

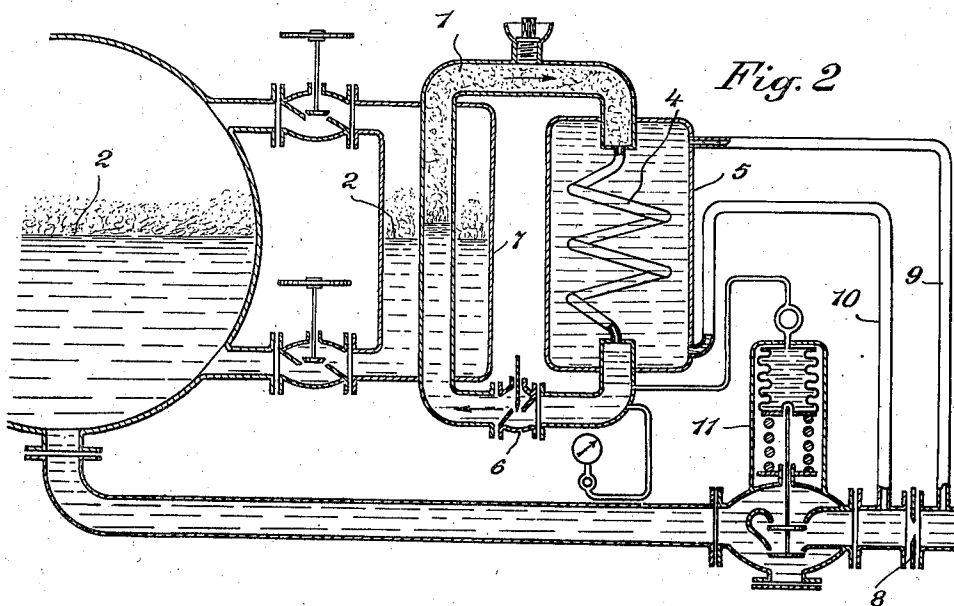
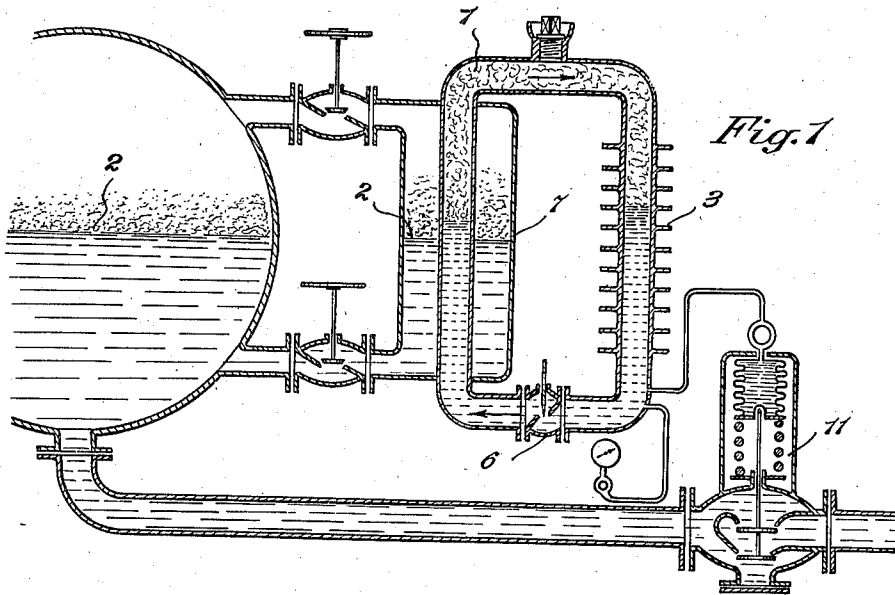
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C. CORTESE

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AUTOMATIC FEED WATER REGULATOR FOR STEAM BOILERS

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Inventor,
C. Cortese.

By: *Glascock Downing & Seebold*
Attys.

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AUTOMATIC FEED WATER REGULATOR
FOR STEAM BOILERSCorradino Cortese, Genoa Cornigliano, Italy, as-
signor to Ansaldo Società Anonima, Genoa
Cornigliano, Italy, a corporation of ItalyApplication December 13, 1939, Serial No. 309,105
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5 Claims. (Cl. 122—451.1)

My invention relates to an automatic feed water regulator for steam boilers, consisting of a ring shaped tube partially filled with an evaporating liquid and partially submerged in the boiler water and in the boiler steam, while the rest of the tube is exposed to the surrounding air or is submerged in another cooling medium; and is characterised in that the stroke of the feeding valve is actuated by the pressure generated in the ring shaped tube as a consequence of the boiler water level.

Two embodiments of the invention are illustrated in the attached drawing in which:

Fig. 1 is a schematic view partially in section of the regulator in the first embodiment of the invention;

Fig. 2 is a similar view of the second embodiment.

With reference to the drawing, in both embodiments the ring shaped tube 1 is partially submerged, above and below the water level 2, in the boiler. A portion of the tube 1 according to Fig. 1 is exposed to the surrounding air and is provided with external ribs 3 for rapid heat dispersion, while according to Fig. 2 a portion of the tube 1 is shaped as a coil 4 and is partially submerged in a cooler 5 in which the feed water can be used as cooling medium. The advantages of latter arrangement will be further referred to in the description.

