

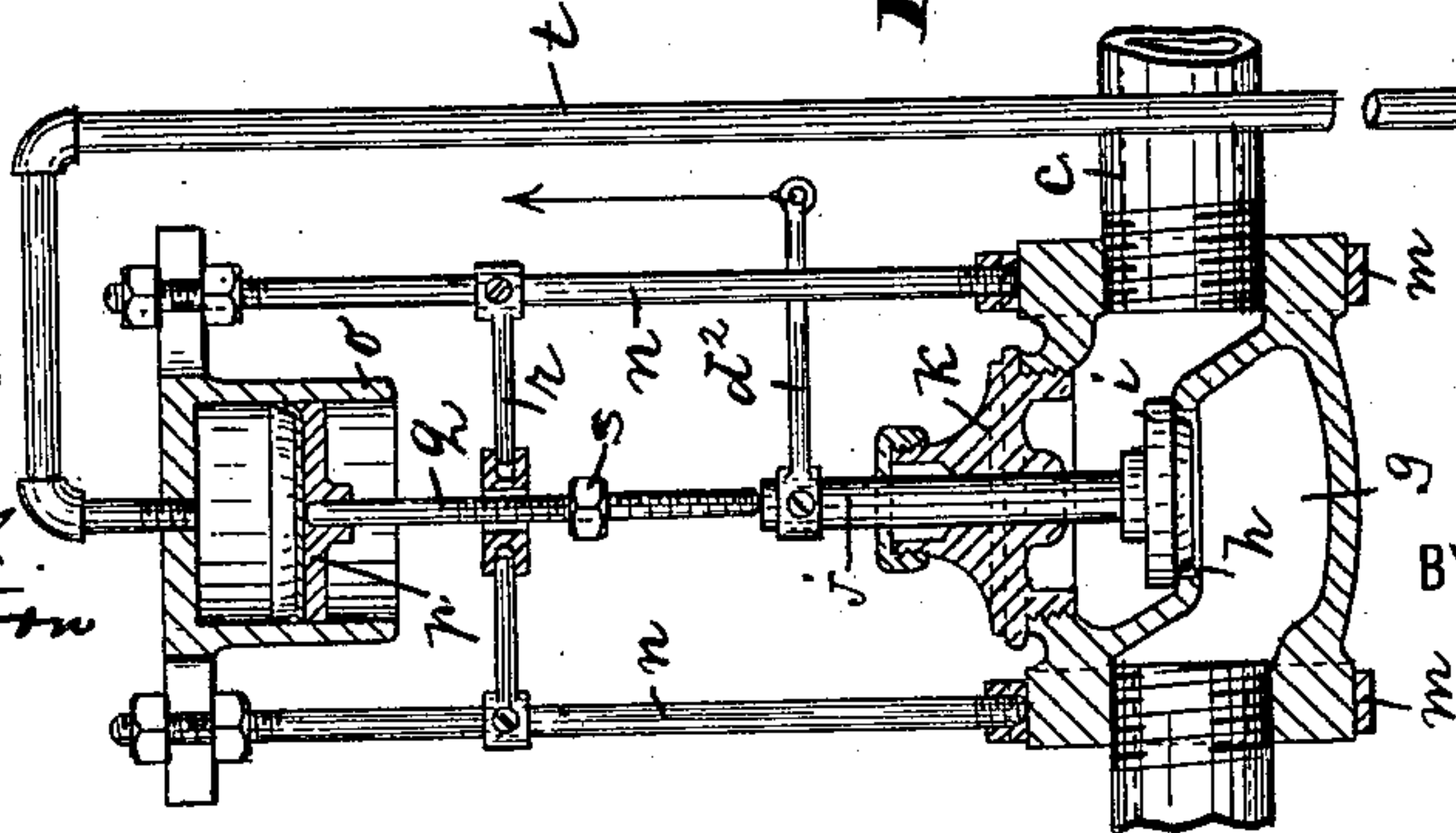
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Patented Nov. 12, 1901.

G. U. MERRILL.
FEED WATER REGULATOR.

(Application filed Aug. 24, 1901.)

(No Model.)



WITNESSES:

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FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 686,413, dated November 12, 1901.

Application filed August 24, 1901. Serial No. 73,122. (No model.)

To all whom it may concern:

Be it known that I, GRANT U. MERRILL, a citizen of the United States, residing in Paterson, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Feed-Water Regulators; and I do hereby 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 drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to automatic boiler-feeding devices, and especially to that class in which an outside thermostat is used instead of the usual float-operated mechanism.

The object of my present invention is to provide an automatic feed-water regulator of simple, strong, and durable construction, perfectly reliable in operation, and which can be readily and quickly attached to boilers or generators of any shape, make, or construction.

The invention consists in the improved automatic feed-water regulator, its thermostat, in the valve controlling the supply-pipe leading to an injector or boiler feed-pump, and in the combination and arrangement of the various parts, substantially as will be hereinafter more fully described and finally embodied in the clauses of the claim.

