Oct. 24, 1933. E. S. BURCH 1,932,242

GAS HEATER

Filed Aug. 14, 1931 3 Sheets-Sheet 1

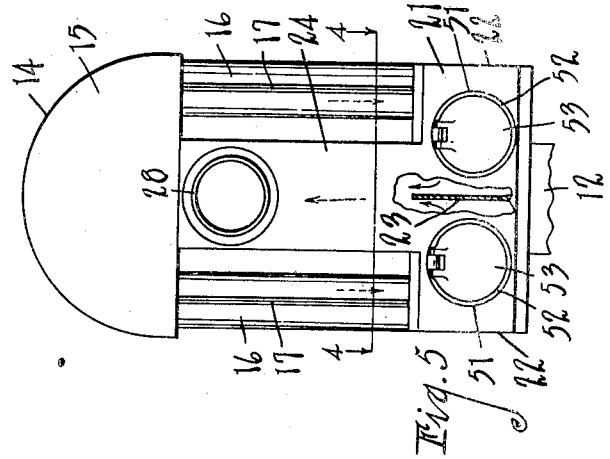


Fig. 5

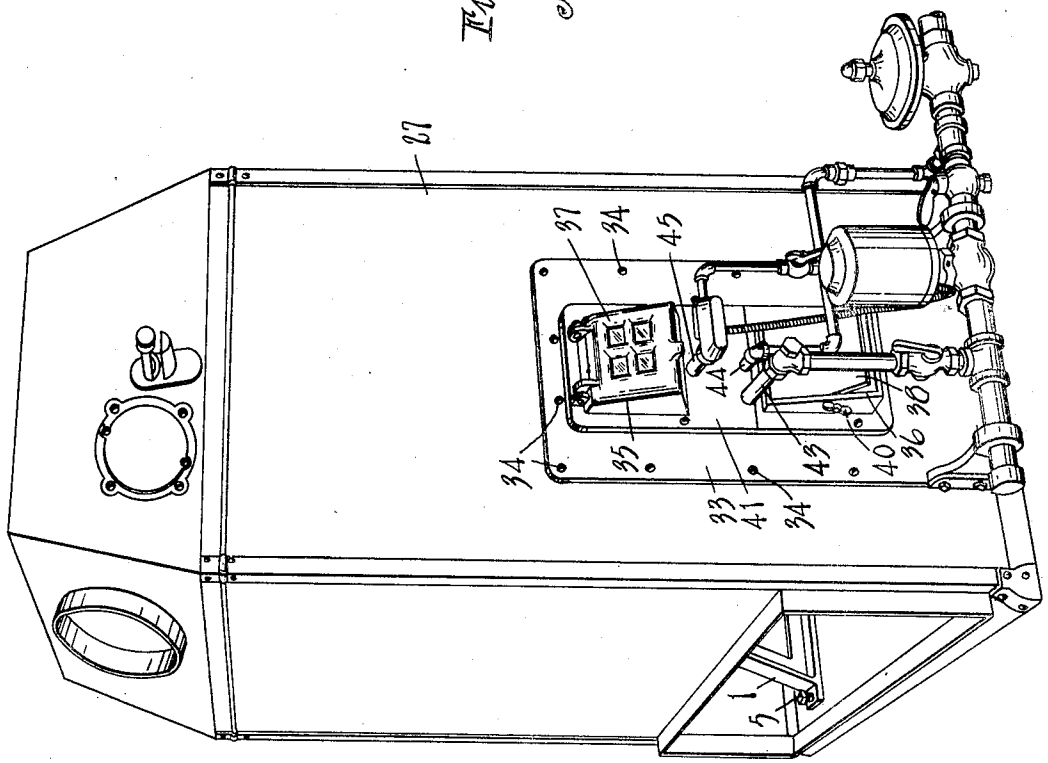


Fig. 1

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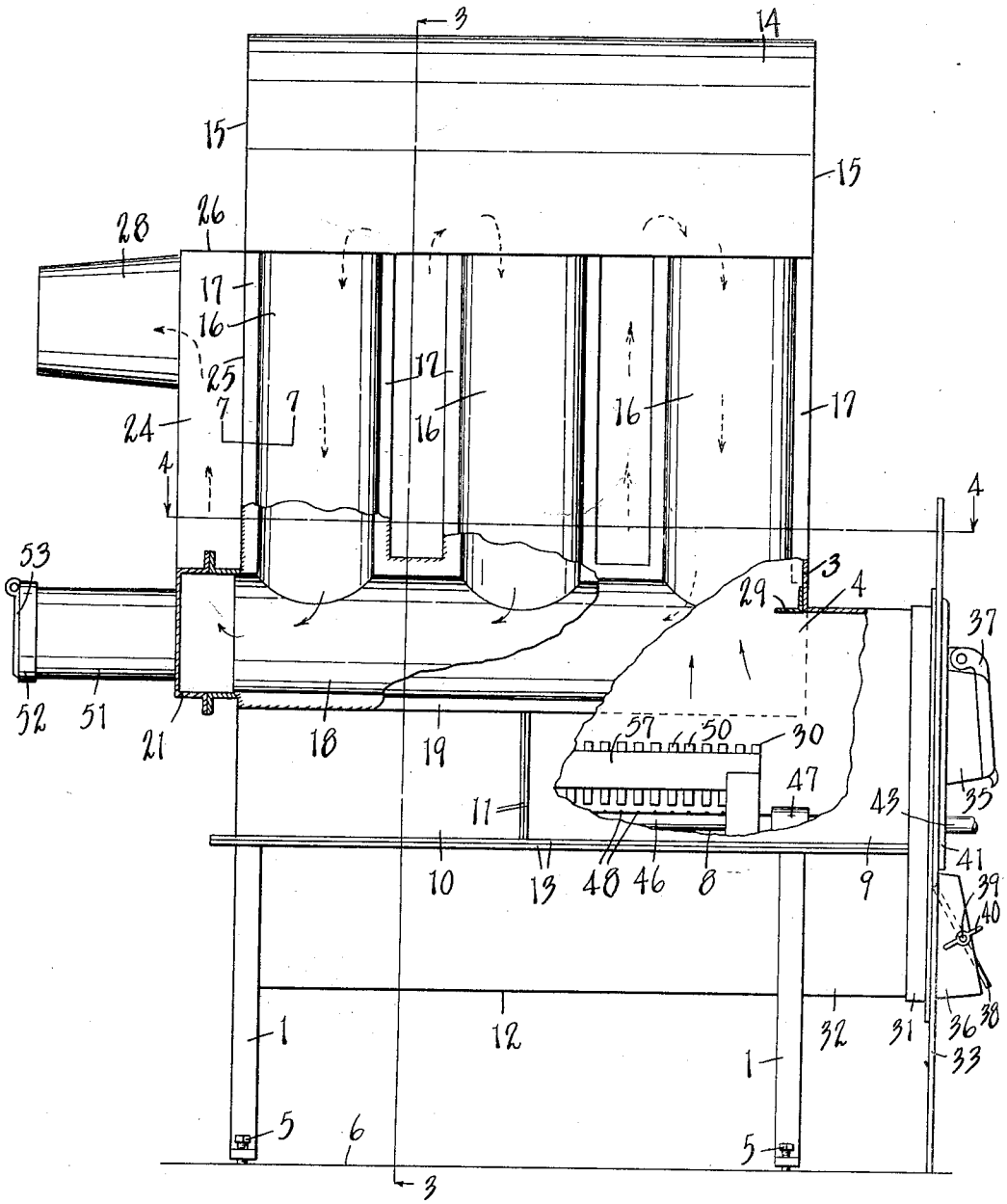


