March 22, 1955 E. A. NORMAN, JR., ET AL 2,704,537

GAS-FIRED AIR HEATER

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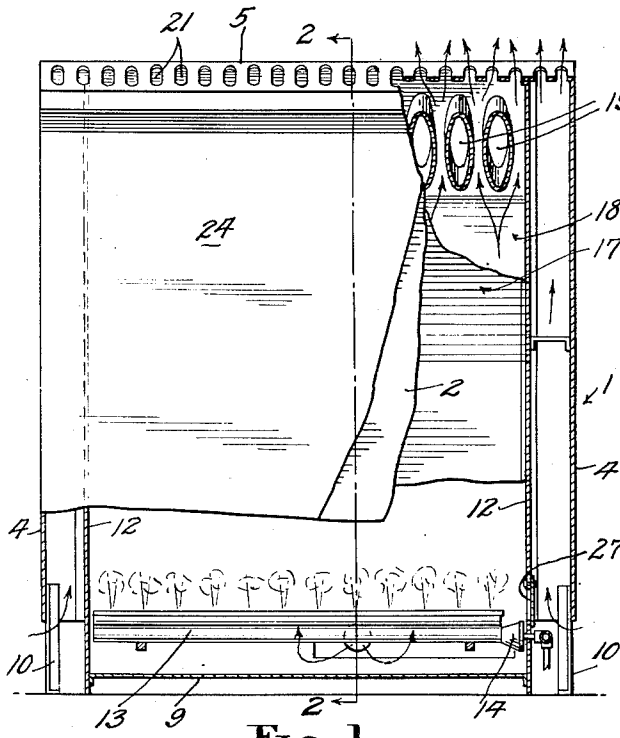


FIG. 1.

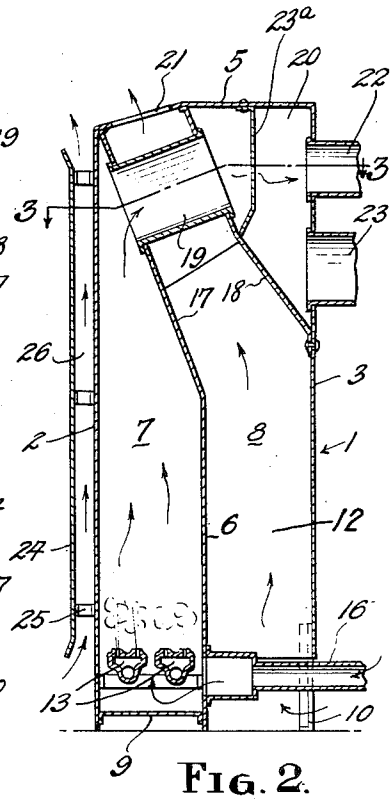


FIG. 2.

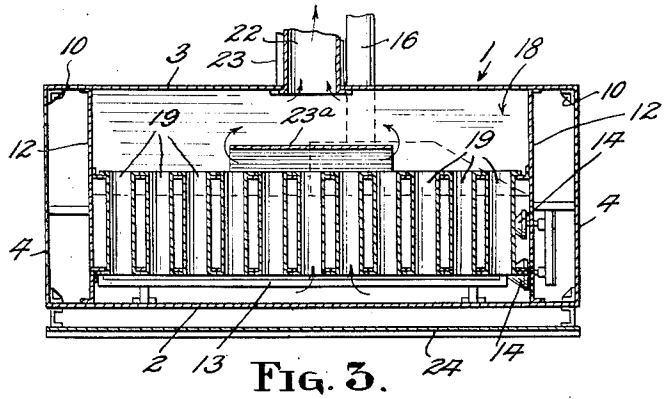


FIG. 3.

