Oct. 11, 1932. J. E. BLACK 1,882,474

HEAT EXCHANGE DEVICE

Original Filed June 7, 1928

Fig-1

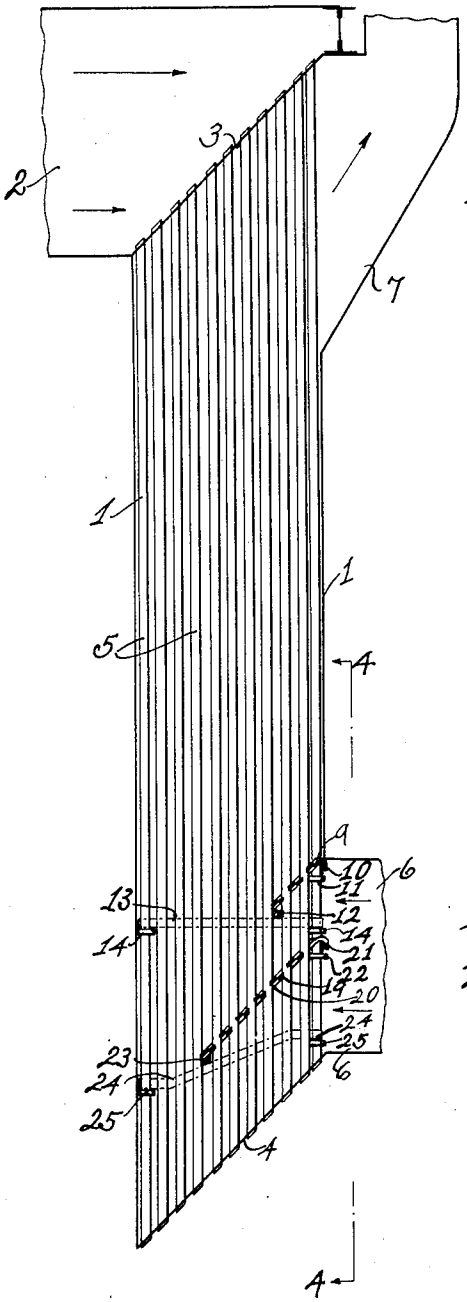



Fig-2

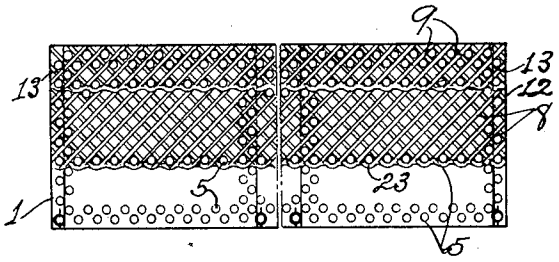



Fig-3

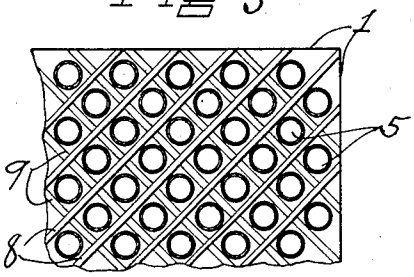
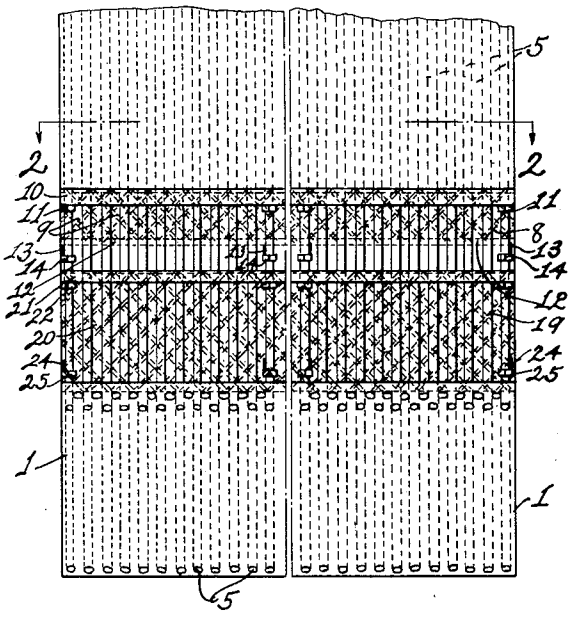



Fig-4




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# UNITED STATES PATENT OFFICE

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## HEAT EXCHANGE DEVICE

Application filed June 7, 1928, Serial No. 283,473. Renewed September 22, 1931.

This invention relates to a device by means of which heat can be transmitted from one fluid to another without permitting the fluids to come into direct contact with each other. It is especially useful in heating air by means of hot gases but is not restricted to this particular use. The invention will be understood from the description in connection with the accompanying drawing in which Fig. 1 is a vertical section through an illustrative embodiment of the invention; Fig. 2 is a section along the line 2—2 of Fig. 4; Fig. 3 is a section similar to Fig. 2 on an enlarged scale partly broken away; and Fig. 4 is a side view partly broken away taken along the line 4—4 of Fig. 1.