Fig. 2

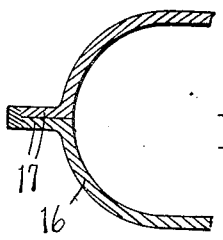


Fig. 7

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GAS HEATER

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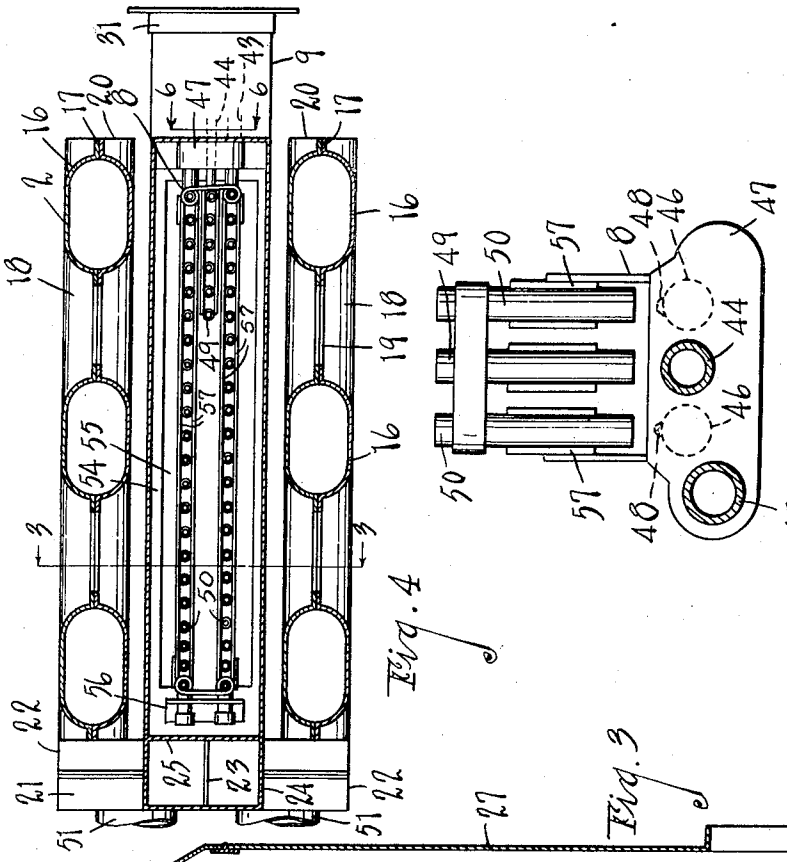


Fig. 4

Fig. 6

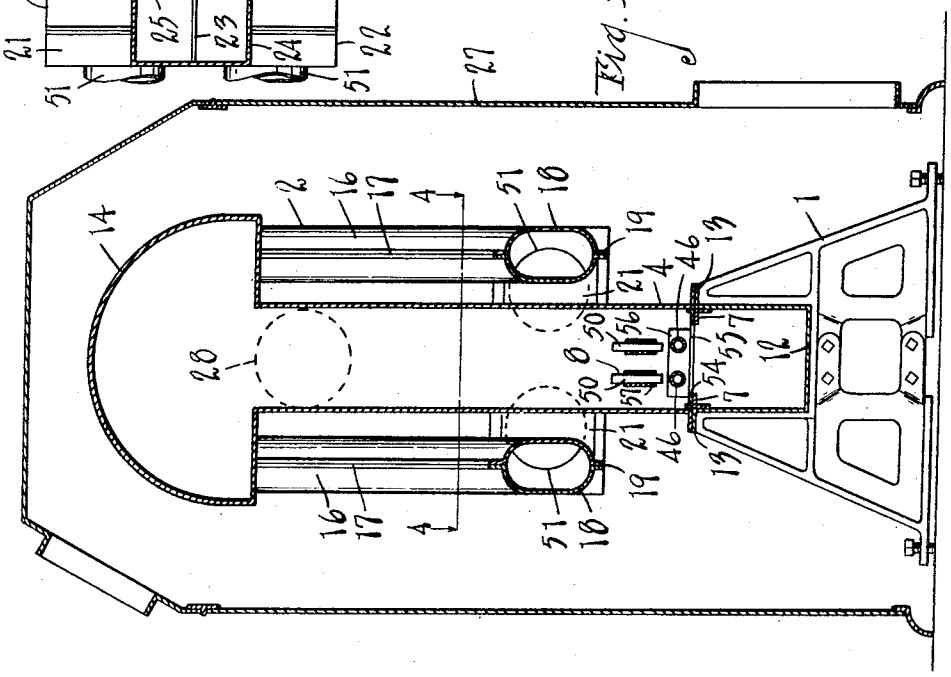


Fig. 3

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UNITED STATES PATENT OFFICE

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GAS HEATER

Elwood S. Burch, Dowagiac, Mich., assignor to Round Oak Furnace Company, Dowagiac, Mich.

