Aug. 9, 1927. 1,638,697

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EVAPORATOR

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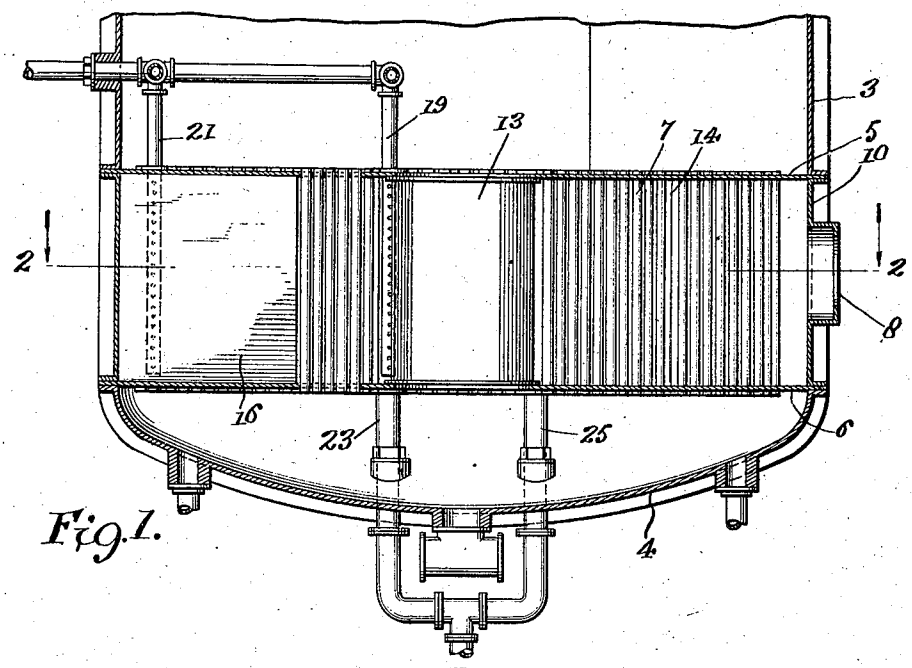


Fig. 1.

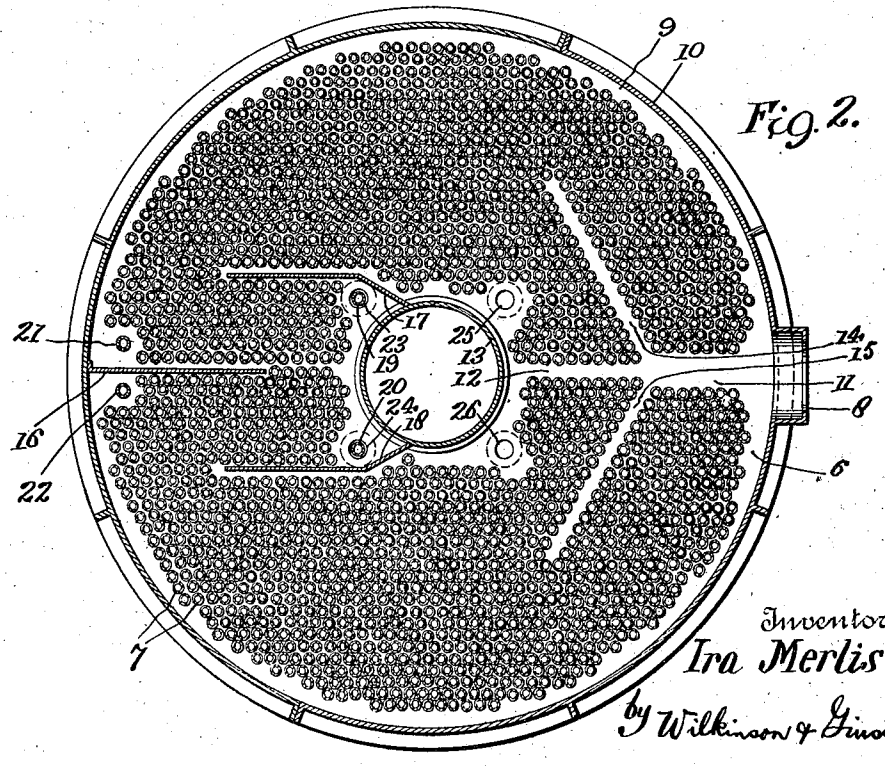


Fig. 2.

