

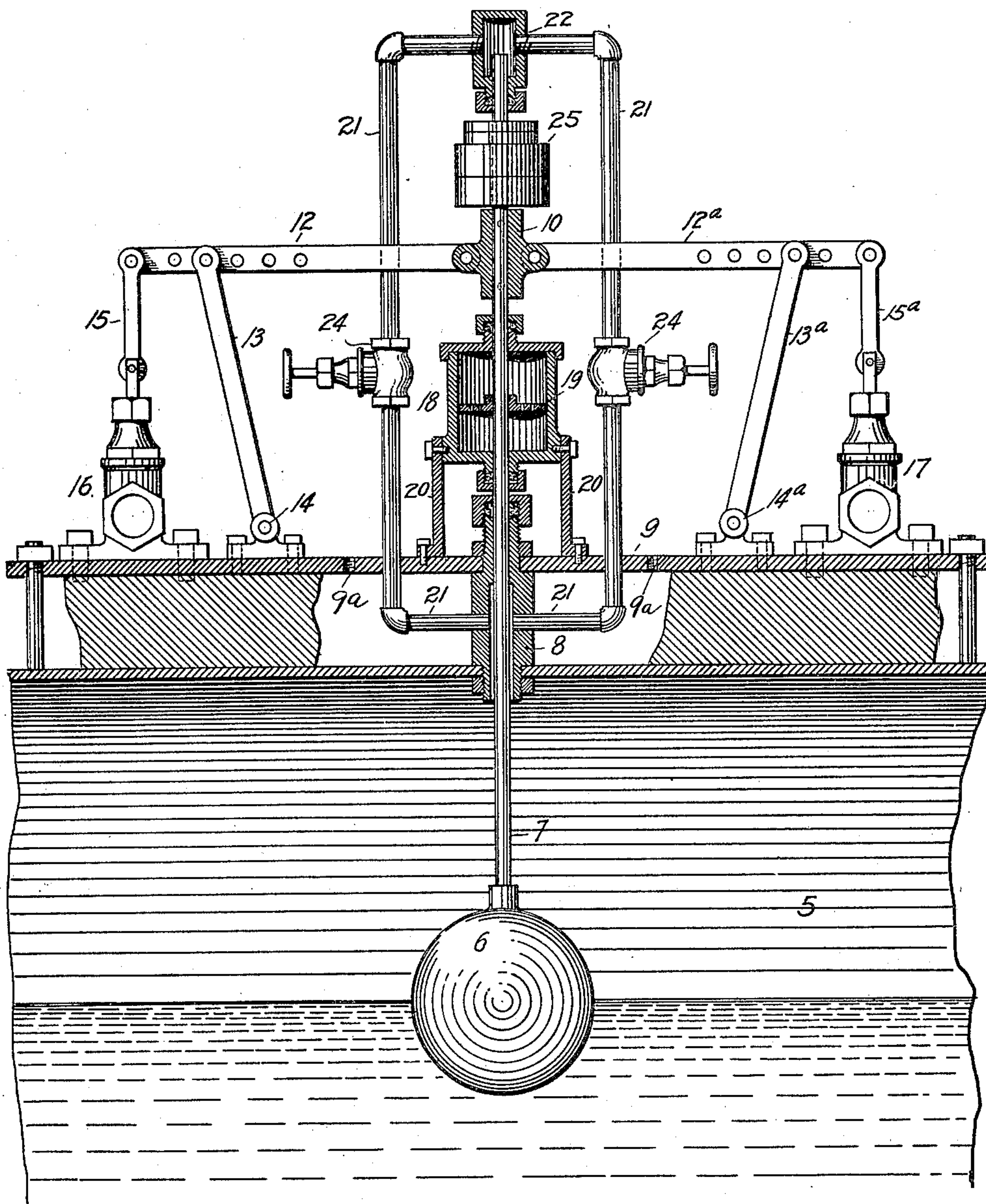
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J. BIBB & E. R. DUNCAN.
FEED WATER REGULATOR FOR STEAM BOILERS.

(Application filed Mar. 19, 1901.)

(No Model.)



WITNESSES:
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FEED-WATER REGULATOR FOR STEAM-BOILERS.

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To all whom it may concern:

Be it known that we, JUDSON BIBB and EDWIN RALPH DUNCAN, citizens of the United States of America, residing at Colorado Springs, in the county of El Paso and State of Colorado, have invented certain new and useful Improvements in Feed-Water Regulators for Steam-Boilers; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to the figures of reference marked thereon, which forms a part of this specification.

