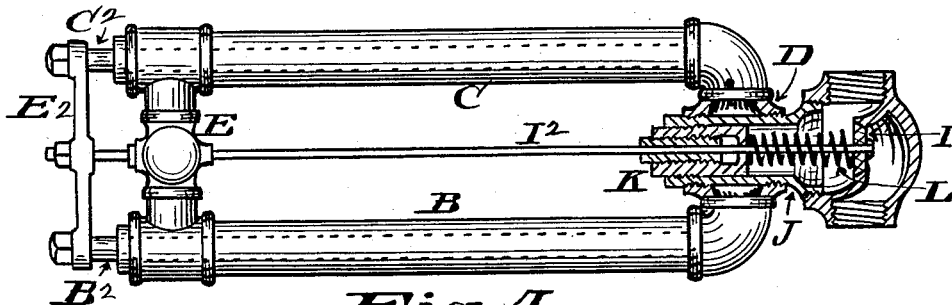


(No Model.)

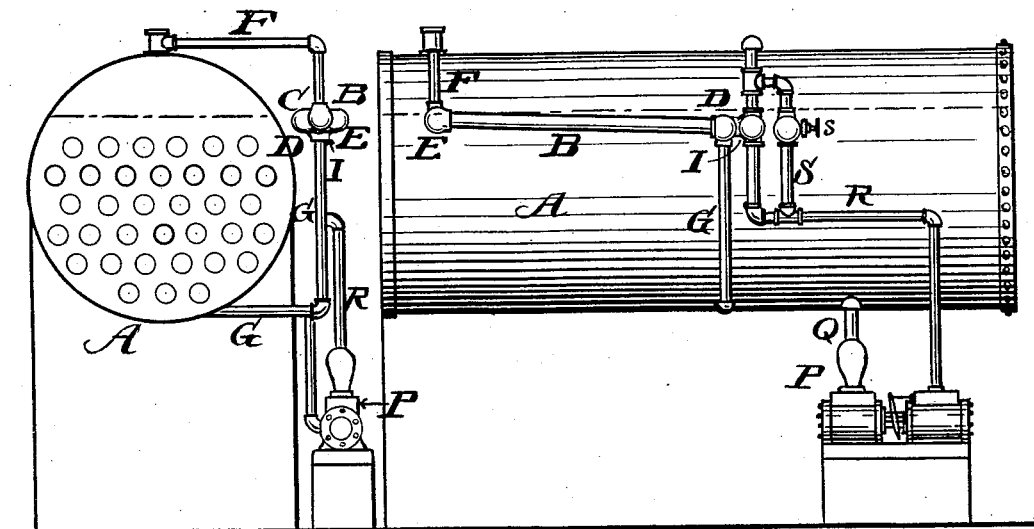
J. THOMAS.  
AUTOMATIC FEED WATER REGULATOR.

No. 454,088.

Patented June 16, 1891.

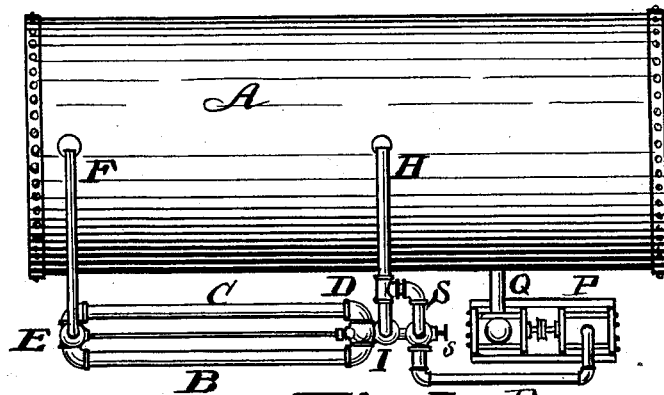


*Fig. 4.*



*Fig. 3.*

*Fig. 2.*



*Fig. 1.*

Witness.

*H. E. Norton.*

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Inventor,

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By *Geo. W. Tibbitts* Atty.

# UNITED STATES PATENT OFFICE.

JOSHUA THOMAS, OF CLEVELAND, OHIO.

## AUTOMATIC FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 454,088, dated June 16, 1891.

Application filed October 15, 1890. Serial No. 368,239. (No model.)

*To all whom it may concern:*

Be it known that I, JOSHUA THOMAS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Automatic Steam-Boiler Feed-Water Regulators, of which the following is a specification.

This invention relates to feed-water mechanism for steam-boilers, and has for its object to provide an automatic device to operate in conjunction with the steam-pressure and height of water in the boiler for regulating the supply of water to the boiler for maintaining the equality of water-supply.

