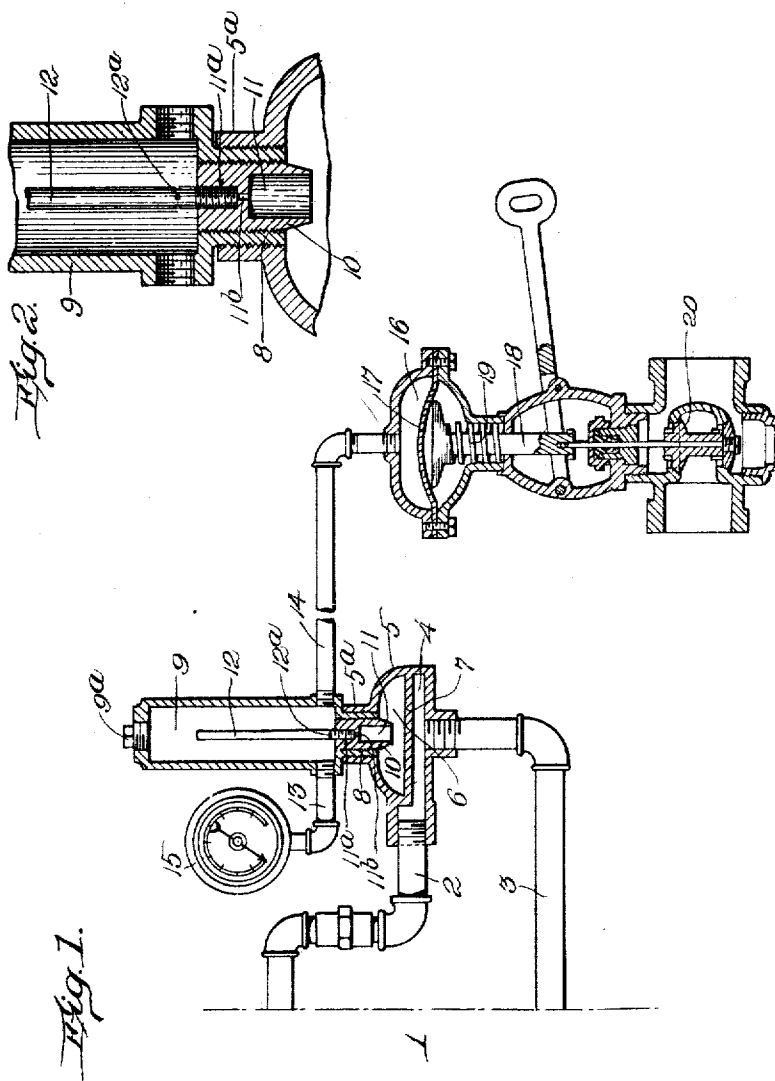


F. H. PLOUFF.
FEED WATER REGULATOR.
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UNITED STATES PATENT OFFICE.

FRED H. PLOUFF, OF BOSTON, MASSACHUSETTS.

FEED-WATER REGULATOR.

950,493.

Specification of Letters Patent.

Patented Mar. 1, 1910.

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To all whom it may concern:

Be it known that I, FRED H. PLOUFF, a citizen of the United States, and resident of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Feed-Water Regulators, of which the following is a specification.

This invention relates to feed-water regulators of the class described in Letters Patent granted to me No. 823,635, dated June 19, 1906, and its object is to render the action of the machine or apparatus more rapid, certain and uniform.

The invention provides for automatically controlling the supply of feed-water to a steam generator, or similar receptacle, and relates more particularly to that class of such devices in which the boiler water and steam act alternately on a chamber containing a vaporizable liquid, the pressure from which is transmitted to a chamber where it operates a diaphragm, or other suitable device, for governing the supply of feed water.

It is illustrated by the accompanying drawings in which—

Figure 1 is a vertical sectional view of the regulator. Fig. 2 is a detailed view showing the connection between the reservoir and liquid chamber.

Similar characters refer to similar parts throughout the several drawings.

1 represents the boiler, the steam and water spaces of which are connected, respectively, by pipes 2 and 3 with the steam and water chamber 4 located at the average or normal water line level in said boiler. The chamber 4 forms the lower portion of the casing 5, the upper portion of which casing forms the liquid chamber 6, which is separated from said chamber 4 by the heat conducting partition 7. The casing 5 has a threaded tubular extension 5^a which engages the corresponding threaded tubular extension 8 of the reservoir and expansion chamber 9 which is furnished on its upper end with the plug 9^a. The bushing 10 is screwed into the tubular extension 8 and extends into chamber 6; there is a vertical passage through said bushing being larger below at 11, smaller above at 11^a and smaller still centrally at 11^b, thereby forming a shoulder

support for the pipe 12 which is screwed into the upper bore 11^a, and extends into the reservoir 9, being furnished near its lower end with the apertures 12^a which lead into said reservoir 9. Pipes 13 and 14 lead, respectively, to the gage 15 and the expansible chamber 16 one of whose walls is the diaphragm 17 which is connected, by the stem 18 controlled by the spring 19, with the valve 20 which it operates; which valve controls the feed-water supply to the boiler in some suitable manner; as for instance by being the throttle valve to a steam boiler pump.

Any suitable vaporizable liquid, such as water or a liquid non-freezable at ordinary temperatures, fills the chamber 16, the pipe 14, the lower part of reservoir 9, the passage between said reservoir and said chamber 6 and said chamber 6 to a point above the opening of said passage into said chamber 6. Some air may be entrapped in the closed pocket formed by the upper part of the chamber 6. The upper part of the chamber 9 above the liquid contained therein is practically a vacuum at ordinary temperatures containing substantially only the vapor of the liquid used in the apparatus at a pressure much less than that of the outside atmosphere.