Our invention relates to improvements in feed-water regulators for steam-boilers, our object being to automatically maintain the water at a suitable predetermined depth in the boiler, whereby accidents and other disadvantages resulting from dry boilers or too little water therein may be avoided; and to this end our improvement consists of the features, arrangements, and combinations hereinafter described and claimed, all of which will be fully understood by reference to the accompanying drawing, in which is illustrated an embodiment thereof.

The drawing is a section taken through a boiler equipped with our improved automatic feed-water regulator, the mechanism of which is shown partly in section.

Let the numeral 5 in the drawing designate the boiler, in which is located a ball 6, arranged to rise and fall with the level of the water in the boiler. This ball is made fast to a stem 7, passing through an opening in the top of the boiler, in which is inserted a hollow stud or sleeve 8, whose opening is larger than the stem to allow the steam from the boiler to circulate around the stem. Above the boiler is located and suitably supported a plate 9, which forms the stationary support upon which the mechanism is mounted. Through an opening formed in this plate passes the upper extremity of the sleeve 8, which is threaded at both ends and secured by nuts applied, respectively, to its extremities on the inside of the boiler and above the stationary plate. The stem 7 passes upwardly through the sleeve 8 above the plate

9. To the upper portion of the stem is secured a sleeve 10, provided with ears, which are pivotally connected with the inner extremities of two levers 12 and 12^a, which, as shown in the drawing, project in opposite directions from the stem. These levers are fulcrumed on the upper extremities of links 13 and 13^a, respectively, whose lower extremities are pivotally connected with the plate 9, as shown at 14 and 14^a. Each lever 12 12^a is provided with a number of openings, whereby the fulcrum-point may be regulated at will. The outer extremities of the levers are connected, by means of links 15 15^a, with valves 16 and 17, respectively, which may be of any suitable construction. One of these valves controls the passage of water to the boiler from the pump, (not shown,) while the other controls the passage of steam from the boiler to the pump. It will be assumed that 16 is the water-valve and 17 the steam-valve.

Between the sleeve 10 and the stationary plate 9 is located a dash-pot 18, through which the stem 7 passes. The piston 19 of the dash-pot is made fast to the stem. The function of the dash-pot is to prevent sudden fluctuations of the water in the boiler, as would occur in marine service, from being communicated to the stem and thence to the valves 16 and 17 through the instrumentality of their connections. The dash-pot is mounted on suitable supports 20, secured to the plate 9. A stuffing-box is located above and another below the dash-pot and also between the top of the sleeve 8 and the bottom of the dash-pot, whereby there is no escape for the steam around the stem above the sleeve 8. Communicating with the space around the stem in the sleeve 8 and leading therefrom are two pipes 21, which extend upwardly and open into a steam-chest 22, into which the upper extremity of the stem 7 protrudes.

Surrounding the stem 7, above the sleeve 10 and resting on the sleeve, are a number of weights 25 for convenience in balancing the mechanism, as hereinafter explained. Each pipe 21 is provided with a valve 24, which is normally open. These valves are utilized to shut off the steam from the chest 22 when for any reason it may be necessary to do so.

From the foregoing description the operation of the mechanism in a general way will be readily understood. The float 6 rises and falls with the water in the boiler through the connections heretofore explained and by virtue of its action on the valves 16 and 17 regulates the supply of steam to the pump and the flow of water from the pump to the boiler, whereby the water is maintained at the proper level. As the load on the boiler varies or as the requirements for steam fluctuate, a device of this kind automatically regulates the supply of steam to the pump and the supply of water to the boiler through its action on the valves 16 and 17, as described.

In water-tube boilers or when for any reason it is not practicable to place the float directly in the boiler the float may be placed in a tank adjacent and communicating with the boiler, whereby the water in the tank rises and falls with the water in the boiler. In this event the hollow stud or sleeve 8 would be attached to the top of the tank and the other mechanism would be correspondingly arranged. In other words, what is referred to in the drawing as a "boiler" may be considered a tank or receptacle in communication with the boiler and so arranged that the water-level in the tank always properly indicates or is the same as the water-level in the boiler.

