

July 14, 1942.

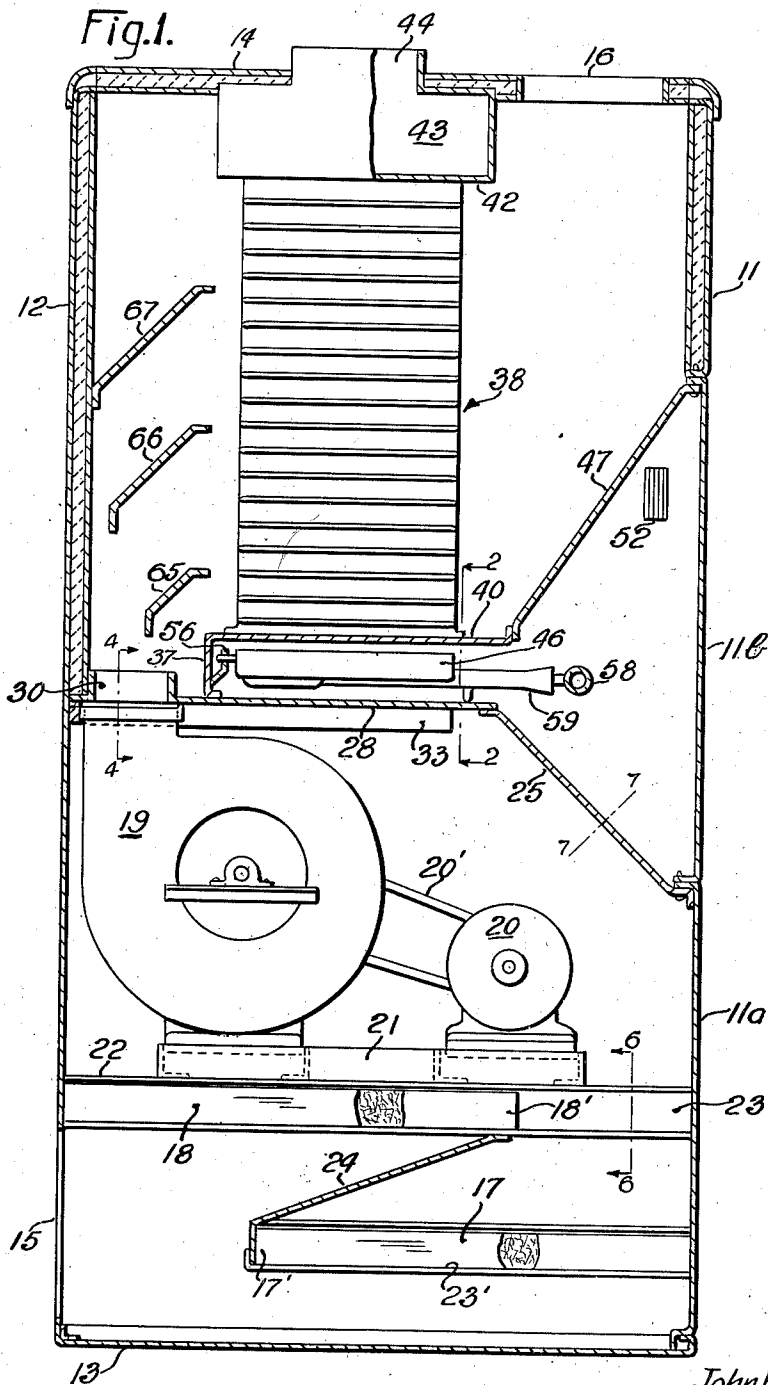
J. R. DENISE

2,289,759

WARM AIR HEATER

Filed Oct. 22, 1940

2 Sheets-Sheet 1



Inventor

John R. Denise

Charles A. Lind
Attorney

July 14, 1942.

