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HEATED DRUM FOR WARM AIR FURNACES

Filed Dec. 19, 1946

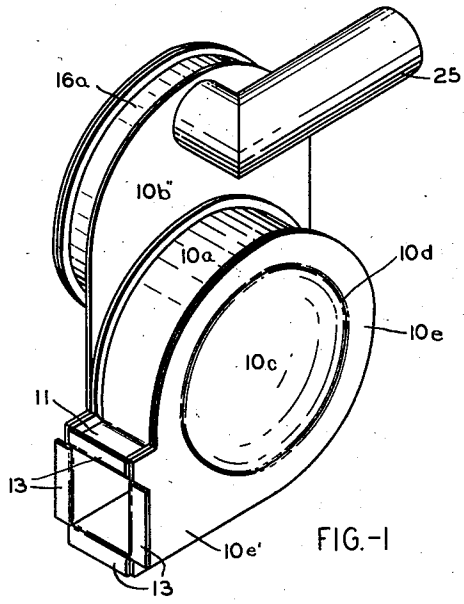


FIG.-1

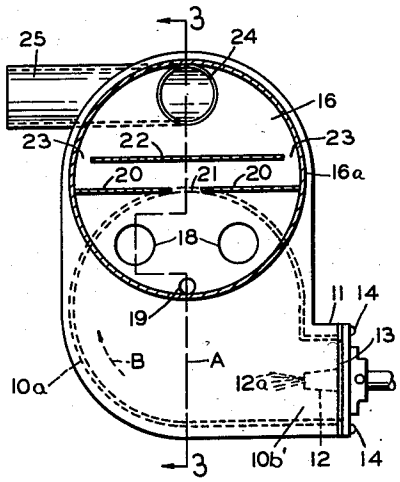


FIG.-2

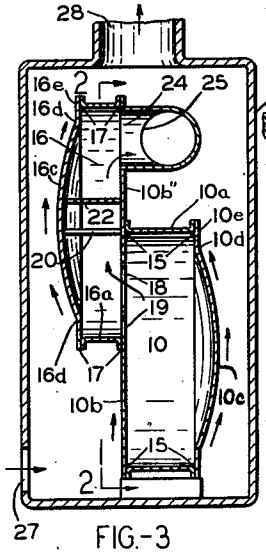


FIG.-3

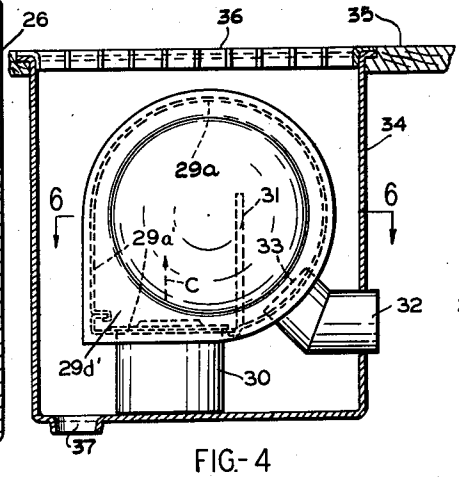


FIG.-4

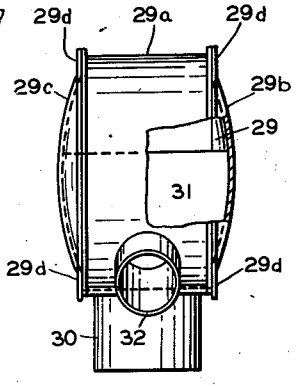


FIG.-5

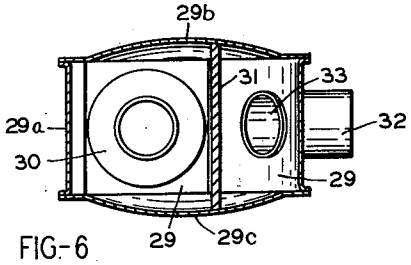


FIG.-6

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HEATED DRUM FOR WARM AIR FURNACES

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1 Claim. (Cl. 126—99)

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This invention relates to improvements in a heat exchanger and more particularly to improvements in a combined combustion chamber and heat exchanger for heating a fluid stream such as a stream of air in a warm or hot air furnace.

An object of the present invention is to provide a chamber of novel shape having heat conducting walls streamlined to provide a smooth flow of the fluid to be heated around the exterior walls thereof together with a casing or duct compelling the flow of the fluid stream to be heated in a direction roughly parallel to the direction of heat flow inside the chamber so that the coldest fluid comes in contact with the hottest portions of the heated chamber walls.

Another object of the present invention is to provide a novel arrangement of a burner in a combustion chamber of the type described above so as to provide a long flame travel before the flame strikes a cool surface and to provide novel baffle means so as to insure complete heating of the chamber.

Still another object of the invention is to provide a novel combination of two streamlined chambers wherein combustion occurs in one of the chambers, after which the heated gases flow through the second chamber to the stack and both of said chambers arranged for efficient heat exchanging action.

