(No Model.) 2 Sheets—Sheet 1.

O. J. SCOTT.

BOILER FEEDER.

No. 577,325. Patented Feb. 16, 1897.

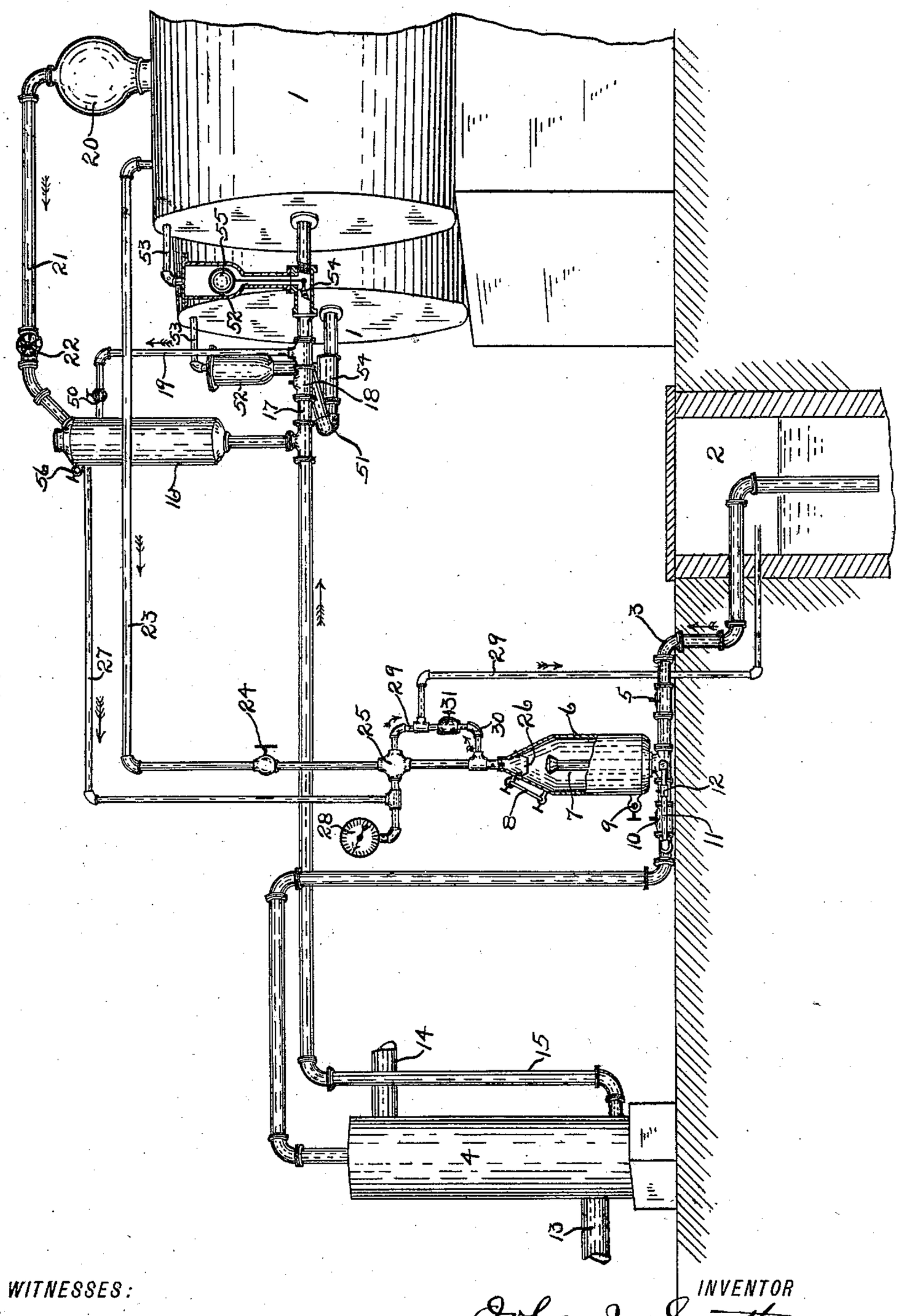

FIG. 1.

