Oct. 4, 1949. R. W. DE LANCEY 2,483,489

HOT AIR FURNACE

Filed Jan. 26, 1946 2 Sheets-Sheet 1

Fig. 1.

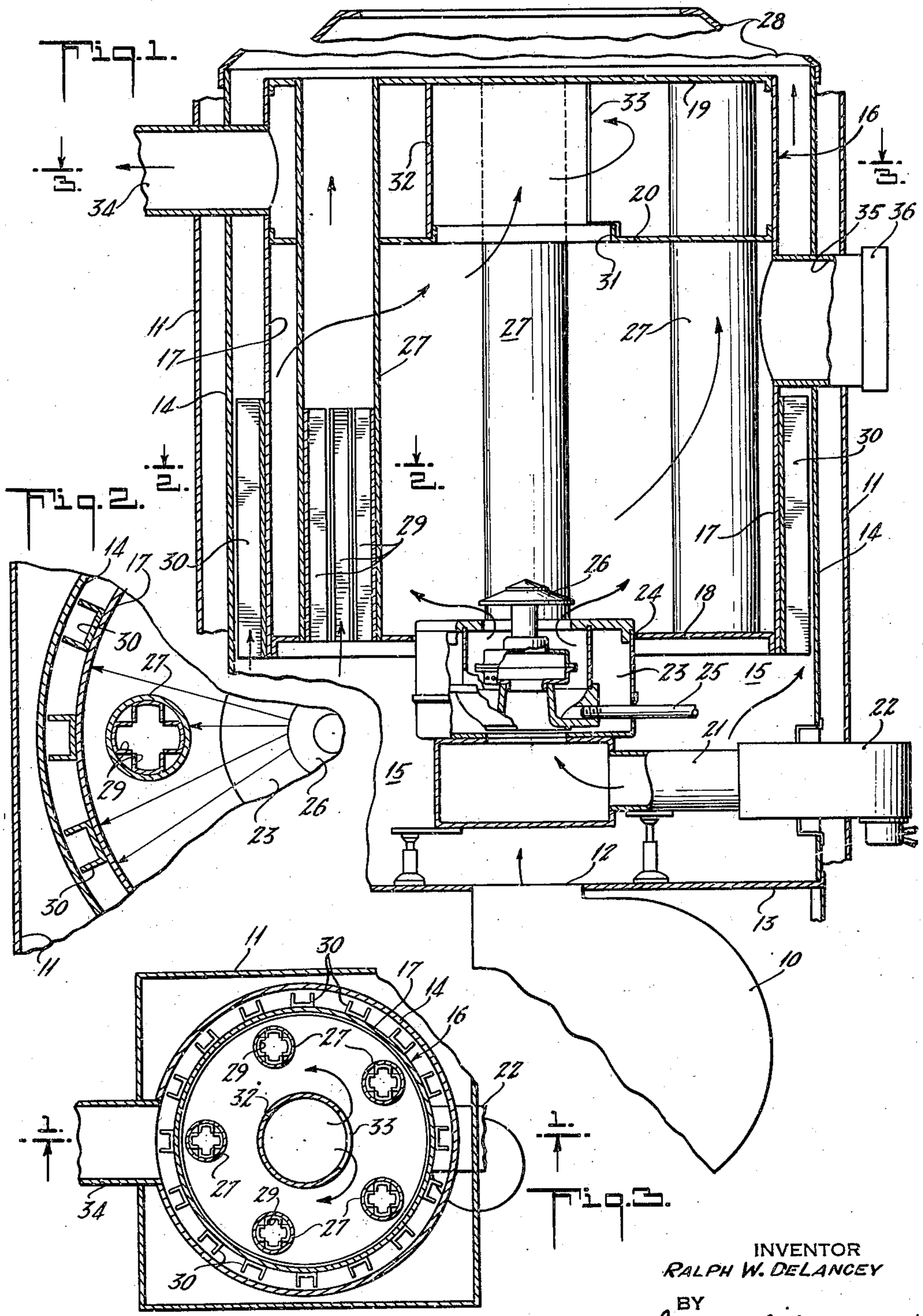

Fig. 2.

Fig. 3.