Independently of the ball 6 our improved mechanism is supposed to be exactly balanced. Let it be assumed that the parts are in the position shown in the drawing, that the water-level is at the proper height in the boiler, and that the valves 16 and 17 are both closed. Now if the float-ball were removed and the stem 7 left projecting into the boiler the parts would remain in the same position regardless of the pressure in the boiler, since there is free communication between the steam-chest 22 and the steam in the boiler by way of the pipes 21. By virtue of this construction the steam or pressure in the boiler acts on the upper extremity of the stem to balance the pressure on its lower extremity, which protrudes into the boiler. If the steam were not allowed to pass to the upper extremity of the stem, it would be impossible to automatically maintain a perfect balance of the mechanism at all boiler-pressures, since when the float is applied to the stem as well as when it is not applied the pressure in the boiler acts to raise the stem 7 with a force equal to the boiler-pressure on the cross-sectional area of the stem, and consequently the greater the boiler-pressure the greater the force acting to raise the stem. The raising of the stem closes the valves 16 and 17, as heretofore stated, and without the steam-chest construction, whereby the steam is allowed to act on the upper extremity of the stem 7, the pressure in the boiler might be sufficiently great to hold the valves 16 and 17 closed, though the water were lowered in the boiler below the danger-point, in which case the construction would be inoperative. However, by allowing the steam

or boiler pressure to act on the upper extremity of the stem the pressure on the stem inside and outside the boiler is equalized under all circumstances and the ball or float is free to rise and fall with the water in the boiler and exert its force to open and close the valves 16 and 17 with the greatest accuracy and independently of any retarding or interfering influences.

The blocks with which the lower extremities of the links 13 and 13^a are connected are adjustable on the plate 9 by means of an extra bolt-hole 9^a.

Having thus described our invention, what we claim is—

1. In a feed-water regulator for steam-boilers, the combination with the boiler or water-receptacle in communication with the boiler, and the valves for controlling the passage of steam from the boiler to the pump and the passage of water from the pump to the boiler, of a float located in the boiler or receptacle in communication therewith, a stem to which the float is rigidly attached, said stem protruding from the tank or boiler, levers connected with the stem and suitably fulcrumed, the steam and water valves being respectively connected with said levers, the arrangement being such that the water and steam valves are closed and opened by the rise and fall of the float through the instrumentality of its connection with the valves.

2. The combination with a boiler or a receptacle in communication therewith, and the water and steam valves, of a float arranged to rise and fall with the water in the boiler, a stem connected with said float, levers connected with the stem, connections between the levers and the steam and water valves respectively, whereby the passage of steam from the boiler to the pump, and water from the pump to the boiler is regulated to correspond with the fluctuations of the water-level in the boiler, and a dash-pot acting on the stem to prevent sudden variations of the water in the boiler from being communicated to the water and steam valves.

3. The combination with a boiler or a water-receptacle in communication therewith, and water and steam valves, of a float arranged to rise and fall with the water, a stem connected with the float, two levers connected with the stem and fulcrumed between the stem and the water and steam valves, connections between the said levers and the said valves respectively, and weights mounted on the stem to facilitate the balancing of the mechanism.

4. The combination with the boiler or water-receptacle in communication therewith, and water and steam valves, of a float, a stem connected with the float, levers connected with the stem, links whose upper extremities form fulcrums for the respective levers, between the stem and the said valves, the lower extremities of the links being adjustably connected with a suitable stationary support,

and suitable connections between the outer extremities of the levers and said valves, whereby the valves are controlled by the rise and fall of the water in the boiler.

5 5. In a construction of the class described, the combination with the boiler, and steam and water valves, of a float arranged to rise and fall with the water in the boiler, a stem connected with said float, levers connected
10 with the stem, adjustable fulcrums for the levers, and suitable connections between the levers and the steam and water valves respectively, whereby the latter are controlled by the fluctuations of the water in the boiler.

15 6. In a construction of the class described, the combination with the boiler and the steam and water valves, of a float arranged to rise and fall with the water in the boiler or other water-receptacle in communication therewith,
20 a stem connected with said float, a steam chest or receptacle located outside of the boiler into which the stem protrudes, and a connection between the interior of the boiler or water-receptacle and said chest whereby
25 the boiler-pressure on the stem is balanced.

7. The combination with the boiler and steam and water valves, of a float located in the boiler or water-receptacle in communica-

tion therewith, a stem connected with the float, and protruding from the boiler, a sleeve 30 inserted in the boiler and through which the stem passes, the sleeve being large enough to allow the steam to circulate freely around the stem, a chest or receptacle into which the upper extremity of the stem protrudes, and 35 a pipe leading from said sleeve to said receptacle.

8. The combination with the boiler and steam and water valves, of a float located in the boiler, a stem connected with the float 40 and protruding from the boiler, a sleeve or hollow stud inserted in the boiler and through which the stem passes, the sleeve being large enough to allow the steam to circulate freely around the stem, a chest or receptacle into 45 which the upper extremity of the stem protrudes, two pipes leading from said sleeve to said steam-chest, and a valve for controlling the passage of steam through said pipes.

In testimony whereof we affix our signatures in presence of two witnesses.

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EDWIN RALPH DUNCAN.

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