C. BRENT.

FEED WATER REGULATOR.

APPLICATION FILED JULY 17, 1907.

995,841. Patented June 20, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

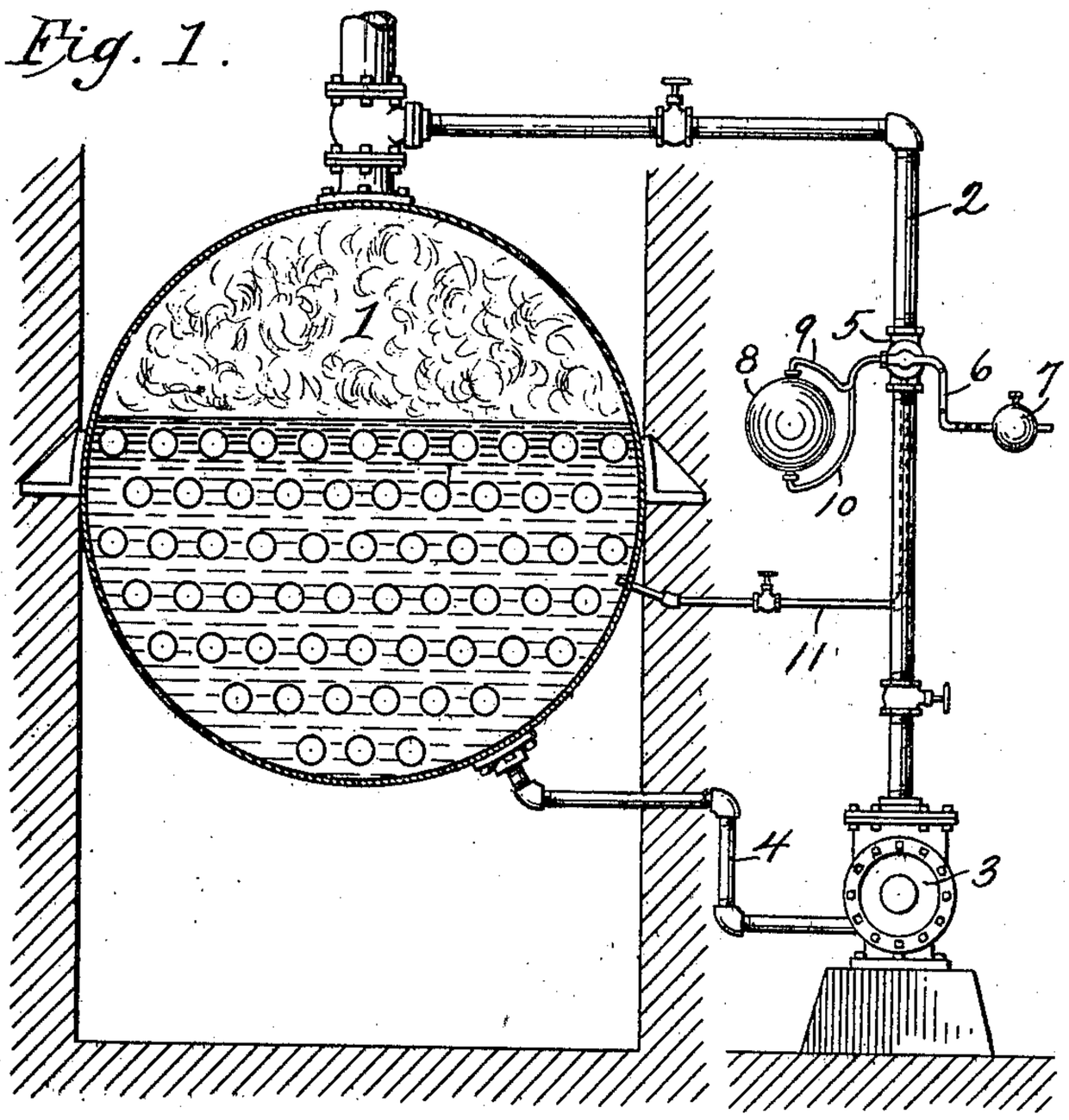
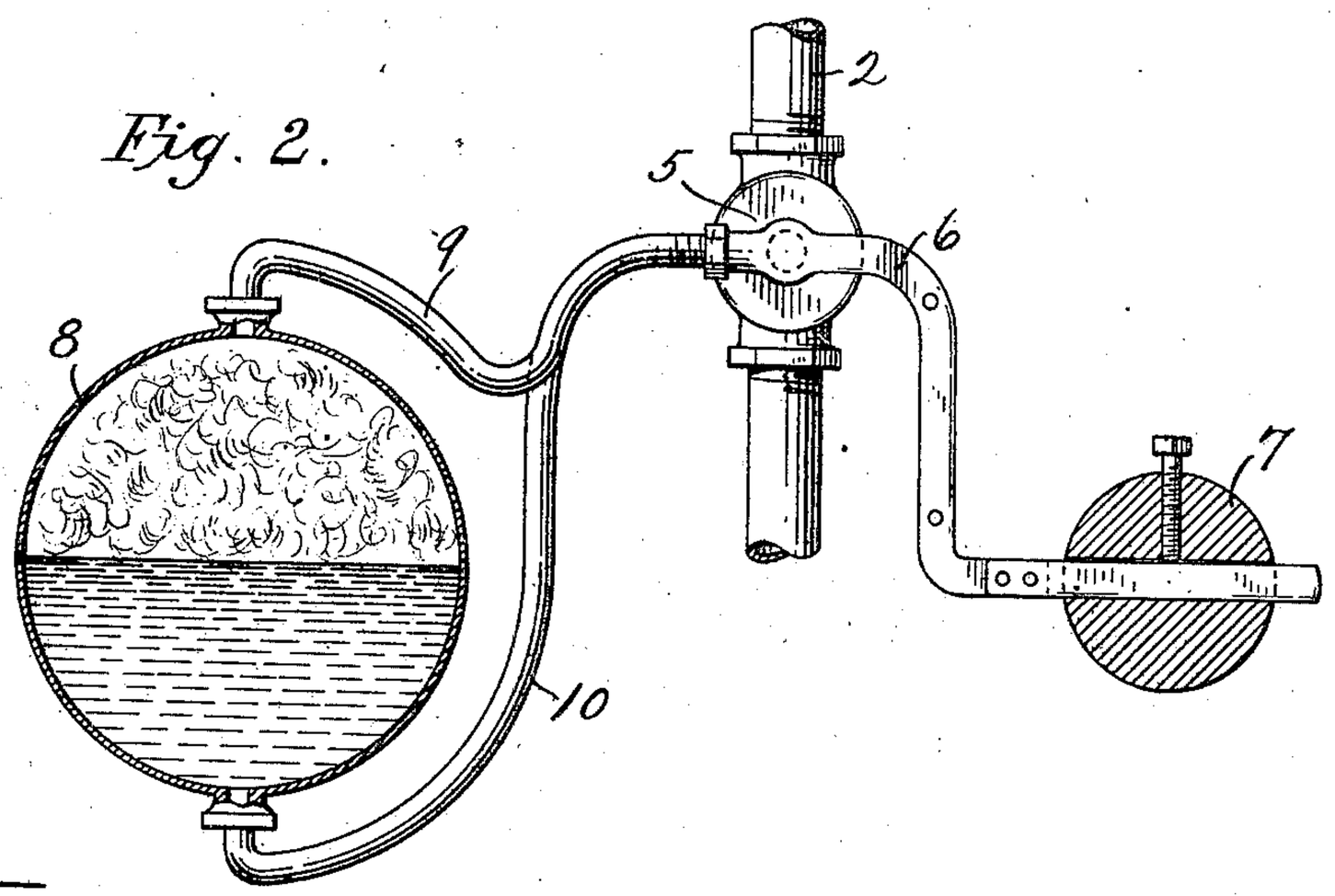


Fig. 2.



