Feb. 3, 1931. T. W. TORR 1,790,777

AIR HEATING FURNACE

Filed July 13, 1929 2 Sheets-Sheet 1

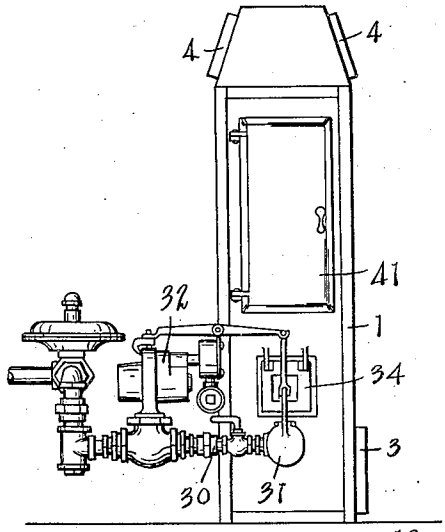


Fig. 1

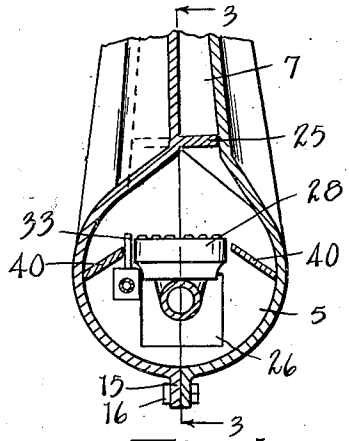


Fig. 5

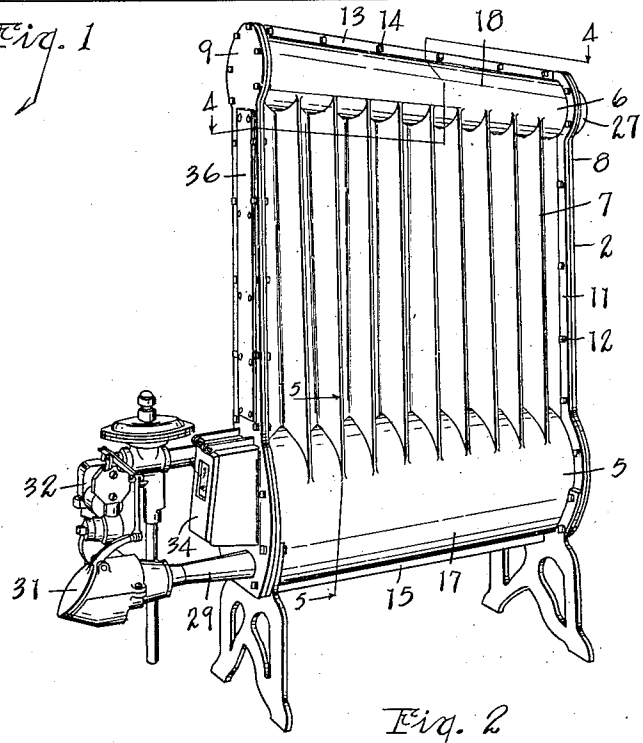


Fig. 2

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AIR HEATING FURNACE

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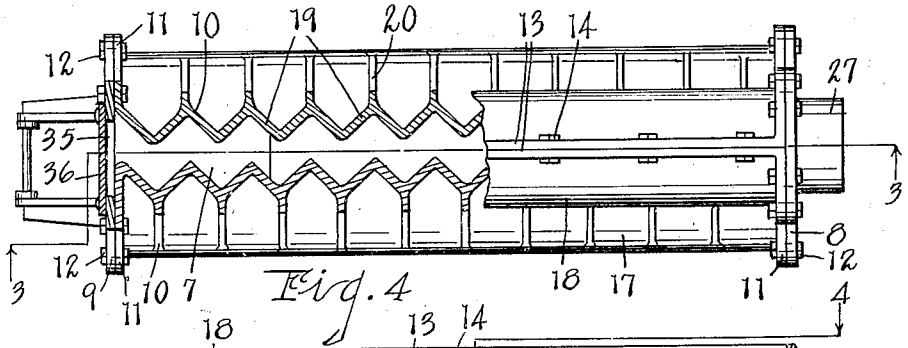


