

UNITED STATES PATENT OFFICE.

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AUTOMATIC WATER-FEED REGULATOR FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 726,123, dated April 21, 1903.

Application filed March 26, 1902. Serial No. 100,047. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WEANT, a citizen of the United States, and a resident of Mannington, in the county of Marion and State of West Virginia, have invented a new and Improved Automatic Water-Feed Regulator for Steam-Boilers, of which the following is a full, clear, and exact description.

This invention provides novel simple means for controlling and graduating the feed of water into steam-boilers; and it consists in the construction and combination of parts, as is hereinafter described, and defined in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a partly-sectional side view of the improvement connected with a steam-boiler front, shown in part. Fig. 2 is a sectional side view of details of a novel valve employed.

The improvement is well adapted for the control automatically of the feed of water into a steam-boiler, so as to maintain the water at a desired height therein, the apparatus operating with equal efficiency when feed-water is supplied to the steam-generator either by gravity from an elevated tank or under pressure from a water-main, a feed-pump, inspirator, or injector.

In the drawings that show the construction and arrangement of the invention, 10 indicates a steam-boiler of any preferred style to be supplied with feed-water that is regulated by the improvement. Upon the boiler-front, as usual, a set of gage-cocks 11 is positioned and suitably spaced apart, three gage-cocks being shown in Fig. 1.

As is well understood by those familiar with steam-boilers and their operation, the upper gage-cock from its relative position defines the highest point of level of water within the boiler, the lowermost gage-cock representing the lowest point for safety that water may be carried level therein, the intermediate gage-cock of the three being placed at a point which will permit the free evolution of steam and avoid the extremes of objectionably-high or dangerously-low water in the boiler.

For efficiency in service it is preferred to connect the improved water-feed regulator with the intermediate gage-cock; but this is not imperative, as the apparatus will operate effectively if connected with the uppermost gage-cock 11. The gage-cock 11, whereon the regulator is attached, is held projected away from the boiler by a nipple having an outlet 13 thereon.

In the outlet 13 a nipple 14 is secured, and upon the opposite end of the nipple 14 a stop-valve 15 is mounted, from which extends the nipple 16, that is detachably connected with another nipple 18 by a union 17 of ordinary construction, a T-fitting 19 being screwed upon the end of the nipple 18 opposite the one engaged by said union.

From the lower end of the T-fitting 19 a short nipple 20 extends downward to receive a T-fitting 21, from which depends the waste-cock 22, that is provided to drain water from parts above it when this is necessary. Upon the upper end of the T-fitting 19 a short nipple 19^a is secured by its lower end, the upper end thereof engaging the lower end of the T-fitting 23, from which extends a long nipple 24, that is closed to prevent the passage of liquid or steam therethrough.

An L-fitting 25 is screwed upon the upper end of the closed nipple 24, and from the lateral opening in said L-fitting a brace rod or tube 26 projects horizontally.

In the lateral outlet of the T-fitting 21 one end of a brace rod or tube 27 is screwed, which is disposed horizontally and in the same vertical plane with the upper brace 26.

The braces 26 27 may be solid bars of metal or may be formed of pipe material; but if the brace 27 is hollow the end that connects with the T-fitting 21 must be closed to prevent the entrance of water or steam therein. Upon the ends of the braces 26 27 that are farthest away from the valve 15 two similar union connections 26^a 27^a are respectively mounted and also have connection with the closed nipples 26^b 27^b, as indicated in Fig. 1. Upon the closed nipples 26^b 27^b are respectively mounted the similar T-fittings 28 29, the nipples engaging lateral openings in said fittings.

As the braces 26 27 have equal length and the described attachments are equal in length, it will be evident that main portions of the

T-fittings 28 29 may be and preferably are disposed in the same vertical plane.

A nipple 28^a projects upward from the T-fitting 28, on the upper end of which the union connection 28^b is secured and from which upwardly extends the nipple 28^c, upon which the L-fitting 28^d is screwed. A nipple 28^e projects laterally from the L-fitting 28^d, and upon the projected end thereof an L-fitting 28^f is mounted and from which depends the waste-pipe 28^g, that is shown broken in Fig. 1, but may be extended to a suitable point for discharge of the water passing through it and as will be further explained.

