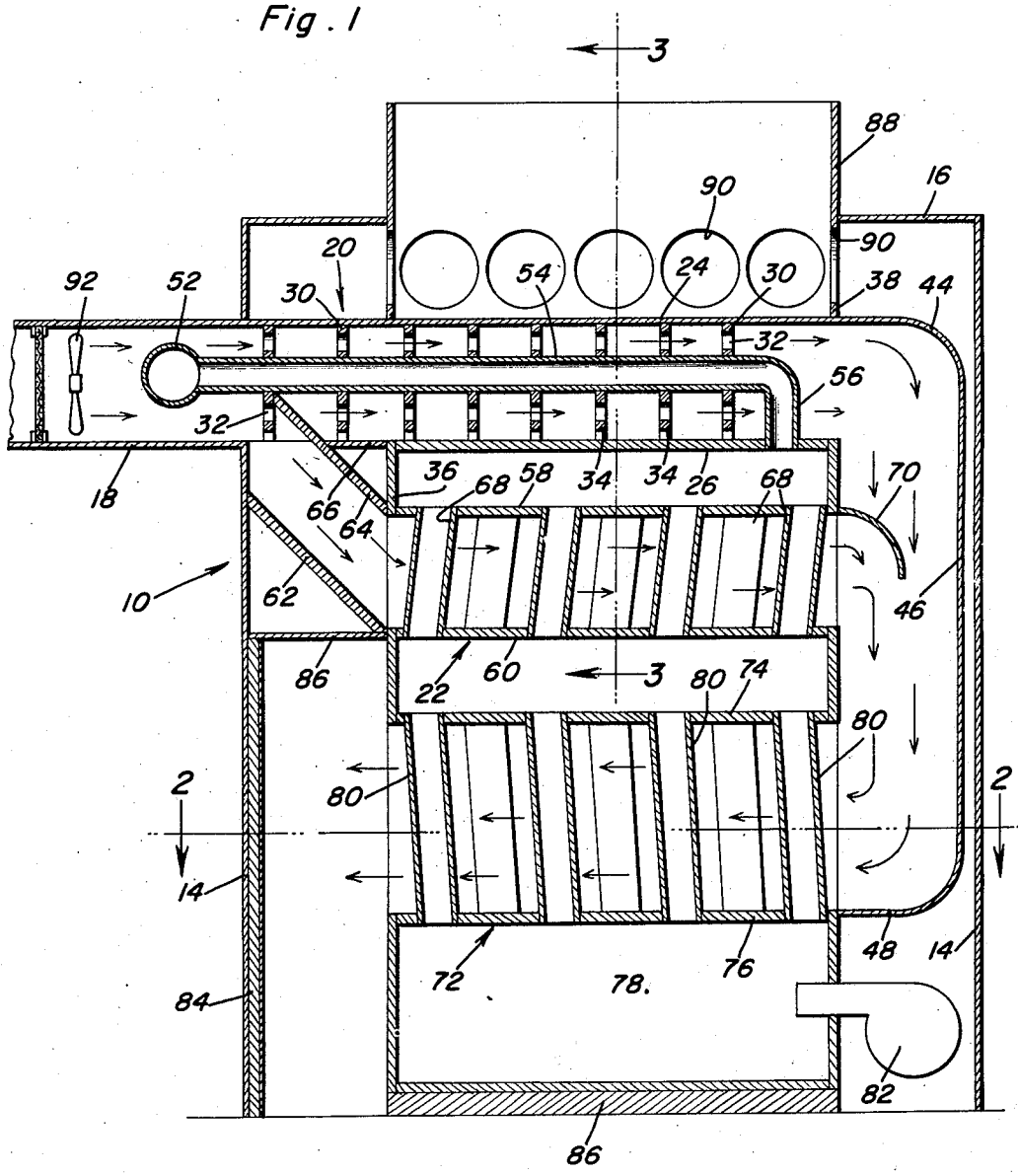
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AIR HEATING UNIT

