Dec. 29, 1942. M. A. NELSON 2,306,895

HEAT EXCHANGE APPARATUS

Filed Oct. 10, 1940

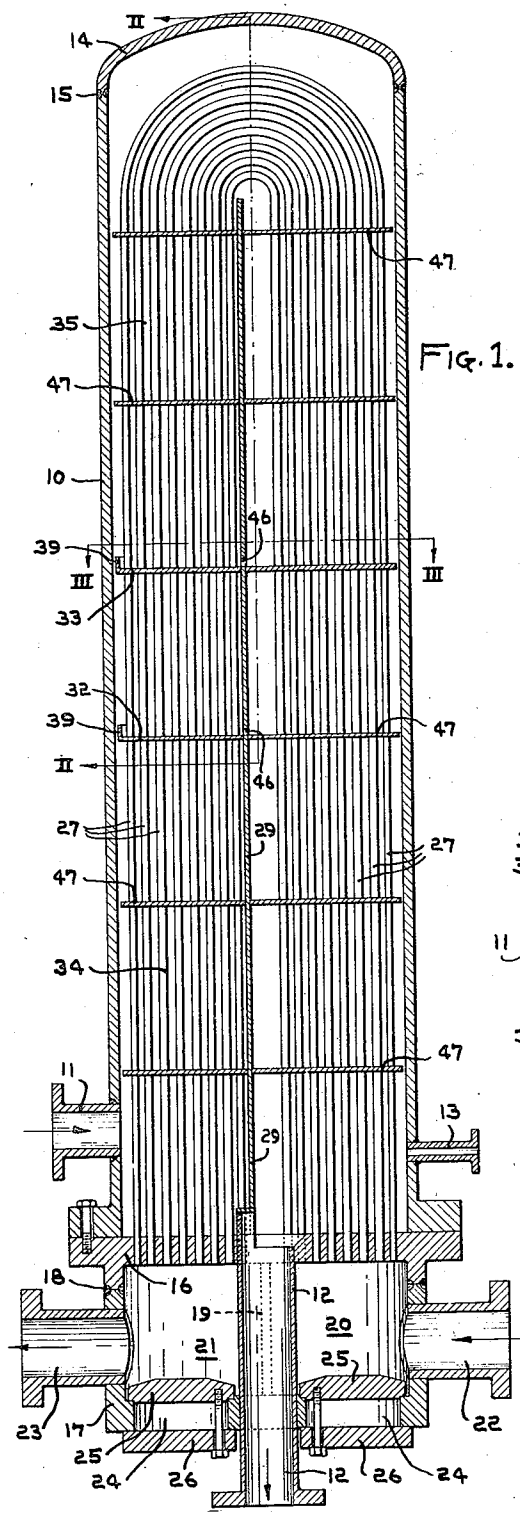


FIG. 1.

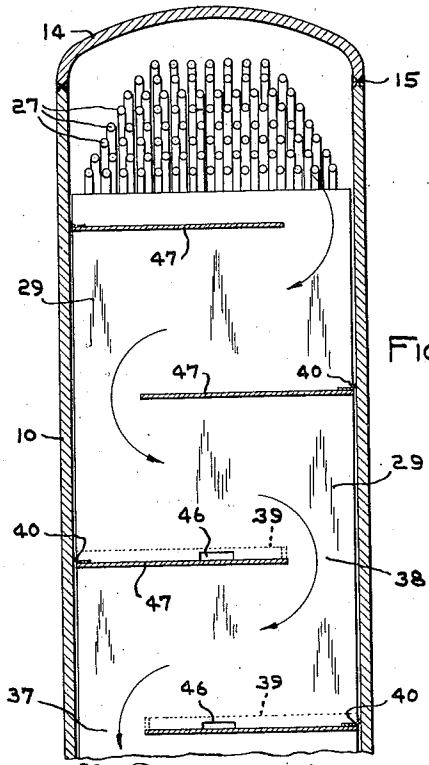


FIG. 2.