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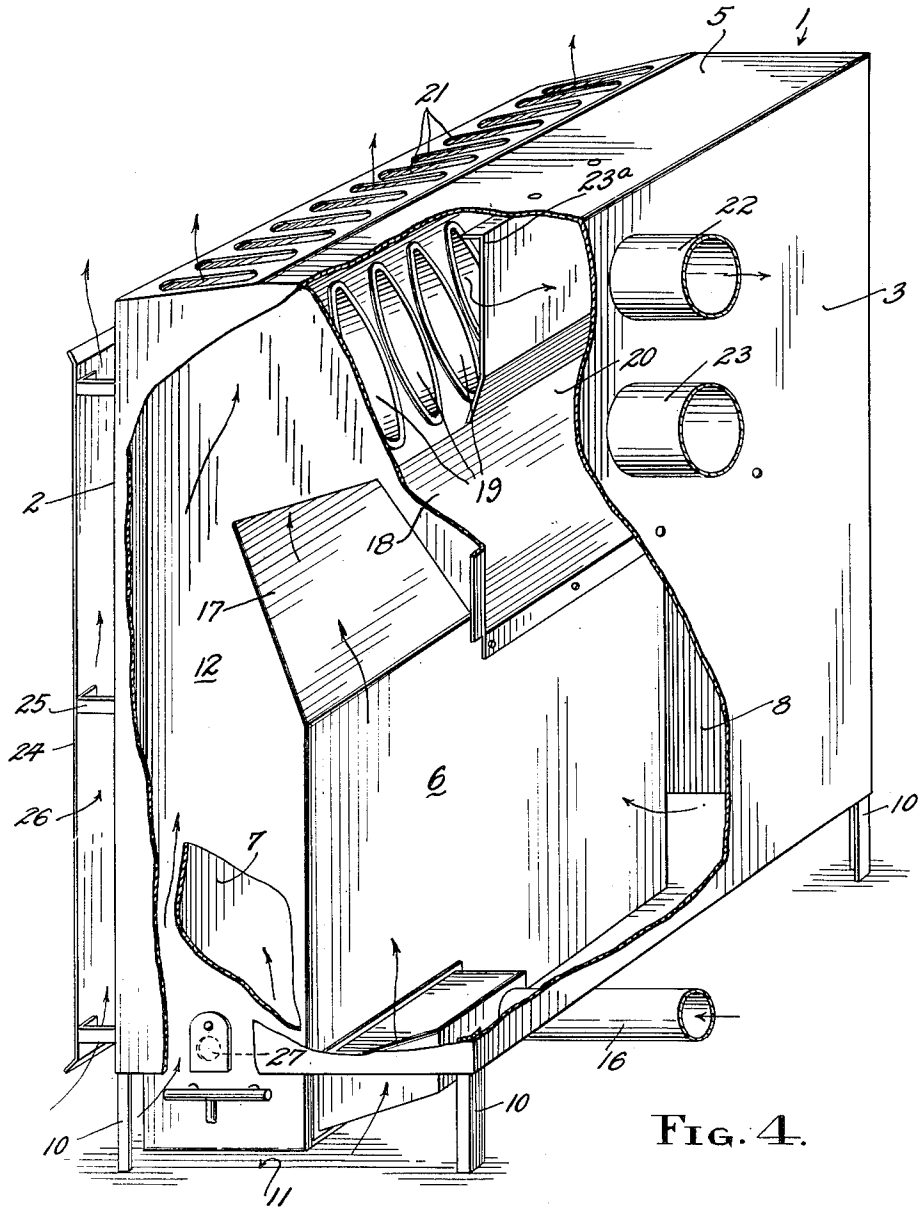


FIG. 4.

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GAS-FIRED AIR HEATER

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3 Claims. (Cl. 126—90)

This invention relates to gas-fired room heaters, particularly heaters of the type adapted to be placed in close proximity to vertical building walls, in order that they will utilize but a minimum of useful floor space.

It is an object of the present invention to provide an improved mechanically simplified yet efficient room heater in which thermal circulation of air to be heated takes place mainly by convection over wall surfaces heated by the operation of casing-enclosed fuel burners, whereby to enable a room to be heated primarily by convected air currents rather than by the radiant heat effects of prior room heaters.

It is another object of the invention to provide a gas-fired room heater of the safety convection type which includes a casing divided internally to form spaced room air-circulating and burner chambers, the air-circulating chamber receiving air from the room of a building in which the heater is mounted from a position adjacent to the floor line, whereby as the air is heated by contact with heated walls of the casing, the same arises in the air-circulating chamber and is vented to the room atmosphere through the open top of the air-circulating chamber of the casing.

It is a further object of the invention to provide a room heater of the character set forth wherein fuel combustion takes place in an enclosed burner chamber, the gaseous products of combustion arising through the burner chamber and contacting heat-transmitting walls thereof in a manner raising the temperature of said walls sufficiently to heat room air contacting the walls on surfaces opposed to those defining the burner chamber.

Another object is to provide a heater wherein the products of combustion discharged from the upper part of the burner chamber of the casing are caused to travel through a plurality of heat-exchanging tubes arranged adjacent to the room outlet of an associated air-heating chamber, whereby to effect improved heat interchange between the heat developed by the operation of the fuel burners in the burner chamber with the room air passing through the adjacent air-heating chamber.

