

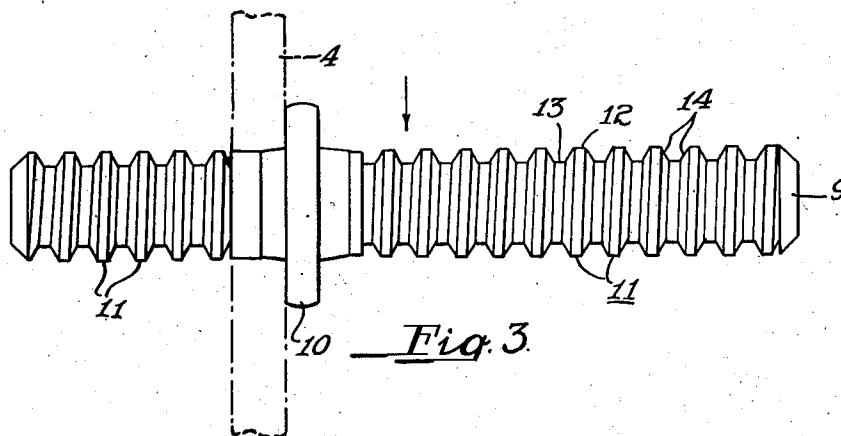
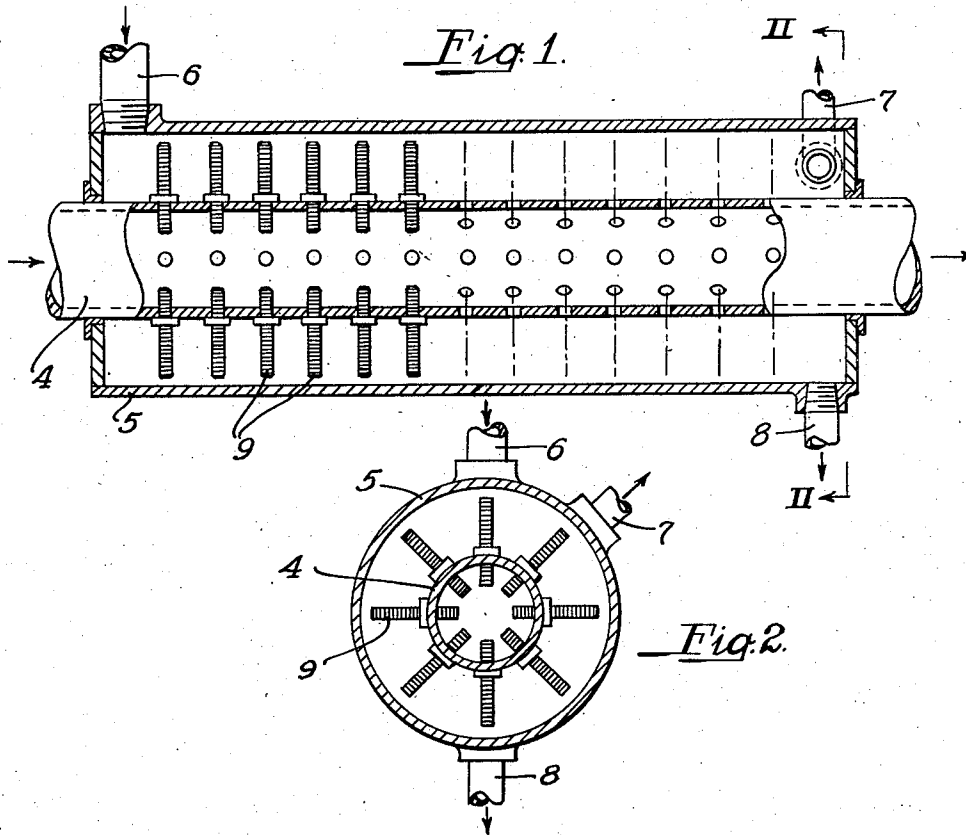
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HEAT EXCHANGER

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HEAT EXCHANGER

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2 Claims. (Cl. 257-263)

My invention relates to heat exchangers and more particularly to the utilization of waste heat for heating fluids, of either a gaseous or liquid nature.