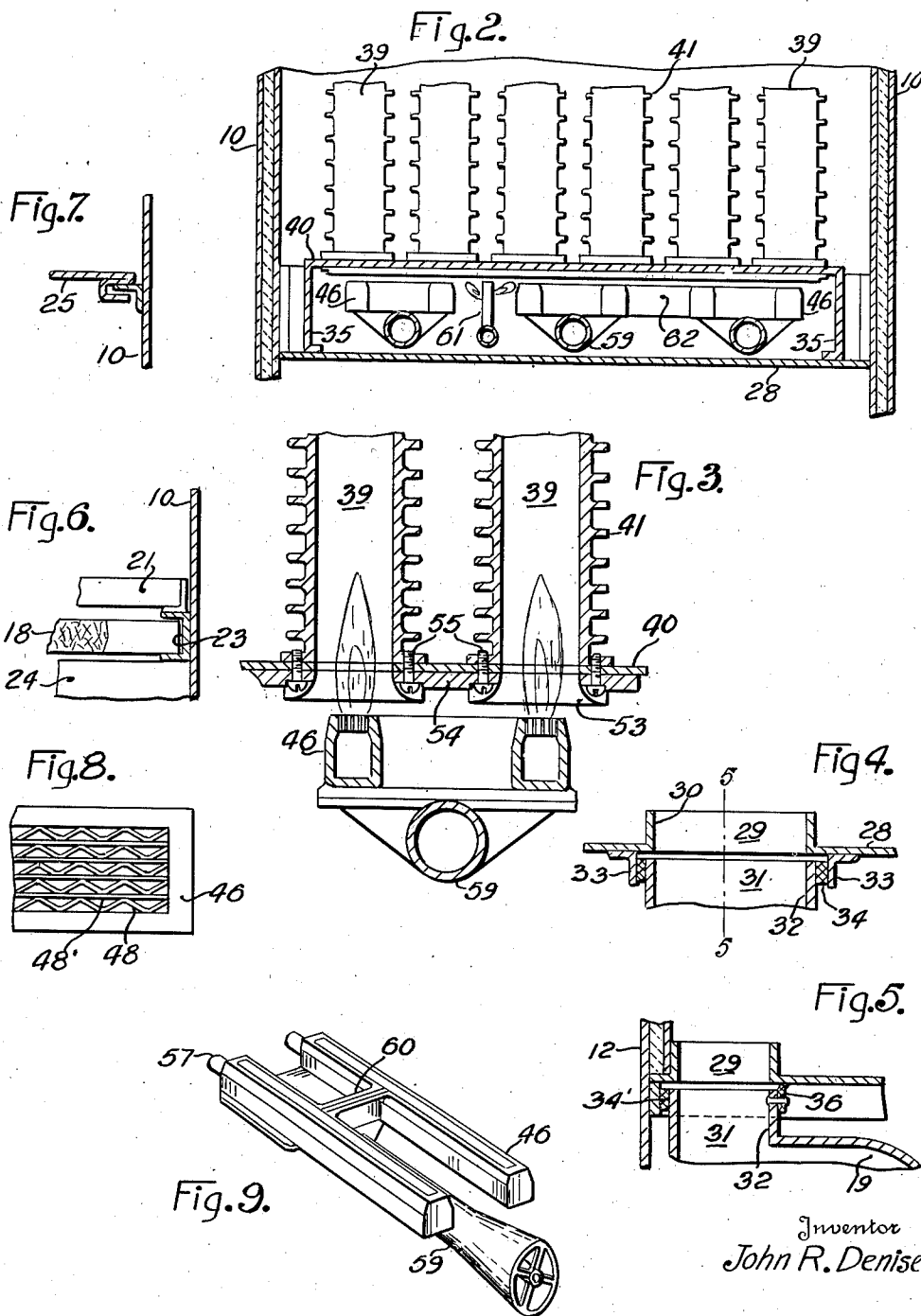
J. R. DENISE

2,289,759

WARM AIR HEATER

Filed Oct. 22, 1940

2 Sheets-Sheet 2



Inventor
John R. Denise

By

Charles A. Lind

Attorney

UNITED STATES PATENT OFFICE

2,289,759

WARM AIR HEATER

John R. Denise, Columbus, Ohio, assignor to
General Properties Company, Inc., a corpora-
tion of Delaware

Application October 22, 1940, Serial No. 362,218

2 Claims. (Cl. 126—110)

This invention relates to improvements in gas-fired warm-air heaters embodying within a single housing or cabinet a radiator for heating the air, burner means for heating the radiator, a blower for forcing the air to be heated over the radiator, and means for filtering the air before it reaches the blower intake.

The object of the invention is to arrange the parts within the housing in such a way as to provide a relatively compact heater unit; to provide an arrangement which will permit the blower to be readily installed in the housing; to provide an improved burner arrangement for heating the radiator, and to provide other improvements hereinafter more fully appearing.

In the accompanying drawings forming part of this specification—

Fig. 1 shows the interior arrangement of parts within the heater housing, some of the parts being in elevation and others in vertical section.

Fig. 2 is a somewhat enlarged fragmentary view taken on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary vertical section on a somewhat enlarged scale of parts shown in Fig. 2.

Fig. 4 is a fragmentary vertical section on line 4—4 of Fig. 1.

Fig. 5 is a vertical section on line 5—5 of Fig. 4.

Fig. 6 is a fragmentary section on line 6—6 of Fig. 1.

Fig. 7 is a fragmentary section on line 7—7 of Fig. 1.

Fig. 8 is a fragmentary top plan view of one of the burner heads.

Fig. 9 is a perspective plan view showing how certain of the burner heads are interconnected.