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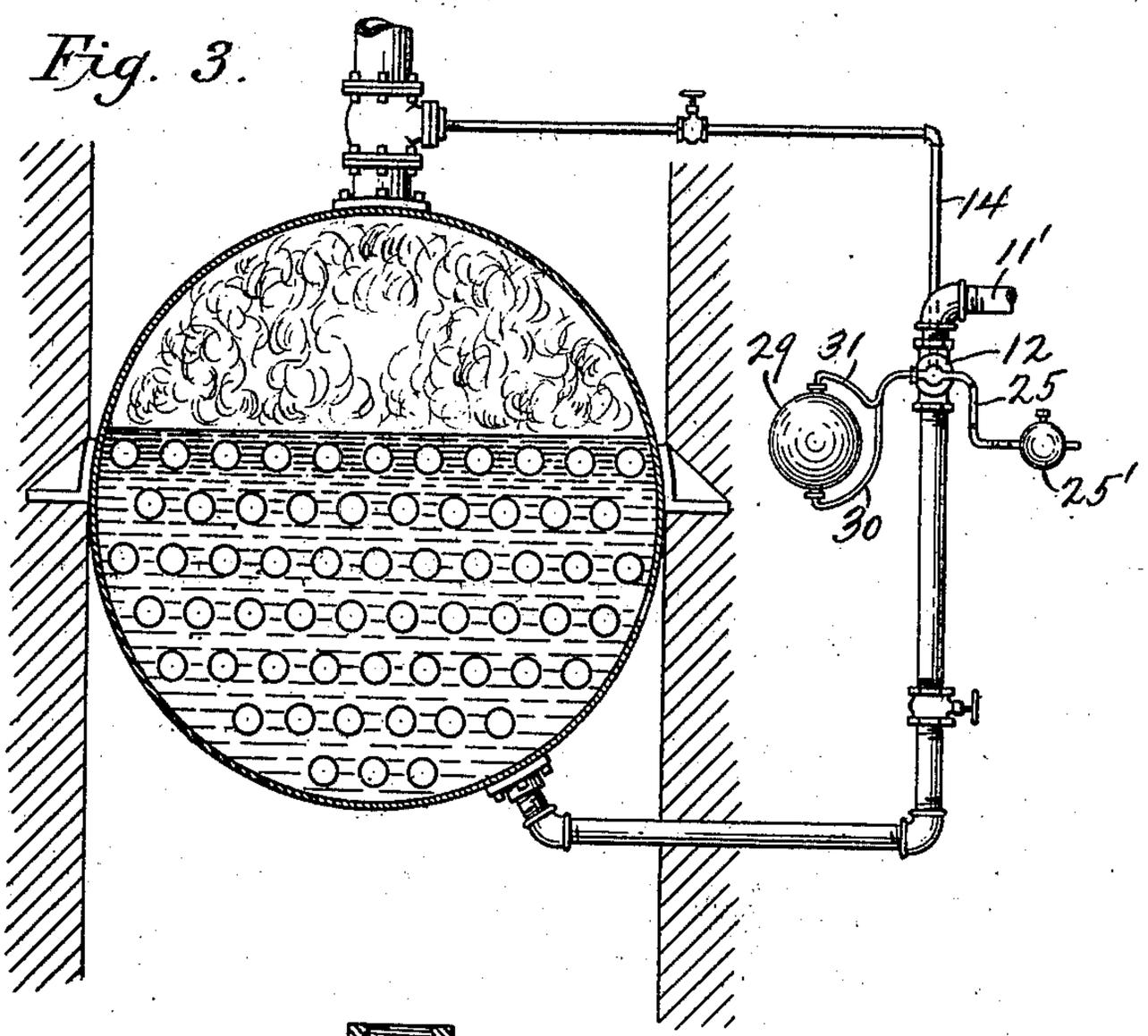
2 SHEETS—SHEET 2.

Fig. 3.



