tank will be approximately in the horizontal plane of the water-level of the boiler. These tanks are provided with upwardly-extending tubes 55′ and 56, which may be provided with stuffing-boxes, and fitting telescopically in these tubes are pipes 57 and 58, respectively, the upper ends of said pipes being connected to the tanks 44 and 45, respectively. In the pipe 57 is a valve 59, and in the pipe 58 is a valve 60, these valves being movable longitudinally to open position, and while one is opened to permit the passage of water from its elevated tank to the suspended tank the other is closed. From the lower ends of the tanks 54 and 55 lead pipe-sections 61, that fit telescopically into tubes 62 and 63, which may also be provided with stuffing-boxes, and these tubes are connected by a pipe 64, from the center of which leads a pipe 65 to the boiler, the point of connection with the boiler being below the water-line thereof. The pipe 64 contains two valves 66 and 67, and when one of these valves is opened the other is closed.

Leading from the steam-dome of the boiler is a pipe 70, that is connected to a pipe 71, the opposite ends of which are connected to the pipes 57 and 58, and in said pipe 71 are two valves 73 and 74, that are so arranged that when one is opened the other is closed.

In the lower portion of each of the movable tanks 54 and 55 is a float 76, secured to one end of a rock-shaft 77, that extends out through a stuffing-box 78 on the side of the tank, and to the outer ends of these shafts are secured catches 79 and 80, respectively, said catches being arranged to engage shoulders 81 and 82, carried by a frame that is supported by the standard 50. These catches are so arranged that when one of the tanks descends the catch will engage against one of the shoulders and will hold the tank in the depressed position so long as there is sufficient water in the tank to elevate the float. When the water-level lowers, the float descends and the catch moves from engagement with the shoulder, allowing the tank to ascend to refilling position.

Each of the measuring-tanks 44 and 45 is arranged to hold a certain quantity of water, and when this quantity has been supplied the float-valve 84 in the upper portion of the tank closes the supply-pipe and prevents the entrance of further water, so that by counting the number of operations the quantity of water supplied to the boiler may be determined.

The vertically-movable tanks 44 and 45 are provided with air-cocks 85 and 86, respec-

tively, and the stems of these cocks are provided with levers 87 and 88, that are arranged to engage against pins or lugs carried by vertical brackets or supports 89, so that at each movement of the tank the air-cock will be opened or closed, the cock being opened while the boiler is filling with water and being closed while the water is being discharged therefrom.