As hereinafter described, the invention is shown as employed in the heating of air by exhaust gases from an internal combustion engine, the heated air being utilized for various purposes in an airplane, such as for preventing the forming of ice on the wings.

One object of my invention is to provide a heat exchange device of the character referred to, which, for a given weight of material, will produce maximum areas of heat absorption and radiating surfaces and effective conduction of heat from the exhaust gases to the air to be heated.

As shown in the accompanying drawing, Figure 1 is a longitudinal sectional view through the heater or heat exchanger; Fig. 2 is a view taken on the line II-II of Fig. 1; and Fig. 3 is an enlarged view of one of the heat-conducting elements.

The numeral 4 represents a portion of an exhaust pipe and is snugly surrounded by a drum or chamber 5. The air which is to be heated is supplied under pressure through an inlet pipe 6 to the interior of the drum 5, the drum at its other end being provided with a desired number of outlets 7 and 8 that lead to places where it is desired to utilize the heat.

The exhaust pipe 4 has a number of holes to receive studs 9 that are distributed circumferentially and longitudinally of the pipe, and serve as the heat-transfer elements. Each stud has a boss 10 formed thereon whose inner peripheral corners engage the circumferential surface of the pipe 4 and are electrically welded thereto, to securely connect the heat-conducting elements to the pipe and to provide a tight seal against leakage of gases from the pipe into the chamber 5.

Ribs 11, each completely spaced from adjacent ribs, are formed on the studs in order to provide greater heat-absorbing and heat-dissipating areas, it being understood that the ribs on the inner portions of the studs will absorb heat from the gases and this heat will be transmitted through the studs to the ribs exteriorly of the pipe, to thereby heat the air in the chamber 5. The tops of the ribs as indicated at 12 may suitably have a width or thickness approximately equal to the spaces 13 between the roots or bases of these ribs and the height of each rib may suitably be approximately the same as the distance at 12 or 13. The sloping sides of the ribs at 14 are therefore, of course, of greater radial dimension than are the axial dimensions of the tops 12. The over-all diameter of each stud may be .260" to .300" and its diameter at the roots of the ribs may suitably be about .236". Again, the width

at 13 may be .026", the width at 12 .026", and the actual height of the ribs .026". These figures are given for convenience of description rather than as a statement of required dimensions.

It will be noted that the plane of each rib 12 is inclined slightly with respect to the axis of the stud 9. If these planes are positioned with their highest edges toward the inlet end of the chamber, the ribs on the outer portions of the studs will tend to direct the air flow toward the exhaust pipe 4, thus tending to keep the air in more intimate contact with the pipe, for better heat absorption. The sloping sides 14 of the ribs may suitably be about 60°, and greater heat absorbing area is thereby provided than if the sides of the ribs were at 90° or radial to the axis of the stud. The rib arrangement produces more than double the heat-absorbing and radiating area than would be the case if smooth studs of approximately the same diameter were employed.

The studs can be formed by cutting heavy wire or rods to suitable length and forging, or by rolling ribs or threads on the rods, or by cutting annular grooves on the stock. Also, it will be understood that the ribs can be formed as complete helices on the inner and outer portions of the studs, after the manner of screw threads.

The matter of weight—particularly in the case of airplanes—is important and not only does my arrangement provide for a great area of heat absorption and radiation in the heat exchanger relative to the number and size of heat-transfer elements employed, but a smaller heat exchange until will be required in order to heat a given amount of air than if smooth studs were employed.

I claim as my invention:

1. A heat exchanger comprising a passageway for heated fluid, a second passageway for fluid to be heated, separated from the other passageway by a wall, and studs carried by said wall and extending into the said passageways, those portions of the studs in the second passageway having axially-spaced ribs disposed circumferentially thereof and spaced apart axially on the studs, the ribs being disposed in planes that are so inclined as to direct the fluid flow in the second passageway toward the said wall.

2. A heat exchanger comprising a passageway for heated fluid, a second passageway for fluid to be heated, one passageway surrounding the other and being separated therefrom by a wall, and studs carried by said wall and extending into the said passageways, those portions of the studs in the second passageway having ribs disposed circumferentially thereof and spaced apart axially on the studs, the ribs being disposed in planes that are so inclined to direct the fluid flow in the second passageway toward the said wall.

CHARLES FASSINGER, Sr.,