

Aug. 20, 1929.

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1,725,549

HEAT TRANSFER APPARATUS

Filed March 10, 1926

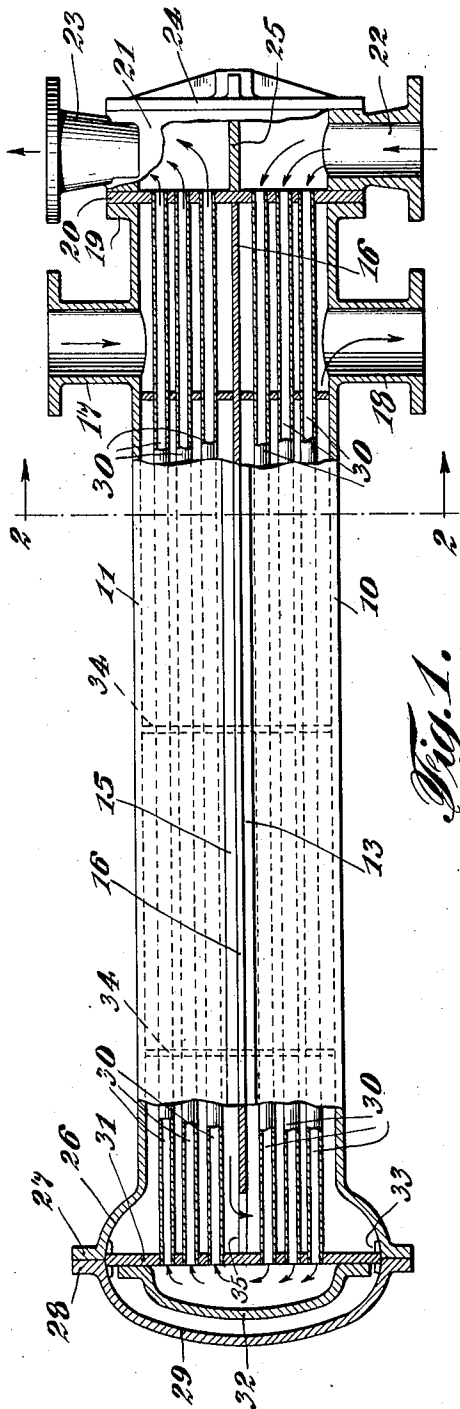


Fig. 1.

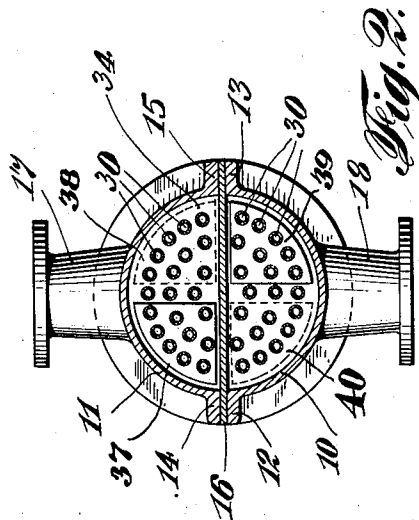


Fig. 2.

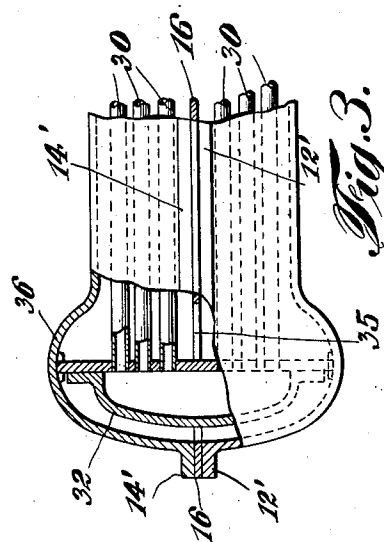


Fig. 3.

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Patented Aug. 20, 1929.

1,725,549

UNITED STATES PATENT OFFICE.

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HEAT-TRANSFER APPARATUS.

Application filed March 10, 1926. Serial No. 93,549.

This invention relates to a heat transfer apparatus and as herein illustrated and described the application thereof is embodied in a surface condenser, although it will be understood that the invention is not limited to this particular use.

Heretofore in heat transfer apparatus of the type to which this invention relates, it has been customary to employ a casing or shell and a plurality of nested or bundled tubes within the shell, together with means for supplying a cooling medium either interiorly or exteriorly of the tubes to effect the transfer of heat from steam or any given medium passed to the interior of the shell or the interior of the tubes, depending of course, upon the manner in which the cooling medium is applied. In this type of apparatus as I am aware, the construction in some instances has also been such as to make it possible to withdraw the nested tubes as a unit in a direction longitudinally of the tubes from one end of the shell. In structures of this nature, however, it has been difficult, if not impossible, to fill the shell with the tubes or to make the baffle plates usually employed to accurately fit within the shell, resulting in waste space and undesirable passages for the vapors, and furthermore, the withdrawal of the nested or bundled tubes longitudinally required considerable floor space for this operation.

The object of my invention is the provision of a heat exchange apparatus preferably in the form of a surface condenser which is so constructed that the shell or casing is made in parts which are separable longitudinally so that when one or more of the parts of the shell is removed the tubes may be removed as a unit in a direction transversely of their length. In this construction it is also possible to substantially fill the shell with the tubes and to make the transverse baffles and tube supports fit the shell so as to prevent the passage of the fluids in any path except that intended, thereby increasing the efficiency of the apparatus and making the handling of the same considerably easier than in types of this apparatus heretofore employed.

In the drawing Figure 1 is an elevation and partial vertical section of an apparatus embodying my present invention.

Fig. 2 is a section on line 2—2, Fig. 1, and

Fig. 3 is a partial elevation and section illustrating another form of one end of the apparatus.