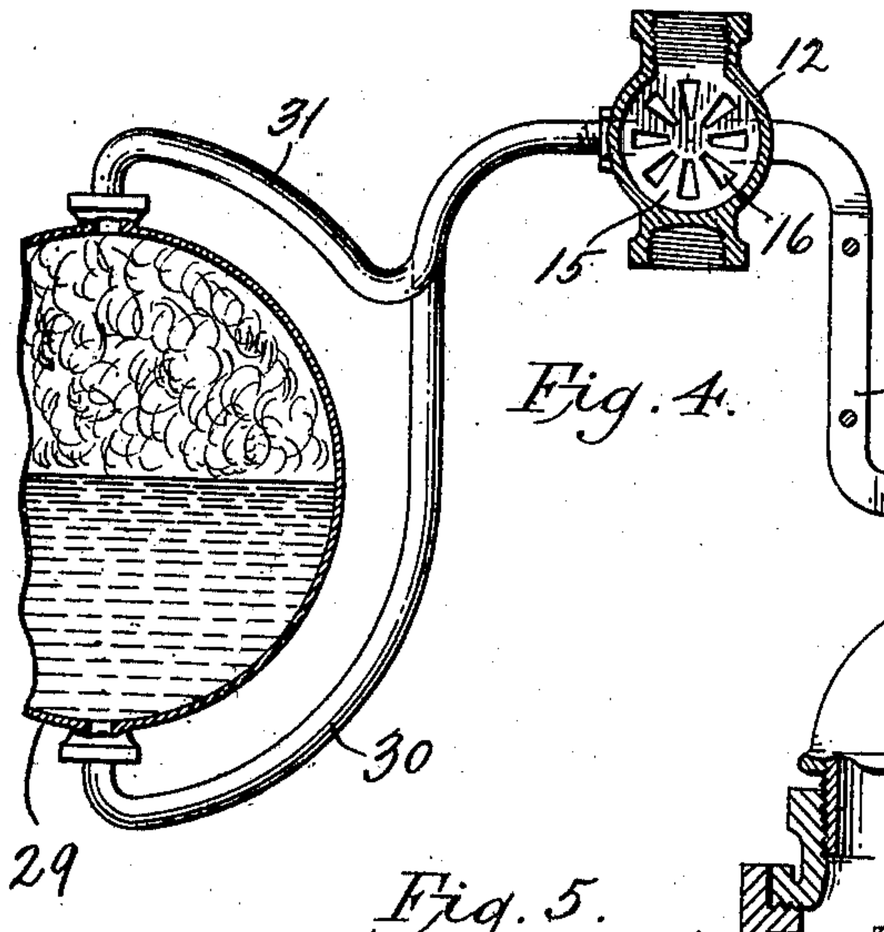


Fig. 4.

Fig. 6.

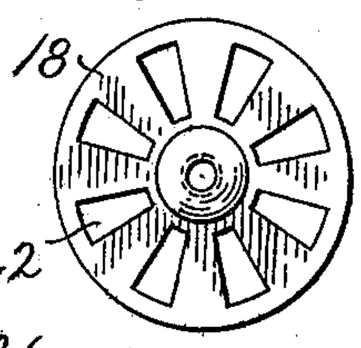
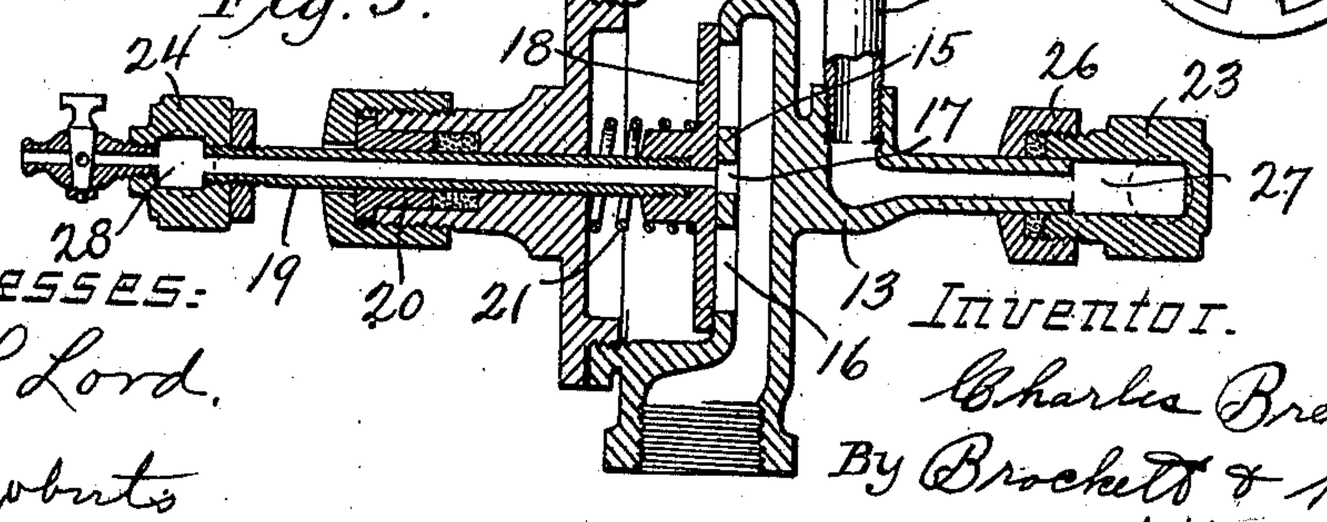