The vacuum is produced in the following manner: Water is introduced into the apparatus through the opening shown at the top of the chamber 9 until the liquid-chamber, the expansible chamber in the valve-controller, and the conduits are filled and the chamber 9 is partially filled. The opening is then closed by the plug 9^a and the apparatus heated to a comparatively high temperature. This causes the air contained in the top of chamber 9 to be raised to a high pressure and also causes much of the air contained in the water and in the top of chamber 6 to be expelled and gathered in the top of chamber 9. When the pressure has become sufficiently high, the opening at the top of chamber 9 is opened a slight amount sufficient to allow the air to escape, and when all of the air has been forced out and the vapor of the liquid appears at the opening the latter is closed. This operation is performed as many times as may be

necessary to cause the expulsion of practically all of the air contained in the apparatus except that in the upper part of the liquid-chamber 6 above the outlet therefrom. When the liquid is allowed to cool then to the ordinary temperature, the space above the liquid in chamber 9 is practically free from air and contains only a quantity of vapor at a pressure so much less than that of the atmosphere that it may for all practical purposes be regarded as and called a "vacuum." Usually the vacuum obtained is as nearly complete as is obtained in the condenser of a steam-engine.

As the water-level in the boiler fluctuates the boiler steam and water alternately fill the chamber 4. The presence of steam in said chamber at low water causes a partial vaporization of the liquid in chamber 6 overlying the partition 7, said steam giving up a portion of its latent heat to the liquid above partition 7. Because of the increase of pressure thereby caused through the expansion and vaporization of the water in chambers 6 and 9 the liquid in pipe 14 is forced into the chamber 16, causing the diaphragm 17 to depress stem 18 and open valve 20, thereby starting the pump in operation or allowing the feed-water to be forced into the boiler.

As the water-level in the boiler rises water occupies the chamber 4 in place of steam and being incapable of adding enough heat to the liquid in chamber 6 and connections to make up for the loss of heat by radiation from the exposed surfaces a decrease takes place in the vapor-pressure above the surface of the liquid in said chambers 6 and 9. The liquid is thereby allowed to return to chambers 6 and 9 from the chamber 16, and the spring 19 is permitted to elevate the stem 18 and close the valve 20, thereby stopping the supply of feed-water.

The chamber 9, by reason of the vacuum-space in the upper part thereof, acts as an expansion-chamber to take care of the slight expansion of the liquid in conduit 14 and connections due to heating and as a reservoir-chamber to maintain a supply of liquid over the inlet-orifice 11. It also constitutes a condensing-chamber for the vapor therein owing to its exposed position, which permits rapid radiation, and, also on account of the low pressure therein, the vapor is quickly condensed when the water-level in the boiler has risen to such an extent as to fill the water and steam chamber with water.

Chamber 9 with its several functions is the principal feature of the invention described in my earlier patent above referred to because, as therein stated, it provides for maintaining a thin layer of liquid over the

partition 7, while securing sufficient movement of the liquid to properly actuate the diaphragm 17 and the rapid condensation of the vapor, thereby shutting off quickly the supply of water to the boiler.

In operation, the reservoir in my improved device is filled with water to a point below the top of pipe 12.

As shown in my earlier patent, employing the numerals used in the drawings accompanying said earlier patent, the reservoir 9 has a single central opening in its bottom leading downwardly into chamber 6 and leading laterally into pipe 10 and the pipe (not lettered) leading to the gage (not lettered) with the result that the steam entering chamber 5 from the boiler must boil the comparatively large amount of water in the reservoir to generate the steam required to operate the valve 15 as described.

My present invention consists in mounting the pipe 12 in the opening in the bottom of the reservoir 9 with openings from said pipe into said reservoir, thus confining within said pipe a comparatively small body of water from which to generate the required steam. By this means steam is more quickly generated to open the valve and more quickly dissipated to close the valve.

Having described my invention what I claim and desire to secure by Letters Patent is:

1. In a feed-water regulator, in combination, a water and steam chamber adapted to be connected with the water and steam spaces of a boiler, a liquid chamber separated from said water and steam chamber by a heat-transferring partition, a reservoir with a passage leading therefrom to said liquid chamber, a pipe mounted in said passage and extending therefrom into said reservoir and furnished, preferably near its lower end, with apertures leading into said reservoir and a conduit leading from said reservoir to a chamber adapted by suitable mechanism to control a water supply for said boiler; substantially as described.

2. In a feed-water regulator, in combination, a water and steam chamber adapted to be connected with the water and steam spaces of a boiler, a liquid chamber in close heat-transferring relation to said steam and water chamber, a reservoir with a passage leading therefrom to said liquid chamber, a pipe mounted in said passage and extending therefrom into said reservoir and furnished, preferably near its lower end, with apertures leading into said reservoir and a conduit leading from said reservoir to a chamber adapted by suitable mechanism to control a water supply for said boiler; substantially as described.

3. In a feed-water regulator of the class

described, a liquid chamber and a reservoir
connected therewith by a passage, a pipe
mounted in said passage and extending
therefrom into said reservoir and furnished,
5 preferably near its lower end, with aper-
tures leading into said reservoir; substan-
tially as described.

In testimony whereof I have affixed my
signature, in presence of two witnesses.

FRED H. PLOUFF.

Witnesses:

GEORGE G. CLARK,
RALPH W. FOSTER.