A further object of the invention is to provide a room heater of this nature in which an improved casing structure is provided embodying vertically and substantially parallel fuel combustion and air-heating chambers, the combustion chamber being arranged in the casing toward the front thereof with the air-heating chamber toward the rear and in heat-exchanging relationship therewith, and wherein the front of the casing is provided with a radiant heat shield disposed in parallel but spaced relationship to the front wall of the casing defining the front of the burner chamber, whereby to produce a restricted air circulating space between the shield and the front wall of the casing for the thermal circulation of room air, the shield further serving to increase the ability of the heater to heat the atmosphere of an associated room or rooms through the use of convected rather than radiant heat.

It is another object of the invention to provide a structurally simple room-type heater which will operate efficiently through thermal and draft-induced passage of air and gases, without employing necessarily the use of relatively expensive and complex motor-driven air-displacing means.

With these and other objects and advantages in view, which will appear as the description proceeds, the invention consists in the novel features of construction, combinations of elements and arrangements of parts, all hereinafter more fully described and pointed out in the appended claims.

In the accompanying drawings:

Fig. 1 is a view partly in front elevation and partly in vertical section of a wall heater formed in accordance with the present invention;

Fig. 2 is a vertical transverse sectional view taken through the heater on the plane indicated by the line 2—2 of Fig. 1;

Fig. 3 is a horizontal sectional view taken through the upper portion of the heater on the plane disclosed by the line 3—3 of Fig. 2;

Fig. 4 is a perspective view of my improved heater, with parts thereof broken away and disclosed in section to set forth interior apparatus.

Referring more particularly to the drawings, the numeral **1** designates the casing of the improved wall heater, comprising the present invention, in its entirety. In this instance, the casing is formed to include a box-like structure, involving a vertical front wall **2**, a back wall **3** arranged in spaced parallelism with the front wall **2**, vertical side walls **4**, and a top wall **5**. Positioned between the front and back walls **2** and **3** is a divisional wall **6**, which together with walls **12** separates the interior of the casing into vertical fuel-combustion and air-heating chambers **7** and **8**, respectively.

The bottom of the chamber **7** is preferably closed to the atmosphere of the room in which the heater is positioned, as by means of a bottom wall **9**. The air-heating chamber, however, is open at the bottom or sides thereof to the room atmosphere. In attaining this result, use is made of vertical corner legs **10** which are carried by the outer casing and depend therefrom for engagement with the floor, or other base, indicated at **11**, the legs **10** serving to support the lower part of the outer casing above the floor level and to provide means for the ready entrance of currents of air drawn from the room atmosphere into the bottom of the air-heating chamber and thence upwardly through the latter. The room air sweeps over the heated surfaces provided by the back of the burner chamber, as formed by the divisional wall **6**, and, also, the vertical side walls **12** of the burner chamber, the latter being disposed in spaced relation from the side walls **4** of the outer casing to produce air-heating ducts.

Arranged within the bottom of the chamber **7** are the fuel gas operated burner members **13**. In this instance, a pair of such members has been disclosed arranged side by side in parallel relationship and supported in any suitable stationary manner within the bottom of the burner chamber. The members **13** include mixing heads **14** into which valved hydrocarbon gas lines extend, in a manner customary to gas burners of this kind. The air used for fuel combustion purposes, however, is preferably drawn from the exterior atmosphere of the building in which the heater is disposed.

Thus, as shown in Fig. 2, air drawn from the outer atmosphere of a building passes by way of a conduit **16** and is delivered under draft flow to the bottom of the burner or combustion chamber, where the air may be used in part to produce a combustible gas mixture in the burner members **13**. This mixture, upon issuing from the orifices or ports of the burner members, is burned to produce flame combustion. Such combustion, however, is confined to the combustion chamber. The resultant heated gaseous products sweep upwardly through the combustion chamber, contacting all its walls, which are preferably of thin sheet metal in order to transmit heat readily, whereby to enable such heat to be imparted to room air moving over the exterior surfaces of the combustion chamber walls.

To utilize as completely as possible the heat present in the combustion gases, the upper portion of the air-heating chamber **8** is deflected angularly forwardly, by angularly bending the upper part of the divisional wall **6** as at **17**, and by utilizing a relatively short and rearwardly disposed second divisional wall **18** in the upper part of the casing. Connecting the walls **17** and **18** are a plurality of heat-exchanging tubes **19**, which unite the chamber **7** with a flue chamber **20** formed in the upper rear portion of the casing at the back of the divisional wall **18**. As the heated combustion gases travel through the tubes

19, the walls of said tubes are heated, so that the air moving upwardly through the forwardly directed outlet neck of the air-heating chamber will be additionally heated by contact with the outer surfaces of said tubes. After such contact, the heated air issues from the top wall 5 of the chamber through one or more openings 21 formed therein for direct re-introduction into the atmosphere of the room containing the heater.