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Fig. 1



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Fig. 2

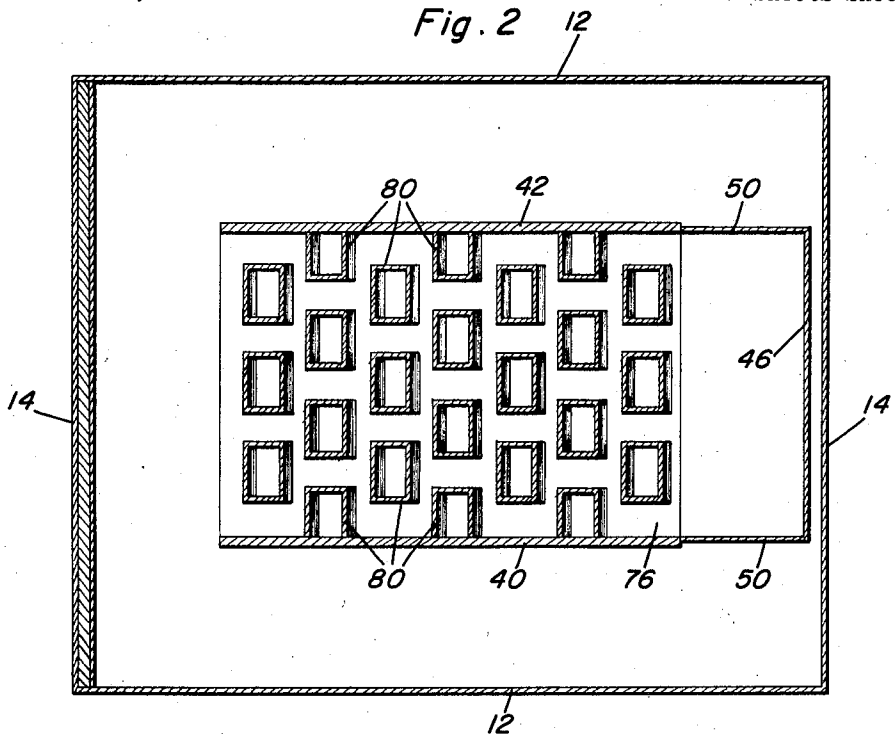
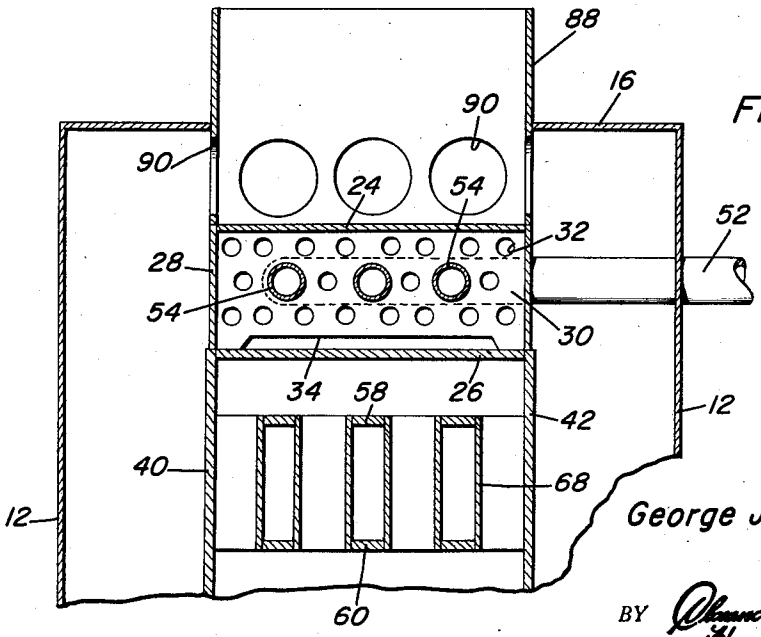


Fig. 3



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AIR HEATING UNIT

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Application February 8, 1957, Serial No. 639,112

3 Claims. (Cl. 126—110)

The present invention generally relates to a heating device and more particularly to a device for heating a dwelling house or other enclosed area by providing a supply of cool fresh air from the atmosphere, heating the same and discharging the heated air into the area to be heated.

An object of the present invention is to provide a heating unit incorporating structural features for increasing the efficiency of the exchange of heat between a circulating heat exchange fluid and hot combustion products whereby a large percentage of the heat produced by the combustion products will be absorbed by the circulating heat exchange medium.

Another object of the present invention is to provide a heating unit incorporating a pair of preheaters and a main heater arranged in vertically spaced relation with the hot combustion products passing through the main heater and the preheaters in sequential relation.

A further object of the present invention is to provide a heating unit in accordance with the preceding object in which the combustion products will engage the surface of the vents or fire tubes facing the flow of the cool heat exchange medium whereby the cool heat exchange medium will impinge upon the hottest surface of the fire tubes.

Other objects of the present invention reside in its simplicity of construction, efficiency of operation, adaptation for various types of installations employing various types of heat exchange media and its relatively inexpensive manufacturing cost.

These together with other objects and advantages will become subsequently apparent. The invention resides in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a vertical sectional view of the heating unit of the present invention illustrating the relationship of the preheaters and the main heater together with the fire box and hot air distribution adapter;

Figure 2 is a transverse plan sectional view taken substantially upon a plane passing along section line 2—2 of Figure 1 illustrating the relationship of the fire tubes or exhaust vents and the inclined construction thereof; and

Figure 3 is a transverse vertical sectional view taken substantially upon a plane passing along section line 3—3 of Figure 1 illustrating further structural details of the preheater units.

