

(No Model.)

2 Sheets--Sheet 1.

J. E. BOTT.

Automatic Feed Water Regulator.

No. 233,199.

Patented Oct. 12, 1880.

FIG. I

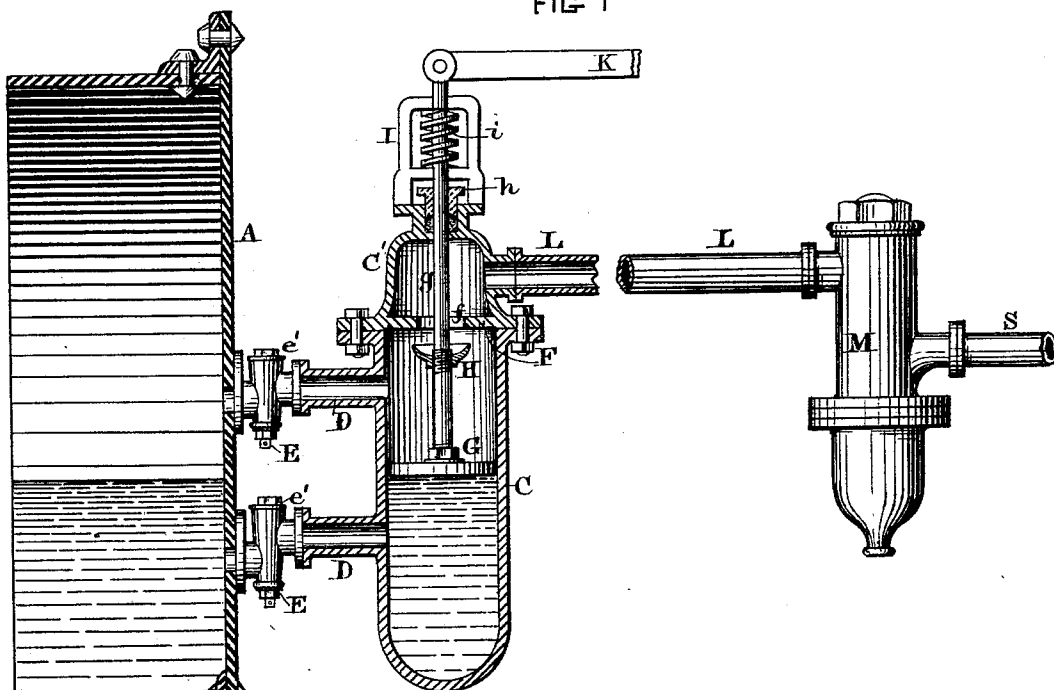
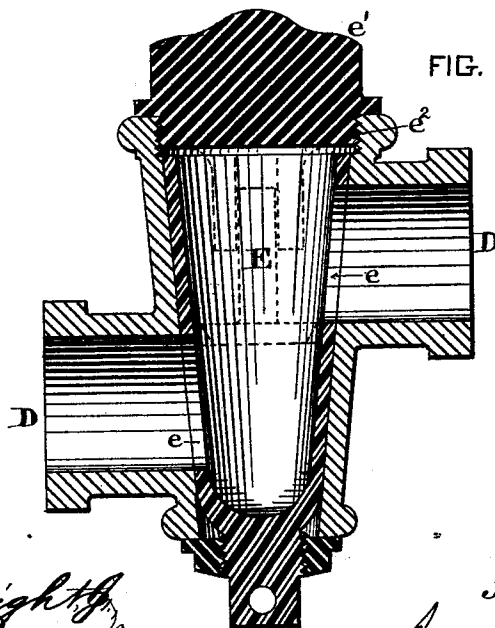


FIG. II.



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By James L. Norris,
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FIG. III.

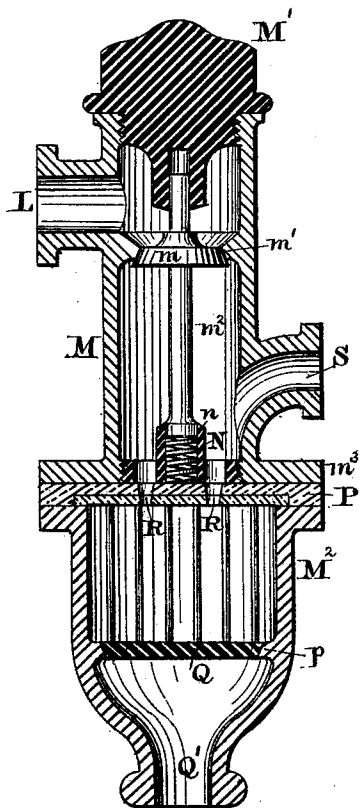


FIG. IV.