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EVAPORATOR.

Application filed July 17, 1926. Serial No. 123,191.

The present invention relates to improvements in evaporators and has relation to my similarly entitled co-pending application, Serial No. 106,922, filed May 5, 1926, the apparatus in the present application being developed for evaporators of small size in which it is advisable to use only a single steam or vapor inlet.

An object of the present invention is to provide a calandria or steam belt for an evaporator, in which by virtue of the arrangement and disposition of the tubes, a direct and unobstructed path is provided for the vapor or steam.

The invention also contemplates the novel disposition of baffle plates by which the incondensible gases are trapped at a number of strategically located points.

A further object of the invention is to so construct, arrange and dispose the calandria tubes, baffle plates, drains and incondensible gas outlet pipes as to secure a sufficient quantity of steam or vapor for every portion of the calandria, thus obtaining the most efficient results.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views.

Figure 1 is a fragmentary vertical section taken through an evaporator and through the calandria or heat belt thereof, and

Figure 2 is a horizontal section taken on the line 2—2 in Figure 1.

Referring more particularly to the drawings, 3 designates generally the evaporator having a bottom 4; and 5 and 6 designate the upper and lower tube sheets respectively, the tubes themselves being indicated at 7.

In accordance with the invention only one steam or vapor inlet port 8 is provided, this being placed through one side of the calandria belt.

The arrangement of tubes is such that a circumferential or annular space 9 is provided about the outermost circle of the tubes and the shell 10 of the calandria, whereby steam entering through the port 8 may pass in two opposite streams about the wall of the calandria. A central passage 11 is also made through the tubes substantially in alignment with the axis of the entrance port or opening 8, the width of this central passage being proportioned to the diameter of the opening 8 in order to maintain the velocity of the steam uniform. The tubes near opening 8 are disposed on an inclination toward the mouth of the passage, whereby the steam is deflected toward the passage. A certain amount of this steam will be diverted and conducted around in opposite directions along the inside wall of the shell 10. Steam will also enter through the various pipes at the sides of the passage 11.

The passage 11 is disposed radially and in line with a second radial passage 12, which extends to the down-take 13. This passage 12 is of less width than the passage 11 in order to keep the velocity of the steam uniform. The projecting tube portions at the entrance to passage 11, divert the steam or vapor into the lateral channels 14 and 15, which extend angularly out from opposite sides of the innermost portion of the wider passage 11. The steam or vapor will be carried by these lateral passages to all portions of the tube spaces at opposite sides of the belt and the narrowing of the passage 12 will divert the proper proportional share of the steam into these lateral passages 14 and 15.

The above arrangement of steam passages will conduct the steam to all parts of the calandria. This arrangement is symmetrical and forms separate and opposite streams which will be diverted by the shell 10 and the tubes to opposite sides of the baffle plate 16, which is secured to the upper and lower sheets and to the wall 10. at a point diametrically opposite the inlet port 8. This baffle plate 16 extends radially, but is spaced from the down-take 13, and it co-operates with the lateral baffle plates 17 and 18, the major portions of which are parallel with the baffle plate 16 and spaced laterally therefrom, while the inner portions of the lateral baffle plates are diagonal and extend to the down-take 13. The perforated take-off pipes 19 and 20 for the incondensible gases are disposed within the lateral baffles 17 and 18 close to the down-take 13, but other perforated take-off pipes 21 and 22, likewise for the incondensible gases, are located at opposite sides of the central baffle plate 16 near

the outer shell 10 of the heat belt; it being found that these are strategic points in which the gases collect.

The arrangement of the baffles is such as to form traps where the incondensible gases naturally accumulate and the purpose of the perforated take-off pipes is to provide for the rapid withdrawal of the gases at such points, preventing the spreading of the same among the tubes and interfering with the proper heat transmission.