Fig. 5.



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UNITED STATES PATENT OFFICE.

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FEED-WATER REGULATOR.

995,841. Specification of Letters Patent. **Patented June 20, 1911.**

Application filed July 17, 1907. Serial No. 384,242.

To all whom it may concern:

Be it known that I, CHARLES BRENT, a subject of the King of England, residing at Buffalo, in the county of Erie and State of New York, have invented a certain new and useful Improvement in Feed-Water Regulators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates generally to feed water regulators for steam boilers and particularly to that class of such devices wherein the supply of water is regulated by a suitable valve, or other similar devices, which is directly controlled by suitable mechanism which is rendered operative by changes in the water level.

In my prior application for improvements in feed water regulators, Serial No. 208,220 filed May 16, 1904 and Serial No. 354,007 filed February 26, 1907 a construction is shown wherein a controlling valve in the steam supply of a water pump is operated by a weighted lever which is held from operation by a reservoir supplied with water varying in amount with the water level in the boiler.

In the present application the applicant has arranged the valve operating lever and the reservoir so that the parts are at all times in a state of stable equilibrium, thereby making it vastly more sensitive in its response to variations in the water level in the boiler. This of course renders the use of the device very economical in point of consumption of fuel and water.

Still more specifically the invention contemplates the use of a suitable water circulating system, such for example as a pump supplied with steam from the boiler and with water from any suitable source, or it may be from the water main itself provided the pressure is sufficient to overcome the internal pressure in the boiler, together with a suitable controlling valve for such circulating system, which is provided with an operating lever having on one end a weight normally tending to shift the valve into an open position, and a reservoir or ball on the other end connected to the boiler in a manner such that it is supplied with water and steam therefrom whereby the water level in the boiler is maintained in the reservoir or ball, and to arrange this reservoir at some point below the point of suspension of the lever whereby when it moves upward, as a result of a drop in the water level its effective leverage is increased proportionately and the lever and its parts are substantially in the state of stable equilibrium at all times.

The sensitive operation of the device is brought about by the reason of the fact that, as the water drops in the ball and it consequently rises, due to the action of the weight, its effective leverage length increases, thus causing the controlling valve to be cracked only to the extent of permitting the operation of the pump to supply the boiler with water, sufficient in amount to raise the water level therein and return the ball to its normal position. In other words in the present device the parts are at all times substantially in a state of stable equilibrium.

The invention may be further briefly summarized as consisting in the construction and combination of parts hereinafter set forth in the following description, drawings and claims.

Referring to the drawings Figure 1 is a sectional view of a boiler with my device applied thereto; Fig. 2 is a detail view; Fig. 3 is a sectional view of a boiler with a modified form of my invention applied thereto; Fig. 4 is a view partly in section of the operating lever of this modified form; Fig. 5 is a sectional view of the valve mechanism and Fig. 6 is a detail view of the valve.

