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HEAT EXCHANGER

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Fig. 1.

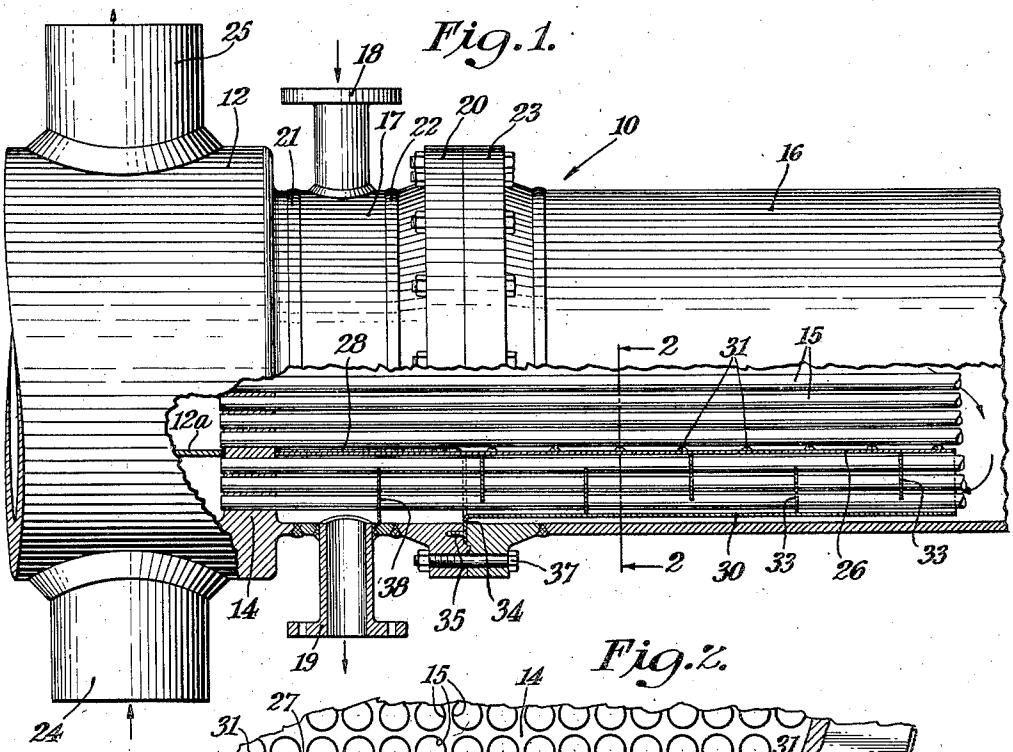
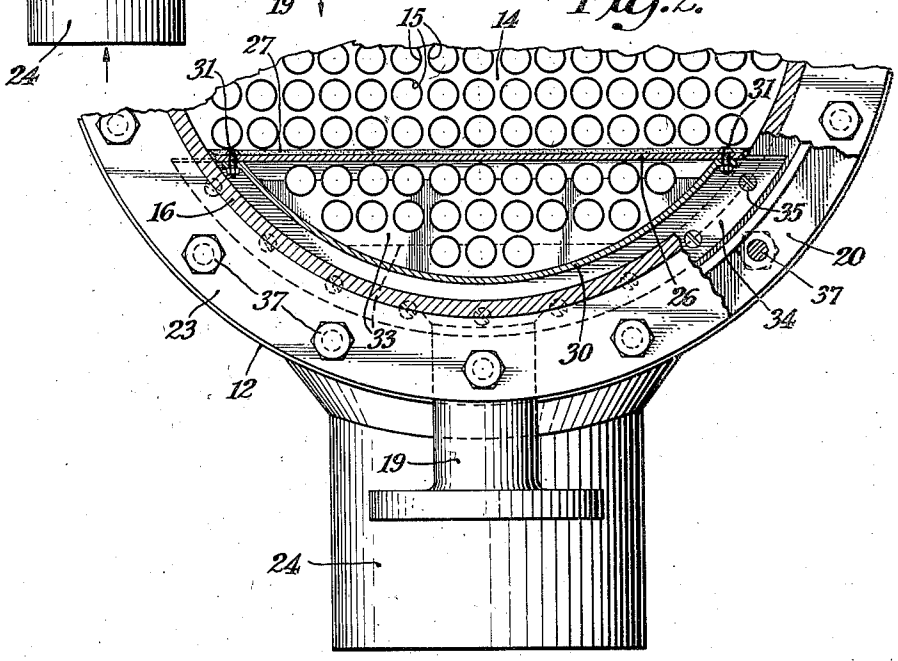


Fig. 2.



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HEAT EXCHANGER

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2 Claims. (Cl. 257—236)

This invention relates to improvements in heat exchangers of the so-called "shell and tube" type, and more particularly relates to the construction of the baffles for a sub-cooler.

It is well known that in shell and tube heat exchangers, it is customary practice to provide internal baffling to produce a circuitous flow of fluids in the tubes as well as in the shell. It is important, however, that the baffles be substantially tight against by-passing, and also be readily secured to the unit. Many forms have been used but they have either been of a complicated adjustable type or some compromise had to be tolerated in leakage.

In accordance with the present invention, an exchanger for cooling of condensate is provided with a fully confined, non-adjustable baffle to produce an internal drain of condensate for sub-cooling purposes and such baffle is substantially liquid tight, readily removed, and inexpensive in construction.

A still further object and advantage of the invention is to provide a high pressure, heavy duty heat exchanger with a nozzle construction which meets all code requirements for strength, and which permits the removal of the shell without destroying the nozzle connections.

