

Aug. 4, 1925.

1,548,159

T. E. MURRAY

HEAT INTERCHANGER

Filed June 13, 1923

2 Sheets-Sheet 1

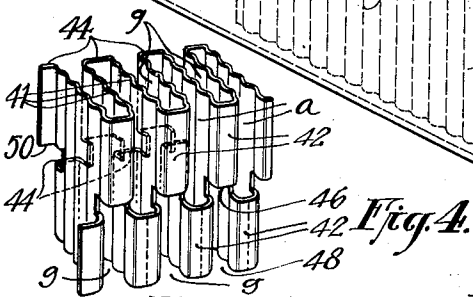
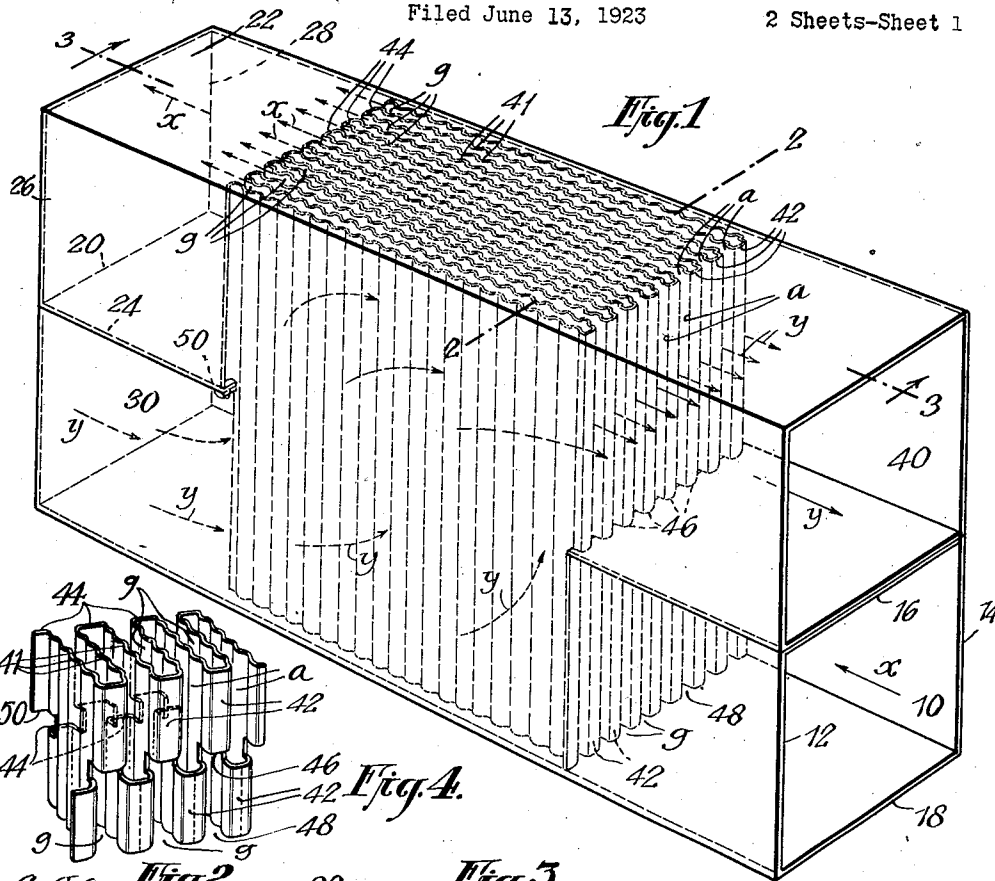


Fig. 2.

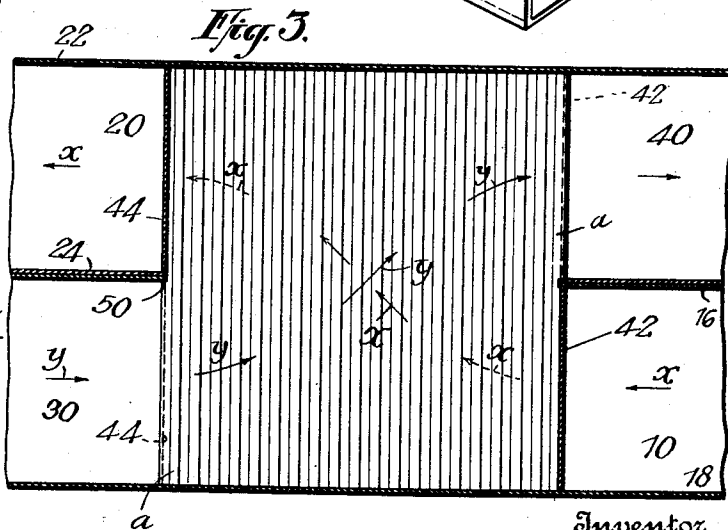
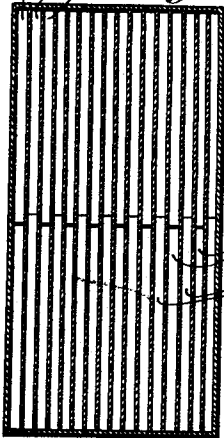


Fig. 3.