WITNESSES:

Horace B. Jones.

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INVENTOR

Orla J. Scott

BY

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(No Model.) 2 Sheets—Sheet 2.

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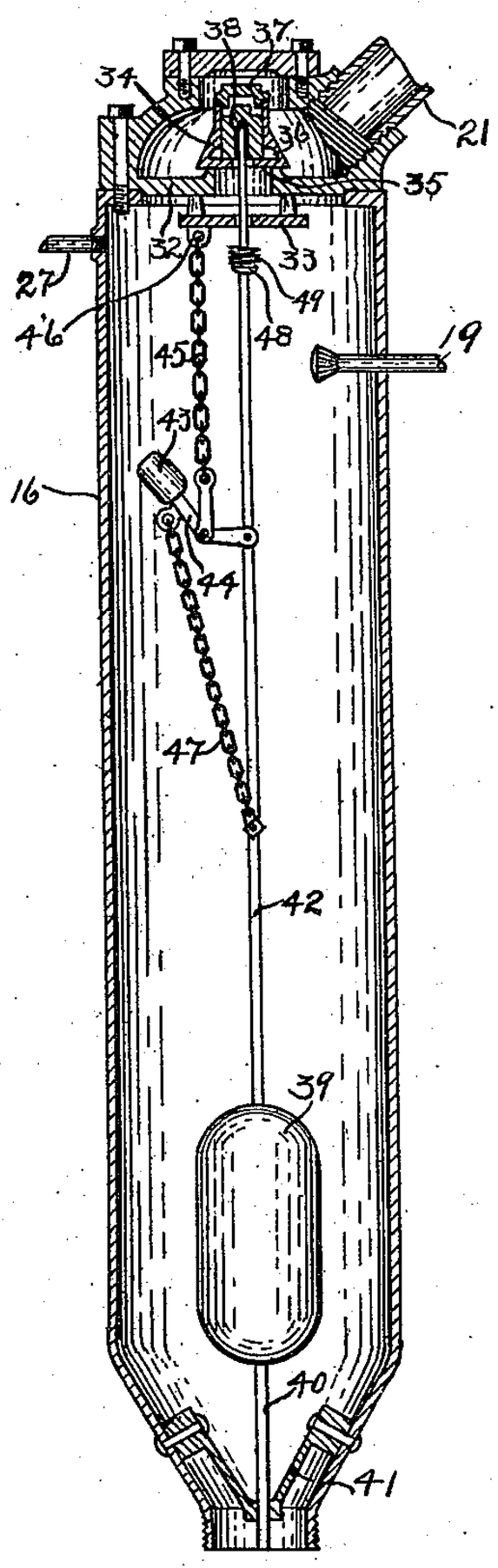


FIG. 2.

FIG. 3.