A nipple 28ⁱ projects down from the T-fitting 28, and a similar nipple 29^a extends up from the T-fitting 29, and between said aligned nipples the specially-constructed globe-valve casing 30 is introduced, that will be hereinafter particularly described.

In the lateral opening of the T-fitting 23 one end of an expansion-pipe 31 is secured and thence extends toward the valve-casing 30, having such length as permits the introduction of other details between the outer end of the expansion-pipe and the valve-casing, as will now be explained.

Upon the end of the expansion-pipe that is nearest to the valve-casing 30 a T-fitting 32 is mounted, in the lateral opening of which the lower end of the steam-pipe 33 is secured, a valve 34, introduced in the steam-pipe, controlling the passage of steam therethrough.

The steam-conduit pipe 33 in completed form extends to the boiler 10, tapping its steam-space, which may be a steam-dome or the shell of the boiler, as indicated in the drawings. A cylindrical coupling-box 35 is connected by one end to a closed nipple 32^a, which projects from the T-fitting 32, and in the opposite end of the coupling-box 35, that is axially perforated and threaded in said perforation, the screw-threaded body of the pusher-bar 36 is screwed, said bar having an angular formation 36^a thereon which adapts it for longitudinal adjustment by use of a wrench applied to said angular formation, the jam-nut 36^b holding the pusher-bar where adjusted.

The preferably globular casing of the controlling-valve 30 is formed internally with the usual diaphragm *a*, which is centrally apertured to provide a liquid-passage *a'* therethrough that is commanded by a peculiarly-constructed double-headed valve, which is a detail of the invention.

In alinement with the pusher-bar 36 the valve-stem 30^a is held to slide by a water-tight engagement within the axial bore of the packing-box 30^b, that projects from the casing of the valve 30 toward the coupling-box 35. A coniform head *a*² is formed on the inner end of the valve-stem 30^a, having proper area to close the passage *a'* when seated upon the diaphragm *a*, as clearly shown in Figs. 1 and 2.

The proportion of parts is such that by adjustment of the pusher-bar 36 its free end may contact with the stem 30^a when the valve-head *a*² is adjusted nearly or fully in contact with the valve-seat in the valve-casing 30, and obviously the retraction of the pusher-bar more or less will permit the valve-stem to correspondingly slide out of the packing-box 30^b when pressure is had upon the valve-head.

The jam-nut 36^b, that is mounted upon the pusher-bar 36, may have enforced engagement with the adjacent end of the coupling-box 35, which will enable the pusher-bar to be held at any point of longitudinal adjustment, as before mentioned.

It is essential for the effective operation of the expansion-pipe 31 that it be inclined slightly downward from the T-fitting 32 to its point of connection with the T-fitting 23 and also that it be supported, so as to be free to expand and contract as it is heated and cooled. As a means for supporting the expansion-pipe a longitudinally-adjustable hanger-arm 37 is introduced between the upper brace and expansion-pipe, hooking upon the latter, as represented in Fig. 1.

From the T-fitting 29 a water-feeding pipe 38 projects in a proper direction, which may be downward, as shown, and from said feed-pipe the branch pipe 38^a extends toward the boiler 10, tapping its lower portion, and a check-valve 38^b of any suitable construction may with advantage be introduced into the branch pipe 38^a.

The water-feed pipe 38 (shown broken away) may in completed form be extended to a source of water-supply under pressure sufficient to overcome the pressure of steam generated in the boiler 10, and, as before mentioned, the supply of water may be taken from a water-main, an elevated tank, or either a pump, injector, or inspirator fed from a suitable source.

To facilitate the correct formation of the valve-seat *a'* in the diaphragm *a*, a threaded opening *a*⁵ may be formed in the wall of the casing 30, which opening is normally closed by the plug *a*⁶.