Fig. 4

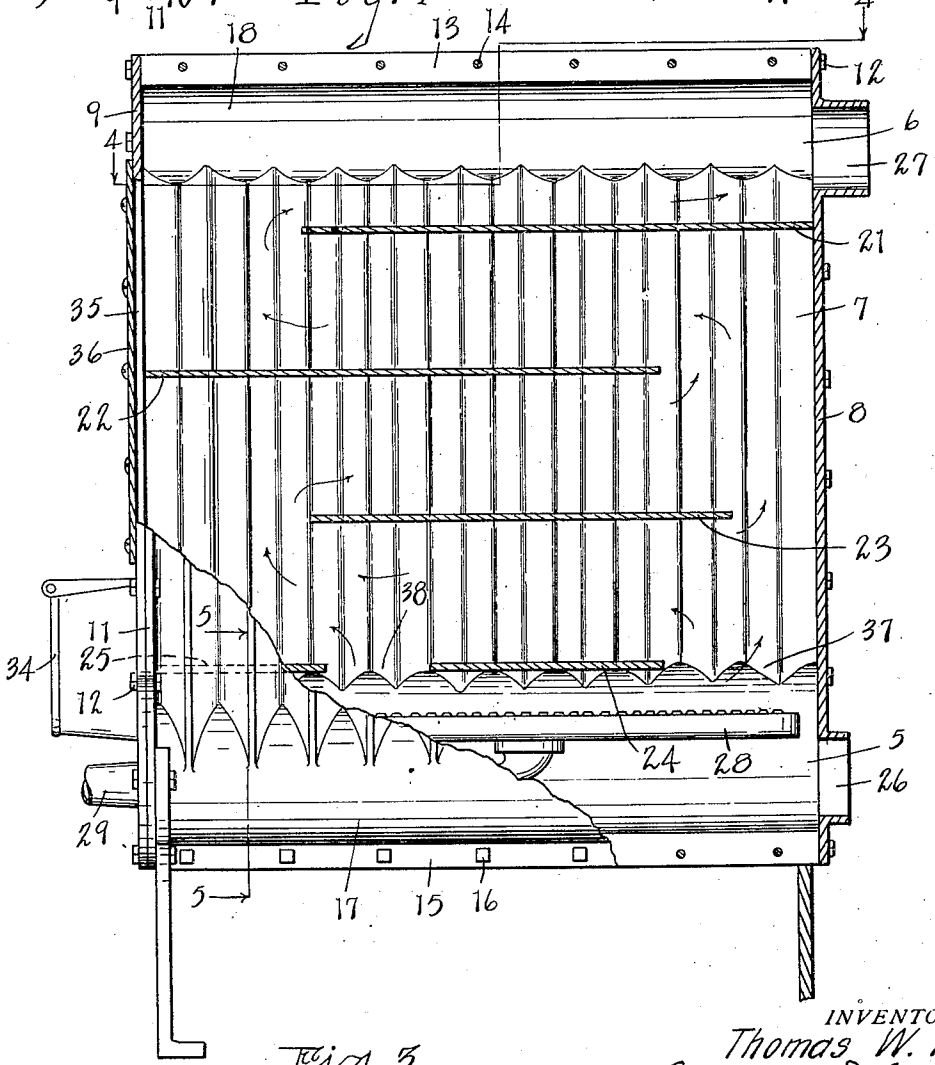


Fig. 3

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Patented Feb. 3, 1931 1,790,777

UNITED STATES PATENT OFFICE

THOMAS W. TORR, OF DOWAGIAC, MICHIGAN, ASSIGNOR TO THE RUDY FURNACE COMPANY, OF DOWAGIAC, MICHIGAN

AIR-HEATING FURNACE

Application filed July 13, 1929. Serial No. 378,031.

The main objects of this invention are—

First, to provide a gas air heating furnace which is highly efficient.

Second, to provide a combined combustion chamber and radiator unit for gas furnaces which is well adapted for use in series in a single casing or as a complete unit.

Third, to provide a gas heating furnace which is compact and at the same time has a relatively large amount of radiating surface.

Objects pertaining to details and economies of my invention will appear from the description to follow. The invention is defined and pointed out in the claims.

A structure which is a preferred embodiment of my invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a front elevation of a hot air heater or furnace embodying the features of my invention.

Fig. 2 is a perspective view with the casing removed.

Fig. 3 is a fragmentary view mainly in vertical section on a line corresponding to line 3—3 of Figs. 4 and 5.

Fig. 4 is a fragmentary view partially in horizontal section on line 4—4 of Figs. 2 and 3.

Fig. 5 is a fragmentary vertical section on line 5—5 of Fig. 2.

In the drawings similar reference characters refer to similar parts throughout the several views.

In the embodiment illustrated, the hot air casing 1 is of general rectangular form and of such dimensions as to receive a single heating unit 2 although in certain installations the casing is designed to receive a plurality of heating units. This casing has a cold air inlet 3 at the bottom and openings surrounded by collars 4 adapted to receive hot air flues.