Application August 14, 1931. Serial No. 557,125

12 Claims. (Cl. 126—116)

The main object of the invention is to provide a gas fired air heating unit of pleasing appearance which is economical to manufacture and easy to operate.

Another object of the invention is to prevent the noise caused by expansion and contraction of the heating unit.

A still further object is to provide a gas fired heating unit which is highly efficient in operation.

Objects relating to details and economies of my invention will apear from the description to follow. The invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view of a furnace constructed in accordance with my invention.

Fig. 2 is a view partially in side elevation and partially in vertical longitudinal section of the heating unit.

Fig. 3 is a transverse section on line 3—3 of Figs. 2 and 4.

Fig. 4 is a horizontal section taken on line 4—4 of Figs. 2, 3, and 5.

Fig. 5 is a fragmentary view in end elevation of the heating unit.

Fig. 6 is a transverse section taken on line 6—6 of Fig. 4, illustrating certain details of the burner, and

Fig. 7 is a fragmentary view in horizontal section taken on line 7—7 of Fig. 2, illustrating the flue.

Referring to the drawings, numeral 1 designates a pair of supporting frames or pedestals preferably of cast iron, one being disposed at the extreme rear of the unit 2 and one toward the front, preferably in the same plane as the front end plate 3 of the combustion chamber 4. The feet of the supporting frames 1 are provided with screws 5 for leveling the unit when placed on an uneven surface indicated generally by the numeral 6.

Angle irons 7 are mounted on the inner side of the side walls of the combustion chamber 4 to provide supports for the burner assembly 8.

The combustion chamber 4 preferably comprises a pair of similar sheet steel front and rear sections 9 and 10 having abutting outwardly extending flanges 11 which are welded together near the outer edge thereof along a vertical seam. The combustion chamber bottom 12 is preferably formed of sheet metal of substantially the shape of the combustion chamber 4 and is secured thereto by means of abutting flanges 13 welded together along their outer edges to form a horizontal seam.

The heater unit 2 is provided with a head or radiator member 14 preferably of sheet metal welded thereto having sides which project beyond the sides of the combustion chamber a substantial distance. The top of the radiator member is arched. The end plates 15 of the radiator member are welded to the top.

Flue gases are conducted downwardly from the radiator member 14 through vertical flue pipes 16 which are preferably constructed of two identical sections of sheet steel having outwardly extending abuting flanges 17 welded together along their outer edges as indicated by Fig. 7 to obviate pounding caused by the contraction and expansion. The tops of the flue pipes 16 are welded to the outwardly extending lower portions of the radiator member 14 as shown. The flue gases are collected from the flue pipes 16 and conducted to the rear of the heating unit 2 through horizontal side headers or pipes 18. The flue headers 18 are also constructed of two similar pieces of sheet steel having abutting flanges 19 welded together along their outer edges for the purpose mentioned above. The front ends of the headers 18 are sealed by end plates 20 welded thereto.

The horizontal sheet steel connecting flue 21 is welded to each of the sheet steel side or header flues 18 and sealed at both ends with sheet steel end plates 22. A vertical sheet steel baffle 23 is disposed in the connecting flue 21 for preventing cross currents of flue gases passing through the connecting flue 21.

A vertical sheet steel discharge flue 24 is preferably a single piece section which is welded directly to the back wall 25 of the combustion chamber 4. The discharge flue preferably extends to the top edge of the combustion chamber and provides a practical method for increasing the temperature of the flue gas passing therethrough to thereby prevent condensation. The efficiency of this feature of the invention is increased by utilizing the back wall 25 of the combustion chamber as a common wall between the combustion chamber and the discharge flue 24. Heat is transmitted from the combustion chamber by radiation to the flue, thereby constituting a drying compartment in the flue. The discharge flue 24 is sealed at the top by the flue end plate 26 which is welded thereto. Flue gases are conducted from the heating unit to a point beyond the casing 27 by a conical sheet steel smoke or outlet connection 28 welded to the top of the rear of the discharge flue 24. The outlet 28 may

be connected to a chimney by any suitable conducting means, (not shown).

