

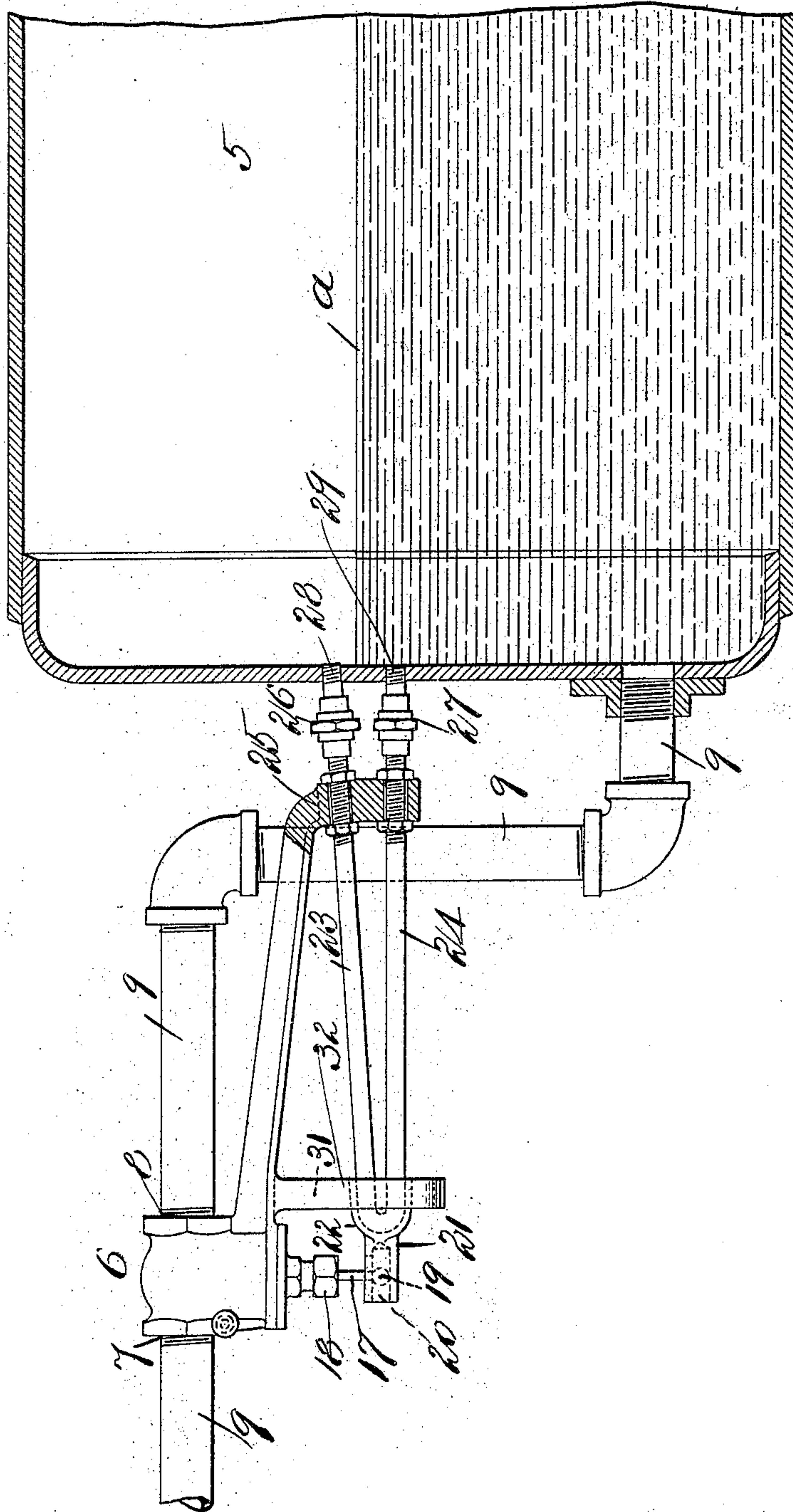
No. 798,273.

PATENTED AUG. 29, 1905.