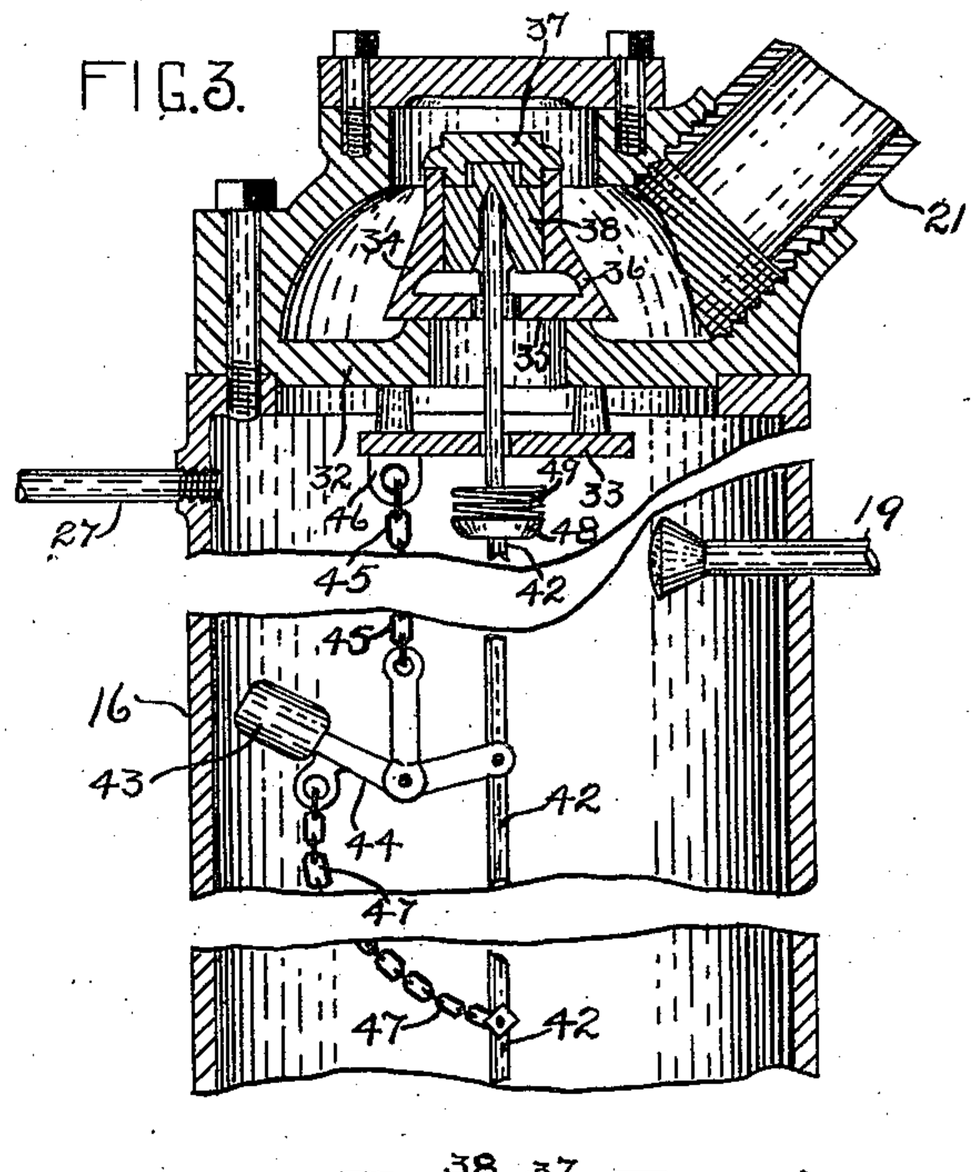
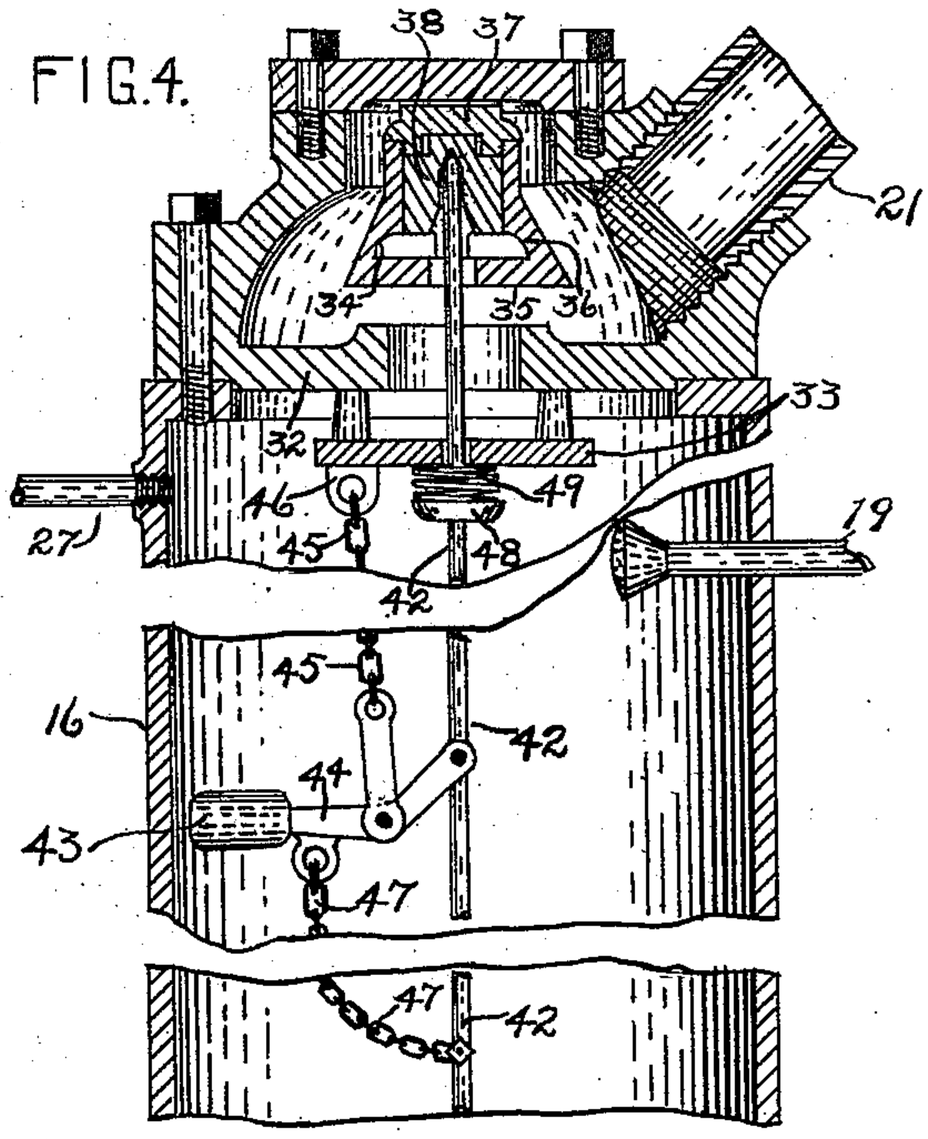