The flue chamber 20 carries a pipe or conduit 22 which leads to a chimney, outlet stack or other atmospheric vent. Also, the flue chamber may be in communication with a second pipe or conduit 23 arranged below the first pipe or conduit 22 which serves to provide down draft relief in the event back pressures within the chimney or stack joined with the pipe 22 become excessive.

A baffle 23*a* is positioned in the flue chamber between the discharge ends of the tubes 19 and the pipe or conduit 22. The baffle extends, as shown in Fig. 3, part way of the length of the flue chamber, and serves to prevent channeling of the flue gases discharged from the tubes directly into the flue outlet 22. The arrangement serves to cause the flue gases to circulate uniformly into contact with the wall surfaces of the flue chamber before finding vent to the atmosphere.

To further insure heating by air circulation and convection, there is provided at the front of the casing 1 a heat shield or panel 24, the latter being mounted in connection with the front wall 2 by studs or their equivalents, indicated at 25. The panel 24 is spaced from the wall 2 to form a restricted air-circulating space 26 of comparatively narrow width which is open along its upper, side and lower edges, providing for the circulation of room air through the space in the manner indicated in Fig. 2 of the drawings. One or more openings 27 may be provided in the walls defining the lower portion of the burner chamber 7 for the purpose of igniting combustible fuels issuing from the orifices of the burner members 13, which openings may be suitably closed after combustion has been initiated.

In view of the foregoing, it will be seen that the present invention provides an efficient, economical, gas-fired heater for use in the heating of dwelling and other room areas. The device is characterized by the effective utilization of heat developed through fuel combustion therein and the uniform heating of the atmosphere of a room in which the heater is disposed. Particularly, the construction makes efficient use of the principle of thermal circulation of heated air, and provides for such circulation in a free, unobstructed and efficient manner. The heater is further characterized by its safety in operation, the absence of an open flame in the building room and also by the fact that the gaseous products of combustion are at all times confined within the heater while being advanced to an atmospheric vent, after having given up the greater portion of their heat indirectly to room air undergoing circulation through the heater.

While the preferred form of the invention has been set forth in considerable detail, nevertheless it will be understood that the construction is subject to certain variations or modifications without departing from the spirit and scope thereof as set forth in the following claims.

We claim:

1. A room heater comprising: an outer casing having vertical front, side and back walls and a substantially horizontal top wall; an inner divisional wall structure including a pair of laterally spaced, vertically disposed, divisional walls arranged within said casing and extending between and united with the front and back walls of the casing in inwardly spaced parallel relation with respect to said side walls, said divisional wall structure further including a laterally and vertically extending partitional wall arranged substantially midway between said front and back walls within said casing and extending from the top to the bottom thereof, said partitional wall being united with said divisional walls to form the back of a combustion chamber, the front wall of said casing forming the front wall of said chamber, burner means disposed in the bottom of said combustion chamber, the upper part of said partitional wall being inclined toward the front wall of the outer casing so that the upper edge thereof terminates adjacent to the junction of the front and top walls; a second partitional wall positioned in the upper and rear part of said outer casing in substantially parallel and spaced relationship from the inclined upper portion of the first partitional wall, said first and second partitional walls forming in connection with the back and side walls of said casing an air-heating chamber; said second partitional wall and the back and top walls of said outer casing forming a flue chamber, the inclination of the first and second-named partitional walls serving to direct the upper region of said air-heating chamber angularly upwardly and forwardly of the casing in front of said flue chamber; a plurality of relatively short open-ended heat-exchanging tubes positioned in registering openings formed in said first and second-named partitional walls and extending perpendicularly thereto, said tubes acting as heat-exchanging devices with their outer surfaces arranged across said air-heating chamber for intercepting contact with air traveling therethrough, whereby to remove heat from products of combustion emanating from said burner means prior to their delivery to said flue chamber; means for delivering air for combustion purposes to said burner means; separate means for supplying air to be heated to said air-heating chamber; outlet means formed in the top wall of said casing for the discharge of heated air from the upper end of said air-heating chamber; and outlet means for the escape of spent burner gases from said flue chamber.

2. A room heater as defined in claim 1, and wherein said flue chamber is provided with a vertically and laterally disposed baffle arranged to deflect burner gases entering said flue chamber from certain of said heat-exchanging tubes laterally of the flue chamber and away from the outlet means thereof.

3. A gas-fired room heater as specified in claim 1 and further characterized by the provision of an imperforate heat shield carried by the front wall of the heater casing in spaced relation thereto, said shield serving in conjunction with said front wall to provide a passage of restricted cross-sectional area for the upward travel of air to be heated over the heated front wall of the casing, said restricted passage terminating adjacent to the heated air outlet openings in the top wall of the casing.

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