Feb. 20, 1934. R. F CUYLER ET AL 1,947,830

GAS HEATER

Original Filed Dec. 6, 1930 2 Sheets-Sheet 1

Fig.1.

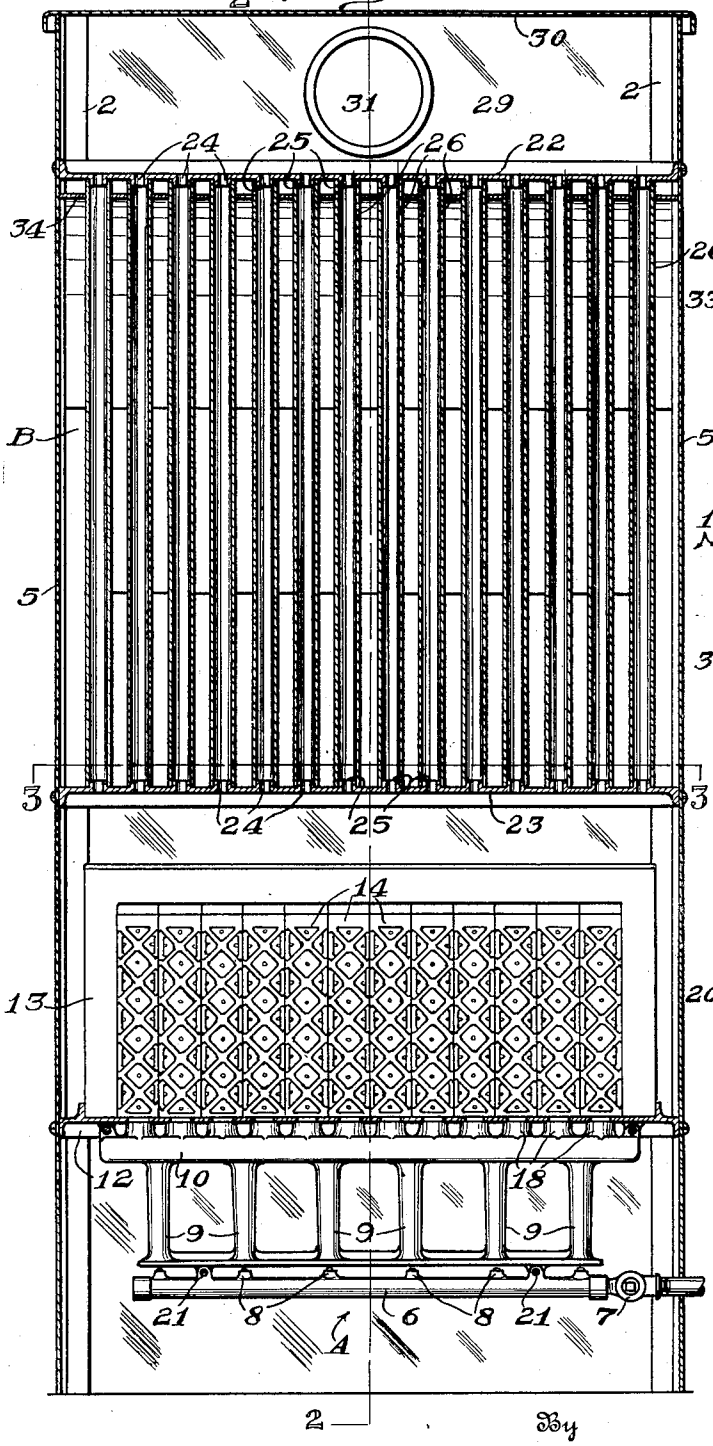
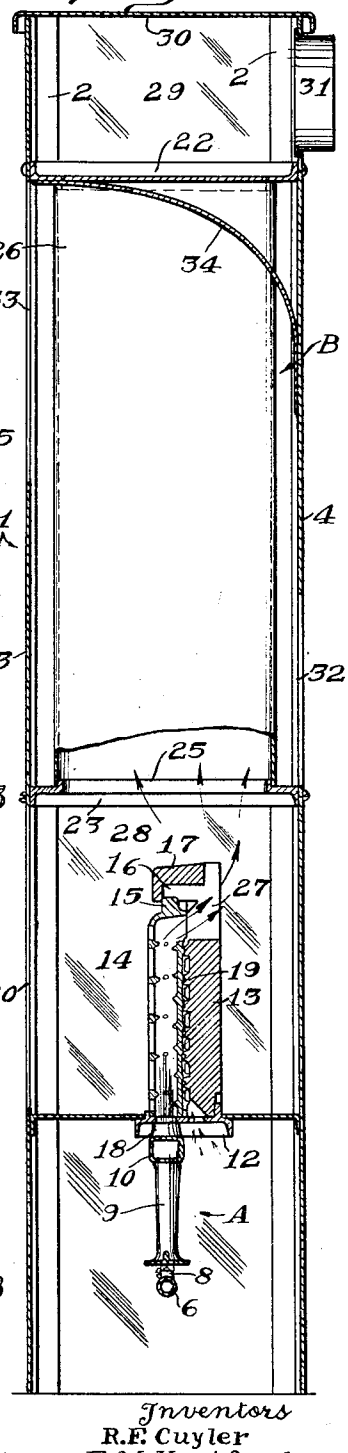


Fig.2.