Referring now specifically to the drawings, the numeral 10 generally designates the heating unit of the present invention which includes upstanding side walls 12 and end walls 14 which are interconnected by a top wall 16 and generally form an outer casing or outside jacket for the entire heating unit.

A tubular intake conduit 18 is provided and extends through a suitable opening in the wall of the building

where the unit is installed to the outside atmosphere for the intake of cool fresh air. The intake conduit 18 extends into the interior of the heating unit and is connected to an upper preheating chamber generally designated by numeral 20 and a lower preheating chamber generally designated by numeral 22. The upper preheating chamber 20 is in alignment with the conduit 18 and includes an upper plate 24 and a lower plate 26 disposed in horizontal relation. The upper and lower horizontal plates 24, 26 are provided with side plates 28 all of which coact to form a generally rectangular horizontal passage.

Disposed in the passage defined by the plates 24, 26 and 28 are a plurality of transverse vertical baffle plates 30 each of which is provided with a plurality of small openings 32 throughout the surface thereof together with a transversely elongated slot or recess 34 in the bottom edge thereof thus providing passages for the incoming air. The upper preheater 20 extends through vertical end plates 36 and 38 which are disposed in spaced parallel relation to the end walls 14 and are connected by spaced side plates 40 and 42 in spaced parallel relation to the side walls 12 of the outer jacket. The top wall 24 extends beyond the end wall 38 and curves downwardly as designated by numeral 44 to form a vertical wall 46 in closely spaced relation to the end wall 14. The vertical wall 46 terminates in an inwardly curved portion 48 and this entire area is confined by a pair of side plates 50 which generally form extensions of the side wall members 40 and 42. The lower plate 26 is connected to end walls 36 and 38 for forming a continuous passageway for the upper preheater 20.

The inlet conduit 18 is provided with a transversely extending exhaust header or manifold 52 which is communicated at its outer end to a chimney or exhaust stack (not shown). The header or manifold 52 is generally horizontally disposed and is communicated with a set of exhaust pipes 54 extending in perpendicular relation thereto through the baffle plates 30 generally at the horizontal center thereof with the inner ends of the exhaust pipes 54 being downturned as designated by numeral 56 and extending through the lower plate 26 for communication with the area immediately thereunder. Plate 26 is the top wall of an upper manifold for the tubes 68.

The lower preheater 22 includes an upper plate 58 and a lower plate 60 interconnected by the side walls 40 and 42 thus forming a horizontal passageway for incoming air which is directed into the same by a pair of spaced inclined plates 62 and 64. The upper inclined plate 64 extends upwardly to a point substantially at the center of the first baffle plate 30 whereby approximately 50% or one-half of the air incoming through the conduit 18 will be directed downwardly into the passageway defined by the top and bottom plates 58 and 60 and the side plates 40 and 42. It is pointed out that a small horizontal plate 66 is provided for connecting the upper surface of the upper inclined plate 64 with the adjacent edge of the end plate 36 and bottom plate 26 of the upper preheater 20. The upper plate 58 is in spaced parallel relation to the lower plate 26 of the upper preheater 20 and the upper and lower plates 58 and 60 are interconnected by a plurality of tubular fire tubes or flues 68 each of which is generally rectangular in construction having a longitudinal axis inclined from the bottom to the top away from the point of entry of the intake air. This construction is shown specifically in Figure 1 and is for the purpose of causing the hot combustion gases or products passing upwardly through the fire tubes or flues 68 to drag along the surfaces of the tubes 68 facing the incoming air thereby causing these surfaces of the tubes 68 to be the hottest, thus causing proper heating of the incoming air since the air will initially engage

the hottest surfaces of the fire tubes and will contact such surfaces in a manner to cause more effective heat exchange between the cool intake air and the hot surfaces.

The discharge end of the lower preheater 22 communicates with the vertical passage formed by the vertical wall 46 and a downwardly and arcuately curved deflector 70 is provided at the upper edge of the discharge end of the upper preheater 22 for directing the heated air downwardly, thus mixing the air which has been preheated in the upper and lower preheaters 20 and 22 prior to discharging the preheated air into the main heating unit which is generally designated by numeral 72. The latter is defined by upper and lower plates 74 and 76 extending between the side walls 40 and 42 and receives preheated air from the chamber formed by the vertical wall 46 and the inwardly curved wall 48. The upper plate 74 is in spaced parallel relation to the lower plate 60 of the lower preheater 22 and the lower plate 76 forms the top wall of a fire box or combustion area designated by the numeral 78.