In the operation of the device the tank 11 is shown in elevated position, and valve 31 is therefore closed, while valve 30 is open and water is flowing from the tank 10 through pipe 32 and pipe 46. Valve 47 is open and valve 48 is closed, so that the water flows into the tank 44 and will continue to flow thereinto until the supply is cut off by the float-valve 84. At this time valve 59, leading from the tank 44, is closed, and valve 66, leading from the vertically-movable tank 54, is open, so that tank 54 is in communication with the boiler. At this time the catch 79 of tank 44 is engaged with the shoulder 81, so that the tank is locked in depressed position and will be held in the depressed position so long as any water remains therein. When the water runs from the tank into the boiler, the float 76 will descend, and catch 79 will be withdrawn from the shoulder 81 in order to allow tank 54 to ascend. During this operation the steam-valve 56 is open in order that the steam-pressure on the water of the tank 54 may be equal to the boiler-pressure, and at the same time air-cock 85 is closed to prevent the escape of any steam or water at that point. On the opposite side valve 48 is closed, while valve 60 is open and valve 74 is closed, so that water is flowing from the tank 45 to the tank 55, while the entrance of steam to the tank 55 is prevented. The air in the tank 55 may freely escape through the air-cock 86; but said tank cannot descend until the catch 79 leaves the shoulder 81. When the catch 79 moves to release position, the superior weight of the tank 55 causes the latter to move down and elevates the now empty tank 54. The tank 54 carries with it a rod 90, having two slots 91 92 for the reception of the ends of levers 93 94, that are connected to the valves 59 and 47, respectively, and valve-lever 93 is further connected by a link 94′ to a lever 95 on the steam-valve 73. The upward movement of tank 54 therefore moves the ends of the slots 91 and 92 into engagement with the levers 93 and 94. The first result of this operation will be to close the steam-valve 73, then to open the valve 59, close the valve 47, and allow the water to flow from the tank 44 into the vertically-movable tank 54, any steam which may remain in the tank 54 being condensed by the entering water and serving to heat the same. The final movement results in the opening of the air-cock 85, so that the water may flow freely into the tank 54, while the air exhausts through the air-cock, and at the same time, valve 47 being closed, a fresh supply of water cannot enter the measuring-tank 44 until all of the contents of said measuring-tank have been deposited in the movable tank 54. The descent of the measuring-tank 55 moves the counterpoise 53 toward and finally over the vertical plane of the pivot of beam 51, and after passing beyond such vertical plane the movement of the beam is accelerated. The downward movement of the tank 55 closes the air-cock 86, and a valve-operating rod 98, carried by said tank, will engage a lever 99 on valve 60, moving the same to closed position, and will also engage a lever 100 on the valve 48, moving said valve to open position to permit refilling of the measuring-tank 45. The lever 99 is connected by a link 101 to a lever 102 on the steam-valve 74, so that steam is allowed to flow into the tank 55. This downward movement of the tank 55 further opens the valve 67 through the medium of a rod 102 and lever 103, and the corresponding upward movement of the tank 54 closes the valve 66 through the medium of a rod 104 and lever 105. The catch 80 of the measuring-tank 55 now passes under locking-shoulder 82, and the tank 55 is locked in its depressed position and the water from said tank flows by gravity into the steam-boiler. This operation is repeated as quickly as the water in the boiler is evaporated, and as the water-level in either of the tanks lowers the float in said tank will descend and the tank will be unlocked and allowed to reassume filling position.

For the purpose of sounding an alarm in case of low water a branch pipe 108 leads from the pipe 65 to a casing 109 containing water, which follows the water-level of the boiler. From the top of this casing extends a pipe 110, at the top of which is a steam-whistle 111, and in the pipe is a valve 112, serving to close communication between said pipe 110 and a pipe 113, that forms a branch communication from the steam-pipe 70. When the water-level lowers to a dangerous degree, valve 112 is opened and the steam flows through pipe 113 and pipe 110 to the whistle and sounds an alarm.

In the operation of the air-cock, as hereinbefore pointed out, it is essential that the cock be opened at the completion of the upward movement after the remaining valves have been operated and that it be closed at the beginning of the downward movement before any of the valves have been operated. For this purpose the arm 89, hereinbefore referred to, is provided with a stationary pin 120 near its upper end, with which the valve-arm engages at or near the limit of upward movement, and said arm 89 is further provided with a pivotally-mounted spring-pressed finger 121, which will act on the valve-operating arm at the beginning of the downward movement of the latter in order to close the air-cock; but on upward movement of said valve-

operating lever the latter will engage the inclined face of the finger 121 and will force the same inward to inoperative position until the lever has passed beyond the same. The construction of this device is fully illustrated in Fig. 7.

With a device constructed in accordance with this invention it is possible to fill cold boilers and to automatically maintain a constant water-level in boilers already in use. The device is at the same time of the utmost value in determining the quantity of water evaporated in a given time and may be employed for testing purposes where data of this nature are required.

Having thus described the invention, what is claimed is—

1. In a water-feeding apparatus, a collecting-tank for receiving the water of condensation, a float-controlled valve for governing the discharge of water from the tank, an elevated tank suspended above the level of the boiler and to which the water is conveyed from the collecting-tank under steam-pressure, an auxiliary source of water-supply, and a valve mechanism under the control of the suspended tank for permitting the flow of water therefrom in the direction of the boiler, so long as the supply in said tank is sufficient for the purpose, and for cutting off the tank and opening communication with the auxiliary source of supply when additional water is required.

2. In a water-feeding apparatus for boilers, a vertically-movable counterweighted tank arranged to receive the water of condensation from a heating system or the like, an auxiliary source of water-supply, a piping system leading from the tank and said auxiliary source of supply to the direction of the boiler to be fed, and valves under the control of said movable tank for cutting off the flow from the tank while the latter is elevated, and establishing communication between the auxiliary source and the piping system during the same period and for cutting off the auxiliary source and opening the outlet from the tank when the latter is depressed.