C. B. EDWARDS.
FEED WATER REGULATOR.
APPLICATION FILED FEB. 23, 1904.

2 SHEETS—SHEET 1

Fig. 1.



Witnesses:

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Inventor:

Charles B. Edwards

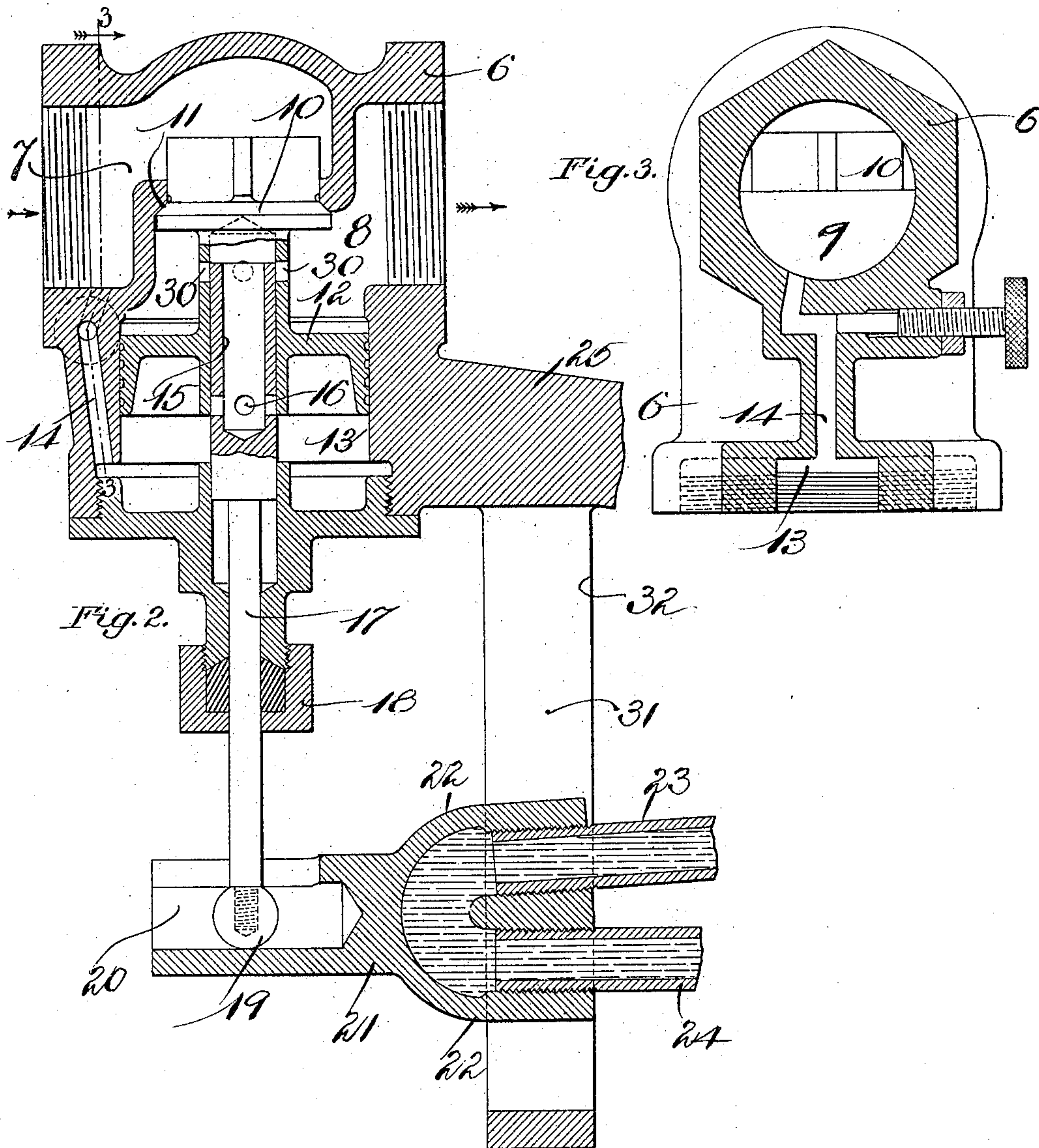
By his attorney, *Paul D. Gooding.*

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2 SHEETS—SHEET 2.