The top and bottom plates 74 and 76 of the main heating chamber 72 are interconnected by a plurality of fire tubes or flues 80 generally of rectangular construction and extending through the plates 74 and 76 with the longitudinal axis thereof being inclined upwardly and away from the intake end of the main heater. The construction of the fire tubes 80 is substantially identical to the construction of the fire tubes 68 except that they are somewhat longer. The extremely hot combustion products passing upwardly from the fire box or combustion area 78 will impinge against and frictionally drag against the surfaces of the fire tubes 80 facing the air coming into the main heater thereby heating this surface of the fire tubes 82 to a greater extent and thereby providing a larger area of extremely hot surfaces for contact by the air to be heated. As illustrated in Figure 2, the flues 80 are disposed in transverse rows with the individual flues in adjacent rows being disposed in staggered relation thus assuring generally a tortuous path for the air passing through the heater and assuring proper frictional drag of the intake air over the extremely hot surfaces of the tubes 80 facing the intake of the heater 72. It is noted that the flues 68 are arranged in substantially the same manner and the space between the plates 74 and 60 as well as the space between the plates 58 and 26 form generally a manifold for evenly distributing the hot combustion gases for passage through the heater and preheaters.

For purposes of illustration, a schematic pressure-type gun burner 82 is shown for providing a combustible mixture in the fire box 78. It is pointed out that any suitable type of burner arrangement may be employed using any type of fuel.

The main heater 72 discharges the air that has been heated into the area between the walls 36 and 38, 40 and 42 forming the inner jacket and the walls 12 and 14 forming an outer jacket. It is noted that the area of the end wall immediately in front of and adjacent to the discharge point of the main heater is provided with insulation designated by numeral 84 and also the fire box 78 is provided with insulation 86. The insulation 84 extends upwardly to a transverse plate 86 which forms a closure for the bottom of the preheater 22 and generally forms a continuation of lower plate 60 thereof. Thus, the heated air may pass upwardly along both sides of the inner jacket and substantially about the entire periphery thereof.

Extending upwardly from the top wall 24 of the upper preheater 20 and extending outwardly through the top wall 16 is a distribution manifold or adapter 88 having a plurality of enlarged apertures 90 therein, these apertures being disposed between the top wall 24 of the preheater 20 and the top wall 16 of the outer jacket thus permitting the heated air to enter into the interior of the distribution adapter 88 for discharge to a suitable area to be heated.

As illustrated schematically in Figure 1, a fan 92 is provided in the intake duct or conduit 18 and the fan 92 may be thermostatically controlled in response to the temperature of the air entering the heating chamber for forcing air through the preheater and heater and providing sufficient air for circulation through the heating unit 10. It is pointed out that there is no cold air return duct on the heating unit for returning air from the living quarters or other area being heated. All cold air in the area being heated is either forced outside of this area or can be transferred to an enclosure not requiring heat, such as an attic or the like. This is accomplished by the thermostatically controlled valve in the cold air duct. This construction eliminates recirculation of the same stale and germ-laden air through the living quarters or other area being heated, thereby reducing occurrence of illness during cold periods due to the recirculation of the same air. A filtered fresh air that is heated and distributed and changed numerous times during a day is considered much more healthful than recirculated air.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A heating device comprising a vertically disposed outer casing with an air distribution chamber at the top thereof, an inner casing disposed within said outer casing in spaced relation and forming a firebox in the bottom thereof, means including portions of said inner casing forming a main heat exchange chamber above the firebox, means including other portions of said inner casing forming a pair of vertically spaced air-preheating heat exchange chambers disposed above the main chamber with the inner casing enclosing the space between said chambers, an air inlet duct extending through said outer casing, means dividing the inlet duct and directing air to both air-preheating chambers, duct means including deflector means receiving preheated air from both air-preheating chambers and delivering the preheated air to said main chamber, said main heating chamber discharging heated air between the casings whereby the heated air will move upwardly into the distribution chamber, each of said chambers having flue means extending therethrough for passage of hot combustion products, the flue means in the upper air-preheating chamber being communicated with an exhaust duct, said flue means in the upper air-preheating chamber including an elongated conduit disposed concentrically within the chamber, said elongated conduit having an inlet adjacent the discharge end of the upper air-preheating chamber and an outlet to the exhaust duct adjacent the intake end of the upper air-preheating chamber, baffle means in said upper air-preheating chamber for controlling the flow of air therethrough, and fan means in the inlet duct for inducing air flow through the heating device.

2. The combination of claim 1 wherein said inlet duct is communicated with the atmosphere whereby said fan means may force cold stale air from the space being heated and replace the same with fresh, heated air.

3. The device as defined in claim 1 wherein said flue means in said main heat exchange chamber and in at least one of said air-preheating chambers are inclined in the direction of air flow through said chambers, said means dividing the inlet duct being arranged to deliver air through said air-preheating chambers in a direction opposite to the flow of air delivered through said main heat exchange chamber by said duct means.

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