FIG. 4.



WITNESSES:

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UNITED STATES PATENT OFFICE.

ORLA J. SCOTT, OF LOUISVILLE, KENTUCKY, ASSIGNOR TO THE SCOTT AUTOMATIC BOILER FEEDER COMPANY, OF SAME PLACE.

BOILER-FEEDER.

SPECIFICATION forming part of Letters Patent No. 577,325, dated February 16, 1897.

Application filed May 18, 1896. Serial No. 592,011. (No model.) Patented in Canada August 4, 1896, No. 53,107.

To all whom it may concern:

Be it known that I, ORLA J. SCOTT, of Louisville, county of Jefferson, and State of Kentucky, have invented certain new and useful Improvements in Boiler-Feeders, (for which I have obtained Canadian Patent No. 53,107, dated August 4, 1896;) and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like figures refer to like parts.

My invention relates to an automatic boiler-feeder adapted especially to take water automatically from a well, cistern, or reservoir, pass it through a heater in the first place, and then into the boiler as the boiler needs it.

The apparatus herein shown and described is an improvement upon the automatic boiler-feeders shown and described in a previous patent issued to me January 21, 1896, No. 553,476, and also in a previous application for a patent filed by me November 18, 1895, Serial No. 569,260.

The purpose of the improvements set out herein is to adapt it to different conditions, make it much quicker and more sensitive in its action, and also to enable the feeder to be employed in connection with a battery or group of boilers.

The distinctly novel features will appear from the following description and claims and the accompanying drawings.

In the drawings, Figure 1 is a perspective of my device connected up with a battery of two boilers, some of the parts being in vertical section. Fig. 2 is a central vertical section of the main receiving-chamber with the steam-valve closed. Fig. 3 is the upper portion of Fig. 2 enlarged and partly broken away, with the steam-valve partially open. Fig. 4 is the same with the steam-valve wholly open.