Inventors
R.F. Cuyler
F. M. Hartford

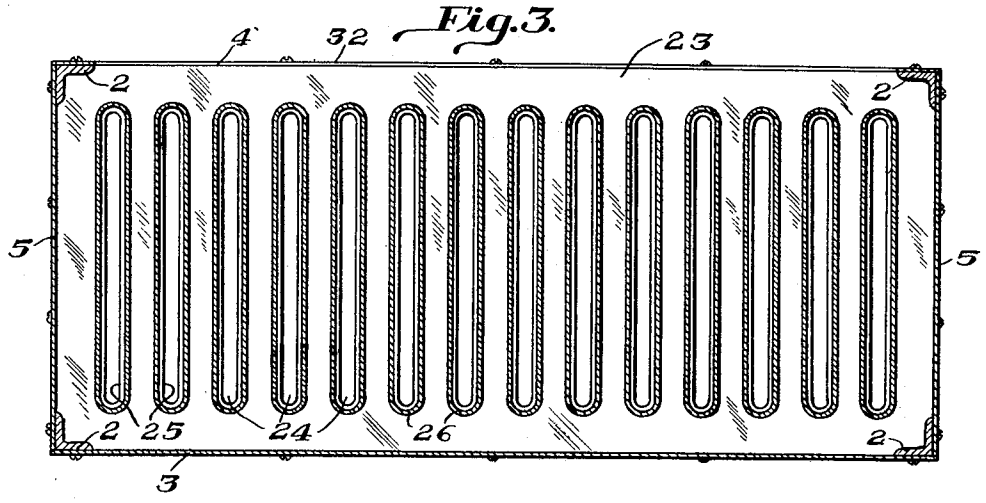
By W. A. McDowell

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Fig.3.



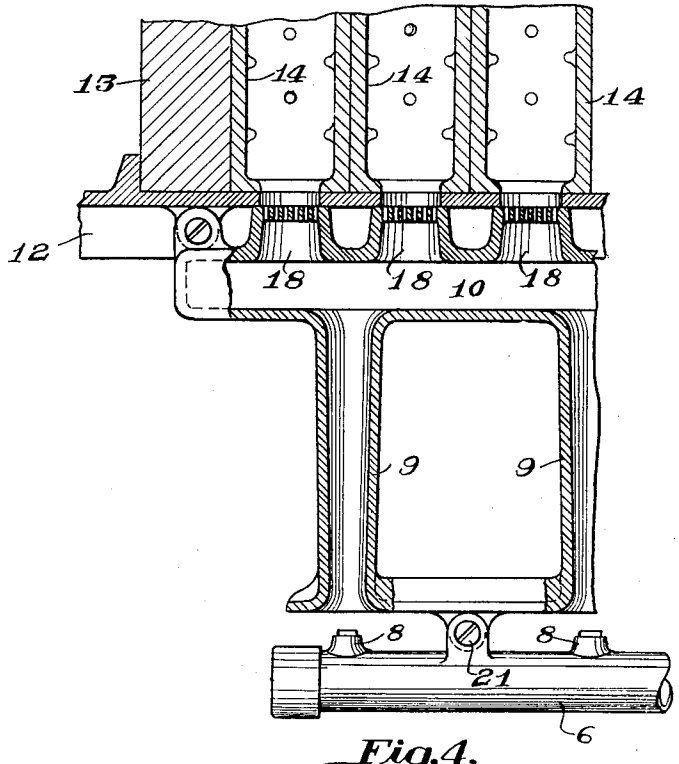


Fig.4.

Inventors
R. F. Cuyler
F. M. Hartford

By W. S. McDowell
Attorney

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UNITED STATES PATENT OFFICE

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GAS HEATER

Robert F. Cuyler, Athens, and Frank M. Hartford, Columbus, Ohio, assignors to Ray-Glo Corporation, Athens, Ohio, a corporation of Ohio

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1 Claim. (Cl. 126—90)

This invention relates to improvements in gas heaters of the type generally employed for room heating service and has particular reference to that type of gas heater utilizing a plurality of refractory foraminated heat radiating elements supported above a burner structure and mounted in conjunction with a refractory backing member constituting a fire-brick. In the operation of heaters of this type, the combustion of the burner gases results in heating the radiant or glower elements to temperatures where the latter become substantially incandescent with the result that the intense heat thereby developed is radiated outwardly from said elements and the fire-brick through the substantially open front of the heater into the room areas to be heated.

