June 2, 1942. H. M. ROGERS 2,284,769

HEAT EXCHANGER

Filed Aug. 3, 1940

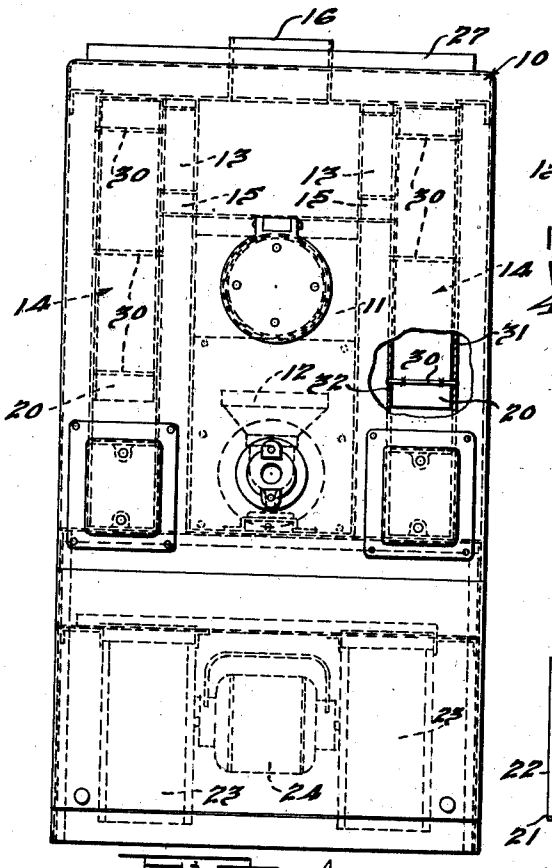

FIG. 1.

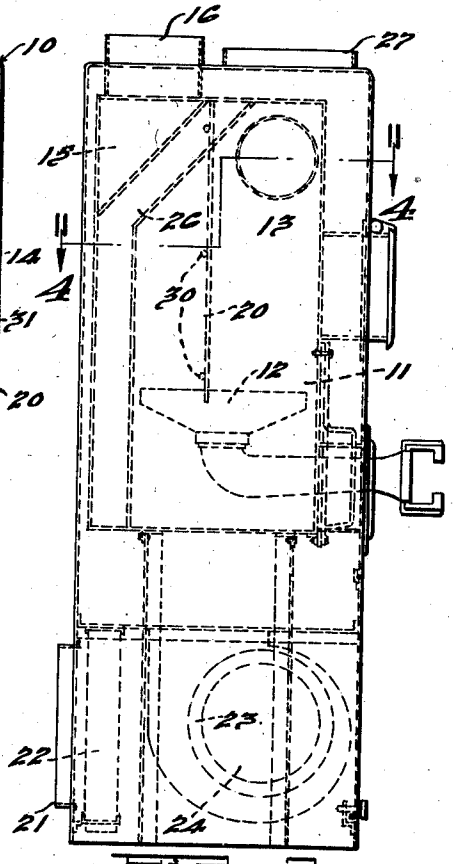

FIG. 2.

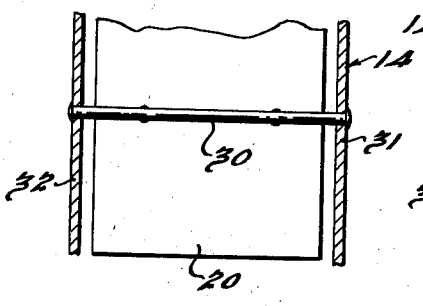

FIG. 3.

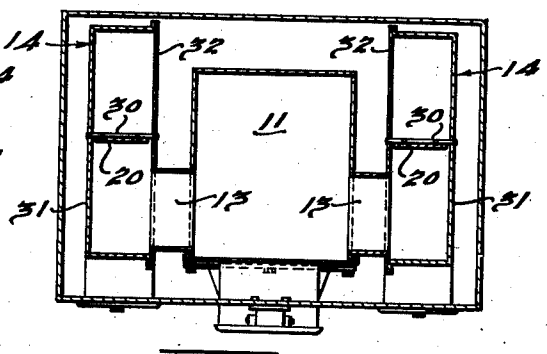

FIG. 4.