A sheet steel angle member 29 is secured within the combustion chamber to the front wall thereof to prevent radiant heat and currents of air from disturbing the combustion of the front jets of the burner 30.

The front frame 31 preferably comprises four sections of angle iron welded together and to the forwardly extending portion 32 of the heating unit. The front panel 33 is bolted to the frame 31 by bolts 34. The front panel 33 is preferably of cast iron and is provided with flanged openings 35 and 36 to which are hinged doors 37 and 38 respectively. The upper opening 35 constitutes an observation opening and the lower opening 36 constitutes a primary and secondary air inlet to the heating unit. The amount of primary and secondary air admitted to the unit by the opening 36 is conveniently controlled by the door 38 which is adjustable to any desired position. Door 38 is hinged off center to allow it to fall open in case of loosening. The door 38 is preferably of sheet steel and is held in position by a bolt 39 and wing nut 40, as shown. A supply of air to the burners is assured at all times by the mounting of door 38.

The frame 41 carrying the doors is preferably secured to the cast frame 33 by bolts 42. Openings are provided in the door frame 41 for a main gas supplying conduit 43 and an auxiliary gas supplying conduit 44. Another opening is provided in the door frame for an electric safety pilot 45.

Manifold pipe 46 conducts gas from the burner head casting 47 to supply burner ports or jets 48 of main burners 50. The jets discharge into the mixing tubes and draw primary air therein. The burners thereby shoot vertical relatively long conical flames up through the high combustion chamber. Secondary air is admitted to the combustion chamber through the openings between the burners or mixing tubes.

The header flues 18 are made accessible for cleaning by means of clean-out tubes 51 which are preferably welded to the flue 21 and extend to a point beyond the casing 27. The end of each clean-out tube is provided with a door frame 52 carrying a door 53.

The auxiliary burner 49 is adapted to be operated manually and to burn continuously, being supplied with gas through conduit 44, to keep the heating unit warm at all times so as to prevent the main burner 50 from being operated to bring the entire unit up to a high temperature from a cold start. The burners rest on a burner supporting plate 54 which is in turn supported by the angle members 7.

The burner supporting plate 54 is provided with a central opening 55 for admitting primary and secondary air to the burners 49 and 50. The burners 49 and 50, header 47, manifold pipes 46, and gas supply pipes 43 and 44 constitute a unit assembly which may be removed from or inserted into the combustion chamber readily without disturbing the latter.

The burner assembly 30 is supported at the rear on the burner supporting plate 54 by a bracket 56. A clamp 57 rigidly secures the burner tubes at a predetermined fixed distance apart for the burning of manufactured or natural gas.

The welded construction of the all-sheet steel members of the combustion chamber obviates the possibility of gas entering the circulating air in the casing 27. The high relatively narrow combustion chamber 4 is adapted to accommodate an exceptionally long conical flame from the burner 30. This construction places the heating surfaces of the unit at the highest temperatures at the nearest points of outlet of the casing, namely, near the bonnet. This promotes a better circulation of cool inlet air through the casing because of the elimination of the radiant heat at the cool air inlet levels. The flue gases are conducted from the top of the combustion chamber downwardly so as to retard the passage of the flue gases as much as possible and so that the surface temperatures of the unit are increased. This increases the efficiency of the device by causing the removal of a high percentage of the heat units from the products of combustion before they pass from the furnace. Also, as pointed out above, the construction of the heating unit obviates condensation by heating the flue gases before leaving the unit.