We have found that in heaters of this general category, a large percentage of the developed heat remains unutilized from the standpoint of its room heating capacity and passes wastefully to the outlet flue of the heater and it is therefore an outstanding object of the present invention to provide a gas heater, of the radiant or glower type, with an improved heat exchanger which is mounted stationarily in the frame or casing of the heater above the fire-brick and radiant elements, and which heat exchanger is formed to provide a plurality of spaced vertically arranged tubes, provided with thin metal walls, through which the products of combustion, following discharge from the radiant elements pass in a generally upward direction before reaching the vent or outlet flue, the casing of the heater being further constructed to provide for the positive circulation of room air across and in contact with the exterior surfaces of said tubes, whereby to raise the temperature of the room air, remove heat from the waste products of combustion and efficiently use the thus heated air for room heating purposes.

It is another object of the invention to provide a heater of the character specified with a backing or refractory fire-brick, in which the radiant or glower elements are mounted, with a plurality of passages in the upper portion thereof, which passages provide for the free escape of the products of combustion from the upper portions of the radiant or glower elements and the flow of such products of combustion into the superposed heat exchanger.

It is a further object of the invention to provide a heater of the character set forth which shall be of simple and improved construction and one which shall be both efficient and economical when employed for room heating purposes.

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

In the annexed drawings:

Fig. 1 is a view in vertical section taken through a gas heater constructed in accordance with the present invention,

Fig. 2 is a vertical 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 on the plane disclosed by the line 3—3 of Fig. 1, disclosing more particularly the formation of the heat exchanger tubes, and

Fig. 4 is a detail view of the burner mechanism.

Referring more particularly to the drawings, the numeral 1 designates the improved heater comprising the present invention in its entirety. This heater is formed to embody a casing which, in the specific embodiment of the invention under consideration, comprises a plurality of vertically arranged leg members 2, disposed in the corners of the casing and formed in this instance from angle irons. Secured to these leg members are front, back and side walls 3, 4 and 5 respectively, the latter walls being preferably formed, though not necessarily, from sheet metal.

Mounted in the bottom of the heater is a burner mechanism A. This burner mechanism may be one of several forms utilized in heaters of this character. In the form thereof depicted in the drawings, the burner mechanism comprises a gas supply manifold 6 supported horizontally in the lower portion of the heater. This manifold is provided with a regulating valve 7 for governing gas flow therethrough from a suitable source of supply. At longitudinal intervals the upper portion of the manifold is provided with outlet orifices 8, preferably of fixed diameter. These orifices are arranged in vertical registration with and are slightly spaced from the lower ends of a plurality of vertical mixing tubes 9 into which the gas streams from the orifices 8 are discharged and mixed with air drawn in to the lower portions of the tubes from the atmosphere. A highly combustible mixture is thus produced which passes upwardly through said tubes into a header 10, in this instance integrally formed with the tubes 9. The header 10 is suspended from the member 12 which is secured to the side walls 5 of the heater casing. The member 12 is preferably in the form of a metallic casting and its

upper surface receives and effects the support of a clay refractory member ordinarily known as the fire-brick or fire-back, which is designated by the numeral 13. Supported on the member 12 in front of the fire-brick 13 is a row of vertically arranged radiant or glower elements 14 which, as usual, are formed from a refractory material such as burnt clay and are each of an open foraminated construction providing freely for the passage of air and burning gases therethrough. The upper end of each of the elements 14 is provided with a stud 15 which is loosely receivable within a pocket 16 formed in the overhanging upper portion 17 of the fire-brick, whereby the radiants are supported in vertical order in relation to the fire-brick and yet may be individually removed and replaced whenever necessary. The header 10 is provided with a plurality of gas outlets 18 arranged in registration with the lower portions of each of the radiant elements 14, whereby when the valve 7 is open, a highly combustible mixture is delivered into the interior of each of said radiant elements, where active combustion at high temperature of the mixture takes place. These resulting high temperatures causes the radiant elements to assume a state of incandescence and also the short studs 19 formed on the front wall or surface of the fire-brick 13. Due to the body of the fire-brick 13, the heat thus developed is to a very large extent radiated outwardly or forwardly through the opening 20 provided in the front wall 3 into desired room areas in a manner customary in heaters of this variety. In this instance, the manifold 6 is supported by being suspended as at 21 from the lower portions of the mixing tubes 9.