In the accompanying drawings, Figure 1 is a view in front elevation of a boiler provided with my improved feed-water regulator, only such portions being shown which are necessary to fully illustrate the nature of my said invention; Fig. 2, an enlarged detail front elevation, partly in section, of the supply-pipe-controlling valve and its auxiliary valve; and Fig. 3, an enlarged detail view of the top portion of the thermostat used in connection with my improved feed-water regulator.

In said drawings, *a* represents a boiler having the usual water-column *b* and receiving the water-supply through the pipe *c*, leading to an injector or feed-water pump, which latter is not shown in the drawings, as it does not form a part of my invention. In the supply-pipe *c* is interposed a valve *d*, consisting of a valve-casing *g*, having an interior valve-seat *h*, controlled by the valve *i*, which lat-

ter is carried by the valve-stem *j*, suitably guided in the head or stuffing-box *k*. The end portions of the valve-casing *g* are surrounded by metallic straps *m*, in which are mounted the parallel uprights *n n*, supporting at or near their upper ends the outwardly-projecting slotted flanges or lugs of a piston-cylinder *o*, in which is arranged the piston *p*. By having the projecting flanges or lugs of the piston-cylinder slotted and the uprights supported by the metallic straps supply-pipe valves of different lengths can be fitted. The piston-rod *q* of said piston *p* is in vertical alinement with and rests on the free end of the valve-stem *j*, as clearly shown in Fig. 2 of the drawings. The uprights *n n* likewise support a cross-arm *r* (penetrated by the piston-rod *q*) and adapted to be engaged by a nuts, which latter is adjustably arranged on the screw-threaded portion of said piston-rod *q* for the purpose of regulating the throw or movement of the piston *p* and the valve *i*, respectively, as will be manifest. It may be well to remark that the valve *i* is held in normal position—that is to say, on the valve-seat *h*—by means of the piston *p*, in turn controlled by the pressure of water introduced into the piston-cylinder *o* through a pipe *t*, which is connected, by means of an intermediate auxiliary valve *f*, with a source of water-supply *u*, such as city pressure, &c. The auxiliary valve *f* consists of a cylindrical shell or casing *v* and heads *v' v²* and is provided with three ports *w, w', and w²*. The port *w*, which is centrally arranged, is connected, preferably, by a flexible pipe or joint *w³* with the pipe *t*, while the ports *w²* and *w'* are connected, respectively, with the water-supply *u* and exhaust or outlet. In the valve-casing *v* is arranged a valve *x*, having a stem *x'* pivotally connected to an arm *e'*, while the valve-casing proper is pivotally mounted on an arm *e²*. Said arms *e'* and *e²* are limited in their outward movement by means of a rod *e³*, pivotally secured with one end at or near the free end of the arm *e'* and having its opposite end slotted and engaging the free end of the arm *e²*. The length of said outward movement of said arms can be regulated by means of an adjusting-screw *e⁴*, as will be manifest. The arms *e'* and *e²* are operated by means of the thermostat *e*, which consists of

a vertical tube e^5 , having its lower end connected by a pipe e^6 with the lower leg of the water-column b . On the upper end of the tube e^5 is mounted a cross e^7 , from which leads
 5 a pipe e^8 to the water-column b and communicates with said water-column at a point or level indicating the normal water-line in the boiler. In the cross e^7 is secured a block e^9 ,
 10 to which is fulcrumed a slotted arm e^{10} , having pivotally secured thereto the inner end of the arm e' , heretofore mentioned. A metallic spring b' , secured with its free ends, respectively, to the arms e^{10} and e' , tends to give rigidity to said arms for a purpose and in a
 15 manner hereinafter described. The tension of said spring can be regulated by a set-screw b^2 . Within the slotted arm e^{10} is pivotally arranged one end of a link or rod b^3 , having its lower end securely mounted in a cross b^4 ,
 20 which latter is arranged on the tube e^5 . On the opposite portion of said cross b^4 is securely mounted one end of an adjusting-link b^5 , the other end being pivotally secured to a forked lever b^7 , which forms a part of the arm
 25 e^2 and is fulcrumed, as at b^8 , on the tube e^5 . It must be remarked that the rod b^3 , the adjusting-link b^5 , and the tube e^5 are substantially parallel when in normal position and, further, that the bottom or lower end of the
 30 thermostat e must always be above the normal water-line in the boiler. A thermometer-cup c^2 , containing a thermometer c^3 , is arranged in the cross e^7 , as best shown in Fig. 3 of the drawings.

35 So that the attendant can readily see that the valve i is closed or open, an arm d^2 is mounted on the valve-stem j and is connected, by means of a cord or wire d^3 , passing over rollers or pulleys d^4 d^5 , with a fulcrumed
 40 pointer g^3 , registering on a dial g^4 , as will be manifest.