INVENTOR
RALPH W. DELANCEY
BY
ATTORNEY

Oct. 4, 1949. R. W. DE LANCEY 2,483,489

HOT AIR FURNACE

Filed Jan. 26, 1946 2 Sheets-Sheet 2

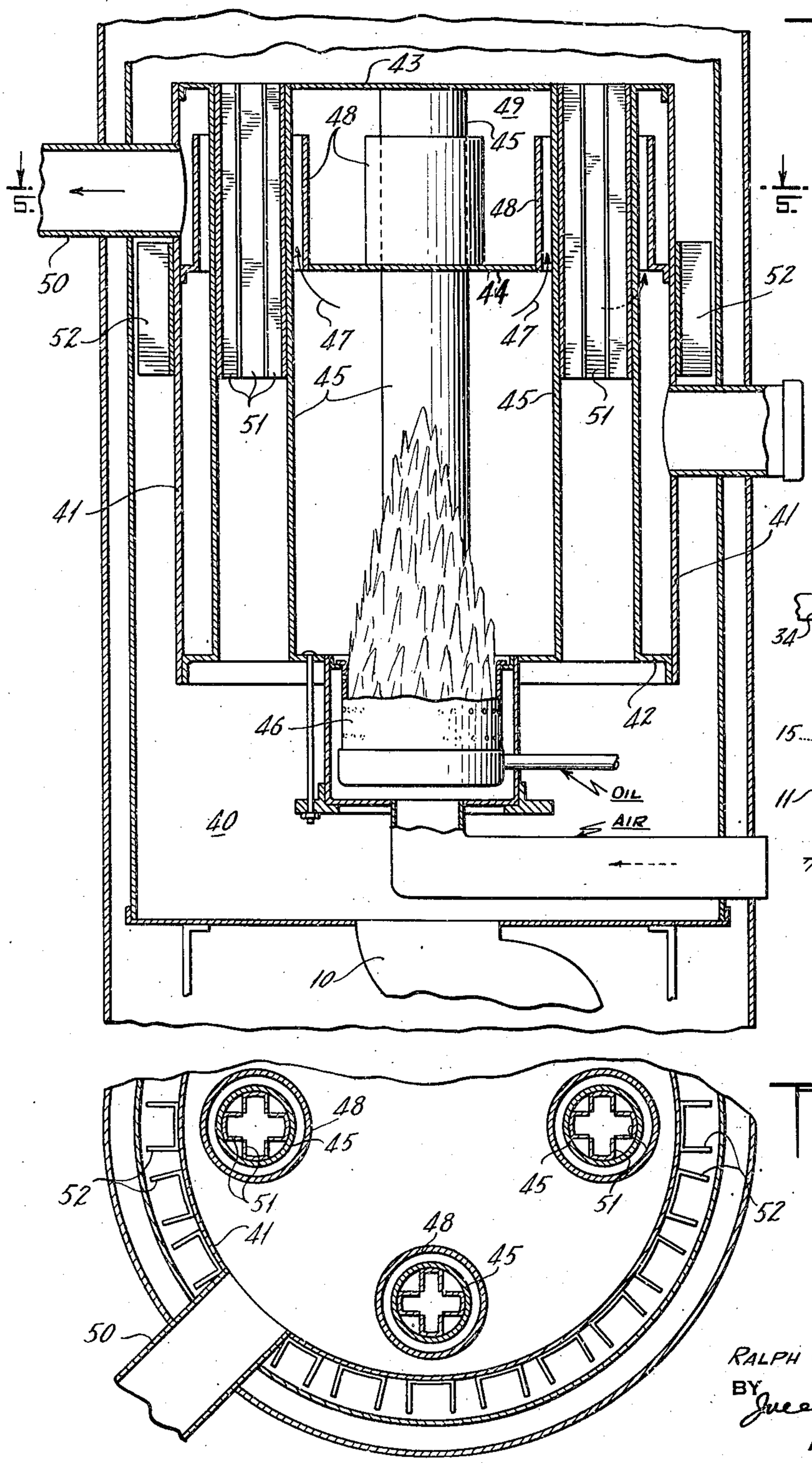

Fig. 4.

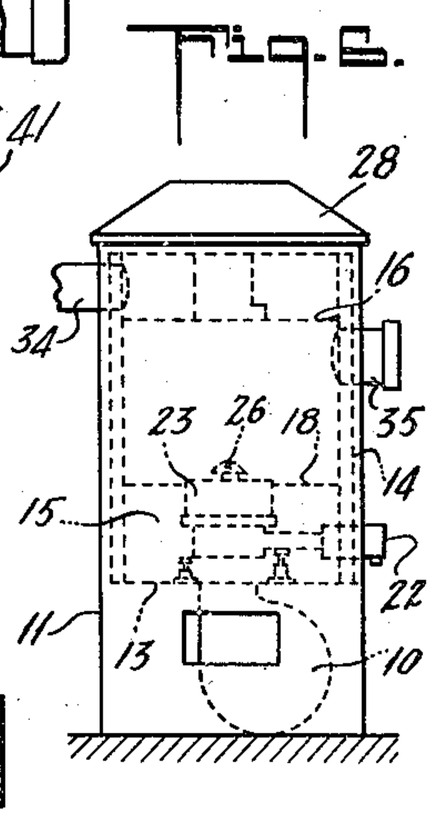

Fig. 6.