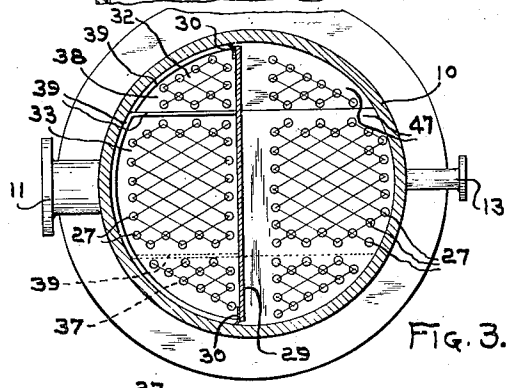


FIG. 3.

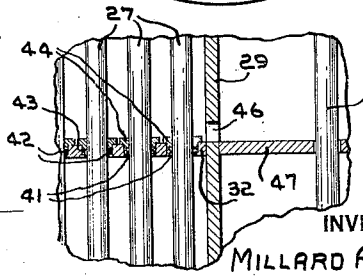


FIG. 4.

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HEAT EXCHANGE APPARATUS

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Application October 10, 1940, Serial No. 360,551

3 Claims. (Cl. 257—28)

This invention relates to heat exchange apparatus, more particularly to heat exchange apparatus of the vertical type wherein the lower portion of the first steam pass constitutes a desuperheater with the remaining upper portion of the pass serving as a condensing section, and has for an object the provision, in such apparatus, of means for preventing condensate from the condensing portion of the first pass reaching the heat transfer surface of the desuperheater.

Another object of the invention is the provision of a vertical type heat exchanger with the initial portion of the steam path constituting a desuperheater and wherein tray-type baffles are provided to collect and direct to the condensing portion of the apparatus condensate which would otherwise pass to the desuperheater.

Yet another object of the invention is the provision of a vertical type feed-water heater wherein the lower portion of the first steam pass constitutes a desuperheating section and the upper portion of the same pass constitutes a condensing section, together with a plurality of tray-type baffles for separating the two sections, the baffles being provided with openings through which steam may pass from the desuperheating section to the condensing section and the openings being so disposed as to be in non-overlapping relation.

These and other objects are effected by the invention as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a vertical sectional view through apparatus embodying the principles of the present invention;

Fig. 2 is a vertical sectional view taken along the line II—II of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a transverse sectional view taken along the line III—III of Fig. 1, looking in the direction of the arrows; and,

Fig. 4 is an enlarged fragmentary view illustrating one form of sealing means between the tubes and the tray-type baffles.

Referring now to the drawing more in detail, there is shown heat exchange apparatus comprising a vertically-disposed shell 10 having an exhaust steam inlet 11 adjacent the bottom thereof, a condensate outlet 12 and the usual air and non-condensable gas offtake 13. The upper end of the shell is closed by means of a cap member 14 secured thereto in any suitable manner, as by welding, at 15. In like manner, the lower end of the shell is closed by a stationary tube plate 16, preferably bolted thereto, the latter being either formed integral with a waterbox 17 or permanently connected thereto by suitable means, such as the weld material 18. The waterbox 17 is provided with a transverse partition 19 dividing the interior thereof into an inlet chamber 20 and an outlet chamber 21 having an inlet connection 22 and a discharge connection 23, respectively. If desired, the waterbox may be provided with hand holes 24 closed by pressure-sealed covers 25 bolted to the usual clamping members 26.

A plurality of U-tubes 27 extend longitudinally of the shell with their terminal portions supported by the stationary tube plate 16. The waterbox 17 provides for circulation of water through the tubes 27 in a plurality of passes. A baffle structure 29 extends longitudinally of the heater and divides the interior thereof into a plurality of steam passes so located that the exhaust steam inlet 11 communicates with the lower end of the first steam pass, and the condensate outlet 12 and air offtake 13 communicate with the lower end of the last steam pass. Preferably, the longitudinally-extending baffle structure 29 is provided at its vertical edges with suitable means, such as the Lamiflex seal 30, for preventing by-passing of steam from one pass to another about such edges.