Further objects and advantages of the invention will appear from the following description of a preferred form of embodiment thereof, taken in connection with the attached drawing, in which

Fig. 1 is a partial side elevation of a heat exchanger with parts broken away to show the internal construction;

Fig. 2 is a partial transverse vertical section on a slightly larger scale and taken substantially along the line 2—2 of Fig. 1.

In the preferred form of embodiment of the invention, as shown in Fig. 1, the heat exchanger generally represented as 10 is of a heavy duty type and is provided with a forged channel 12 and integral fixed tube sheet 14, from which the tube bundle 15 extends. The other ends of the tubes 15 are secured in suitable fashion to a floating tube sheet (not shown), and all of the construction is embraced within the shell 16.

The channel 12 is also preferably provided with a shell extension 17 into which nozzles 18 and 19 are secured. Code requirements make it necessary to use a spacing at least twice the metal thickness between the nozzles and the nearest welds, which are at the joints with the channel at 21 and at 22 with the flange 20. This necessarily controls the spacing of the flange 20 from the channel 12, the flange 20 being the attaching flange for the flange 23 on the shell 16.

In the normal construction of a cooler, the channel 12 receives cooling water through the nozzle 24 and by suitable baffling in the channel, such as is indicated at 12a, the heated water is eventually discharged out nozzle 25. The condensate enters the nozzle 18 and comes in contact with the water-cooled tubes 15 with the sub-cooled condensate being drawn off from the nozzle 19.

In accordance with the present invention, a baffle 26 is provided to assure an added sub-cooling of the condensate before it reaches discharge nozzle 19. This baffle is substantially horizontal and extends across the lower part of the heat exchanger from a point adjacent the fixed tube sheet 14 of the channel to a point along the length of the tubes sufficiently far to assure an adequate contact of the condensate which falls to the bottom. This baffle is preferably welded along the transverse line 27 to the fixed tube sheet and is welded along the longitudinal line 28 to the channel extension section 17. It will be obvious that in this channel extension section 17 there can be no possible by-passing of condensate from the nozzle 18 through to the nozzle 19.

To complete the internal drain section, a partially cylindrical baffle 30 surrounding the lower portion of the tubes is integrally secured to the horizontal baffle member 26 as by a plurality of securing devices 31 along the edges thereof. Throughout the length of this lower pan or baffle, there is also no possibility of the condensate by-passing, and the condensate intimately contacts with all of the lower portion of the tube bank. If desired, a plurality of vertical baffles 33 may also be used, certain ones projecting downward from the baffle member 26, and certain others projecting upward from the pan 30 toward the horizontal plate 26. By suitably staggering these baffles, the condensate must pass across the lower portion of the tube bank in a circuitous path with the most intimate contact with the tubes.

The lower part of the baffle forming the internal drain cooler is preferably provided with an outwardly flanged edge 34, which is conveniently countersunk into and secured as by screws 35 to the flange 20. It will be apparent that by removing the bolts 37, the shell 16 may be removed from the heat exchanger and thereafter the screws 35 and 31 can be withdrawn to completely remove the lower portion of the baffle.

The entire surface of the internal drain cooler

is surrounded by what amounts to a separate shell contained within the heater. That part of the drain cooler that is not removable is within the short non-removable section of the shell as formed by the stationary tube sheet forging. The flat top of this compartment, which would be similar to a horizontal baffle, is fully welded to the stationary tube sheet, and the short section of the shell that is permanently attached to this forging. The remaining portion of the internal drain cooler shell is independent of, but may be integrally secured to the curved bottom part, and as this part fits into a recess in the flange 20, a gasket seal is provided which prevents any by-passing or leakage.

The condensate may be kept at a desired level by the last baffle 38, which acts as a weir. It is, of course, apparent that if the nozzle 19 were placed on the side rather than on the bottom, it might be placed at a suitable elevation for controlling the condensate level.

It is of considerable advantage that the nozzles can be permanently welded in place and that the joints need not be broken for replacement of tubes and disassembly of the shell when necessary. The auxiliary section 17 not only provides for this, but also assures a complete contact of the condensate entering at 18 with the entire tube area, which would not otherwise be possible.

While a preferred form of embodiment of the invention has been described, it will be apparent that modifications may be made thereto without departing from the spirit and scope of the invention, and it is, therefore, desired that a broad interpretation be given within the spirit and scope of the description herein and of the claims appended hereinafter.

We claim:

1. In a heat exchanger of the class described having a channel, a shell, means to secure the shell to the channel, and a plurality of tubes extending into the shell, the combination of means to form an internal drain cooler surrounding a portion of said tubes, said means including a fixed plate and a detachable plate each extending along the length of the tubes, means to detachably secure said plates together along their longitudinal edges, said fixed plate being integrally secured at one end to the channel, means to detachably secure the other plate to the channel, said means including a lip on the edge of said plate and means to seal said lip between the shell and channel, said drain cooler forming a liquid path between the channel on one end and a point within the shell spaced therefrom, said drain cooler being removable after the shell is removed.

2. A heat exchanger of the class described including a channel having an integral tube sheet, nozzles for said channel, an integral channel extension portion on the opposite side of the tube sheet from said nozzles, a nozzle on said extension portion, a shell detachably secured to said extension portion, a longitudinally extending baffle integrally secured to the tube sheet and to the side walls of the extension portion, a partially cylindrical baffle below said first mentioned baffle, means to join said baffles along their longitudinal edges to form leak-proof joints, said second baffle having a portion engaging between the shell and the extension portion to form a leak-proof joint therewith, means to secure said engaging portion to the channel extension portion whereby said baffle may be removed after said shell is detached, said baffle members constituting an internal drain cooler in communication with the nozzle in the extension portion on one end and being open to the interior of the shell on the other end.

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