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Louis A. Jones.

Franklin C. Low.

Inventor:

Charles B. Edwards

By his Attorney

Wm. N. Ford

UNITED STATES PATENT OFFICE.

CHARLES B. EDWARDS, OF BRAINTREE, MASSACHUSETTS.

FEED-WATER REGULATOR.

No. 798,273.

Specification of Letters Patent.

Patented Aug. 29, 1905.

Application filed February 23, 1904. Serial No. 194,635.

To all whom it may concern:

Be it known that I, CHARLES B. EDWARDS, a citizen of the United States, residing at Braintree, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Feed - Water Regulators, of which the following is a specification.

This invention relates to feed-water regulators for steam-boilers, the object of the invention being to keep the water in the boiler at substantially the same normal level.

The invention consists in the combination and arrangement of parts set forth in the following specification, and particularly pointed out in the claims thereof.

Referring to the drawings, Figure 1 is a side elevation of my improved feed-water regulator, partly in section, showing the same connected to a portion of a boiler, said boiler being shown in section and the water indicated therein by broken lines. Fig. 2 is a central vertical longitudinal section, partly in elevation, of the preferred form of valve and a portion of the expansion device attached thereto. Fig. 3 is a section taken on line 3 3 of Fig. 2 looking toward the right in said figure.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 5 is a boiler of any desirable construction; 6, a valve-casing having an inlet-chamber 7 and an outlet-chamber 8. The outlet-chamber 8 is connected by a feed-pipe 9 to the boiler 5. The valve-casing 6 contains a valve which may be of any desirable construction, but preferably of the construction illustrated in Figs. 2 and 3, said construction being substantially like that described and shown in United States Patent No. 660,294, issued to me October 23, 1900, and consisting of a valve-disk 10, which is normally held by fluid-pressure against the valve-seat 11. Said valve-disk 10 has a piston 12 rigidly fastened thereto and constructed to move longitudinally of an intermediate fluid-chamber 13.

The intermediate fluid-chamber 13 is connected with the inlet-chamber 7 by a passage 14. Concentric with the piston 12 and constructed to slide therein is a tubular valve 15, provided with ports 16 and with a valve-stem 17, which extends downwardly through a stuffing-box 18 and terminates at its lower end in a ball 19, constructed to fit in a slot 20, provided in an extension 21, formed upon

a return-bend 22. The bend 22 connects together the outer or free ends of two converging tubes 23 and 24. The tube 23 is preferably formed of brass and the tube 24 of steel or iron, and each of said tubes is rigidly fastened at the ends adjacent to the boiler 5 to an arm 25, said arm being fast to or integral with the valve-casing 6. The tubes 23 and 24 are connected by couplings 26 and 27, respectively, and extensions 28 and 29, respectively, to the interior of the boiler 5, the tube 23 communicating with the portion of the interior of the boiler above the normal level of the water, as indicated by the line *a*, and the tube 24 connecting with the interior of the boiler below said line *a*.

The operation of the particular form of valve hereinbefore specifically described is substantially the same in all respects as that of the valve shown and described in my Patent No. 660,294, hereinbefore referred to, it being understood that the pressure of the water in the inlet-chamber 7 is greater than that in the outlet-chamber 8 and the effective surface area of the piston 12 greater than that of the valve-disk 10. It will be seen that normally said valve-disk will be held against the valve-seat 11 and the pressure of the water in the inlet-chamber 7 and in the intermediate chamber 13 will be the same, and as the area of the piston 12 is greater than the area of the valve 10 it will be evident that said valve will remain closed under normal conditions and when the parts are in the position indicated in Fig. 2; but if, as hereinafter described, a downward pull is exerted upon the valve-stem 17 the tubular valve 15 will be drawn downwardly until the ports 16 therein are opened to the interior of the intermediate chamber 13, whereupon water under pressure from the chamber 7 and from the intermediate chamber 13 will enter through said ports 16 and pass upwardly through the hollow tubular portion of the valve 15, out of the upper end thereof through ports 30, provided in the cylindrical connecting portion between the valve-disk 10 and the piston 12 and outwardly into the outlet-chamber 8, thus equalizing the pressure in the intermediate chamber 13 and the outlet-chamber 8. The excess pressure in the inlet-chamber 7 will now open the valve 10 and water will flow through the feed-pipe 9 into the boiler 5.