A pair of transversely-extending baffles 32 and 33 are located intermediate the ends of the first steam pass and separate the latter into a lower desuperheating section 34 and an upper condensing section 35. The baffles 32 and 33 are provided with, or are shaped to provide, openings 37 and 38, respectively, through which steam may pass from the desuperheating section 34 to the condensing section 35.

It should be noted that the openings 37 and 38 are so positioned with respect to each other that they are in non-overlapping relation, whereby condensate falling through the upper opening 38 will be caught by the lower baffle 32, disposed therebeneath.

Clearance spaces 41 (Fig. 4) between the tubes 27 and the baffles 32 and 33 must be closed to prevent leakage of condensate to the desuperheating section 34. This may be accomplished by the provision of soft packing 42 positioned in rabbets 43 at each clearance opening, the packing being forced in place and expanded by suitable sleeve-type pressure rings 44, or other suitable means.

In order to prevent condensate which falls upon the baffles 32 and 33 from flowing through

the openings therein, the baffles are provided with upstanding edges **39** at the peripheries of the openings and, preferably, about the entire edges of the baffles. The longitudinally-extending baffle **29** is provided with openings **46** adjacent the upper surfaces of the baffles **32** and **33** in order that condensate collected on the latter may be drained to the condensing portion of the apparatus.

Preferably, a plurality of transversely-extending baffles **47** are positioned at suitable points throughout the length of the steam path through the apparatus in order to provide for contact of steam with the maximum amount of condensing surface, and the baffles may be provided with suitable sealing means, such as the Lamiflex seals **40**, to prevent leakage of steam between the baffles and the shell **10**.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and it is desired, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What is claimed is:

1. Heat exchange apparatus comprising a vertically-disposed shell, a plurality of tubes extending longitudinally of said shell, waterbox structure associated with said tubes and providing for circulation of water therethrough in a plurality of passes, baffle structure dividing the space within the shell into a plurality of steam passes, means dividing said first steam pass into a lower desuperheating section and an upper condensing section, the shell having an exhaust steam inlet to said desuperheating section and a condensate outlet from the last steam pass, said dividing means comprising a plurality of longitudinally-spaced trays extending transversely of the first steam pass with their edges in sealing engagement with the shell and baffle structure constituting the walls of said pass, said trays each having one or more openings therethrough for passage of steam from the desuperheating section to the condensing section with the opening or openings of each tray disposed in non-overlapping relation to the opening or openings of adjacent trays and having a dam at the periphery of each opening to prevent flow therethrough of condensate collecting thereon, means for discharging to a condensing section of the apparatus condensate collecting on the trays, and means for preventing passage of condensate through clearances between the trays and the tubes of the first steam pass extending therethrough.

2. A structure as specified in claim 1, wherein the last-mentioned means is comprised by packing material.

3. Heat exchange apparatus comprising a vertically-disposed shell; a plurality of tubes extending longitudinally of said shell; waterbox structure associated with said tubes and providing for circulation of water therethrough in a plurality of passes; baffle structure dividing the space within the shell into a plurality of steam passes; means dividing the first steam pass into a lower desuperheating section and an upper condensing section, the shell having an exhaust steam inlet to said desuperheating section and a condensate outlet from the last steam pass, said dividing means comprising a partition extending transversely of the first steam pass with its edges in sealing engagement with the shell and baffle structure constituting the walls of said pass and having an opening therethrough for the passage of steam from the desuperheating section to the condensing section, said partition having a first portion thereof disposed between said opening and a second portion and projecting above the latter and serving as a dam to prevent condensate which collects on said second portion from flowing through the opening; means for discharging to a condensing section of the apparatus condensate collecting on said second portion; baffle means vertically aligned with and overlying said opening to prevent fall of condensate through the latter from the condensing section thereabove; and means for preventing passage of condensate through clearances around the tubes of the first steam pass where they extend through said partition and said overlying baffle means.

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