Beneath the pipes 19 and 20 are provided drains 23 and 24 and other drains are shown at 25 and 26, such drains being located adjacent to the down-take 13 and at opposite sides of the innermost portion of the narrow radial passage 12. These drains provide for the drawing off of the condensate.

It will be appreciated that the steam or vapor introduced through a single inlet will be rapidly and evenly distributed throughout the entire heat belt and an adequate supply of steam will thus be received in every part of the calandria.

It is obvious that changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims:—

What is claimed is:—

1. A calandria belt for evaporators comprising a shell having an inductance port for the heating medium, a tube body in said belt having a radial passage extending substantially in alinement with said port and consisting of a comparatively wide outer portion and a narrower inner portion whereby the tubes bordering upon the outer portion of the narrower part of the passage project in the path of the heating medium entering through the outer wider portion of the passage to deflect such heating medium laterally, said tube body having angularly disposed lateral channels leading from the innermost portion of the wider portion of said passage in position to catch that portion of the heating medium deflected by said bordering tubes.

2. A calandria belt for evaporators comprising a shell having a single inductance port for the heating medium, a central down-take, a tube body in said shell having a substantially radial passage from the port to the down-take and having also lateral channels leading from said passage for distributing the heating medium in oppositely flowing streams, a baffle plate at the other side of said belt diametrically opposite the port and extending radially inwardly from the shell, and a lateral baffle plate extending from the down-take in laterally spaced and parallel relation to the first mentioned baffle plate.

3. A calandria belt for evaporators comprising a shell having a single induction port for the heating medium, a central down-take, a tube body in said shell having a substantially radial passage from the port to the down-take and having also lateral channels leading from said passage for distributing the heating medium in oppositely flowing streams, a baffle plate at the other side of said belt diametrically opposite the port and extending radially inwardly from the shell, a lateral baffle plate extending from the down-take in spaced and parallel relation to the first mentioned baffle plate, and means for drawing off the incondensible gases located at opposite sides of the first mentioned baffle near the shell.

4. A calandria belt for evaporators comprising a shell having a single induction port for the heating medium, a central down-take, a tube body in said shell having a substantially radial passage from the port to the down-take and having also lateral channels leading from said passage for distributing the heating medium in oppositely flowing streams, a baffle plate at the other side of said belt diametrically opposite the port and extending radially inwardly from the shell, lateral baffle plates extending from the down-take in spaced and parallel relation to the first mentioned baffle plate, and at opposite sides thereof, and means for drawing off the incondensible gases between said lateral baffle plates, adjacent the down-take.

5. A calandria belt for evaporators comprising a shell having a single induction port for the heating medium, a central down-take, a tube body in said shell having a substantially radial passage from the port to the down-take and having also lateral channels leading from said passage for distributing the heating medium in oppositely flowing streams, a baffle plate at the other side of said belt diametrically opposite the port and extending radially inwardly from the shell, lateral baffle plates extending from the down-take in spaced and parallel relation to the first mentioned baffle plate, one of said lateral baffle plates being to one side of the first mentioned baffle plate and the other lateral baffle plate being spaced to the opposite side of said first mentioned baffle plate whereby to form pockets with the down-take for receiving the oppositely flowing streams and leading same together between said lateral baffle plates, said belt having drains located adjacent the down-take, certain of said drains being between the lateral baffle plates.

6. A calandria belt for evaporators comprising a shell having a single induction port for the heating medium, a central down-take, a tube body in said shell, a baffle plate extending radially from the shell into

said tube body substantially diametricallly opposite said induction port, and lateral baffle plates extending from the down-take through the tube body outwardly toward the shell, said lateral baffle plates being parallel to said first mentioned baffle plate and spaced from the latter, one of said lateral baffle plates being to one side of the first mentioned baffle plate and the other lateral baffle plate being to the opposite side of said first mentioned baffle plate whereby to form pockets with the down-take for receiving oppositely flowing streams of the heating medium deflected to such pockets by the first mentioned radial baffle plate.

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