To this end the invention consists in the combination and arrangement of a pipe or pipes composed of a metal having quick expansive and contractile qualities connected at one end with the steam-dome and at the other end with water at the bottom of the boiler, said pipes being arranged on a level with the water-level in the boiler and said pipes having a valve attachment automatically operated by the expansion and contraction functions of said pipes, whereby the water-supply to the boiler is regulated and the supply of water to the boiler is equally maintained.

In the accompanying drawings, Figure 1 is a top or plan view of a boiler having my invention attached. Fig. 2 is a side elevation of the same. Fig. 3 is an end elevation of the same. Fig. 4 is a detached enlarged plan view, partly in section, of my new feed-water regulator.

A represents a boiler, which may be of any of the well-known constructions.

B C are two pipes composed of a metal having quick expansive and contractile qualities, and may be of suitable length for obtaining longitudinal motion by expansion. Said pipes are joined by cross-heads D E at their ends and are located and supported at the side of the boiler at the same level as the water-level in the boiler, but on a slight incline therewith. The higher end, having cross-head E, is connected by a suitable pipe F with the top or steam-dome of the boiler, and the other or lower end, having the cross-head D, is connected by a pipe G with the bottom of the boiler. Thus the steam and water meet on

the same level in the pipes B C as that in the boiler.

In the cross-head D is provided a valve I, having a pipe H, connecting it with the steam-dome or top of the boiler. The valve-stem I<sup>2</sup> passes through the cross-head D and extends to and through the cross-head E. The valve has a neck J extending through the cross-head D, provided with a nipple and stuffing-box K. A retracting-spring L is placed on the valve-stem between the valve and said nipple. The ends of cross-head E are provided with T-joints, as shown in Fig. 4.

Within the pipes B and C are contained rods or tubes B<sup>2</sup> C<sup>2</sup>, composed of a highly-expansive metal—as zinc, for example—secured at their inner ends to the elbows in cross-head D, leaving room in the elbows for the water to pass into the pipes and surround said pipes or rods B<sup>2</sup> and C<sup>2</sup>. The other ends of said pipes or rods extend through the T-joints and are connected by a cross-head E<sup>2</sup>, to which the end of the valve-stem I is also attached, for that purpose. The T-joints are provided with suitable packing-boxes for said rods B<sup>2</sup> and C<sup>2</sup> to pass through.

The object of providing the rods B<sup>2</sup> and C<sup>2</sup>, as above described, is to enable the pipes B C and B<sup>2</sup> C<sup>2</sup> to be made short and yet have sufficient expansive function to operate the valve to adapt the device to be applied to marine and locomotive boilers. Otherwise, for stationary boilers, where there is ample room, the pipes or rods B<sup>2</sup> and C<sup>2</sup> may be dispensed with. The pipes B C, which may be of brass or iron, would possess sufficient expansive and contractile qualities for accomplishing the required results.

P represents a force-pump for supplying the boiler with water, having a pipe Q connecting it with the boiler for that purpose.

R is a steam-pipe connecting said pump with valve I, through which steam is had for operating the pump.

S is a branch pipe connecting pipe H with pipe R, passing around valve I, and is provided with a globe-valve s, independently of valve I for the purpose of using the pump independently of the aforesaid regulating device when desired.

The working of my invention is as follows:

Live steam and water from the boiler meet in the pipes B C on the same level with the water-line in the boiler, as shown by the dotted line, Figs. 2 and 3. Now as the water may  
5 lower in the boiler the water will likewise run out of the pipes B C and the steam will take its place in said pipes. The steam, being much hotter than the water, causes said pipes to expand and lengthen out, thereby pulling  
10 on the valve-stem I<sup>2</sup> and opening the valve I. This will admit more steam to the pump, which will at once begin running faster and supply the deficiency of water in the boiler, and as soon as the boiler is resupplied the water again fills the pipes B C, which, being of  
15 lower temperature than the steam, causes the pipes B C to again contract, thereby shutting the valve I and depriving the pump of steam. It ceases to work until the water again lowers  
20 in the boiler. If the boiler should be located where there is a pressure to the water-supply, as in cities having water-works, then the force-pump may be dispensed with, the valve I being employed as a water-valve instead of a

steam-valve. In such a case the upper side 25 of valve I would be connected with the water-supply and the lower side with the boiler.

With the use of this invention the liability and dangers of the water in a boiler getting too low through neglect or carelessness are 30 entirely obviated.

Having described my invention, I claim—

The combination of boiler A, pipes B C, joined by cross-heads D E, cross-head D, connected by pipe G with bottom of the boiler, 35 and cross-head E, connected by pipe F with the top or steam-dome of the boiler, cross-head D, having valve I attached, valve-stem I<sup>2</sup>, passing through stuffing-box K in said cross-head D and also provided with spring L, 40 and the opposite end of valve-stem connected with or passed through cross-head E, constructed to operate substantially as described.

JOSHUA THOMAS.

Witnesses:

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CHARLES ZUCKER.