Jan. 17, 1933. G. D. DODD 1,894,760

FEED WATER HEATER

Filed June 14, 1929

Fig. 1.

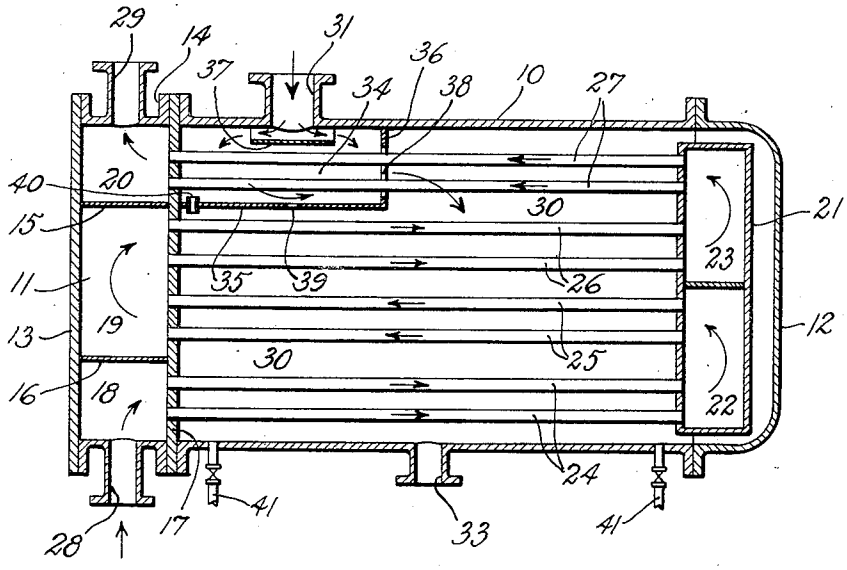
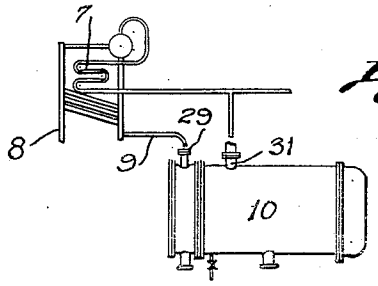


Fig. 2.



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FEED WATER HEATER

Application filed June 14, 1929. Serial No. 370,788.

The invention relates to feed water heaters heated by superheated steam. The object of the invention is to appreciably increase the heat rise of water in a feed water heater heated by superheated steam without increasing the amount of heat exchange surface of the heater or without especially increasing such surface.

The nature of the invention will be readily apparent from consideration of the following description taken in conjunction with the accompanying drawing whereon:

Fig. 1 shows one form of feed water heater in accordance with the invention; and

Fig. 2 shows diagrammatically a part of a steam generator plant including the feed water heater shown in Fig. 1.

On the drawing is shown a feed water heater comprising a shell 10 of generally cylindrical construction having a water box 11 at one end and a closure 12 at the other end. The water box comprises an outside plate 13, a circular flanged member 14 and partitions 15 and 16. A tube sheet 17 is secured between the water box and the major cylindrical portion of the shell. Chambers 18, 19 and 20 are formed by partitions 15 and 16 between tube sheet 17 and plate 13.

Within the shell at the other end of the heater is a return member 21 formed to provide chambers 22 and 23. The heater contains four groups of tubes. Group 24 extends from chamber 18 to chamber 22. Group 25 extends from chamber 22 to chamber 19. Group 26 extends from chamber 19 to 23. Group 27 extends from chamber 23 to chamber 20. A feed water inlet 28 is connected to chamber 18. A feed water outlet 29 is connected to chamber 20. A conduit 9 is connected to feed water outlet 29 and to a steam generator 8 for conducting feed water from the feed water heater to the steam generator.

It will be seen that the heater comprises a path of flow of water from the inlet 28 to the outlet 29 comprising a plurality of groups of tubes connected in series.

Around tubes 24, 25, 26 and 27 is the steam space 30. Steam is admitted to steam space 30 from a superheater 7 by means of steam inlet connection 31 which is situated near the water outlet 29. Steam may pass through the steam space and leave the heater as steam or it may be condensed and leave the heater as water. I have shown a water outlet 33.

Adjacent the steam inlet and at the outlet end of the path of water flow is a chamber 34 formed by baffles or walls 35 and 36. Steam inlet 31 connects to this chamber. This chamber forms a steam zone of relatively small size in heat transfer relation with a part of the last tube group 27 adjacent the feed water outlet of the heater. A baffle 37 is provided against which steam entering through inlet 31 impinges. An opening 38 is provided connecting zone 34 with the remainder of the steam space 30. Any condensate forming in zone 34 passes through drain opening 39 and falls down into the larger portion of steam space 30 and passes out through connection 33. A nipple 40 is provided in wall 35 adjacent plate 17. Some steam passes through this nipple and prevents stagnation of air directly under horizontal wall 35.

By means of the desuperheating zone 34, a considerably greater heat rise is obtained through the heater in cases where the entering steam is superheated. The high level of superheat temperature of the heating steam entering first this zone permits a higher exit temperature of the water than is obtainable if the heating steam were simply allowed to enter the heater in an unconfined space, dissipating the heat level of the superheat at random. It will be noted that the superheat level is dissipated in heat transfer relation with an advanced point of flow in the path of flow of feed water and that this advanced point is preferably the point nearest the water outlet connection for the heated water.

After giving up its heat of superheat in zone 34, the heating steam passes through opening 38 into the remainder of the steam space, there giving up the latent heat of vaporization.

If the steam were admitted directly to the unconfined inner space of the heater it would not be possible to obtain a temperature higher than the saturated temperature of the steam in cases where the steam is not highly super-

heated and in any event the available temperature gradient of the heating steam could not be utilized. By means of the present invention I am able to heat the feed water to a higher temperature corresponding to a utilization of the heat level of superheat of the superheated steam as distinguished from the latent heat of vaporization.

Vents 41 are provided in the bottom of and near each end of the main cylindrical body of shell 10 to scavenge the air from the steam space 30.

It will be obvious that various changes in the construction may be made and that the invention may be applied to a number of different forms of feed water heaters. It will further be obvious that the water heated may be used for other purposes than as feed water for steam generators. It will further be obvious that the method of heating feed water herein described can be carried out in a variety of different structures.

What I claim is:

1. A feed water heater comprising a shell, a feed water inlet, a feed water outlet, means comprising a plurality of parallel tubes forming a path of flow of water from the inlet to the outlet, the heater having a steam space around the tubes, means comprising a baffle within said shell transverse to said tubes and a baffle parallel to said tubes, said baffles forming a chamber in said steam space in heat transfer relation with said path of flow at an advanced point of flow, an inlet for steam to said chamber, an aperture for admitting steam from the chamber into the remainder of the steam space, means to drain condensate from said chamber into said remainder of the steam space and means to drain condensate from said remainder of the steam space.

2. A feed water heater comprising a shell, a feed water inlet, a feed water outlet, means comprising a plurality of tubes forming a path of flow of water from the inlet to the outlet, the heater having a steam space around the tubes, means comprising a baffle within the shell substantially transverse to the tubes and a baffle substantially parallel to said tubes, said baffles forming a chamber in the steam space in heat transfer relation with the path of flow at an advanced point of flow, an inlet for steam to the chamber and an outlet through which steam flows from the chamber into the remainder of the steam space.

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