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Fig. 5.

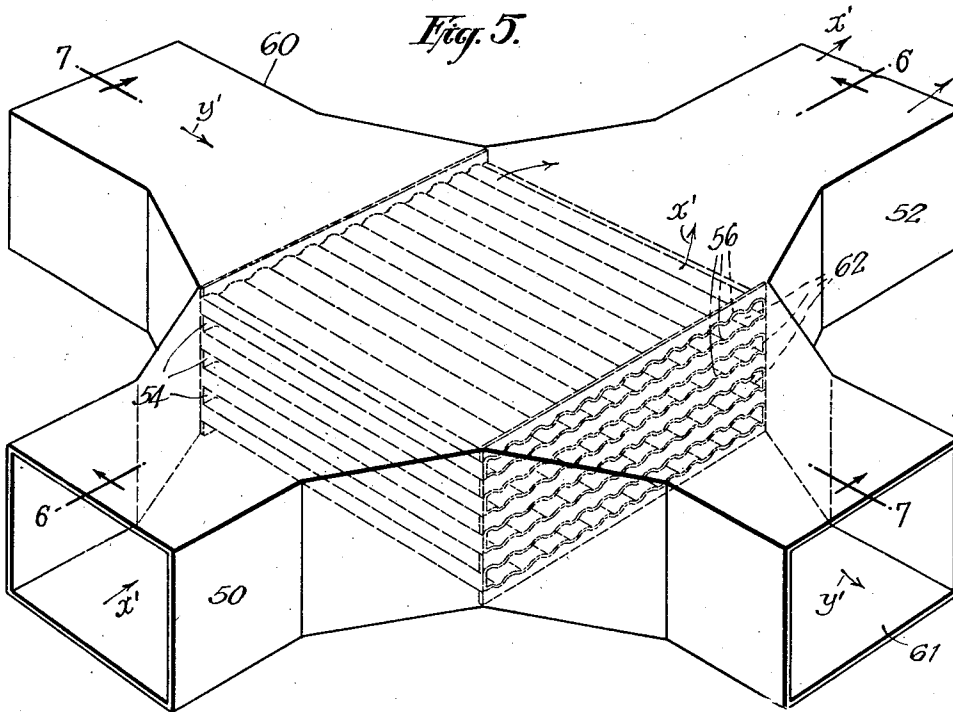


Fig. 6.

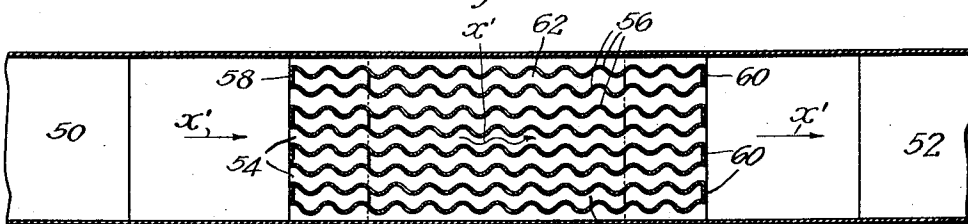
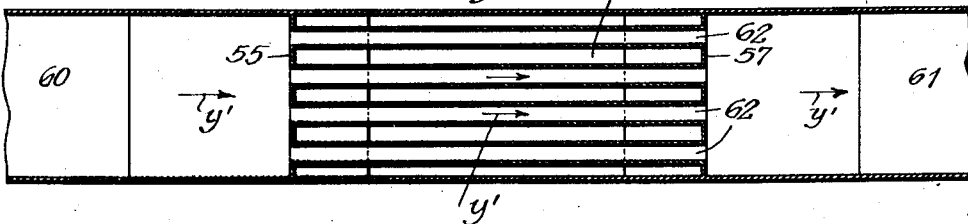


Fig. 7.



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Patented Aug. 4, 1925.

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UNITED STATES PATENT OFFICE.

THOMAS E. MURRAY, OF BROOKLYN, NEW YORK.

HEAT INTERCHANGER.

Application filed June 13, 1923. Serial No. 645,018.

To all whom it may concern:

Be it known that I, THOMAS E. MURRAY, a citizen of the United States, and resident of the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Heat Interchangers, of which the following is a specification.

This invention relates to means whereby a heated fluid flowing through one conduit may give up its heat to a body of air or other fluid flowing through a juxtaposed conduit.

An embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a perspective view showing an air and a gas conduit illustrating one form of the invention;

Fig. 2 is a transverse section on line 2—2 of Fig. 1;

Fig. 3 is a longitudinal section on line 3—3 of Fig. 1;

Fig. 4 is a detail perspective view showing a portion of the corrugated plates used to form alternate passages for gas and air;

Fig. 5 is a perspective view illustrating a modified form of the invention;

Fig. 6 and Fig. 7 are section views on the correspondingly numbered lines of Fig. 5.