As said above, the ring tube 1 is partially filled up with an evaporating liquid. Owing to the transmission of heat between boiler water and boiler steam and the liquid in the tube 1, there occurs a partial evaporation of the same liquid in the hot section of the tube. In the cooled section of the tube 1 there is a heat transfer from the inside fluid to the cooling fluid (air in the case of Fig. 1, feed water in the case of Fig. 2). Such heat transfer causes the steam condensation and, as a consequence, a circulation of the same liquid and of its steam in the tube as above.

In the top section of this tube 1 the steam flows continuously from the heated section to the cooled section, while in the bottom section the liquid flows from the cooled to the heated section of the tube. The circulation can be controlled by means of a throttling valve 6.

The heat transfer from the boiler water and from the boiler steam to the fluid contained in the heated section of the ring shaped tube 1 is highly influenced by the boiler water level 2 owing to the great difference between the two heat transfer coefficients, one from the water to the tube wall and the other from the steam

to the tube wall. In such a way, to each position of the water level in the boiler and consequently of the level in the container 7, corresponds a well defined pressure value in the ring shaped tube 1.

Such a pressure operates on a spring biased bellows indicated generally at 11 connected with the rod of a balanced feed valve. The device operates so, that when the water level in the boiler rises, the pressure of the ring shaped tube 1 drops, because the amount of heat delivered to the liquid in the heated section of the tube 1 will be reduced. The pressure drop in this tube reduces the feed valve stroke and consequently the amount of water delivered in the boiler.

The arrangement shown in Fig. 2 refers to an alternative construction according to which the ring shaped tube 1 is cooled by means of the feed water. With this arrangement it is possible to add to the action due to the variation on the feed valve stroke, a secondary damping action due to the effected controlling action. Fitted in the feed pipe there is a throttling baffle plate 8 arranged between two flanges in order to obtain a pressure drop between the pipes 9 and 10 of cooler 5.

If the water level in the boiler suddenly increases, according to the above description, the pressure in the tube 1 will drop so that the feed water flow in the feed pipe will be throttled or shut off.

Under such conditions, with the reduction or interruption of the feed charge, the pressure drop caused by the diaphragm 8 will partially or totally lose its value, so that the water flow to the cooler 5 will be reduced or interrupted.

Consequently the cooling action on the tube 1 will be reduced and the pressure in the same increased so that the feed valve 11 will open again. This procedure explains how the cooling of tube 1, by means of the feed water, damps the action exerted by the main system on the feed valve.

It clearly appears from the above that the scheme of Fig. 2 is very useful for boilers in which the level fluctuations take place suddenly for casual reasons as for instance in marine boilers, where the stroke of the feed valve should be damped in relation with sudden variations due to large hogging of the ship.

My invention has been illustrated and described in two preferred embodiments with the understanding that changes and modifications in the construction could be realised within the protection of this patent.

I claim:

1. Automatic feed water regulating apparatus for steam boilers comprising, a ring-shaped tube, a container surrounding a portion of the ring-shaped tube receiving water and steam from the boiler, an evaporable liquid in said ring-shaped tube, a housing surrounding another portion of said ring-shaped tube, a pipe for conveying feed water to the boiler, an apertured diaphragm in said pipe, conduits connecting said housing with said pipe at both sides of said diaphragm, a valve in said pipe between the diaphragm and the boiler, and means responsive to the pressure in said ring-shaped tube for controlling the position of said valve.

2. Automatic feed water regulating apparatus for steam boilers comprising, a ring-shaped tube, a container surrounding a portion of the ring-shaped tube and receiving water and steam from the boiler, an evaporable liquid in said ring-shaped tube, a housing surrounding another portion of said ring-shaped tube, a pipe for conveying feed water to the boiler, means providing a pressure differential within said pipe upon movement of the feed water therethrough, conduits connecting said housing with said pipe at both sides of said means, a valve controlling the movement of feed water in said pipe, and means responsive to the pressure in said ring-shaped tube for controlling the position of said valve.

3. Automatic feed water regulating apparatus for steam boilers comprising, a ring-shaped tube, a container surrounding a portion of the ring-shaped tube and receiving water and steam from the boiler, an evaporable liquid within said ring-shaped tube adapted to be heated by the boiler water and the boiler steam present in the container, a pipe for conveying feed water to the

boiler, a valve in said pipe, means responsive to an increase in pressure in said ring-shaped tube for opening said valve, and means responsive to the movement of feed water in said pipe for cooling a portion of said ring-shaped tube to reduce the pressure therein.

4. Automatic feed water regulating apparatus for steam boilers comprising, a ring-shaped tube, a container surrounding a portion of the ring-shaped tube and receiving water and steam from the boiler, an evaporable liquid within said ring-shaped tube adapted to be heated by the boiler water and the boiler steam present in the container, a pipe for conveying feed water to the boiler, a valve in said pipe, means responsive to an increase in pressure in said ring-shaped tube for opening said valve, and means responsive to the movement of feed water in said pipe for reducing the pressure in said ring-shaped tube to prevent rapid fluctuations in the positions of said valve.

5. Automatic feed water regulating apparatus for steam boilers comprising, a ring-shaped tube, a container surrounding a portion of the ring-shaped tube and receiving water and steam from the boiler, an evaporable liquid within said ring-shaped tube adapted to be heated by the boiler water and the boiler steam present in the container, a pipe for conveying feed water to the boiler, a valve in said pipe, means responsive to an increase in pressure in said ring-shaped tube for opening said valve, and means for diverting a portion of the feed water flowing in said pipe for cooling a portion of said ring-shaped tube to reduce the pressure therein and prevent rapid fluctuations in the positions of said valve.

CORRADINO CORTESE.