The heater housing is rectangular in plan and comprises a pair of upright laterally-spaced side walls 10 and upright connecting walls 11 and 12. For descriptive purposes, the wall 11 will sometimes be referred to as the front wall of the housing, and the wall 12 as the back wall thereof. The bottom wall of the housing is indicated at 13 and the top wall at 14. In the back wall at the lower end thereof is an opening 15 constituting an air inlet to the housing, and in the top wall is an opening 16 constituting the air outlet from the same.

19 indicates a blower, 20 a driving motor therefor, 20' the drive belt, and 21 a structural steel frame on which both the blower and motor are mounted, the frame being slidably supported on a trackway comprising rails 22 secured to the opposite side walls 10, the rails being shown as channel irons whereby to provide below said frame a guideway 23 for an upper tray-type air

filter 18, it being noted that the filter is normally disposed with its front end 18' a substantial distance inwardly of the plane of the front wall 11.

Below the guideway 23 is another similar guideway 23' for a lower tray-type air filter 17, it being noted that the rear end 17' of the filter terminates a substantial distance inwardly of the plane of the back wall 12. An upwardly inclined wall 24 between the filter guideways 23 and 23' insures that air entering the inlet 15 shall flow in part through the upper and in part through the lower filter, it being understood that the wall 24 extends all the way across the housing between the side walls 10 thereof. The front wall 11 comprises panels 11a and 11b. By removing the panel 11a both filters may be withdrawn from the heater housing as will now be readily understood. By removing both of the panels 11a and 11b and an inclined wall indicated at 25, the frame 21 with the blower and motor thereon may also be withdrawn from said housing. As shown in Fig. 7, the wall 25 is slidably connected to the side walls 10 of the heater housing, thus permitting ready removal of the wall 25 by a downward pull.

Above the blower 19 is a horizontally disposed wall 28 which extends between the side walls 10 of the heater housing and from the back wall 12 thereof forwardly to the upper end of the inclined wall 25, the walls 25 and 28 therefore serving to divide the housing into main upper and lower compartments. The wall 28 adjacent the back wall 12 of the enclosure is provided with a rectangular opening 29 shown as surrounded by an upstanding collar 30, the blower 19 having a top outlet 31 adapted to underlie the said opening when the blower is in its normal position in the enclosure, the outlet of the blower being shown as comprising an upstanding collar 32, it being noted that the top of the collar is below the level of the underside of the wall 28 as clearly shown in Figs. 4 and 5.

Secured to and depending from the under side of the wall 28 are two parallel laterally-spaced guide strips 33 which extend from the back wall 12 of the enclosure to a point short of the upper end of the inclined wall 25, the collar 32 of the blower outlet being confined between these strips, there being interposed between the strips and the adjacent sides of the collar a strip of packing material 34 which is preferably secured to and carried by the walls of the collar 32. Interposed between the back wall 12 of the enclosure and the adjacent wall of the collar 32 is another

packing strip 34', preferably carried by the collar wall and adapted to engage the back wall itself or a parallelly extending abutment secured to the wall 12. Secured to the front wall 32 of the blower outlet is an upright flexible packing strip 36 in frictional engagement with the underside of the wall 28. It will now be readily appreciated that the two packing strips 34, the packing strip 34' and the packing strip 36 serve to prevent objectionable leakage of forced air from the blower at the joint between the top of the blower outlet collar 32 and the wall about the opening 29. It will now also be understood that there is a severable connection between the blower outlet and the flow passage 29 in the wall 28 and that the blower unit as a whole may be readily inserted into and withdrawn from the enclosure after the inclined wall 25 and the front panels 11a and 11b have been removed. Removal of the wall 25 is accomplished by first removing the said panels 11a and 11b.

38 indicates a radiator comprising a plurality of upright tubular elements 39 which are relatively long and narrow in cross-section, the elements being secured at their lower end to a horizontally disposed plate or wall 40 having openings with which the lower ends of the tubular elements are in register, it being understood that the openings have the same shape in plan as the bottom openings of the tubular elements. The tubular elements are arranged in laterally spaced relation with their broad sides facing each other to provide air flow passages therebetween, the broad sides of said elements being preferably provided with a series of vertically-spaced horizontally-disposed heat radiating fins 41. Heat absorbing fins not shown may also be provided on the interior walls of the tubular elements, as will be readily understood. The upper ends of the tubular elements are connected to a horizontally disposed wall 42 which constitutes the bottom of a waste gas manifold 43 shown as provided with a top outlet 44 which extends through the top wall 14 of the heater housing.

Between the walls 28 and 40 are two side walls 35 and an end wall 37 whereby to form a compartment wherein burner heads 46 are located. A wall 47 extending downwardly at an angle from the front wall 11 of the enclosure to the adjacent end of the wall 40 separates the burner compartment from the radiator compartment, it being understood that the wall 47 extends all the way across between the side walls 10 of the enclosure. The top wall 14 and the upright walls 10, 11 and 12 of the radiator compartment are shown as double for heat insulating purposes.

