Sept. 21, 1965 A. WHITTELL, JR 3,207,215

HEAT EXCHANGER

Filed June 2, 1961

FIG. 1.

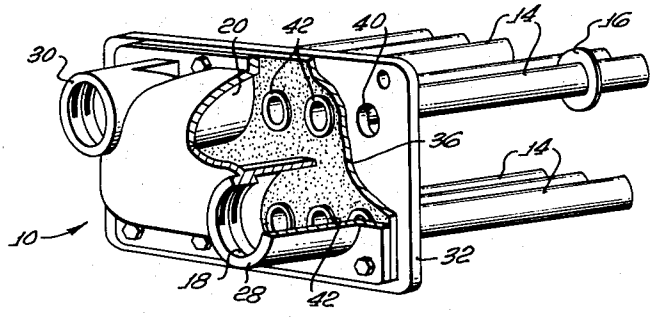


FIG. 6.

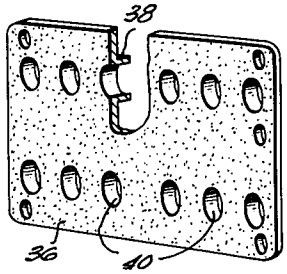


FIG. 2.

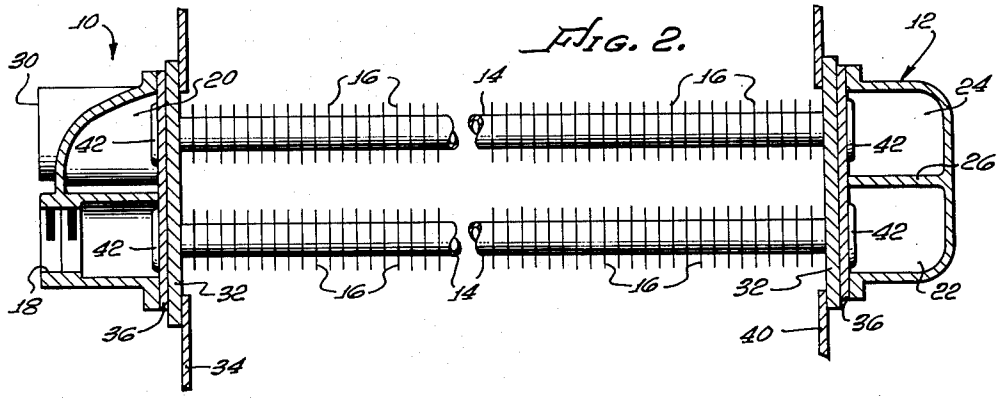


FIG. 3.

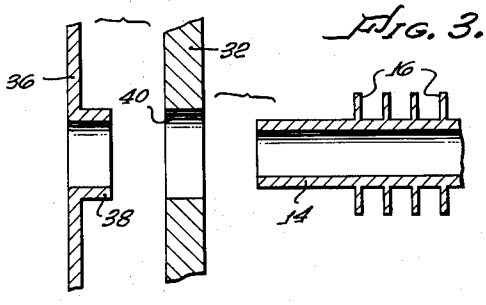


FIG. 4.

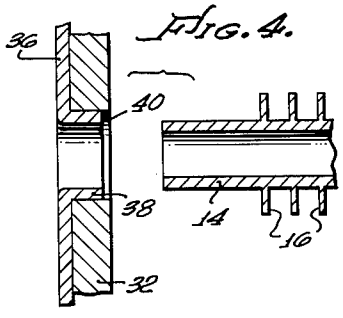
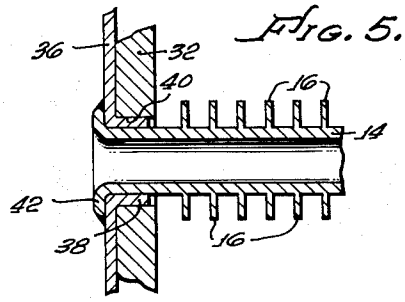


FIG. 5.



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3,207,215

HEAT EXCHANGER

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1 Claim. (Cl. 165—134)

This invention relates to an improved heat exchanger.

It is an object of this invention to provide a heat exchanger, such as a hot water boiler, wherein all water ways are coppered to avoid corrosion.

It is still a further object of this invention to shield the parts of the exchanger which are not copper from the water circulated therein.

It is still a further object of this invention to provide a heat exchanger of high efficiency and volume.

Other objects and advantages will be readily apparent from the following description:

In the drawings:

FIGURE 1 is a fragmentary perspective of the front header with parts broken away.

FIGURE 2 is a side elevation with the headers in section.

FIGURE 3 is a diagrammatic view of the tubing supporting and sealing assembly.

FIGURE 4 is a view similar to FIGURE 3 with the liner and tube sheet assembled.

FIGURE 5 is a view similar to FIGURE 4 with the tube assembled.

FIGURE 6 is a perspective of the tube sheet with a portion thereof broken away.

A heat exchanger is provided with a front header **10** and a rear header **12** with copper tubing **14** therebetween. A series of fins **16** are provided on each tube **14** to facilitate heat transfer.

The tubes are arranged in four banks so that water entering the front head through inlet **18** is directed by baffle **20** into the first group or bank of tubes to the rear header. The rear header is divided into upper and lower chambers **22** and **24** by baffle **26** and water enters the lower chamber **22** on the right hand side and its direction is reversed flowing through a second bank of tubes back to the front header. The flow is then between baffles **20** and **28** to a third bank of tubes leading to upper chamber **24** where flow is directed through a fourth bank of tubes to the front header **10** and hence outlet **30**.

Thus the water makes four passes through the heated

gases from a burner (not shown) positioned beneath the tubes. The first two passes are closest to the burner to facilitate the heat transfer.

The tubes **14** are of copper and the headers and their baffles of bronze. However, a tube sheet **32** is provided as a tube support at either end of the exchanger and is fixed to the housing **34** thereof.

To add strength and reduce expense, these tube sheets are of cast iron which have the outerface thereof very finely ground. A heavy duty deep drawn copper liner **36** is then utilized having a series of tubular protuberances **38** formed therein which may be inserted into holes **40** in the tube sheet as best seen in FIGURE 4. The tubes **14** are then inserted through the liner and flared back as at **42**, best seen in FIGURE 5.

The headers **10** and **12** are secured by screws or otherwise to the tube sheets **32** to complete the assembly.

Thus, the water ways in the heat exchanger are all copper or bronze with the ferrous tube sheet shielded therefrom.

While what hereinbefore has been described as the preferred embodiment of this invention, it is readily apparent that alterations and modifications can be resorted to without departing from the scope of this invention and such alterations and modifications are intended to be included within the scope of the appended claim.

I claim:

A heat exchanger assembly comprising: a ferrous tube sheet having holes therethrough, a copper sheet liner lying against one face of said tube sheet and having tubular protuberances thereon extending substantially through said holes from said one face, a series of copper tubes projecting through said holes and protuberances from the other face of said tube sheet, and having the extremities thereof flared outwardly into contact with the outer face of said liner.

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