Other objects and advantages of the present invention will be apparent from the accompanying drawings and description, and the essential features thereof will be set forth in the appended claim.

In the drawings,

Fig. 1 is a perspective view of one embodiment of my heat exchanger having two chambers;

Fig. 2 is a sectional view of the same taken along the line 2—2 of Fig. 3;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2 and showing a furnace casing around the heat exchanger;

Fig. 4 is a side elevational view of a modified form of my device utilizing but one chamber;

Fig. 5 is an end elevational view taken at the righthand side of Fig. 4; while

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 4.

In the form of my device shown in Figs. 1, 2 and 3, a combustion chamber 10 is provided having a generally cylindrical wall 10*a*, the axis of which is horizontal. One of the side walls 10*b* is flat and the other side wall 10*c* is formed convex outwardly with the convexity extending to a point adjacent the cylindrical wall 10*a*. The convexity might extend to the juncture of the walls 10*a* and 10*c*, but preferably, as shown in the various views, it extends to the circular boundary 10*d*, and radially outward therefrom is a flat plate portion 10*e* which may extend some distance beyond the convex head 10*c* as indicated at 10*e'* in Fig. 1, so as to provide one of the walls for a burner housing 11 which is secured to one side of the chamber 10, so as to receive a burner such as the gas burner 12 diagrammatically shown in Fig. 2. Obviously, the wall 10*b* is provided with a portion 10*b'* parallel to 10*e'* forming the other side wall of the burner housing. The mouth of this housing is flanged, as indicated at 13 and the burner 12 may be secured to these flanges by any suitable securing means such as that indicated at 14. The walls 10*b* and 10*c* are secured by seam welding to the cylindrical wall 10*a* in the zones indicated at 15.

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A second chamber 16 is provided having a generally cylindrical wall 16*a* and a flat wall 16*b* which includes a portion in communication with the chamber 10, and a portion 10*b''* located thereabove. The other wall of chamber 16 at 16*c* is convex outwardly and similar to the wall 10*c*. In fact, the walls 10*c* and 16*c* may be exact duplicates, if desired, to simplify production. The convexity of these walls ends along the circle 16*d* and radially outward therefrom are the flat surfaces 16*e*. The cylindrical wall 16*a* is secured by welding to the walls 16*c*, 10*b* and 10*b''* by welding along the zones 17.

Intercommunication is provided between chambers 10 and 16 through that portion of the wall 10*b* which is common to both chambers. Preferably, I provide two symmetrical openings 18, located an equal distance from the center line A of the chambers 10 and 16. Preferably also, a smaller opening 19 is provided at the lowest point of chamber 16 so as to prevent the collection of any condensate at this point.

Baffle means is provided in chamber 16 to compel flow of the hot gases to all portions of this chamber. As clearly shown in Figs. 2 and 3, two baffles 20 are provided, each of which is secured in a fluid-tight manner to the wall 16*a* from which point each baffle extends horizontally inwardly stopping short of the center line A to provide a rectangular opening 21 between the outer ends of the two baffles and approximately on the center line A. A third baffle 22 extends from the wall 16*c* to the wall 10*b''* above and parallel to the baffles 20. This baffle stops short of the cylindrical wall 16*a* at each end so as to provide open-

ings 23 adjacent the cylindrical wall for the flow of gases upwardly. At the uppermost portion of chamber 16 is provided an outlet pipe 24 which is connected to the flue 25. The outlet 24 is on the center line A.

It results from the construction thus described, that the flame 12a from the burner 12 enters approximately tangentially of the chamber 10 and flows toward the left and upwardly, as viewed in Fig. 2 because of the tendency of the flame and heated gases to rise as they move farther away from the burner 12. In this fashion, it is the tendency of the flame 12a and hot gases therefrom to travel approximately in the direction of the arrow B of Fig. 2, generally parallel to the wall 10a which is curved upwardly and outwardly at that point. There is thus very little tendency for the products of combustion to condense on the walls of the chamber 10. Instead, the products of combustion are given a swirling motion in a clockwise direction, as viewed in Fig. 2, so that they are evenly distributed about the chamber 10, so as to thoroughly heat the walls 10a, 10b and 10c. The products of combustion then pass through the openings 18 out of the upper portion of chamber 10 and into the lower portion of chamber 16. The baffles 20 compel the gases to flow from the openings 18 toward and through the opening 21, after which, they pass laterally outwardly between the baffles 20 and 22 to the side wall 16a where they pass upwardly through the openings 23 and converge again toward the center and top of chamber 16 where they pass through the outlet 24. Thus, the walls of chamber 16 are thoroughly heated.