Fig. 5.

INVENTOR
RALPH W. DELANCEY
BY Jules S. Silverman
ATTORNEY

Patented Oct. 4, 1949

2,483,489

UNITED STATES PATENT OFFICE

2,483,489

HOT-AIR FURNACE

Ralph W. De Lancey, Meriden, Conn., assignor to The Miller Company, Meriden, Conn., a corporation of Connecticut

Application January 26, 1946, Serial No. 643,503

8 Claims. (Cl. 126—116)

1

The present invention relates to hot air furnaces, and is more particularly directed toward forced circulation hot air furnaces employing burners, which may be pot-type vaporizing burners or gas burners.

The present invention contemplates hot air heating furnaces of the above type in which the blower employed for producing forced air circulation causes fresh air to enter into an air chest below a combustion drum, this air chest being partly occupied by the burner. Air for combustion is supplied by a suitable blower or duct independent of the forced air circulation blower. According to the present invention the fresh air passes from the air chest up through an air space between the combustion drum and an outer housing and up through tubes which pass through the combustion drum. The outside of the drum and the inside of the tubes in the regions where the heat from the burner is concentrated on to them are provided with fins to facilitate the rapid transfer of heat to the fresh air and avoid overheating. The location of these fins depends upon the type of burner employed. The combustion drum has a lower combustion space and an upper flue gas circulating space leading to a stack with baffle means arranged between the combustion space and stack so as to promote turbulence and circulation of the gases to cool them to a low stack temperature.

Other and further objects will hereinafter appear as the description proceeds.

The accompanying drawings show, for purposes of illustrating the present invention, two embodiments in which the invention may take form, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In these drawings:

Figure 1 is a vertical sectional view on the line 1—1 of Figure 3 showing a hot air furnace adapted for operation by a forced draft pot-type burner with flame spreader;

Figure 2 is a fragmentary horizontal sectional view on the line 2—2 of Figure 1;

Figure 3 is a horizontal sectional view on the line 3—3 of Figure 1;

Figure 4 is a view similar to Figure 1 of a furnace adapted for operation by a natural draft oil burner or gas burner;

Figure 5 is a cross-section on line 5—5 of Figure 4; and

Figure 6 is a diagrammatic side elevational view of a complete hot air furnace.

The present invention contemplates furnaces

2

of the type suitable for central heating plants in a comparatively small house, that is to say, one which can be heated by a burner having an input of from 50,000 to 100,000 B. t. u. per hour.

As the parts may be made smaller than the more common forced circulation hot air furnaces employed for larger outputs, a blower may be placed at the bottom of the unit, the burner above the blower, the combustion drum and air passages above the burner and yet the entire structure be capable of being installed in the spaces ordinarily available for furnaces.

In Figures 1 and 6 the blower is indicated at 10 as being at the bottom of a more or less ornamental outer housing 11 having an air filter inlet 12 near the bottom. The blower 10 discharges air through a central opening 12 in a plate 13 suitably supported at the desired distance above the floor. This plate is secured to the bottom of a generally cylindrical outer drum or housing 14 of sufficient height to provide an air chest 15 and combustion drum generally indicated at 16. The combustion drum has an outer cylindrical wall 17, a bottom plate 18, a top plate 19 and an intermediate plate 20. The wall 13 at the bottom of the air chest supports the air supply duct 21, blower 22 and pot-type burner 23. This burner extends up through the central opening 24 in the bottom wall of the combustion drum. The burner is supplied by fuel through a pipe 25 and controls, not shown, and is adapted to discharge flame under a flame spreader indicated at 26. This flame spreader is so disposed as to cause a wide spreading of the flame, for purposes to be referred to later.

The plates or walls 18, 19 and 20 are provided with aligned apertures adapted to receive vertical tubes 27. These tubes are open at the bottom and top and are adapted to conduct air from the air chest 15 to the dome space indicated at 28 above the upper plate 19 of the combustion drum. The lower portions of the tubes 27 are provided with sheet metal fins 29 and the outside of the lower portion of the combustion drum wall 17 is also provided with fins 30. These fins may be made out of U-shaped strips of sheet metal and welded to the tubes 27 and drum wall 17.