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HEAT EXCHANGER

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3 Claims. (Cl. 257—164)

My present invention relates to warm air furnaces, the invention being of particular utility in a furnace of the type set forth and claimed in the patent to Livar, No. 2,196,703, April 9, 1940.

The primary object of the present invention is to provide a warm air furnace with a heat exchanger through which flue gases travel, so arranged as to provide for the utmost transfer of heat between the flue gases and the warm air being heated by the furnace. To this end, the furnace comprises a heat exchanger having a baffle therein and so arranged as to direct flue gases in one direction through a portion of the heat exchanger and around an end of the baffle so as to pass in an opposite direction out of the heat exchanger. The principal object of the present invention is accomplished by permitting small quantities of the flue gases to pass around the edges of the baffle while the main portion thereof passes around the end, the small quantities of flue gases so passed around the edges greatly aiding the transfer of heat by increasing the temperature of some portions of the heat exchanger.

A second object of the invention is so to arrange a baffled heat exchanger as to prevent the trapping of any unburned or partially burned gases between burner operating periods which might flash or explode in the heat exchanger with resulting rumbles and reverberations, if not damaging explosions. Such flash explosions of small quantities of unburned gases are usually harmless but the noise is annoying and sometimes frightening. Proper adjustment of the burner would prevent the occurrence of such flash explosions, but the present invention is designed to prevent their occurrence in spite of improper burner adjustment.

The objects and advantages of the present invention should be more readily apparent to those skilled in the art from a study of the following specification and accompanying drawing wherein like numerals refer to like parts throughout.

In the drawing, Fig. 1 is a front elevational view of a furnace constructed in accordance with my invention;

Fig. 2 is a side elevational view of the furnace;

Fig. 3 is a partial section on an enlarged scale of the lower end of a baffle and the portions of the side walls of the heat exchanger adjacent thereto; and,

Fig. 4 is a cross-section taken along line 4—4 of Fig. 2.

In the drawing, the numeral 10 refers to a furnace jacket in which is enclosed a welded firebox and heat exchanger construction including the firebox 11 in which the burner 12 is located, lateral flues 13 extending from the front, upper corners of the firebox into laterally spaced heat exchangers 14, and a lateral triangular connecting flue 15 which leads into the smoke stack connector 16 from the upper, rear corners of the heat exchangers. The hot flue gases passing upward from the burner 12 divide and pass through the passages 13 into the upper, front corners of the heat exchangers 14 where they are directed downwardly by vertically extending baffles 20. After passing around the lower ends of the baffles the gases pass upward into the triangular connecting flue 15 and out through the stack 16. The air to be warmed is admitted to the interior of the jacket through a duct connector 21 and drawn through a filter 22 by centrifugal blowers 23 driven by motor 24. The blowers direct the air upwardly through the spaces between the jacket 10, the heat exchangers 14, and the furnace firebox 11, and also through the inclined crown sheet passage 26 extending over the hottest portion of the flame area. The warmed air is forced outward through the duct connector 27 which is adapted to be connected to the ducts leading to the space to be heated. Other types of furnaces having heat exchangers in which baffles change the direction of travel of the flue gases may have my invention incorporated therein, the above construction being one of many which would find the invention of utility.

The improvement comprising my present invention is so to arrange the baffle 20 in the heat exchanger 14 as to provide for the escape of small quantities of hot flue gases at the upper end of the baffle, preferably entirely around the edges thereof, or at least at certain portions thereof as in the area between the passages 13 and the triangular connecting flue 15 so as to prevent the trapping of any gases in the upper portions of the heat exchanger. Preferably, also, the passages around the edges of the baffles extend throughout the length of the baffles as shown in the drawing, so as to provide for intimate contact of moving streams of hot gases against the side walls of the heat exchangers adjacent the edges of the baffles 20 so as to heat the surfaces of the heat exchangers more uniformly to a greater extent than possible with prior construction. By this means the air passing over the outer surfaces of the heat

exchangers tends to be heated to the same extent as the air which passes through the crown sheet passage 26 adjacent the triangular flue 15. Also, any tendency of the sheets forming the side walls of the heat exchangers to buckle or warp is lessened since the surfaces thereof are heated more uniformly throughout their areas, and the welds between the sheets do not tend to crack due to uneven expansion and contraction thereof.