On a suitable foundation I show a battery or group of two boilers 1. In the ground adjacent thereto I show a cistern, well, or reservoir 2. A pipe 3 leads from the cistern to the heater 4, which is placed upon a suitable foundation. This pipe has a check-valve 5 in it. After passing the valve 5 I connect up with the pipe 3 a primary receiver 6, having in it a spray-pipe 7, that extends from the pipe 3. On the upper portion of such primary receiver I provide a water-gage 8 and near the lower end thereof an air-cock 9. After passing the primary receiver 6 the pipe 3 is provided with another check-valve 10. This, as well as the check-valve 5, opens toward the heater 4. I provide about the valve 10 a shunting-pipe or by-pass 11. It leads from a point in front of the valve 10 to a point between the two valves 5 and 10, preferably to the point where the spray-pipe 7 leads from the main pipe 3. In this shunting-pipe I provide a check-valve that permits the passage of water through it toward the primary receiver.

Connected up with the heater 4 are two pipes 13 and 14, that are exhaust-pipes extending from the engine. The pipe 15 leads from the heater to the main receiver 16. The pipe 17 leads from such main receiver to one of the boilers. It has in it a check-valve 18. A spray 19 leads from such boiler-pipe at a point between the check-valve 18 and the boiler to the upper portion of the main receiver.

Extending from the steam-space of one of the boilers there is a steam-pipe 23, leading to the primary receiver 6. It has in it a valve 24 and a differential valve 25. I connect with this differential valve a pipe 27, leading to the main receiver 16, and a steam-gage 28 to show the variations in the pressure of the steam in the main receiver. A pipe 29 extends from the differential valve 25 into the cistern 2, or it may extend into the open air. The pipe 30 extends from the pipe 23 just above the primary receiver and has in it an air-valve 31 for the purpose of freeing the primary receiver of the air that may be accumulated in it. The primary receiver is preferably conical or tapering at its upper end for the purpose of presenting to the steam that may enter it through the pipe 23 a gradually-increasing surface of cold water as the water is being driven out. The object of this is to prevent the sudden condensation of the steam as it enters such receiver.

In the upper end of the main receiver I provide a valve-seat 32 with a port centrally

located in it, and beneath such port I place a deflector or distributer 33. This valve-seat is placed far enough below the extreme upper end of the main receiver as to leave a steam-chamber above it, into which the steam-pipe 21 enters. Within this steam-chamber I place a compound valve that rests upon the valve-seat 32. This valve consists of an outer casing or main valve 34. The lower portion 35 of this casing or outer valve is in the form of a ring that rests flatly upon the valve-seat. This is connected with the main portion of such casing by necks 36, which leave a space between them and also a space between the ring 35 and the main portion of the valve. The upper portion of such outer valve consists of a cap 37, that screws into the body of the valve. The ring 35 has a central port, and such ring forms a seat for the auxiliary or inner valve 38. This inner valve reciprocates in the outer valve, as will be seen in Figs. 2 and 3. When said inner valve is lowered into the position shown in Fig. 2 and the outer valve is also seated, steam cannot enter the main receiver. When the inner valve is elevated, as seen in Fig. 3, steam can enter through the space or passage-way between the necks 36 in the outer valve and the aperture in the ring 35. The admission of steam, however, through this means is slow because the opening is small. When the whole valve mechanism is elevated, as seen in Fig. 4, the steam-port is wholly opened for the admission of steam into the receiver. The parts of this valve mechanism are elevated by the following mechanism: I provide a float or weight 39, provided with a downwardly-extending stem 40, which passes through a suitable funnel-shaped guideway 41 in the lower part of the main receiver. Such float is also provided with an upwardly-extending stem 42, that extends and fits into a central bore or seat in the inner or auxiliary valve 38. It also passes through a central opening in the deflector 33. This, together with the passage of the stem 40 through the guide-piece 41, guides the direction of movement of the float and prevents any lateral movement that might affect the operation of the valve mechanism at the upper end.

To assist the float in the actuation of the valve, whereby the same may be positive, I provide a weight 43, that is carried on the lever 44, pivoted at one end to the stem 42 of the float. The lever is supported by the chain or links 45, that extend from the central portion of the lever 44 to some means of attachment above. I show it attached to the ear 46 on the under side of the deflector 33. The lever 44 should be angular or shaped like a bell-crank, as shown, so that the weight 43 will be more effective when it is desired to hold the valve in an upward position than when the valve is seated. To limit the upward movement of the weight 43, I connect the outer end of the lever by the chain 47 to some point of attachment below, it herein being attached to the float-stem 42. To prevent violent stoppage of the float-stem 42 and the valve mechanism in their upward movement, I rigidly secure the collar 48 to the float-stem a short distance below the deflector 33, and between them I place a spiral spring 49.