My invention may be carried out in various ways to meet the many uses to which it may be applied but I have shown one construction in the drawings which is very effective in operation and in such embodiment 1 represents a boiler, which is connected by a suitable steam line 2 with a feed water pump 3 in turn connected by a water pipe 4 with the boiler. The arrangements of these parts is such that when the pump 3 is operated by steam from the boiler, feed water is forced in through the pipe 4 from any suitable source of supply.

The admission of steam to the pump 3 through the steam line 2 is controlled by a valve 5 which is of the construction set forth in my co-pending application wherein the valve and its seat are provided with coöperating ports which are adapted to register upon a very slight movement of the valve stem and thereby admit a full head of steam to the pump, so that the maximum supply

of water is delivered to the boiler upon a very slight movement of the valve shifting mechanism and consequently with a very slight fluctuation in the water level. This valve is adapted to be shifted by a lever 6 which may project horizontally from the valve or may drop in the manner shown in Fig. 2 and it is provided at its free end with a counterbalance weight 7 normally tending to operate the lever and shift the valve into open position. The operation of this weight is counteracted by a reservoir or ball 8 connected to and carried by a steam pipe 9 and a water pipe 10 which are secured rigidly to the lever 6 in any preferred manner. The steam pipe 9 is connected to the steam space in the valve 5 as set forth in the last mentioned application or in any other preferred manner, while the water pipe 10 is connected to the boiler below the water line by means of a pipe 11 which is in communication with the pipe 10 through a suitable pivoted member of the lever 6 as set forth in the last mentioned application or in any other suitable way. The pipes 9 and 10 carry the reservoir 8 in a manner such that it is hung below the point of suspension of the lever for shifting the valve.

The valve shifting mechanism is preferably located in the steam line in a manner such that the center of the ball, when the lever is in normal position with the valve closed, is below the point of suspension of the lever and in the instance shown, below the valve. The ball or reservoir is designed so that it is lighter than the counterbalance weight and when substantially half full with water is adapted to substantially counteract the action of the weight and hold the valve shifting mechanism in a state of stable equilibrium with the valve in the steam line closed. The location of the device is such that when the ball is half full of water its water line should correspond to the desired water line in the boiler.

Upon the water dropping below the desired water line in the boiler and the decrease in the amount of water in the ball reservoir, brought about by the connections with the boiler, the ball becomes lighter and the counterbalance weight swings it upward an amount in proportion to the displacement of water therein, then upon the operation of the pump as a result of the shifting of the valve, an amount of water is permitted to enter the boiler with the consequent raising of the water line in the boiler and in the ball thus shifting the valve operating mechanism back to normal position and preventing a further feeding of water to the boiler.

In the modification shown in Figs. 3, 4, 5, and 6 the water main 11′ is connected directly to the boiler below the water line thereof and at a suitable point above this water line it is provided with a valve casing 12, having upon one side of the same a hollow stud 13, provided with a steam pipe 14 and projecting out from the casing, and forming a trunnion for supporting the lever as will later appear. The casing is further provided with an inner partition 15 which divides the same into two parts, and it has ports 16 which serve as the only means of communication between the main side and the boiler side of the valve. A port 17 is arranged at the center for a purpose to be later described. The partition 15 further serves to form a seat for a valve 18 mounted upon the end of a hollow stem 19 passing through a stuffing box 20 secured upon the valve casing 12. A spring 21 is arranged to bear against the valve 18 and hold the same tightly upon its seat. The opening in the hollow valve stem 19 is extended through the valve as shown in Fig. 5, whereby communication is established between the former and the boiler side of the valve through the port 17 in the partition 15. The valve 18 is provided with ports 22 corresponding to the ports 16 in the partition 15 and when the valve is in proper position and is rotated sufficiently these ports all register and communication is established between the two sides of the valve.