As seen in Figs. 3 and 4 the baffles 20 are preferably mounted upon a plurality of rods 30 as by means of welding the same to the surface of the baffle. The ends of the rods 30 are passed through openings in the side walls of the heat exchangers 14 and welded thereto to form a rigidly braced structure having the edges of the baffles properly spaced from the inner surfaces of the heat exchangers.

The ease of assembly of this construction is clearly shown in Fig. 4 wherein it is shown that the outer wall 31 of the heat exchanger 14 may be formed as a continuous sheet having its edges notched and bent outward to form the end and side walls of the heat exchanger, the edges of the walls being flanged outward so as to enable the same to be welded to the flat sheet forming the inner wall 32 of the heat exchanger. The outer wall 31 is formed and shaped, then the baffle 20 is placed in position and welded to the wall 31 and then the rods 30 welded to the wall 31. Thereafter the wall 32 is welded to the rods 30 and to the flanges of the walls extending from sheet 31 to form the complete heat exchanger which may then be united to the firebox 11 by welding the connecting flues 13 and 15 thereto.

Having described the preferred form of my invention, it should be apparent to those skilled in the art that the same permits of modifications in detail and arrangement. All such modifications as come within the scope of the following claims are considered to be a part of my invention.

I claim:

1. In a warm air furnace, a relatively narrow heat exchanger having an inlet and an outlet, both of which are located in the upper part thereof, and side walls of relatively large area over which air passes to be heated by thermal exchange with the flue gases therein, a plurality of tie-rods extending between said side walls and having their ends integrally united thereto in order rigidly to brace said side walls, and a substantially vertical baffle integrally united to said tie-rods and extending from the top of said heat exchanger to a point spaced a substantial distance from the bottom thereof so as substantially to block direct passage of the flue gases through the heat exchanger from said inlet to said outlet and to cause the major part of the flue gases to flow through said heat exchanger around the lower end of said baffle while passing from said inlet to said outlet, a side edge of said baffle being slightly spaced from the adjacent side wall whereby to permit direct passage of a small quantity of flue gases from said inlet to said outlet in order to prevent trapping of unburned gases in the upper part of said heat exchanger and in order to heat said side walls more uniformly when the furnace is in operation.

2. In a warm air furnace, a relatively narrow heat exchanger having an inlet and an outlet, both of which are located in the upper part thereof, and side walls of relatively large area over which air passes to be heated by thermal exchange with the flue gases therein, a plurality of tie-rods, extending between said side walls and having their ends integrally united thereto in order rigidly to brace said side walls, and a substantially vertical baffle integrally united to said tie-rods and extending from the top of said heat exchanger to a point spaced a substantial distance from the bottom thereof so as substantially to block direct passage of the flue gases through the heat exchanger from said inlet to said outlet and to cause the major part of the flue gases to flow through said heat exchanger around the lower end of said baffle while passing from said inlet to said outlet, the side edges of said baffle being slightly spaced from said side walls whereby to permit direct passage of a small quantity of flue gases from said inlet to said outlet in order to prevent trapping of unburned gases in the upper part of said heat exchanger and in order to heat said side walls more uniformly when the furnace is in operation.

3. In a warm air furnace, a relatively narrow heat exchanger having an inlet and an outlet, both of which are located in the upper part thereof, and side walls of relatively large area over which air passes to be heated by thermal exchange with the flue gases therein, a plurality of tie-rods extending between said side walls and having their ends integrally united thereto in order rigidly to brace said side walls, and a substantially vertical baffle integrally united to said tie-rods and extending from the top of said heat exchanger to a point spaced a substantial distance from the bottom thereof so as substantially to block direct passage of the flue gases through the heat exchanger from said inlet to said outlet and to cause the major part of the flue gases to flow through said heat exchanger around the lower end of said baffle while passing from said inlet to said outlet, the side edges and upper edge of said baffle being slightly spaced from said side walls and the top of said heat exchanger, respectively, whereby to permit direct passage of a small quantity of flue gases from said inlet to said outlet in order to prevent trapping of unburned gases in the upper part of said heat exchanger and in order to heat said side walls more uniformly when the furnace is in operation.

HARRY M. ROGERS.