The operation of the mechanism which has been described will more fully appear from the following description of it. Assuming that the receivers are empty, the valve 24 is opened to permit the passage of steam into the primary receiver 6 and the air-cock 9 is opened to permit the escape of air from such receiver. When the air has escaped, the air-cock 9 is closed, and when the receiver has become filled with steam the valve 24 is likewise closed. The natural condensation of the steam in the primary receiver 6 will tend to create a vacuum which draws water from the cistern, causing the primary receiver 6 to gradually become filled. Then the air-cock 56 in the main receiver 16 is opened, and also the valve 24 is opened and left open. The steam-pressure through the pipe 23 drives the water which has accumulated in the primary receiver 6 to the heater and through it and the pipe 15 to the main receiver 16, the air-cock 56 permitting the air to escape from these pipes and vessels in advance of the incoming water. Then the air-valve 56 is closed, and the valve 22 in the steam-pipe 21 and the valve 50 in the spray-pipe are opened. At this stage the incoming steam from the boiler through the pipe 21 enters and permits the water to flow out of the main receiver 16 through the pipe 17 into the boiler. The water is prevented from flowing through the pipe 17 in a direction away from the boiler by the valve 10 in the pipe 3. When the steam enters the main receiver 16, there is a pressure exerted by it upon the water in the pipe 17, heater 4, and pipe 3 tending to force it back, and it does force a small portion of it back through the by-pass or shunting-pipe 11, which passes through the spray-pipe 7 in the primary receiver. After this primary receiver has discharged its contents, as has been explained, it becomes filled with steam through the pipe 23. This steam is condensed by the spray from the pipe 7, tending again to cause a vacuum in said receiver, which again draws a charge of water from the cistern. This second operation and all subsequent operations of this part of the mechanism is quick and positive. The condensation of the steam in the primary receiver 6 and its charge of water immediately thereafter takes place while the main receiver 16 is discharging its water into the boiler, but is completed before the main receiver 16 has become discharged.

During the steps of the operation described the position of the valve mechanism in the main receiver is that shown in Fig. 4. In this mechanism without the weight 43 as the water becomes low in the main receiver it is obvious that the float would gradually lower

with the water, permitting the valve at the upper end to gradually approach its seat. This slow seating of the valve is a serious defect and drawback to machines of this character. There is constant natural condensation going on at the side of the receiver. As the valve gradually and slowly approaches its seat it reaches a point where there is sufficient space for the admission of enough steam to equal the natural condensation spoken of. While this slight inflow of steam is permitted to equal the natural condensation in the receiver, it is obvious that there will be no further outflow of water from the receiver until the water has lowered in the boiler, so that the difference in the height of the water in the receiver and that in the boiler will cause a slightly-increasing tendency of the water to leave the receiver. When the water thereby is decreased enough in the receiver, the valve will become seated. During this vacillating and uncertain position of the valve the distance between it and its seat is about equal to the thickness of ordinary writing-paper, just enough space being left to admit a slight quantity of steam. In order to prevent this feature in the operation of the valve that I have just described, I provide a weight 43, that coöperates with the float to actuate the valve. When the water is lowered to such an extent in the main receiver that the float and valve would begin to lower, as has been described in the preceding paragraph, it is obvious that the weight 43 will continue to hold the valve and float up until the water has so far left the receiver as to cause the float or weight 39 to overcome the weight 43 and to permit the float to move far enough downward as to cause the valve to seat itself. Then the weight is suddenly thrown into the position shown in Fig. 2, the float and valve stem drawing the inner end of the lever 44 downward. This sudden tripping and movement of the float and weight causes the valve to make the whole movement from the position shown in Fig. 4 to that shown in Fig. 2 suddenly, whereby the valve will be moved promptly into place on its seat.