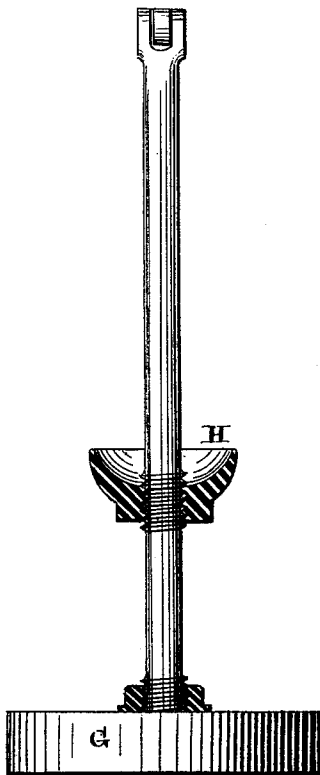
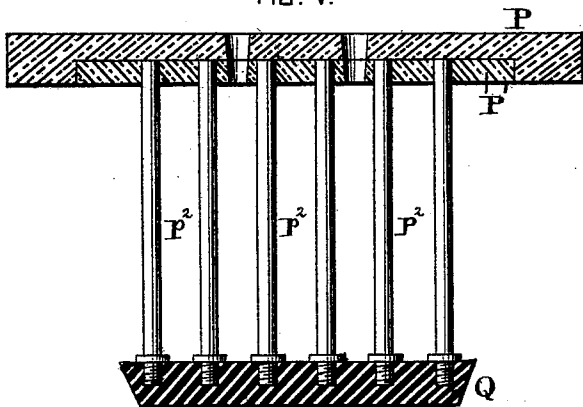


FIG. V.



WITNESSES:

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INVENTOR

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By James L. Norris,
Attorney.

UNITED STATES PATENT OFFICE.

JOSEPH E. BOTT, OF WILMINGTON, DELAWARE, ASSIGNOR OF ONE-HALF
OF HIS RIGHT TO JOHN R. FLINN, OF SAME PLACE.

AUTOMATIC FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 233,199, dated October 12, 1880.

Application filed September 14, 1880. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH ELTON BOTT, a subject of the Queen of Great Britain, residing at Wilmington, in the county of New Castle and State of Delaware, have invented new and useful Improvements in Automatic Feed-Water Regulators, of which the following is a specification.

The nature of my present invention relates to automatic feed-water regulators for boilers; and it consists, first, in an automatic feed-water regulator for boilers, in the combination, with the boiler, of a steam and water receiving cylinder inclosing a float and valve both secured upon a common stem, and a lever for controlling the water-supply connected with the said stem of the valve and float, pipe-connections being made between the cylinder and boiler at points above and below the float, and the valve being adjusted to cut off the flow of steam from the cylinder to the pump or injector at the proper moment, as more fully hereinafter set forth; second, in an automatic feed-water regulator for boilers, in the combination, with the boiler and a mechanism for automatically establishing or cutting off the flow of steam from the boiler to a pump or injector, of a regulator comprising a spring-valve arranged within a shell or casing, and a condensing or condensed-steam-collecting chamber provided with a valve adapted to be automatically opened or closed by the contraction or expansion of metallic rods or wires constituting supporting-stems for the valve, substantially as described; third, in an automatic feed-water regulator for boilers, in an expansion-valve supported by metal rods or wires secured at their upper ends, the said rods or wires being adapted to contract and open the valve by the contact of moist steam or water of condensation with them, whereby the outlet for the discharge of condensed steam is opened, the said rods being also adapted to close the valve by their expansion incident to the heat from the steam passing from the boiler to a pump or injector, as more fully hereinafter set forth; fourth, in an automatic feed-water regulator for boilers, in the combination, with the shell of the regulator, of steam inlet and outlet pipes leading into and out from said shell, the regulator-

valve, a chamber communicating with the interior of the shell through passages in fixed plates, and the expansion-valve suspended from said fixed plates by means of copper rods or wires, as more fully hereinafter described; fifth, in a feed-water regulator for boilers, in the combination, with the boiler and a steam and water receiver provided with devices for automatically cutting off the outflow of steam therefrom, of pipes connecting the boiler with the steam and water receiver, and check-valves arranged in said pipes and composed each of a conical shell with openings adapted to the area of the bore of the pipes, the said conical valve being adapted to be turned in its seat so as to close the pipes, and being also provided with screw-caps, as more fully hereinafter set forth.

