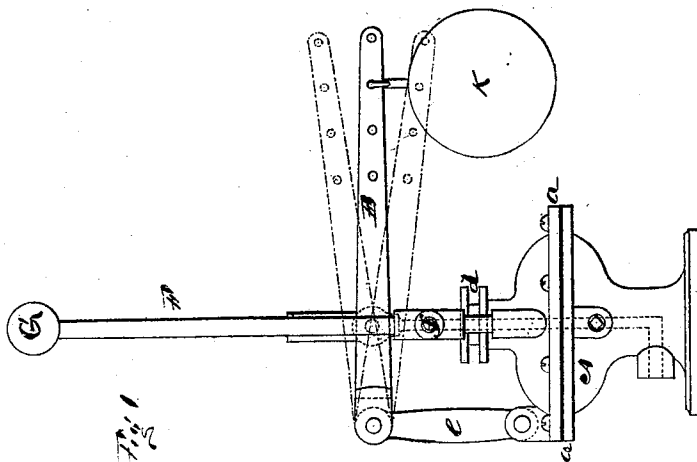
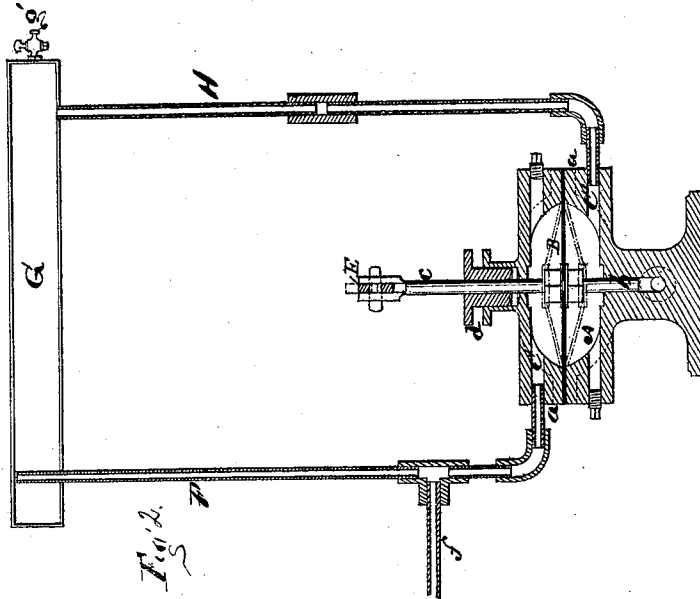


J. B. ROOT.
Feed-Water Regulators.

No. 141,592.

Patented August 5, 1873.



Witnesses:
M. H. Kinckel
A. C. Bradley

Inventor:
John B. Root
by J. M. Plympton
Atty.

UNITED STATES PATENT OFFICE.

JOHN B. ROOT, OF NEW YORK, N. Y.

IMPROVEMENT IN FEED-WATER REGULATORS.

Specification forming part of Letters Patent No. **141,592**, dated August 5, 1873; application filed January 4, 1873.

To all whom it may concern:

Be it known that I, JOHN B. ROOT, of the city, county, and State of New York, have invented a new and Improved Feed-Water Regulator; and that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings and to the letters of reference marked thereon making a part of this specification.

This invention is in the nature of an improvement in apparatus for regulating the supply of feed-water to steam-boilers and other purposes; and the invention consists in constructing an apparatus for regulating the supply of feed-water to steam-boilers and other purposes automatically in the manner herein-after fully described, by operating the feed or check valve of a boiler or throttle-valve of a steam-pump by means of an elastic diaphragm operated by the weight of a column of water.

In the accompanying sheet of drawings, Figure 1 represents a side elevation of my regulator, and Fig. 2 a longitudinal section of same.

Similar letters of reference indicate like parts in the several figures.

A represents a case with hollow interior, cast in two parts, and bolted together through the flanges *a*. Between the upper and lower halves of said case is placed an elastic diaphragm, B, of India rubber or any like substance, which is retained in place by the bolts which secure the two halves of the case together. Cast with the case A are passages C and C'. To the under side of the diaphragm B is secured a guide, *b*; and to the upper side of said diaphragm is secured a spindle, *c*. This spindle passes through a stuffing-box, *d*. To the upper end of the spindle *c* is bolted a lever, E, one end of which is secured to the fulcrum *e*, and the other end of which is provided with a weight, K. Into the passage C of the case A is fitted a pipe, F, which extends upward into and nearly to the upper interior surface of a drum, G; and into the passage C' is fitted another pipe, H, which extends upward until it enters just within the drum G, as shown in Fig. 2. The pipe F is provided with a branch pipe, *f*, which connects directly with the boiler, entering the boiler at the

height it is desired to carry the water within the same.

My apparatus being constructed substantially as above described, its operation is as follows: The feed-water valve or the throttle-valve of a steam-pump is connected in any convenient manner to the lever E. The branch pipe *f* enters the boiler at the point it is desired the water-level within the boiler shall be. So long as the water within the boiler is maintained at the height at which the branch pipe *f* enters the same the water from the boiler will pass through the pipe *f* into the upper half of the case A; and also through the pipe F into the drum G, and through the pipe H and the passage C' into the lower half of the case A, thus establishing an equal pressure on both sides of the diaphragm B; and the lever E will remain at the lowest position shown in dotted lines in Fig. 1, being brought down by the weight K, and cause the check or other valve attached to it to close; but, should the water in the boiler fall below the point at which the pipe *f* enters the same, steam will enter the branch pipe *f* and pipe F, and, since the steam in said pipe F is lighter than the column of water in the pipe H, the water in said last-mentioned pipe will enter into the lower half of the case A, force up the diaphragm B, which, in turn, will force out the spindle *c*, causing the lever E to be raised, and, by its upward movement, open the feed-water or other valve until the desired level of water is attained, when water instead of steam will again enter the pipes F *f* as the steam therein is condensed by radiation. When the pipes F and H are each filled with water an equilibrium is established, and an equal pressure brought to bear on both sides of the diaphragm B, which is maintained until the water is again below the desired level, when the operation just described is repeated.

The lever E is provided with an adjustable weight, K, by means of which the action of the lever and throw of the feed-water or throttle valve is regulated.

The pipe F, as will be seen in Fig. 2, extends into the drum G to very nearly the upper interior surface of the same, the object of which is to cause the water within the said

drum G to drain off through the pipe H, when the steam is admitted above it through the pipe F, so that the movement of the diaphragm upward would cause but little diminution of height of column H. Also, the drum G gives greater cooling-surface and quicker condensation, and consequent quicker action.

To allow any surplus air that may accumulate to escape, a small cock, *g*, is fitted to one end of the drum G.

From the foregoing description it will be clearly seen that with my apparatus suitably connected to any feed-water valve or throttle-valve of a steam-pump that the required water-level in a boiler may be maintained automatically and with a certainty not otherwise

obtainable, thus avoiding the dangers incident to a low water-level in the boiler, and also resulting in a saving of fuel.

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

The combination of the drum and case with connecting-pipes opening at the top and bottom of the drum and case, respectively, and the diaphragm and its spindle, substantially as described.

JOHN B. ROOT.

Witnesses:

H. L. WATTENBERG,
G. M. PLYMPTON.