After the valve has been closed and the water has largely left the receiver, the receiver being filled with steam, natural condensation continues to occur and lower the pressure in the receiver, and as soon as the pressure in the receiver is lowered slightly below the pressure in the boiler there is a back pressure from the boiler through the pipe 17 and the spray-pipe 19, which causes water to pass through the spray-pipe 19 and discharge into the receiver to assist in the condensation of steam therein. This will render the pressure in the receiver slightly lower than what it is in the boiler. The lower pressure in the receiver acting through the pipe 27 upon the differential valve 25 causes such valve to open the pipe 23 and permit the inflow of steam through said pipe from the boiler under the higher or boiler pressure into the primary receiver 6, which thereby forces the water out of it through the heater up into the main receiver and fills it.

As the main receiver is filling with water and the water passes the mouth of the spray-pipe 19 the pressure in the receiver will begin to increase very rapidly to such an extent that, acting through the pipe 27, it will cause the differential valve 25 to close the pipe 23. At the same time the increasing pressure will cause the float 39 to move upward, and in turn it, through the float-stem 42, will cause the inner or auxiliary valve 38 to be elevated into the position shown in Fig. 3 approximately. When such valve 38 is moved at all from the ring 35, steam will begin to enter through the openings in the lower part of the outer casing or valve 34. The purpose of this slight admission of steam is to counteract any tendency of the valves, such as the valve 10, to leak while the parts are under high pressure. This incoming steam also increases the pressure in the receiver to the pressure equal to that above the valve, or, in other words, the boiler-pressure. Then the float moves to its upward limit, carrying the whole valve mechanism with it until the latter assumes the position shown in Fig. 4, which affords a large port for the admission of steam from the boiler, so that there will be no failure of the steam to enter the receiver as fast as the water would leave it. For this reason the exit of the water from the receiver is in no wise retarded.

I have now outlined the operation of that portion of my device the construction of which I have heretofore described. The mechanism will continue to operate automatically.

Before proceeding to the description of the remainder of my device I desire to give additional reasons for the valve construction to be found in the upper part of the main receiver. By the construction there shown of the inner or smaller auxiliary valve 38, whose seat has a much smaller port than the large valve, it is obvious that I am enabled to use a much smaller float than would be necessary to actuate the whole valve mechanism or if it were all made of one piece. This construction of valve also enables a valve to be operated when the pressure in the main receiver is considerably below the pressure in the chamber about the valve mechanism. This is due to the fact of the very small area presented to the steam from the upper side of the inner valve 38, so that such inner valve will be actuated while the pressure is far below boiler-pressure. This is a very useful feature, in view of the fact that after the machine has been used a while and the valve 10 or other parts of the mechanism be worn or otherwise caused to leak somewhat it is more difficult to raise the pressure in the main receiver to boiler-pressure.

In order to feed a battery or group of boilers, it is necessary to provide a regulating mechanism for the boilers to control the ad-

mission of water into each boiler. To that end I provide a branch pipe 51, running off from the main boiler-pipe 17 and entering the second boiler. This branch pipe may be extended to accommodate any number of boilers, the principle of operation being the same. It is necessary, however, that the branch pipe leave the main boiler-pipe 17 at a point between the boilers and the check-valve 18. The regulating mechanism is connected up with the boiler-pipe of each boiler. Above each boiler-pipe I provide a chamber 52 with a passage-way connected up with the boiler-pipe. The upper end of such chamber is connected with the boiler by the pipe 53. In the main boiler-pipe I provide a valve 54, the form I have herein shown being what is known as the "butterfly-valve." Such valve is operated by the float 55, connected with the valve by a suitable stem. The float 55 is placed at the desired water-line in the boiler, so that when the water in the boiler is low the float will be lowered and the valve opened, and when the water in the boiler is high the float will be elevated and the valve closed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a boiler-feeder, the combination with a receiver and its steam-port, of a compound valve composed of a main valve and an auxiliary valve, for controlling said port, and means for successively actuating the auxiliary valve and the main valve from the fluid in the receiver, whereby the pressure between the boiler and receiver may be rapidly equalized, substantially as and for the purposes specified.