In the drawings, Figure I is a sectional view taken on a vertical plane through a portion of the boiler and through the drum or cylinder with the float and valve mechanism. Fig. II is a section taken through one of the check-valves which are arranged in the pipes leading from the boiler to the cylinder containing the float and valve. Fig. III is a section taken on a vertical plane through the regulator. Fig. IV represents the float and valve removed from the cylinder, and Fig. V is a section taken through the expansion-valve and the plates supporting the same by means of metal rods.

Referring by letter to the drawings, let A designate a section of an ordinary steam-boiler, and B a portion of the furnace. Secured to or supported alongside of the boiler in any suitable manner is a drum or cylinder, C, connecting with the boiler through the medium of two horizontal pipes, D D, which are provided with check-valves E, for cutting off or establishing communication between the boiler and the cylinder. These valves are each composed of a hollow conical-shaped plug formed with two side openings, *e e*, and fitted in an elbow in the pipe, which constitutes a seat for the valve. This form of valve is closed at its lower end, and at its top open end is covered by a screw-cap, *e'*, fitted into a screw-threaded socket, *e''*, of the elbow. The valve is supplied with a handle for turning it, or its lower end may be either adapted to be grasped

by a wrench or provided with a mortise for the insertion of a lever.

When the valves are open their side openings will be coincident with the bores of the pipes D, as shown in Fig. II, and when the valves are closed they will be turned so as to bring the solid faces of their sides in position to close the bores of the pipes. The lower one of these pipes, D, admits water from the boiler into the lower portion of the cylinder C, below a float arranged therein, while the upper one of said pipes leads from the steam-space above the average water-line in the boiler to a space above the float within the cylinder. This drum or cylinder C is closed at its lower end, and at its upper end provided with a cap, C', between which and the upper end of the cylinder is a copper diaphragm, F, having a central perforation, *f*, constituting a passage both for the stem *g* of the float G and also for steam from the said cylinder, for which last-named purpose the area of the passage through the diaphragm is made somewhat greater than the diameter of the float-stem. This float-stem also serves as a stem for a valve, H, which is arranged upon the stem, so as to close the passage between the cap and cylinder when the float has been raised to a certain height by the water flowing from the boiler into the cylinder. The stem *g* is screw-threaded at its lower end, which fits into a screw-threaded socket of the float, and it is also screw-threaded at a point above said end, so as to receive the valve, which may be thereby adjusted thereon.

The valve and float stem just described pass upward through a stuffing-box, *h*, upon the cap C', and it likewise passes up through a chamber, I, above the stuffing-box, in which chamber a compensating-spring, *i*, is arranged around the stem.

To the upper end of the stem is connected a lever, K, for controlling the water-supply, said lever being for such purpose connected with a suitable tap or valve in a supply-pipe. (Not herein shown.)

From the cap C' a pipe, L, leads to the upper portion of a cylindrical regulator, in which is arranged a valve, *m*, denominated the reducing-valve, the inlet of said pipe into the regulator being at a point above said valve. This valve seats upwardly against the valve-seat *m'*, and it is arranged upon a stem, *m*², the upper end of which is guided within a socket of the cap M', screwed into the top end of the regulator M, while the lower end of said valve-stem rests upon a spring, N, which is inclosed by a small casing, *n*, at the base of the regulator M, and which tends to maintain the valve normally against its seat *m'*.

The base of the regulator M is formed with a circumferential flange, *m*³, to the under side of which is applied a copper plate, P, formed with a mortise, in which is fitted a plate, P', of like material. To this latter-named plate P' is secured a series of vertical copper wires or rods, P² P², inclosed by a condenser, M²,

which is secured in any suitable way against the copper plates P P'. This condenser M² is formed with a valve-seat, *p*, upon which seats a valve, Q, secured to the lower ends of the vertical copper rods, the said valve and its seat being arranged so that a slight contraction of the rods will lift the valve and open communication between the condenser M² and its discharge-outlet Q'.

In order to provide for communication between the regulator M and the condenser M², the copper plates, which are arranged intermediate of the two, are formed with perforations R R. From the regulator M, at a point below the valve *m*, which is arranged therein, a pipe, S, leads to the pump or the injector, which is employed for feeding water to the boiler.

The operation of my improved apparatus is as follows: When the water within the boiler is up to about the average level the water will rise to a like level within the cylinder C, and thus elevate the float together with its stem, so as to seat the valve, which is carried by said stem against the diaphragm F, and thereby close communication between the boiler and the pump or injector. When, however, the water within the boiler falls below the usual required level, the level of the water within the cylinder C will likewise fall, thereby admitting of a consequent descent of the float and stem. As the float and stem descend the valve H is opened, thereby allowing steam which passes from the boiler into the receiver above the float to pass through opening *f* in the diaphragm F into the cap C', and thence out through the pipe L into the regulator M, in which it will act against and open the valve *m*, so as to pass out through the pipe S to the pump or injector employed to force water into the boiler. The descent of the stem *g*, which carries the float and a valve, actuates the lever K, so as to open a valve in the water-supply pipe, in order to admit of the free flow of the water which is to be forced into the boiler.