Referring to the drawing and particularly to Figs. 1 and 2, it will be seen that I have illustrated my invention as embodied in a surface condenser. This condenser comprises a casing or shell, the body of which is preferably made in halves, the division being made longitudinally so that there is a lower shell part 10 and an upper shell part 11. These parts of the shell are provided respectively with flanges 12, 13 and 14, 15, by which the parts of the shell when superimposed may be connected by suitable bolts, as is customary, or otherwise. In this structure I also preferably employ a centrally disposed partition plate 16 which extends across the shell and lies intermediate of the flanged portions of the parts thereof to which it is also connected by the bolts or equivalent devices connecting the parts of the shell.

The upper part of the shell is fitted with an inlet nozzle 17 for the intake of steam or other fluid and the lower part of the shell is provided with an outlet nozzle 18 for the discharge of the condensed steam or fluid. At one end of the parts of the shell the same are provided with flanges 19, and a tube plate 20 abuts against these flanges 19 and lies between the same and a water box 21. These parts, namely the tube plate and the water box are connected to the flanges 19 and consequently to the shell by means of suitable bolts or otherwise. As is customary, the water box is provided with an inlet nozzle 22 and an outlet nozzle 23. These nozzles like the nozzles provided on the shell may be made to assume the necessary positions for use in any particular case. Also as is customary, the water box is fitted with a bonnet 24 and a centrally disposed partition wall 25.

In this form of the apparatus the opposite ends of the members or parts of the shell are enlarged as indicated at 26, terminating in flanges 27 adapted to be connected by suitable bolts or otherwise to a flange 28 of an end bonnet 29.

Within the shell or casing there is a plurality of tubes indicated at 30. At one end these tubes are connected in the tube plate 20 in any suitable manner, and at their opposite ends the tubes 30 are similarly connected in a tube plate 31 to which there is suitably secured a bonnet 32 which lies within the bonnet 29. The tube plate 31 and the bonnet 32 form a floating head which due to the expansion and contraction of the tubes may

move longitudinally on guide supports 33 provided therefor in the enlarged end portion of the parts of the shell. Within the shell there is provided a plurality of suitably spaced walls 34 which act both as tube supports and as baffles for directing the passage of the fluid through the apparatus. It will be noted that the partition plate 16 is provided with an aperture 35 in that end thereof which lies adjacent the tube plate 31 so as to provide a passage for the fluids from the upper to the lower section of the apparatus. The support and baffle walls 34 are provided with suitable openings in addition to the tube openings for the passage of the fluid through the shell, as is customary in this art, for example, as illustrated in Fig. 2 one of the transverse baffles above the longitudinal partition wall may be provided with an opening 37 at one side thereof and the next adjacent baffle with an opening 38 in the opposite side thereof, these openings being staggered in adjacent baffles to provide for a zig-zag course of the fluid in passing through the shell. In like manner, one of the baffles below the longitudinal partition wall may be provided with an opening 39 and the next adjacent baffle with an opening 40, the opening 39 being at one side of the baffle while the opening 40 is at the opposite side of another baffle. These openings, therefore, are also staggered in adjacent baffles so as to provide for a zig-zag path for the fluid in passing through the lower compartment in the shell in the same manner that it is caused to pass through the upper compartment.

Referring to Fig. 3 it will be seen that the enlarged end portions of the shell may be made integral to provide a bonnet which is a part of the shell as indicated at 36. In this structure the longitudinal flanges of the upper and lower members of the shell are continued as indicated at 12' and 14', and the partition plate 16 also continued longitudinally to the extremity of this end of the apparatus.

In the construction of the heat exchange apparatus as hereinbefore described, the tubes may be so placed as to substantially fill the members of the shell when the parts are assembled, and furthermore, the partition walls forming the support and baffle plates may be made to closely fit within the shell and against the longitudinal partition wall thereby positively causing the passage of the fluids in the intended directions, and as will also be apparent, by removing the water box at one

end and the bonnet at the other end of the construction as shown in Fig. 1, or merely by removing the water box in the construction as shown in Fig. 3, and separating the parts of the shell, the entire bundle or nest of tubes may be removed from the shell in a direction transversely of the length of the tubes, all of which are the particular features involved in this invention.

I claim as my invention:

1. In a heat transfer apparatus, a longitudinally divided casing having a flange at one end and an enlarged head and bonnet integral therewith at the other end, a nest of tubes in the shell, a tube plate secured to the flanged end of the casing, and a tube plate movable in the enlarged end of the casing, the ends of the said tubes being secured in the said tube plates and the parts of the casing being separable after the first aforesaid tube plate is disconnected therefrom in order to remove the tubes and tube plates bodily as a unit in a direction transversely of the length of the tubes.

2. In a heat transfer apparatus, a shell divided longitudinally into substantially similar members, a nest of tubes therein, and a plurality of diametrically transverse walls each forming a tube support and baffle plate and having its peripheral dimensions corresponding substantially with the inner transverse dimensions of the shell whereby the parts of the shell are separable making possible the removal of the nest of tubes as a unit and also in placing the parts of the shell together and connecting the same with the said plates in position, liquid tight joints are made between these parts.

3. In a heat transfer apparatus, a shell divided longitudinally into substantially similar members, a nest of tubes therein, a longitudinal partition wall, and a plurality of diametrically transverse walls each comprising a section having an edge abutting against the said longitudinal partition wall and an edge corresponding with the inner surface of the shell whereby the parts of the shell are separable for the removal of the nest of tubes and the partition walls as a unit, and also whereby in placing the parts of the shell together and connecting the same in position the said edges of the parts of each transverse partition wall form tight joints between the shell and the transverse partition wall.

Signed by me this 1st day of March, 1926.
FRANK J. SWENSON.