In operation of the device when parts are arranged for service as shown in Fig. 1, it is necessary when first filling the boiler with water to start it that if the water is taken from a street-main or other supply under pressure the valve-head *a*² be seated upon the diaphragm *a*, so as to close the passage *a'*. Water may now be fed into the boiler 10 through the branch pipe 38^a until it shows at the upper gage-cock 11. Then to adapt the apparatus for use as a regulator for control of water subsequently fed into the boiler to compensate for evaporation into steam it is essential that the valve-head *a*² be permitted to recede under pressure of water upwardly in the feed-pipe, this slight opening of the valve permitting water that passes upward in the feed-pipe 38 to partially or wholly pass

through the valve-diaphragm a and thence upward to enter the waste-pipe 28^b , thus reducing or stopping the introduction of water into the boiler. Assuming that the valves 5 15 and 34 have been opened, it will be seen that when water in the boiler falls below the second gage-cock 11 the water previously contained in the expansion-pipe 31 and which cooled and contracted it, so as to permit the 10 valve-head a^2 to leave its seat, will be permitted to flow by gravity back into the boiler 10, this being due to the equalization of steam-pressure at each end of the expansion-pipe. As the wall of the pipe 31 is thin, it will 15 quickly become heated by the high-pressure steam that occupies it, which will expand the pipe in length and cause the bar 36 to press upon the valve-stem 30^a sufficiently to seat the valve-head a^2 upon the water-passage a' , 20 and thus prevent feed-water from escaping through the waste-pipe 28^b , which will manifestly cause a full supply of water to enter the boiler through the branch feed-pipe 33^a .

It will be seen that as soon as water is fed 25 into the boiler above the second gage-cock 11 its pressure will fill the expansion-pipe 31 with water that will displace the steam, and this will so contract the pipe that the valve-head a^2 will leave its seat, affording an 30 opening more or less in degree, whereby the feed of water in the boiler will be reduced in volume and the water-feed be thus automatically controlled. The novel regulator is very 35 sensitive to changes in temperature given to the expansion-pipe, so that the water-level in the boiler may be maintained with but slight fluctuation and due compensation be effected for differences in furnace heat in the boiler that are liable to occur.

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

1. A water-feed regulator for a steam-boiler, 45 comprising a water-supply pipe, a waste-water pipe connected with the water-supply pipe, a valve in the waste-water pipe adapted by adjustment for control of water fed in the water-supply pipe, an expanding and contracting pipe connected by one end with the 50 boiler at normal water-line, an adjustable coupling-box projected toward the valve from the expanding and contracting pipe, a valve-stem extended from the valve, and a pusher-rod longitudinally adjustable in the coupling- 55 box whereby the length of the expanding and

contracting pipe may be graduated to effect a proper closure of the valve.

2. A water-feed regulator for steam-boilers, comprising an expanding and contracting pipe connected with a boiler at normal water-line, said pipe inclining toward the boiler, 60 a water-supply pipe, a waste-water pipe, a valve in the waste-water pipe that is moved for closure by steam heat in the expanding and contracting pipe, and a live-steam-supply 65 pipe connected with the expanding and contracting pipe near the end thereof that extends toward the valve, thus supplying steam to the said pipe at each end for insuring a rapid increase in its temperature. 70

3. A water-feed regulator for steam-boilers, comprising a water-supply pipe, a waste-water pipe connected with the water-supply pipe, a valve-casing in the water-supply pipe, having an apertured diaphragm affording a 75 valve-seat, an expanding and contracting pipe connected by one end to the boiler and inclined toward said boiler, and having a valve-head at the other end adapted to move toward or from the valve-seat as said pipe 80 expands and contracts in length, and a live-steam pipe extended from the steam-space in boiler to connect with the expanding and contracting pipe at its end nearest to the valve.

4. In a feed-water regulator for steam-boilers, the combination with a steam-boiler, a 85 water-feed pipe, a waste-water extension on the water-feed pipe, and a valve casing and seat therein forming a part of the water-feed pipe, of an expanding and contracting pipe supported by braces extended from the boiler, a 90 pipe extending from a gage-cock in the boiler, a stop-valve in said pipe, pipe connections between the gage-cock extension and the expanding and contracting pipe, a steam-supply 95 pipe extended between the steam-space in the boiler and the outer end of the expanding and contracting pipe to equalize steam-pressure therein, and a valve-stem having a valve-head on its end nearest the valve-seat 100 in the casing, its outer end being adapted for actuation by the longitudinal expansion of the expanding and contracting pipe.

In testimony whereof I have signed my name to this specification in the presence of 105 two subscribing witnesses.

GEORGE WEANT.

Witnesses:

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