While I have illustrated and described a preferred modification of the invention, it is to be understood that various changes may be made therein and other modifications may be made without departing from the spirit of the invention, which is to be limited only by the prior art and the scope of the following claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a gas fired warm air furnace, the combination with a plurality of spaced vertical cast iron supporting frames, leveling screws carried by the feet of said frames and an all-sheet steel welded heating unit mounted on said frames comprising a relatively tall narrow combustion chamber having a curved combustion chamber dome head projecting beyond the sides of said combustion chamber, vertical radiator flues welded to said head at the sides of said combustion chamber for carrying the flue gases downwardly and away from the combustion chamber and head, horizontal header flues welded to the lower ends of the radiator flues for conducting the gases to the rear of the unit, a horizontal connecting flue welded to the rear ends of said header flues, a vertical baffle disposed in said header connecting flue between said header flues for preventing cross currents of the flue gases, a vertical discharge flue welded to the rear of said combustion chamber and the top of said header connecting flue for conducting gases upwardly therefrom, and a horizontal conical outlet welded to the discharge flue at the top thereof for delivering the gases therefrom to a chimney.

2. In a gas fired warm air furnace, the combination with a plurality of spaced vertical supporting frames, leveling screws carried by the feet of said frames and a heating unit mounted on said frames comprising a relatively tall narrow combustion chamber having a head projecting beyond the sides of said combustion chamber, vertical radiator flues welded to said head for carrying the flue gases downwardly and away from the combustion chamber and head, horizontal header flues welded to the lower ends of said radiator flues for conducting the gases to the rear of the unit, a header connecting flue welded to the rear ends of said header flues, a vertical baffle disposed in said connecting flue between said header flues for preventing cross currents of the flue gases, and a discharge flue welded to the rear of said combustion chamber and to the top of said connecting flue for conducting gases upwardly therefrom.

3. In a gas fired warm air furnace, the combination with a plurality of spaced vertical supporting frames and a heating unit mounted on said frames comprising a relatively high narrow combustion chamber having a semi-cylindrical head projecting beyond the sides of said combustion chamber, vertical radiator flues for carrying the flue gases downwardly and away from the combustion chamber and head, horizontal header flues for conducting the gases to the rear of the unit, a horizontal connecting flue, means in said connecting flue between said header flues for preventing cross currents of the flue gases, and a vertical discharge flue at the rear of said combustion chamber and at the top of said connecting flue for conducting gases upwardly therefrom.

4. In a device of the character described, the combination with a sheet metal combustion chamber, of a sheet metal vertical discharge flue welded thereto, means connecting the lower end of the discharge flue with the combustion chamber whereby the combustion gases from said combustion chamber pass upwardly through said flue, the combustion chamber and the discharge flue having a common sheet metal wall, whereby the heat of said combustion chamber raises the temperature of said discharge flue thereby making the discharge flue a drying compartment which prevents condensation of flue gases within the unit.

5. In a gas fired warm air furnace, a heating unit comprising a relatively high narrow combustion chamber having an overhanging head projecting beyond the sides of said combustion chamber, vertical side flues for carrying the flue gases downwardly and away from the combustion chamber and head, horizontal side header flues for conducting the gases to the rear of the unit, a horizontal connecting flue for the side flues, a vertical baffle disposed in said connecting flue between said header flues for preventing cross currents of the flue gases, and a discharge flue at the rear of said combustion chamber and at the top of said connecting flue for conducting gases upwardly therefrom, the combustion chamber and the back flue having a common wall, whereby the heat of said combustion chamber raises the temperature of said back flue thereby making the back flue a drying compartment.

6. In a device of the character described, the combination with a combustion chamber, of a vertical discharge flue welded thereto, means connecting the lower end of the discharge flue with the combustion chamber whereby the combustion gases from said combustion chamber pass upwardly through said flue, the combustion chamber and the discharge flue having a common wall, whereby the heat of said combustion chamber raises the temperature of said discharge flue thereby making the discharge flue a drying compartment which prevents condensation.