Each radiator element 39 is individually internally heated by flames from a burner head 46 therebelow, the burner head having a flat top which is multi-apertured throughout its length to provide a substantially continuous flame from one end of the burner head to the other and crosswise of the burner head, it being understood that the flame in plan is long and narrow, the same as the lower end of the tubular element. As shown in Fig. 8, the apertures in the burner head are preferably formed by a plurality of parallelly extending corrugated strips 48 separated by spacer strips 48'. Burners of this type are commonly known as "ribbon" burners.

Inasmuch as the burner heads 46 are positioned one directly below each tubular element 39, the flame from each burner head passes directly upwardly into the tubular element. The

compartment wherein the burner heads are located therefore remains relatively cool. It will be understood that secondary air is required to complete the combustion of the fuel issuing from the individual burner heads. The inlet for secondary air is indicated at 52 between the two inclined plates 25 and 47. In order that the secondary air may flow into the lower end of the tubular elements 39 with minimum turbulence, a downwardly and outwardly flaring mouth 53 is provided at the lower end of each said tubular element. This mouth will of course be of substantially the same shape in plan as the lower end of the radiator element and is preferably formed by securing to the under side of the plate 40 between adjacent radiator elements an elongated body 54 whose longitudinally extending sides curve downwardly toward each other, as clearly shown in Fig. 3. Screws 55 passed through the body 54 and through the plate 40 and into the bottom flanges of the tubular elements serve to clamp the plate 40 between the said flanges and the said body 54.

Secured to the upright wall 37 which forms the back end of the burner compartment is a bracket 56 having a horizontal row of holes for receiving pins 57 extending from the adjacent end of each burner head, whereby to support the burner heads in proper position in the burner compartment. Means including a horizontally extending gas-supply manifold 58 and mixing tubes 59 for the burners serve to hold the other end of the burner heads in proper position.

A single mixing tube 59 preferably supplies a pair of adjacent burner heads, and such burner heads are cross connected by a flame propagating portion 60, as clearly shown in Fig. 9, with the result that as soon as the combustible mixture issuing from one burner head has been ignited, the adjacent burner head will also be ignited by propagation of the flame along the portion 60. A pilot for igniting the burners is indicated at 61. Referring to Fig. 2, it will be noted that there are three pairs of burner heads and therefore three mixing tubes 59. In order that the burner heads of the pair most remote from the pilot may be ignited, there is provided between adjacent heads of adjacent pairs a flame propagating portion 62 similar to the portion 60 previously described. The portions 60 and 62 are integral with the burner heads and are hollow, whereby gas flows into the same from the adjacent burner heads. The gas discharge slot in said portions 60 and 62 may be formed by a single corrugated strip similar to the strip 48 shown in Fig. 8. It will be understood that by removing the front panel 11b of the front wall 11, access may be readily had to the burner compartment.

The forced air from the blower 19 on entering the radiator compartment is deflected toward the radiator by a plurality of deflector elements 65, 66 and 67. From what has been said, it will be understood that the air flows between the radiator panels for heating and then flows out of the enclosure by way of the top outlet 16.

The primary reason for inclining the walls 25 and 47 is to provide a space wherein the various heater controls (not shown) may be housed.

What I claim is:

1. In an air heater, the combination of a relatively tall cabinet, a partition wall dividing the cabinet into upper and lower compartments and having an opening adjacent one side of the cab-

inet, means comprising said wall and a horizontally extending second wall thereabove forming between themselves a burner compartment at one side of said opening, a blower in the lower compartment for delivering forced air to the upper compartment by way of said opening, a plurality of radiator tubes extending upwardly into the upper compartment from said second wall, burners in said burner compartment individual to each radiator tube, and means for supporting said burners in alinement with and sufficiently close to their respective radiator tubes to fire directly therein to whereby to avoid substantial heating of said second wall.

2. In an air heater, the combination of a relatively tall cabinet, a partition wall dividing the cabinet into upper and lower compartments and having an opening adjacent one side of the cab-

inet, means comprising said wall and a horizontally extending second wall thereabove forming between themselves a burner compartment at one side of said opening, a blower in the lower compartment for delivering forced air to the upper compartment by way of said opening, a plurality of radiator tubes extending upwardly into the upper compartment from said second wall, burners in said burner compartment individual to each radiator tube, means for supporting said burners in alinement with and sufficiently close to their respective radiator tubes to fire directly therein to whereby to avoid substantial heating of said second wall, and a removable wall comprising a part of the cabinet side wall for permitting access to the burner compartment.

JOHN R. DENISE.