2. In a boiler-feeder, the combination with the receiver and its steam-inlet port, of a compound valve composed of an outer casing or main valve having ports or spaces, and an inner piston or auxiliary valve movable within the casing, and means for successively actuating the inner piston-valve and the outer casing or main valve from the fluid in the receiver, substantially as and for the purposes specified.

3. In a boiler-feeder, a valve mechanism for opening and closing the steam-port into the receiver comprising a seat with a large port, an outer valve consisting of a cylindrical casing with a ring below it connected up by necks, such ring having a small port in it, an auxiliary valve movable within such outer valve so as to be seated on such ring, a float in the receiver and a stem extending from such float to such inner valve.

4. In a boiler-feeder, a valve mechanism for opening and closing the steam-port into the receiver comprising a seat with a large port, an outer valve provided with a seat having a small port, an auxiliary valve seated within the outer valve, and means for actuating such inner valve and through it the outer valve, a float in the receiver, a stem extending from such float to such inner valve, a guide-bracket in the lower end of the receiver, and a stem connected to the float and extending through such guide-bracket.

5. In a boiler-feeder having a receiver and a steam-port entering it, the combination with a valve for opening and closing the steam-port and a float in the receiver connected with the valve by a suitable stem for actuating the valve, of a bell-crank weighted at one end and pivoted at the other end to the valve-stem and means independent of the float for supporting or suspending said bell-crank, substantially as and for the purposes specified.

6. In a boiler-feeder having a receiver and a steam-port entering it, the combination with a valve for opening and closing the steam-port and a float in the receiver connected with the valve by a suitable stem for actuating the valve, of a bell-crank pivoted at one end to the valve-stem, a weight carried on the other end thereof, a chain supported from the upper end of the receiver and connected with the bell-crank near its middle, and a chain extending from the outer end of the bell-crank to the stem below it to limit the upward movement of the weight and downward movement of the float.

7. In a boiler-feeder, the combination of a main receiver, a primary receiver for drawing water from a cistern or other reservoir whose upper end is conical or tapering, a steam-pipe from the boiler entering such conical end, and a suitable valved delivery-pipe for connecting the primary receiver with the main receiver, as and for the purpose shown and described.

8. In a boiler-feeder, the combination with a receiver and its steam-inlet port, of a valve for controlling said port, a float and stem for actuating said valve from the fluid in the receiver, a suspended weighted lever, means for connecting said weighted lever with the stem of the float, and means for limiting the upward movement of said weighted lever, substantially as and for the purposes specified.

9. In a boiler-feeder, the combination of a boiler, a main receiver, a check-valve between the main receiver and boiler, a primary receiver, a pipe leading thereto from a suitable water-supply, a pipe leading from the boiler to the primary receiver, a pipe leading from the primary receiver to the main receiver having a check-valve in it between such receivers, and a by-pass around such valve.

10. In a boiler-feeder, the combination of a primary receiver, a main receiver, a steam-induction pipe leading to the primary receiver and provided with a differential valve, a connection between the differential valve and the main receiver whereby the valve is governed by the pressure in the main receiver, and a feed-water heater interposed between the primary receiver and main receiver, substantially as and for the purposes specified.

11. In a boiler-feeder, the combination with a receiver and its steam-inlet port, of a valve for controlling the steam-inlet port of the re-

ceiver, a float having a stem for actuating said valve, a suspended weighted lever, and means for connecting said weighted lever with the stem of the float, substantially as and for the purposes specified.

12. In a boiler, the combination with a receiver and its steam-inlet port, of a valve for controlling the steam-inlet port of the receiver, a float provided with a stem for actuating said valve, a supported or suspended weight, means for connecting said weight with the float-stem, and a buffer-spring for preventing injury to the valve when the float trips the supported or suspended weight, substantially as and for the purposes specified.

In witness whereof I have hereunto set my hand this 1st day of May, 1896.

ORLA J. SCOTT.

Witnesses:
V. H. LOCKWOOD,
ZULA GREEN.