In the drawing reference character 1 indicates the casing of the heater that is rectangular in cross section. It is provided with an air inlet 2 at the upper end so arranged that the air passes through the inside of the tubes of the heater. Tube plates 3 and 4, may be inclined at an angle and may be parallel to each other. They are located at opposite ends of the casing and the ends of the tubes 5 that extend through the casing are connected to these tube plates. These tubes are preferably arranged in rows of staggered tubes. A hot gas inlet 6 is provided on one side near the end opposite the air inlet 2 and an outlet 7 is provided for the gases on the same side near the other end.

In order to prevent a dead space or inactive surface from being present in the lower left hand portion of the tubes as shown in Fig. 1, baffles extend from the inlet 6 partially across the heater. The baffles may be made up of rods that cross each other in lanes between the tubes. One of the baffles which extends from the upper edge of the inlet 6 preferably parallel to the tube plate 4 from side to side of the casing across a few of the tubes, is made up of rods 8 and 9 crossing each other as most clearly shown in Figs. 2 and 3. The rods 8 and 9 at one end are hooked over a cross bar 10 sustained upon some of the tubes 5 by means of clamps or rings 11 around the tubes below the cross bar. The other ends of the rods 8 and 9 rest upon a cross bar 12 that is made sinuous in shape, if necessary, so as to extend through a space between tubes as shown in Fig. 2. The cross bar 12 rests upon supports 13 that may be supported by rings or clamps 14 that are attached to some of the tubes 5.

Another baffle that is wider than the one just described extends from near the middle of the inlet 6 in a similar direction across a larger number of the tubes 5. This baffle is also made up of rods 19 and 20 that cross each other in the lanes between the tubes. The rods 19 and 20 at one end are hooked over a cross bar 21 that rests upon clamps or rings 22 on some of the tubes 5 and the other ends of the rods 19 and 20 rest upon a cross bar 23 that is similar to the cross bar 12. The cross bar 23 is supported by supports 24 that rest upon rings or clamps 25 on some of the tubes 5.

The rods 8, 9, 19 and 20 which make up the baffles may be made of different sizes to vary the amount of gas that passes between the rods and the outside surfaces of the tubes 5, thus regulating the amount of gases that will leak through these baffles, the remainder being caused to pass beyond the inner edges of the baffles. By this arrangement, the heating gases which enter the heater through the inlet 6 may be more uniformly distributed over the tubes while passing through the heater to the outlet 7. The air to be heated enters through the inlet 2 and passes downwardly through the tubes 5.

While the invention has been described with the air passing through the tubes 5 and the hot gases along the outside thereof, it is to be understood that the hot gases may be passed through the tubes and the air along the outside thereof, in a similar manner.

I claim:

1. In a heat exchanger, a casing, tubes extending through said casing, a fluid inlet on one side of said casing near one end, and a baffle in said casing composed of strips between said tubes.

2. In a heat exchanger, a casing, staggered rows of tubes extending through said casing, a fluid inlet on one side of said casing near

one end, and a baffle in said casing composed of strips between said tubes.

3. In a heat exchanger, a casing, tubes extending through said casing, tube plates at the ends of said tubes, a fluid inlet on one side of said casing near one end, and a baffle in said casing composed of strips between said tubes.

4. In a heat exchanger, a casing, tubes extending through said casing, tube plates at the ends of said tubes, a fluid inlet on one side of said casing near one end, and a baffle in said casing composed of strips between said tubes, said baffle being substantially parallel to said tube plates.

5. In a heat exchanger, a casing, tubes extending through said casing, a fluid inlet on one side of said casing near one end, and a baffle in said casing composed of strips between said tubes, said baffle being supported upon said tubes.

6. In a heat exchanger, a casing, tubes extending through said casing, a fluid inlet on one side of said casing near one end, and a baffle in said casing composed of strips between said tubes of less widths than the distances between said tubes.

7. In a heat exchanger, a casing, tubes extending through said casing, a fluid inlet on one side of said casing near one end, and baffles of different widths in said casing composed of strips between said tubes.

8. In an air heater, a casing, an air inlet and an air outlet at opposite ends of said casing, a gas inlet and a gas outlet on the same side of said casing and baffles of different widths composed of strips in said casing.

9. In an air heater, a casing, an air inlet and an air outlet at opposite ends of said casing, a gas inlet and a gas outlet on the same side of said casing and strip baffles supported upon said tubes near said gas inlet.

10. In an air heater, a casing, an air inlet and an air outlet at opposite ends of said casing, a gas inlet and a gas outlet on the same side of said casing, and strip baffles near said gas inlet partially filling the spaces between the tubes.

11. In a heat exchanger, a casing, tubes extending through said casing, a fluid inlet on one side of said casing near one end, and a baffle in said casing composed of strips with straight edges between said tubes.

12. In a heat exchanger, a casing, tubes extending through said casing located so as to provide lanes between said tubes and a baffle in said casing composed of strips lying in said lanes.

13. In a heat exchanger, a casing, tubes extending through said casing, a gas inlet on one side of said casing near one end, a baffle extending part way across said tubes opposite said gas inlet for directing the flow of gases across the tubes toward the opposite side of said casing, said baffle being so constructed that part of the gases are caused to flow through the baffle and along the tubes and the remainder of the gases are diverted beyond the inner edge of the baffle and caused to flow between the tubes which lie beyond the baffle.

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