As already described, it will be seen that the copper rods P² are of such length that when expanded by heat the valve Q, at their lower ends, will be seated. This heat is imparted to the rods by the steam, which, during its flow from the boiler to the pump or injector, as hereinbefore mentioned, also enters the condenser M² through the openings R, formed in the copper plates. When, however, moist steam or the slightest quantity of water of condensation collects within the condenser M² it cools and causes a contraction of the same copper rods or wires sufficient to raise the valve Q from its seat, and thus allow the water of condensation to flow out from said condenser through its discharge-outlet. As soon as the condenser has been emptied of this water of condensation the heat of the steam will cause the copper rods to again expand, and thereby seat the valve Q.

As the water which is supplied to the boiler

rises within the same to the proper level, the
 water flowing from the boiler into the cylinder C rises to a corresponding degree in the
 latter, and hence raises the float and its stem
 5 g, so as to both close the valve H and also act-
 uate the lever K, which controls the water, and
 thereby check the flow of water. The flow of
 steam through the regulator M being at the
 same time checked, the action of the spring
 10 N will force the valve-stem m^2 upward, and
 thereby close the valve m thereon.

The water of condensation from the steam
 remaining within the regulator and condenser
 will cool the copper rods P^2 , so as to control
 15 them, and thereby cause the valve Q to rise
 and allow such water to flow out through the
 outlet Q'.

During the operation of feeding water to the
 boiler the valve E will be turned so that com-
 20 munication between the boiler and the cylinder C
 is established through their respective
 passages. In order, however, to admit of the
 valves being cleaned while pressure is exerted
 either upon one or both of their sides, the hol-
 25 low valve will be turned so as to bring its
 solid sides in position to close the pipes D, after
 which the screw-caps of the valve may be re-
 moved.

What I claim is—

30 1. In an automatic feed-water regulator for
 boilers, the combination, with the boiler, of a
 steam and water receiving cylinder, a float,
 and a valve, both secured upon a common stem,
 and a lever for controlling the water-supply
 35 connected with the said stem of the valve and
 float, pipe-connections being made between
 the cylinder and boiler at points above and be-
 low the float, and the valve being adjusted to
 cut off the flow of steam from the cylinder to
 40 the pump or injector at the proper moment,
 the described members being constructed and
 arranged in the relation herein set forth.

2. In an automatic feed-water regulator for
 boilers, the combination, with the boiler and
 45 a mechanism for automatically establishing or
 cutting off the flow of steam from the boiler
 to a pump or injector, of a regulator compris-
 ing a spring-valve arranged within a shell or

casing, and a condensing or condensed-steam-
 collecting chamber, provided with a valve
 50 adapted to be automatically opened or closed
 by the contraction or expansion of metallic
 rods or wires constituting sufficient stems for
 the valve, substantially as described.

3. In an automatic feed-water regulator for
 55 boilers, an expansion-valve supported by metal
 rods or wires secured at their upper ends, the
 said rods or wires being adapted to contract
 and open the valve by the contact of moist
 steam or water of condensation with them,
 60 whereby the outlet for the discharge of con-
 densed steam is opened, the said rods being
 also adapted to close the valve by their expan-
 sion incident to the heat from the steam pass-
 ing from the boiler to a pump or injector, sub-
 65 stantially as described.

4. In an automatic feed-water regulator for
 boilers, the combination, with the shell M of
 the regulator, of steam inlet and outlet pipes
 leading into and out from said shell, the regu-
 70 lator-valve m , a chamber, M^2 , communicating
 with the interior of the shell M through pas-
 sages in fixed plates R, and the expansion-
 valve Q, suspended from said fixed plates by
 means of copper rods or wires P^2 , substantially
 75 as described.

5. In a feed-water regulator for boilers, the
 combination, with the boiler and a steam and
 water receiver provided with devices for au-
 tomatically cutting off the outflow of steam
 80 therefrom, of pipes connecting the boiler with
 the steam and water receiver, and check-valves
 E, arranged in said pipes and composed each
 of a conical shell with openings e , adapted to
 the area of the bore of the pipes, the said con-
 85 cal valve being adapted to be turned in its
 seat so as to close the pipes, and being also
 provided with screw-caps, substantially as de-
 scribed.

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

JOSEPH ELTON BOTT.

Witnesses:

GEO. H. MURPHEY,
 WM. W. PRITCHETT.