7. In a gas fired warm air furnace, the combination with a supporting frame and a heating unit mounted on said frame comprising a vertical combustion chamber having a head projecting beyond the sides thereof, vertical radiator flues for carrying the flue gases downwardly and away from the head, horizontal header flues for conducting the gases to the rear of the unit, a horizontal connecting flue for collecting the gases from the header flues, a baffle disposed in said connecting flue between said header flues for obviating cross currents of the flue gases, a discharge flue at the rear of said combustion chamber for conducting gases upwardly from said connecting flue, an outlet flue at the top of the discharge flue, and a gas burner unit comprising a plurality of sections of burner tubes, one of said sections being relatively small and forming an auxiliary to the main burner adapted to keep the unit warm while the main burner is not functioning.

8. In a gas fired warm air furnace, the combination with a plurality of spaced vertical supporting frames and a heating unit mounted on said frames comprising a combustion chamber having a head projecting beyond the sides of said combustion chamber, radiator flues for carrying the flue gases downwardly and away from the head, horizontal header flues for conducting the gases to the rear of the unit, a horizontal connecting flue for collecting the gases from the header flues, a vertical baffle disposed in said connecting flue between said header flues, a vertical discharge flue at the rear of said combustion chamber and at the top of said horizontal connecting flue thereby making the back flue a drying compartment, and a gas burner unit disposed below said combustion chamber and comprising a plurality of sections of burner tubes, one of said sections being relatively small and forming an auxiliary to the main burner adapted to keep the unit warm while the main burner is not functioning.

9. In a gas fired warm air furnace, the combination with a supporting frame, leveling screws carried by the feet of said frame and an all sheet metal welded heating unit mounted on said frame comprising a combustion chamber having a semi-cylindrical dome projecting beyond the sides of said combustion chamber, radiator flues welded to said dome for carrying the flue gases downwardly and away from the combustion chamber and head, header flues welded to the lower ends of the radiator flues for conducting the gases to the rear of the unit, a horizontal connecting flue welded to the back ends of said header flues for collecting the gases therefrom, a vertical baffle disposed in said connecting flue between said header flues for obviating cross currents of the flue gases, a vertical discharge flue welded to the rear of said combustion chamber and to the top of said horizontal connecting flue for conducting gases upwardly therefrom, an outlet flue welded to the top of the vertical discharge flue, and a manually adjustable air inlet door adapted to admit both primary and secondary air to the unit, said door being hinged below its center of gravity and having an inclined seat, whereby to assure a plentiful supply of air to furnace upon the loosening thereof.

10. In a gas fired warm air furnace, the combination with a frame and a heating unit mounted on said frame comprising a combustion chamber having a head projecting beyond the sides thereof, radiator flues for carrying the flue gases downwardly and away from the head, header flues for conducting the gases from the radiator flues to the rear of the unit, a connecting flue for collecting the gases from the header flues, a vertical baffle disposed in said connecting flue for obviating cross currents of the flue gases, a vertical discharge flue at the rear of said combustion chamber and at the top of said horizontal connecting flue for conducting gases upwardly therefrom, the combustion chamber and the back flue having a common sheet metal wall, whereby the heat of said combustion chamber raises the temperature of said back flue thereby making the

back flue a drying compartment to obviate condensation within the unit, a casing, and an adjustable air inlet door associated with said casing adapted to admit both primary and secondary air to the unit.

11. In a gas fired warm air furnace, the combination with a heating unit comprising a combustion chamber having a head projecting beyond the sides thereof, radiator flues for carrying the flue gases downwardly and away from the head, header flues for conducting the gases to the rear of the unit, a connecting flue for collecting the gases from the side flues, a baffle disposed in said connecting flue, a discharge flue at the rear of said combustion chamber for conducting gases upwardly from said connecting flue, the combustion chamber and the back flue having a common wall, whereby the heat of said combustion chamber makes the connecting flue a drying compartment to obviate condensation within the unit, and a casing enclosing said unit having a bottom cold air inlet opening and a top hot air outlet opening.

12. In a device of the character described, the combination with a combustion chamber, of a vertical discharge flue, means connecting the lower end of the discharge with the combustion chamber whereby the combustion gases from said combustion chamber pass upwardly through said flue, the combustion chamber and the discharge flue having a common wall, whereby the heat of said combustion chamber raises the temperature of said discharge flue thereby making the discharge flue a drying compartment which prevents condensation of flue gases within the unit.

ELWOOD S. BURCH.