Referring first to Figs. 1 to 4, 10 represents the inlet port of a gas conduit having side walls 12 and 14 and top and bottom walls 16 and 18. 20 represents the outlet port of the gas conduit having top and bottom walls 22 and 24 and side walls 26 and 28.

Located below the gas outlet port 20 of the gas conduit is an inlet port 30 of an air conduit, and above the inlet port 10 of the gas conduit is the outlet port 40 of the air conduit. The air conduit has top, bottom and side walls as shown similar to the gas conduit, and the waste gas is passed from the lower inlet port 10 to the upper outlet port 20 in the direction of the arrows *x*. The air is passed in the opposite direction from the inlet port 30 toward the outlet port 40 as indicated by the arrows *y* in Figs. 1 and 3. In other words, the gas and air pass counter-current to each other. Located between the gas inlet and gas outlet ports and also between the air inlet and air outlet ports, I mount a structure forming a multiplicity of alternate cells or chambers for the passage of the air and gas.

As shown in Figs. 1 and 4, this structure

consists of a series of corrugated walls or plates 41 joined at one end by narrow end walls 42 and at the opposite end by walls 44. The walls 42 are cut away as at 46 leaving open end passages as indicated at 48 in Figs. 1 and 4 for the passage of gas through the space between two opposed walls 41.

In a similar manner, the walls 44 are cut away to form passages 50 whereby the air from the port 30 can flow between the opposed walls 41.

Stated in another way, the central portion of the heat interchanger is a cellular structure formed of a corrugated plate bent back and forth in a sinuous or zig-zag manner so as to form a multiplicity of spaced walls 41 connected at their ends by walls 42 and 44. The walls 42 are cut away as at 46 to permit the passage of gas from the port 10 through alternate chambers between the walls 41, and the end walls 44 are cut away at 50 so as to permit the passage of air from port 30 to flow through the chambers adjacent to the gas passages.

In the drawings the chambers through which the air passes are designated by *a*, and the passages through which the gas passes are designated by *g*. The passages *a* are open-ended opposite the outlet air port 40 and are closed by the walls 44 opposite the gas port 20. The portion of the wall 44 below the gas port 20, or in line with the air port 30, is cut away as at 50 to permit the air to enter the passages *a*. Similarly the end walls 42 are cut away as at 46 to permit the gas to enter the passages *g* opposite the inlet port 10 and to permit the gas to pass out the open spaces opposite the gas port 20.

As thus arranged it is apparent that the gas and air are split up into adjacent layers so that the hot gas passing through one of the narrow chambers between the walls 41 heats up the wall and thereby transmits its heat to the air flowing through the adjacent passage.

In Figs. 5 to 7, I have shown a modified construction in which the gas conduit comprises an inlet port 50 and an outlet port 52. The air conduit comprises an inlet port 60 and an outlet port 61. The hot gas flowing from port 50 to port 52 flows through a plurality of passages 54, formed by a series of spaced corrugated plates 56.

The plates 56 are arranged in pairs which

are closed by end walls 58 and 60 so as to form independent passages 62 for the air to flow through. The passages 54 through which the air flows are closed at the ends by walls 55 and 57 as shown in Fig. 7.

As shown clearly in Figs. 6 and 7, the hot gas flows through the multiplicity of passages 54 as indicated by the arrows x' and the air flows at right angles thereto through the multiplicity of passages 62 as indicated by the arrows y' .

From the foregoing it is apparent that the invention provides means whereby a volume of hot gas, for example, the products of combustion from a furnace or the like, can be passed through a multiplicity of passages, while air, for example, to support combustion in a furnace, is passed through adjacent passages so as to be preheated by contact with the hot walls or plates defining the passages.

Though I have described with great particularity of detail the embodiments of the invention shown, it is not to be construed that I am limited thereto as changes in arrangement and substitution of equivalents may be made by those skilled in the art without departing from the invention as defined in the appended claims.

What I claim is:

1. In a device of the class described, a pair of adjacent conduits and a multiplicity

of corrugated plates extending across the conduits and arranged to form a series of alternate zig-zag passages for the gas and air flowing in said conduits, whereby the gas flowing through one conduit transmits its heat through said plates to the air flowing in the other conduit.

2. In a device of the class described, a continuous sheet bent to form plurality of plates shaped to present an extended surface and arranged to form two independent sets of passages and means for passing a fluid through each of said sets of passages independently so that there is an interchange of heat between the fluids flowing in each of said sets of passages.

3. A device of the class described comprising a casing having conduits for the independent passage of gas and air and a continuous sheet metal plate bent back and forth to form a multiplicity of cells, said conduits being disposed one over the other and the size of said plate in one direction being equal to the combined height of both said conduits and the bent end walls of plate having ports so arranged that the gas and air are compelled to leave the cells at a different elevation than that at which they enter.

In witness whereof, I have hereunto signed my name.

THOMAS E. MURRAY.