June 20, 1950 L. FRIEDMAN 2,512,540

HEAT EXCHANGER

Filed Jan. 13, 1948

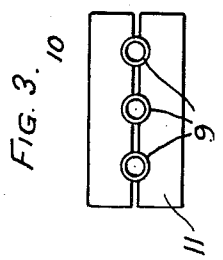


FIG. 3.

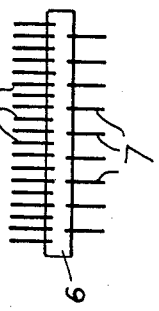


FIG. 1.

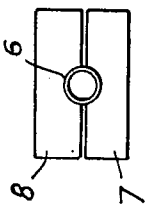


FIG. 2.

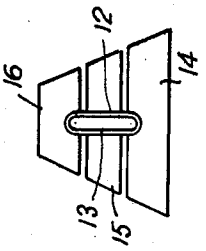


FIG. 5.

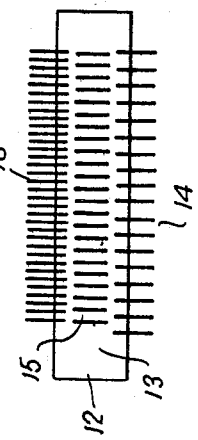


FIG. 4.

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HEAT EXCHANGER

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3 Claims. (Cl. 257—262.16)

1

This invention relates to heat exchanging devices employed with liquid heaters such devices comprising one or more liquid flow pipes fitted with metal fins, the hot gases from the combustion chamber passing over and between the fins to an outlet flue.

The object of the invention is to provide an improved form of heat exchanger giving results similar to those obtained from the use of a multistage heat exchanger. A heat exchanger has been proposed comprising a liquid flow pipe bent to provide a series of parallel portions lying in a common plane parallel to the direction of flow of the hot gases. The parallel portions of the flow pipe are each provided with metal fins, the superficial area of the fins increasing in the direction of flow of the hot gases. This increased area of the fins is obtained by increasing the number of fins on the successive parallel portions of the flow pipe and at the same time decreasing their distance from one another.

According to the invention a heat exchanger comprises a straight flow pipe arranged horizontally, or a series of such pipes arranged in the same horizontal plane which is transverse to the direction of flow of the hot gases, the pipe or the series of pipes having metal fins applied thereto arranged in groups, the superficial area of the fins in the groups increasing in the direction of flow of the hot gases, the increased area of the fins being obtained by increasing the number of fins in the successive groups and at the same time decreasing the distance between them. The flow pipe or pipes is or are arranged in a suitable casing through which the hot gases pass in any usual manner. The heating effect obtained by the above arrangement is the equivalent of that obtained in a multistage heat exchanger.

The fins may be slotted and slipped over the pipes and secured thereto by brazing, soldering or in any usual manner.

To enable the invention to be fully understood it will now be described by reference to the accompanying drawing, in which—

Fig. 1 is a side view of a single liquid flow pipe arranged according to one form of the invention, and

Fig. 2 is an end view thereof,

Fig. 3 is an end view showing an arrangement with three liquid flow pipes,

Fig. 4 is a side view and Fig. 5 is an end view of a further form of the invention.

In the arrangement shown in Figs. 1 and 2, the underface of a straight flow pipe 6 is provided with spaced metal fins 7 and the upper

2

surface of the pipe with an increased number of similar metal fins 8 arranged at a decreased distance apart compared with the fins 7.

Fig. 3 shows in end elevation an arrangement comprising three liquid flow pipes 9 arranged side by side in the same horizontal plane and fitted with top and bottom fins 10, 11 corresponding to the fins 8, 7 of Figs. 1 and 2. Any number of flow pipes may be so arranged in the same horizontal plane.

Figs. 4 and 5 show a further arrangement. In this case a flow pipe 12 of non-circular cross-section is employed having flat vertical sides 13. Four groups of fins are applied to the pipe. The fins 14 on the underside are suitably spaced, a group 15 of increased number is applied to each side 13 of the pipe above the fins 14 and spaced more closely together, the number of fins in each group 15 being equal and a group 16 of a further increased number and still more closely spaced together is applied to the top surface of the pipe.

The fins in this arrangement are shown as having tapered sides so that the cross-section of the device is trapezoidal, but they may be of any desired shape and size.

A flat-sided flow pipe is particularly well adapted for use according to the invention as the flat sides provide suitable attaching surfaces for the various groups of fins. As a flat pipe has two well-defined vertical sides arrangements are possible wherein each side of the pipe is provided with fins arranged with different spacing to produce the desired effect.

It will be understood that the devices illustrated are arranged in a suitable casing through which the hot gases pass in any usual manner.

It will also be understood that the sizes or shapes and/or the thickness of the fins in each group may be varied in any of the constructions contemplated.

The fins may be slotted, as shown, to accommodate the pipes or attached in any other convenient manner.

A heat exchanger for a liquid heater may comprise one section of straight horizontal flow pipes each arranged according to the invention or a superposed series of such horizontal sections according to requirements, and the fin sizes and groupings on each section may be similar or variations may be introduced as will be understood.

I claim:

1. In a heat exchanger of the kind referred to, a straight liquid flow pipe arranged in a horizontal plane transverse to the direction of flow of the hot gases, four groups of metal fins applied

to the pipe, those on the underside being suitably spaced, a group of an increased number being attached to each side of the pipe above those on the underside and spaced more closely together, the number of fins in each of these side groups being equal, and a group of a further increased number of fins on the top surface of the pipe arranged still more closely together.

2. A heat exchanger as claimed in claim 1 wherein the liquid flow pipe is formed with flat parallel sides to provide suitable attaching surfaces for the various groups of fins.

3. In a heat exchanger of the kind referred to, a series of straight liquid flow pipes arranged in the same horizontal plane which is transverse to the direction of the flow of the hot gases, each pipe having four groups of metal fins applied thereto those on the underside being suitably spaced, a group of an increased number being attached to each side of the pipe above those on the underside and spaced more closely together, the number of fins in each of the side groups being equal, and a group of a further increased number of fins on the top surface of the pipe arranged still more closely together.

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