In operation when the water in the boiler falls below the normal water-level steam from the water-column b enters through the pipe
 45 e^8 into the tube e^5 of the thermostat e . Said tube becoming heated expands in a longitudinal direction, causing the arms e^2 and e' (on account of the various pivots and fulcrums) to be moved inwardly—that is to say, toward
 50 each other. This movement operates the auxiliary valve f —that is to say, the valve x closes the port w^2 and establishes communication between the port w and the outlet or exhaust w' , thus allowing the water contained
 55 in the piston-cylinder o to flow through the pipe t into the exhaust or outlet w' . The pressure having thus been removed from the piston p , the valve i will be raised from its seat by means of the pressure from the injector or feed-water pump, and water is accordingly fed into the boiler through the supply-pipe c . The valve i remains open until
 60 the water in the boiler has risen to a height sufficient to close the inlet of the pipe e^8 , thus shutting off any further steam-supply to the thermostat e and allowing the cold water to flood the same. The said thermostat will now

rapidly cool, and thus return the arms e' and e^2 to their respective normal positions, in which the communication between the ports w and w' in the auxiliary valve f is broken,
 70 and, on the other hand, the communication between the ports w and w^2 is established, which again allows the water of the supply u to flow in the piston-cylinder o , and thereby
 75 reseat the valve i , as will be understood. If the fire is withdrawn, allowing the boiler to become cold, the thermostat contracts to a greater degree, which naturally would cause the arms e' and e^2 to spread in an abnormal
 80 manner, thereby causing breakage in some part of the auxiliary valve f . This spreading of the arms is limited by the rod e^3 , causing the arm e' to buckle at its fulcrumed joint with the arm e^2 . When conditions are again
 85 normal, the metallic spring b' brings the arm e' back to operative position.

I do not intend to limit myself to the precise construction shown and described, as various changes can be made without altering the scope of my invention.

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

1. The combination of a feed-controlling
 95 valve, the feed-pipe leading from a suitable fluid-supply and in which said valve is located, the fluid from said supply normally tending to open the valve, a fluid-conducting tubular structure having an exhaust and also an in-
 100 let, the latter being adapted to be also connected with said supply, a piston working in a part of said tubular structure and connected to, and tending under actuation of the fluid in said structure to seat, said valve, and
 105 a valve arranged in another part of said tubular structure and movable to simultaneously close the inlet and open the exhaust, and vice versa, substantially as described.

2. The combination of a feed-water-supply-
 110 pipe valve, an auxiliary valve for controlling said supply-pipe valve, and a thermally-actuated device for operating said auxiliary valve, said device consisting of an expansible tube, two arms or levers pivotally secured on
 115 said tube, and rods likewise carried by said tube and pivotally connected with said arms or levers, substantially as described.

3. The combination of a feed-water-supply-
 120 pipe valve, a thermally-actuated device, said device consisting of an expansible member, arms having pivotal connection with said member, and links connecting said arms and said member, a valve-casing carried by one of said arms, a valve having its stem connected with the other arm, and operative connecting means between said valve-casing and
 125 said feed-water-supply-pipe valve, substantially as described.

4. The combination of a feed-water-supply-
 130 pipe valve, a thermally-actuated device, said device consisting of an expansible member, arms pivotally connected with said member, one of said arms being flexible, and links con-

necting said arms and said member, a valve-casing carried by one of said arms, a valve having its stem connected with the other arm, and operative connecting means between said
5 valve-casing and said feed-water-supply-pipe valve, substantially as described.

5. The combination with a steam boiler or generator and with its supply-pipe, of a valve in said supply-pipe and normally closed by
10 water-pressure, an auxiliary valve controlling said water-pressure for the supply-pipe valve and comprising a valve-casing and the valve proper having a stem, two arms or levers piv-
15 otally connected with the valve-stem and valve-casing, respectively, of the auxiliary valve, and a thermostat for actuating said arms or levers, substantially as described.

6. The combination with a steam boiler or generator and with its supply-pipe, of a valve
20 in said supply-pipe, an auxiliary valve controlling said supply-pipe valve, a thermostat arranged above the normal water-level in the steam boiler or generator and controlled by the latter, two arms or levers pivotally con-
25 nected with said thermostat and with the

valve-stem and valve-casing of the auxiliary valve, respectively, and means for regulating the movement of said arms or levers, substantially as described.

7. The combination with a steam boiler or generator and with its supply-pipe, of a valve
30 in the supply-pipe, an auxiliary valve controlling said supply-pipe valve, a thermostat controlled by the steam boiler or generator, two arms or levers pivotally mounted on said
35 thermostat and having their other ends pivotally connected with the valve-stem and valve-casing, respectively, of the auxiliary valve, one of said arms or levers being joint-
40 ed, and an adjustable spring for holding said jointed arm or lever in operative position, all said parts substantially as and for the pur-
poses described.

In testimony that I claim the foregoing I have hereunto set my hand this 23d day of
August, 1901.

GRANT U. MERRILL.

Witnesses:

ALFRED GARTNER,
WM. D. BELL.