Loosely mounted upon the stud 13 and rigidly mounted upon the valve stem 19 are respectively portions 23 and 24 of the valve shifting lever 25 and the arrangement is such that when the lever is shifted the valve stem 19 and the valve on the end thereof will be rotated simultaneously. A stuffing box 26 is arranged between the lever portion 23 and the stud 13 for preventing any leakage about the same. The lever portion 23 is further provided with a port 27, communicating with the opening in the hollow stud 13 likewise the lever portion 24 is provided with a port 28 communicating with the opening in the hollow valve stem. The valve shifting lever 25 is provided with a counterbalance weight 25′, which normally has a tendency to cause the lever to shift the valve 18 into open position.

A reservoir 29 is mounted in any suitable way upon the lever 25 to counteract the effect of the weight 25′, but I prefer to mount it thereon by means of a water pipe 30 leading from the lower part of the reservoir 29 to the lever portion 24 and communicating with the port 28 therein, and by a steam pipe 31 leading from the upper part of the reservoir to the lever portion 23 and communicating with the port 27. It is essential in mounting the reservoir that, when it is substantially half filled, and the valve 18 is closed, it be below the point of suspension of the lever or below the valve stem and stud which form the pivot of the lever.

The parts just described relating to the

modified form of the invention operate as follows. The water pressure in the main being normally greater than the internal pressure in the boiler there is at all times a tendency for it to flow into the boiler against the pressure therein and this flow is regulated by the valve 18 which is normally closed when the parts are in normal position and the water level in the boiler is at the desired point, the water level in the boiler being maintained in the reservoir through the pipes 30 and 31. Upon a variation in the water level in the boiler due to the consumption of steam and water, the water level in the reservoir falls, with the result that that end of the valve operating device becomes lighter than the counterbalance weight 25′ and the valve 18 is shifted slightly so that water passes through the valve and casing and into the boiler until the predetermined water level is restored when the reservoir will resume normal position and will bring about the closing of the valve and prevent the further feed of water.

Having described my invention, I claim:

1. In a feed water regulator for boilers, in combination, a feed water system, a valve casing having a connection leading to the water space in the boiler and another connection leading to a water supply, a flat partition in such casing and separating the two connections, said partition being provided with suitable ports and a central opening, a hollow valve stem passing into said casing, a valve carried by the end of said stem and having an opening adapted to establish communication between the opening of the valve stem and the opening leading through said partition, a spring normally tending to hold said valve against said partition, said valve being provided with ports adapted to register with the ports in the partition, a lever mounted upon said valve stem and adapted to shift the same and to normally tend to hold said valve in an open position, a reservoir carried by said lever, suitable connections between the hollow valve stem and the lower part of the reservoir whereby water may be supplied thereto from the water space in the boiler, and suitable connections between the upper part of said reservoir and the steam space in the boiler, said lever and said reservoir being supported in a manner such that the center of gravity of the parts is below the point of suspension at all times whereby by reason of variations in the amount of water in said reservoir the extent of opening of the valve is varied directly with the water level in the boiler at all times.

2. In a feed water regulator for boilers, in combination, a feed water system, a valve casing having a connection leading to the water space in the boiler and another connection leading to a water supply, a flat partition in such casing and separating the two connections, said partition being provided with suitable ports and a central opening, a hollow valve stem passing into said casing, a valve carried by the end of said stem and having an opening adapted to establish communication between the opening of the valve stem and the opening leading through said partition, a spring normally tending to hold said valve against said partition, said valve being provided with ports adapted to register with the ports in the partition, a lever mounted upon said valve stem and adapted to shift the same and to normally tend to hold said valve in an open position, a reservoir carried by said lever, suitable connections between the hollow valve stem and the lower part of the reservoir whereby water may be supplied thereto from the water space in the boiler, suitable connections between the upper part of said reservoir and the steam space in the boiler, said lever and said reservoir being supported in a manner such that the center of gravity of the parts is below the point of suspension at all times whereby by reason of variations in the amount of water in said reservoir the extent of opening of the valve is varied directly with the water level in the boiler at all times, and a counter balance weight on said lever for counteracting the effect of said reservoir.

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

CHARLES BRENT.

Witnesses:
F. D. Livingston,
H. A. Mallon.