In the actual use of this device a casing 26 of any suitable size and character is provided around the heat exchanger and preferably not too far away from the convex heads 10c and 16c as shown in Fig. 3. The fluid to be heated, usually air, enters through one or more openings 27 at the bottom of the casing and flows upwardly in the direction of the arrows of Fig. 3 passing in streamline fashion around the convex heads 10c and 16c which, by their construction and position, receive a wiping action from the upwardly moving air so that heat is readily transmitted to the air. The heated air passes out of the casing at 28. It is common knowledge that skin friction generally causes a relatively immobile layer of air against any surface along which the air is flowing. The convexity of the heads 10c and 16c causes the moving air stream to practically wipe away or reduce to a minimum this skin layer of immobile air. Thus, the transfer of the heat from the walls of the chambers 10 and 16 is efficiently transmitted to the air stream. Obviously, a similar wiping action occurs where the air stream passes along side the cylindrical walls 10a and 16a.

It will be noted that the hottest portion of the heat exchanger is at the bottom of chamber 10, and the coldest portion is at the top of chamber 16. It will be noted in Fig. 3 that the coldest air is at the bottom of the heat exchanger, and the warmest air is at the top thereof. Therefore, the flow of the air stream is generally parallel to the flow of the products of combustion with the coldest air in contact with the hottest portions of the heat exchanger. Thus, a high temperature gradient is provided, particularly with respect to the chamber 10, so that the heat exchange is very efficient and the chamber 10 may be constructed of common sheet steel of the

order of twenty gage, which will have a long life without deterioration due to overheating.

A modified form of my device is shown in Figs. 4, 5 and 6. I have here provided a single chamber 29 which provides both combustion and heat exchanging functions. A generally cylindrical wall 29a has secured to its opposite edges side walls 29b and 29c, both of which are convex outwardly over a major portion of the area covered. Flat portions 29d are provided around the periphery of the side walls and this flat portion is extended at 29d' (Fig. 4) to provide means for attaching an oil burner 30. The wall 29a is extended tangentially at 29a' so as to provide means for introducing the oil burner in a position where the flame therefrom will flow vertically upwardly as indicated by the arrow C of Fig. 4, and generally tangentially of the chamber 29. The products of combustion must travel the entire height of the chamber 29 before striking the cylindrical wall 29a near the top of the chamber. This prevents undesirable condensation of the products of combustion.

Baffle means is provided to compel the products of combustion to distribute themselves generally over the entire wall structure of the chamber 29. This means comprises a baffle 31 lying along a chord of the generally circular chamber 29 and between the burner 30 and the outlet flue 32 which is placed on the lower right-hand side of the chamber 29, as viewed in Fig. 4, spaced not a great distance from the burner 30 but with the baffle 31 providing an impenetrable barrier between. Thus, the products of combustion are caused to flow upwardly from burner 30 and around the entire wall 29a to the outlet 33 leading to the flue 32. Thus, all of the walls of chamber 29 are thoroughly and substantially uniformly heated.

The heat exchanger of Figs. 4, 5 and 6 is placed in a casing 34 similar to that indicated at 26 in Fig. 3, so as to compel the flow of air to be heated upwardly along side the convex side walls 29b and 29c, giving the same wiping action, described in connection with the first named form, both on these convex walls and on the cylindrical wall 29a. The casing 34 is suspended from a floor 35 through which an opening is provided covered with a grill 36 over the casing 34. An opening 37 is provided in the bottom of the casing for cold air which is heated in passing over the drum or chamber 29, passing upwardly through the grill 36 into the room to be heated. Here again, it is intended that the flow of the air to be heated is upwardly and generally parallel to the flow of the products of combustion on the left side of baffle 31, as viewed in Fig. 4. On the righthand side of baffle 31 in this figure, the flow of air to be heated will be upwardly, while the flow of the products of combustion is generally downwardly toward the flue 32.

In another form of the single chamber device, I place the flue 32 at the uppermost portion of the chamber 29 and omit the baffle 31.

It will be noted that in my device, particularly the form shown in Figs. 4, 5 and 6, there are practically no flat surfaces, at least of any appreciable area, which are likely to snap out or in during heating or cooling. This eliminates booming noises in my improved heating device.

What I claim is:

A heat exchanger comprising a chamber having a generally cylindrical wall, two side walls closing the opposite open sides of said cylindrical wall, said side walls being generally convex out-

wardly, said chamber being positioned with the axis of said cylindrical wall substantially horizontal, a burner positioned at the bottom of said chamber, an exit flue leading out of said chamber near said burner, and a baffle providing a barrier in said chamber between said burner and exit flue, said baffle extending part of the way toward the top of said chamber.

PAUL B. PATTON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
564,402	White	July 21, 1896
1,561,161	Ionides	Nov. 10, 1925
1,698,937	Cross	Jan. 15, 1929
1,762,951	Breese	June 10, 1930
2,090,053	Kuenhold	Aug. 17, 1937
2,373,090	Livar	Apr. 17, 1945
2,422,694	McCollum	June 24, 1947