Experience has disclosed that in the operation of radiant gas heaters of this general construction, a large proportion of the generated heat is not utilized but escapes through the outlet flue. In order to more completely utilize the developed heat in a gas heater of this character, the present invention provides the casing of the heater, at a position above the burner and radiant mechanism, with an improved heat exchanger, indicated generally by the letter B which is so constructed and positioned as to provide for the removal of the heat remaining in the gases of combustion following discharge from the radiant elements and the transfer of such heat units to the air currents in the room in which the heater is stationed. In the attainment of this and ancillary objects, the heater casing is provided above the radiant elements with spaced stationary upper and lower tube supporting plates 22 and 23 respectively, the said plates having their marginal portions secured to the walls 3, 4 and 5 of the casing. The said plates are provided with a plurality of elongated slots 24 which are reenforced by marginal ribs 25, and engaging with the ribs 25 and stationarily positioned between the plates 22 and 23 are vertically extending, parallel, relatively spaced sheet metal tubes 26 which produces a cross sectional area, as shown in Fig. 3, corresponding to the formation of the slots formed in the plates 22 and 23. The fire-brick 13 in this heater is formed contiguous to its upper portion with a plurality of passages 27 which lead from the top of the radiants 14 to the rear of the upper portion of the fire-brick, and through these passages free and uninterrupted passage of products of combustion pass in a generally upward direction, as disclosed by the arrows in Fig. 2. The passages 27 particularly serve to prevent trapping the products of combustion in the upper portion of the fire-brick and provide for the free passage of the highly heated gases from the radiant elements into the upper portion of the radiant chamber 28 formed in said heater. Since the chamber 28 is in open communication with the tubes 26 which are disposed above the chamber, the waste gases of combustion pass rapidly from the chamber 28 and upwardly through said tubes, contacting with the walls of the tubes to raise the temperature of the latter and at the same time lower the temperature of the waste gases. The waste gases are then discharged into an outlet chamber 29 formed in the upper portion of the heater casing immediately below its top 30, and from the chamber 29 the waste gases, at a low temperature pass by way of a vent 31 to a suitable outlet flue.

The heater casing has its back wall 4 formed at a position in registration with the lower portions of the tubes 26 with an opening 32, while the front wall 3 of the heater casing, in registration with the upper portions of the tubes 26, is formed with a corresponding opening 33. By this arrangement air is drawn from the room into the heater casing by way of the opening 32 and contacts with the heated walls of the tubes 26, raising the temperature of the air before its discharge into the room by way of the outlet opening 33. The passage of this air around the tubes 26 may be suitably controlled by any desired arrangement of baffles in order to control the time factor involved in the heating of the air. In this instance, one of such baffles has been disclosed at 34 and is used to guide the air in an outward direction through the opening 33. If desired, the walls of the tubes 26 may be provided with corrugations or fins to increase the heat radiating surface thereof and we reserve the right to employ such variations in construction in the various commercial adaptations of our heater designs.

In view of the foregoing it will be seen that the present invention provides a gas heater of the radiant type wherein full utilization of the generated heat for room heating purposes is secured. In this respect the heater provides for the delivery of a maximum quantity of heat to a given room area without increasing the quantity of fuel consumed over the ordinary forms of radiant heaters. The heat exchanger is of particularly efficient design in the matter of transferring heat remaining in the waste gases to the air passing over the exterior surfaces of its tubes and furthermore, due to the provision of the passages 27 in the fire-brick, there will be no trapping of the waste gases around the radiant elements, since such gases after traversing the radiant elements pass without restriction through the passages 27, the radiant chamber 28 and thence through the thin walled tubes 26 to the vent connection. While there has been described what is assumed to be the preferred embodiment of the invention, nevertheless it will be understood that we do not limit ourselves to the specific structural details set forth but reserve the right to employ such modifications and variations thereof in the various commercial forms of our heater that may be said to fall fairly in the scope of the following claim.

What is claimed is:

In combination with a gas heater of the radiant glower type, wherein the heater compartment is left open at its upper end, a casing closing the upper end of said compartment, said casing including upper and lower walls formed with reg-

istering openings, inwardly directed marginal ribs formed around said openings, a plurality of parallel flattened tubes arranged between said walls and positioned upon said ribs, said ribs serving to align the tubes in registration with said openings and to space the same relative to one another and from the side walls of said casing, a header situated above said casing for collecting the gases passing through said tubes, the front and rear walls of said casing being provided with openings for the passage of air over the exterior surfaces of said tubes, and curved baffle plates arranged between said tubes for directing the air passing through said openings towards the front of said casing.

ROBERT F. CUYLER.
FRANK M. HARTFORD.