3. In a water-feeding apparatus for boilers, a suspended tank, a counterweight for maintaining said tank in elevated position when empty, said tank being arranged to receive water of condensation from a heating or power system, an auxiliary source of water-supply, feed-pipes leading from the tank and the auxiliary source toward the boiler, valves disposed in said pipes, a rock-shaft, bell-crank levers carried by the rock-shaft, means for connecting the longer arms of the levers to the suspended tank, a cross-bar carried by the shorter arms of the levers, and means for connecting said cross-bar to the valves, the connections being arranged to close the valve controlling the flow from the tank, and open the valve leading from the auxiliary source when the tank is elevated, and vice versa.

4. In apparatus of the class described, a suspended tank, a counterweight for maintaining the same in elevated position when empty, a supply-pipe for returning water of condensation to said tank, and a casing arranged at the discharge end of the pipe and provided with ports forming a tortuous passage for the water, and serving to break the force of the stream issuing from the pipe.

5. In a boiler-feeding apparatus, a suspended tank having a valved water-inlet and a valved water-outlet, the latter communicating with the boiler at a point below the water-line thereof, a valved steam connection between the steam-space of the boiler and the tank, an air-cock on said tank, and means operable on the descent of the tank for closing the water-inlet, closing the air-cock, opening the steam-inlet, and opening the water-outlet, and serving on the ascent of the tank to close the water-outlet, close the steam-inlet, open the water-inlet and open the air-cock.

6. In a boiler-feeder, a suspended tank having a valved water-inlet and a valved water-outlet, the latter communicating with the boiler at a point below the water-line thereof, a valved steam connection between the steam-space of the boiler and the tank, an air-cock on the tank, means under the control of the tank for opening and closing the several valves, and a float-operated catch carried by the tank and serving to retain the latter in depressed position until empty.

7. In a boiler-feeder, a suspended tank having valved water-supply and boiler connections operable automatically on movement of the tank in both directions, and an automatic means for locking the tank in its lowest position until empty.

8. In a boiler-feeder, a vertically-movable tank having a valved water-inlet, and valved boiler connections operable automatically on movement of the tank, and a float-controlled catch for retaining said tank in its lowest position until empty.

9. In a boiler-feeder, a vertically-movable tank having a valved water-inlet and valved boiler connections operable automatically on movement of the tank in both directions, a catch for retaining said tank in its lowest position during the flow of water from the tank to the boiler, and a float connected to the catch, said float moving downward as the water discharges from the tank and serving to release the catch when the tank is empty.

10. In a boiler-feeder, a vertically-movable tank having telescopic connections with valved water inlet and discharge pipes, a valved steam connection also leading to the tank, an air-cock, and a valve-operating means operable on the descent of the tank for first closing the air-cock, then closing the water-inlet valve and opening the steam-inlet valve and water-outlet valve, and serving, also, on movement in a reverse direction for closing the steam-

valve and water-outlet valve, opening the water-inlet valve, and finally opening the air-cock.

11. In a boiler-feeder, a vertically-movable tank having a valved water-inlet, a valved water-outlet, and a valved steam connection, the valves being automatically operated by the tank as the latter ascends and descends, a measuring-tank with which the water-inlet communicates, a supply-pipe leading to the measuring-tank, and means for automatically cutting off the flow to the measuring-tank when the latter has received a predetermined quantity of water.

12. In a boiler-feeder, an elevated measuring-tank, a water-supply leading thereto, a vertically-movable tank arranged below the measuring-tank, a valved water-pipe between the two tanks, a valved connection between the vertically-movable tank and the boiler, a valved steam connection between the steam-space of the boiler and the vertically-movable tank, and an automatic valve-operating means serving when the tank ascends to close communication with the boiler and open communication with the measuring-tank, and serving, also, when the tank descends to close communication with the measuring-tank and open communication with the boiler.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

HEBBER S. CORBITT.

Witnesses:
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A. T. MOORE.