The heating unit consists of a burner chamber 5 at the bottom, a flue 6 at the top, and an intermediate radiator 7. The heating unit is formed of a rear end wall 8, front end wall 9 and side walls 10, the side walls having out-turned flanges 11 on their vertical edges which are secured to the end walls by means of the bolts 12, top flanges 13 at their upper edges disposed in abutting relation and connected by the bolts 14, and abutting bottom flanges 15 connected by the bolts 16.

The side members have horizontal vertically curved portions 17 at the bottom, forming the burner or combustion chamber 5 and horizontal vertically curved portions 18 at the top forming the flue 6.

The intermediate portion or side walls of the radiator has vertical corrugations or flutings 19 disposed in zig-zag or alternating relation; that is, with the crowns or apexes of one side member in alternating relation to the crowns or apexes of the corrugations or flutings of the other member. The corrugations are preferably provided with vertical fins 20 extending into the hot air chamber and flue portions of the side walls constituting reinforcing members and also heat radiating members.

This radiator portion is provided with horizontal baffles 21, 22, 23, 24 and 25.

The rear end wall is provided with a secondary air inlet 26 for the combustion chamber while the discharge flue is provided with a discharge opening 27.

The gas burner 28 is elongated and mounted longitudinally within the combustion chamber 5. This burner is provided with a mixing or Bunsen tube 29 provided with a gas connection designated generally by the numeral 30 and having a primary air inlet valve 31 which is operatively connected to a control mechanism designated generally by the numeral 32 which is the subject matter of my application for Letters Patent, Serial No. 344,899, filed March 6, 1929, and as it forms no part of this invention is not described with further detail herein.

The pilot 33 is accessible through the combustion chamber door 34, the door being preferably provided with a window as illustrated.

The front wall has an opening 35 provided with a closure plate 36 through which access may be had to the radiator section for cleaning between the baffle members.

The baffle members 24 and 25 are arranged with their adjacent ends in spaced relation,

the front end of the baffle member 25 being against the front wall while the rear end of the baffle member 24 is substantially spaced from the rear wall, thus providing discharge openings 37 and 38 for the burner chamber, permitting free escape for the products of combustion from the burner chamber. The baffle 23 is spaced from both the front and rear walls providing a restricted opening at the rear of the baffle 23 and a larger opening at the front thereof. The baffle 22 extends from the front wall and the baffle 21 from the rear wall. This causes the products of combustion to take a zig-zag course through the radiator but at the same time provides a free escape for the products of combustion from the combustion chamber, the arrangement being further highly efficient in the matter of the absorption of heat units and at the same time permitting free escape, as stated, of the products of combustion.

To direct secondary air into effective relation to the burner, the combustion chamber is provided with deflecting plates 40 which extend inwardly and upwardly from the side walls of the combustion chamber, their upper edges terminating adjacent to but spaced from the burner so that the secondary air is caused to flow against and across the burner.

The casing is provided with a door 41 through which access may be had to the closure 36.

Heaters embodying the features of my invention are highly efficient, there being highly efficient combustion and also highly efficient radiation of the heat units. The heater units may be installed singly as in casings or a plurality of them in a single casing.

I have illustrated and described my improvements in an embodiment which I have found very practical from a manufacturing standpoint, and, as stated, one which is highly efficient. I have not attempted to illustrate or describe certain embodiments or adaptations which I contemplate as it is believed that this disclosure will enable those skilled in the art to embody or adapt my improvements as may be desired.

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

1. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of said burner chamber and flue portion being vertically curved, the side walls of the radiator portion having vertical V-shaped flutings or corrugations disposed in alternating relation and merging at their ends into the curved walls of said combustion chamber and flue portion and their outer crowns or apexes terminating in vertical fins, a plurality of vertically spaced baffles disposed horizontally between said radiator side walls and in alternating relation providing a zig-zag passage, a burner arranged in said burner chamber, said burner chamber having a secondary air inlet opening at one end thereof, and upwardly inclined deflector walls disposed within said burner chamber in a plane above said secondary air inlet with their inner edges adjacent to but spaced from said burner.

2. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of said burner chamber and flue portion being vertically curved, the side walls of the radiator portion having vertical V-shaped flutings or corrugations disposed in alternating relation and merging at their ends into the curved walls of said combustion chamber and flue portion and their outer crowns or apexes terminating in vertical fins, a plurality of vertically spaced baffles disposed horizontally between said radiator side walls and in alternating relation providing a zig-zag passage, and a burner arranged in said burner chamber.

3. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of said burner chamber and flue portion being vertically curved, the side walls of the radiator portion having vertical flutings or corrugations disposed in alternating relation, a plurality of vertically spaced baffles disposed horizontally between said radiator side walls and in alternating relation providing a zig-zag passage, a burner arranged in said burner chamber, said burner chamber having a secondary air inlet opening at one end thereof, and upwardly inclined deflector walls disposed within said burner chamber in a plane above said secondary air inlet with their inner edges adjacent to but spaced from said burner.

4. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of said burner chamber and flue portion being vertically curved, the side walls of the radiator portion having vertical flutings or corrugations disposed in alternating relation, a plurality of vertically spaced baffles disposed horizontally between said radiator side walls and in alternating relation providing a zig-zag passage, and a burner arranged in said burner chamber.

5. In a heater, the combination of a com-

bined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top, and an intermediate radiator portion, the side walls of said burner chamber and flue portion being vertically curved, the side walls of the radiator portion having vertical V-shaped flutings or corrugations disposed in alternating relation and merging at their ends into the curved walls of said combustion chamber and flue and their outer crowns or apexes terminating in vertical fins, and a burner arranged in said burner chamber.

6. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top, and an intermediate radiator portion, the side walls of said burner chamber and flue portion being vertically curved, the side walls of the radiator portion having vertical V-shaped flutings or corrugations disposed in alternating relation and merging at their ends into the curved walls of said combustion chamber and flue, and a burner arranged in said burner chamber.

7. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of the radiator portion having vertical flutings or corrugations disposed in alternating relation, a plurality of vertically spaced baffles disposed horizontally between said radiator side walls and in alternating relation providing a zig-zag passage, a burner arranged in said burner chamber, said burner chamber having a secondary air inlet opening at one end thereof, and deflector walls disposed within said burner chamber in a plane above said secondary air inlet with their inner edges adjacent to but spaced from said burner.

8. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of the radiator portion having vertical flutings or corrugations disposed in alternating relation, a plurality of vertically spaced baffles disposed horizontally between said radiator side walls and in alternating relation providing a zig-zag passage, and a burner arranged in said burner chamber.

9. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of the radiator portion having vertical flutings or corrugations disposed in alternating relation and their outer crowns terminating in vertical fins, a plurality of vertically spaced baffles disposed horizontally between said radiator side walls and in alternating relation providing a zig-zag passage, and a burner arranged in said burner chamber.

10. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of the radiator portion having vertical flutings or corrugations disposed in alternating relation, a burner arranged in said burner chamber, said burner chamber having a secondary air inlet opening at one end thereof, and deflector walls disposed within said burner chamber in a plane above said secondary air inlet with their inner edges adjacent to but spaced from said burner.

11. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of said radiator portion having alternatingly disposed vertical flutings therein and being provided with horizontally disposed vertically spaced baffle members, said radiator unit comprising a pair of side wall sections having joint flanges at the top and bottom thereof, and front and rear end walls, said side walls having out-turned joint flanges secured to said front and rear end walls, and a burner arranged in said burner chamber.

12. In a heater, the combination of a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of said radiator portion having alternately disposed vertical flutings therein and being provided with horizontally disposed vertically spaced baffle members, said radiator unit comprising a pair of side wall sections, and front and rear end walls, and a burner arranged in said burner chamber.

13. In an air heating furnace, the combination of a hot air casing having flat side walls, an air inlet at the bottom and an air discharge at the top, a combined combustion chamber and radiator unit disposed within said casing and comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of the radiator portion having vertical flutings or corrugations disposed in alternating relation, and a burner arranged in said burner chamber.

14. In an air heating furnace, the combination of a hot air casing having an air inlet at the bottom and an air discharge at the top, a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, a flue portion at the top and an intermediate radiator portion, the side walls of the radiator portion having vertical flut-

ings or corrugations disposed in alternating relation and their outer crowns terminating in vertical fins, a plurality of vertically spaced baffles disposed horizontally between said radiator side walls and in alternating relation providing a zig-zag passage, and a burner arranged in said burner chamber.

15. In an air heating furnace, the combination of a hot air casing having an air inlet at the bottom and an air discharge at the top, a combined combustion chamber and radiator unit comprising a burner chamber portion at the bottom, and a flue portion at the top and an intermediate radiator portion, the side walls of the radiator portion having vertical flutings or corrugations disposed in alternating relation.

In witness whereof I have hereunto set my hand.

THOMAS W. TORR.