The downward pull upon the valve-stem 17, hereinbefore referred to, is exerted by the

extension 21 when the water in the boiler sinks to such a level that the steam fills the tube 23 and causes the same to expand, throwing the outer end thereof downwardly and causing the bend 22 to move downwardly, thus pulling the valve-stem 17 and tubular valve 15 downwardly, with the result hereinbefore set forth—viz., that water will enter from the inlet-chamber 7 through the intermediate chamber 13 and passing through the ports 16 and 30 will flow into the outlet-chamber 8, thus equalizing the pressure upon both sides of the piston 12, whereupon the excess pressure in the inlet-chamber 7 will cause the valve 10 to open and the water will flow through the outlet-chamber 8 and feed-pipe 9 and into the boiler 5. The bend 22 is guided in a slot 31, formed in a downwardly-depending bracket 32, fast to the arm 25.

It will be understood that the valve 10, together with the piston 12, forms a main valve, while the tubular valve 15 constitutes a supplemental valve concentric with said main valve, the main valve being fluid-operated in its movements and normally subjected to fluid-pressure at both ends, while the supplemental valve extends into and controls the movement of the main valve.

The general operation of the device hereinbefore specifically described is as follows: As the amount of water in the boiler decreases the level thereof will descend and steam will enter the tube 23, causing the same (which is preferably made of brass) to expand, while the tube 24, being filled with water and also being made of iron or steel, will not expand to any appreciable extent, so that the outer ends of the tubes 23 and 24 will be pushed downwardly by the expansion of said tube 23, as the ends of said tubes which are adjacent to the boiler 5 cannot move on account of being rigidly fastened to the arm 25. The effect, therefore, of this expansion of the tube 23 will be to pull downwardly upon the valve-stem 17 and allow water to enter the boiler, as hereinbefore described. As the water rises in the boiler it will enter the tube 23 and driving out the steam will cool said tube off, whereupon said tube 23 will contract and the valve-stem 17 will be moved upwardly until it arrives at the position illustrated in Fig. 2. As soon as the ports 30 are closed by the as-

cent of the tubular valve 15 the fluid-pressure in the intermediate chamber 13 will be greater than that in the outlet-chamber 8 and the pressure upon the piston 12 will cause the valve 10 to be closed and shut off the water from the feed-pipe. The tubes 23 and 24, together with the bend 22, form as a whole a tubular expansion-arm provided with an inlet and an outlet orifice connected to said boiler with said orifices located one above the other.

Having thus described my invention, what I claim, and desire by Letters Patent to secure, is—

1. A feed-water regulator comprising a boiler, a valve-casing provided with an inlet and an outlet chamber, a valve in said casing, a pipe connecting said outlet-chamber to said boiler, two tubes rigidly supported at one end thereof, connected at that end to said boiler, one above the other, said tubes converging toward each other, a return-bend connecting said free ends together, and a valve-stem connecting said return-bend to said valve constructed with a ball fast to one end thereof projecting into a slot provided in said return-bend.

2. A feed-water regulator embodying a fluid-actuated valve having a piston of different effective surface area in fixed connection therewith; means for admitting fluid above the valve and below the piston; a concentrically-disposed tube-valve having ports disposed to conduct fluid from below the piston to a point above said piston; in combination with a boiler and a tubular expansion-arm, consisting of two tubes rigidly supported at one end thereof, connected at that end to said boiler one above the other, said tubes converging toward each other, and a return-bend connecting said free ends together, and a valve-stem connecting said return-bend to said valve constructed with a ball fast to one end thereof projecting into a slot provided in said return-bend.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES B. EDWARDS.

Witnesses:

CHARLES S. GOODING,
ANNIE J. DAILEY.