The plate 20 has a central opening 31 adapted to receive a baffle in the form of tube 32 which has a vertical slot or opening 33, so that the products of combustion from the combustion chamber below plate 20 can be discharged into the flue gas circulating chamber between the plates 19 and 20. A smoke pipe 34 extends through the upper part of the combustion drum

and outer wall 14. This smoke pipe is on the side of the structure opposite the opening 33. A tube 35 extends through the front of the combustion drum and outer wall 14 and is closed by a door 36 so as to provide an accessible inspection opening.

The heat produced by a burner having an input of 84,000 B. t. u. per hour can be very efficiently transferred to the hot air for house heating in a structure having an outside diameter of approximately 24'' and of an over all height of approximately 54''. The combustion drum is so small and its outside walls and the tubes are so close to the burner that flame actually plays on the lower portion of the tubes 27 and the lower portions of the walls of the combustion drum and the purpose of the fins 29 and 30 is to take the heat away from these walls, transfer it to the stream of air so rapidly that the metal is not operated at too high a temperature. It can be kept at a low enough temperature so as to avoid visible hot spots and deterioration from overheating. In a structure such as described the drum may, for example, have a diameter of about 18'' and the difference between the walls 14 and 17 be about 1''. With the construction above described, the heated air can be delivered into the dome above the combustion drum at a proper temperature for house heating and the air coming through the tubes and up through the space between the combustion drum and the outer housing will have substantially the same temperature. The heat transfer is highly efficient.

In the form shown in Figures 4 and 5, the blower 10 discharges air into an air chest 40 similar to the air chest 15. The combustion drum 41 has a bottom plate 42, top plate 43, intermediate plate 44 and tubes 45, generally similar to those above described. This furnace is adapted to be fired by a natural draft, pot-type burner 46 or a gas burner. These types of burner produce tall comparatively narrow flames as indicated in the drawing. Such flames, instead of spreading out as the flame illustrated in Figure 1, reach up toward the intermediate plate 44 where the combustion gases are diverted as indicated by the arrows 47 to pass into tubes 48 extending upwardly from the intermediate plate 44 and surrounding the upper portions of the fresh air tubes 45. The combustion gases are discharged from the tubes 48 into the recirculation space 49 between plates 43 and 44 where the gases are further cooled before they are discharged into the stack 50. As the hot combustion gases are spread by the plate 44 they are brought against the upper portions of the tubes 45 in the lower combustion space and against the upper outer parts of the combustion drum walls below the plate 44. These portions of the tubes 45 and outer drum walls carry fins 51 and 52 as indicated in the drawings. These fins function similarly to the fins above described so as to effect a rapid transfer of heat to the fresh air in the regions where the heat from the burner is concentrated on to them. The combustion gases passing up through the space between the tubes 45 and 48 are rapidly cooled in this passage and as they circulate about in the recirculation space, keep the central portion of the plate 44 from overheating.

The sizes furnished above are by way of example. With change of input the diameters of the parts will be altered. The forced draft type of burner with spreader is better adapted for the larger outputs in the range given than the natural draft type of burner, for the long flame of the latter would require too tall a furnace.

Since it is obvious that the invention may be embodied in other forms and constructions within the scope of the claims, I wish it to be understood that the particular forms shown are but a few of these forms, and various modifications and changes being possible, I do not otherwise limit myself in any way with respect thereto.

What is claimed is:

1. A hot air furnace comprising a combustion drum having a vertical cylindrical outer wall, a top wall having a plurality of openings near is periphery, a bottom wall having similarly spaced and aligned openings and a central opening, an intermediate wall having near its periphery similarly spaced and aligned openings and a central opening, the intermediate wall being closer to the top wall than the bottom wall, vertical air tubes extending through the aligned openings in the top, bottom and intermediate walls, a tube extending from the central opening in the intermediate plate to the top plate and having a lateral discharge slot, a smoke pipe extending out of the drum wall between the upper and intermediate plates and on the side opposite the slot, an outer drum concentric with the combustion drum to provide an outer air passage, the outer drum extending below the combustion drum to provide an air chest, means including a blower for supplying fresh air to the air chest and forcing air through the air tubes and the space between the drums, and a forced draft fuel burner in the central opening in the lower wall of the drum and having a spreader to spread flame against the lower portions of the air tubes and combustion drum walls, the lower portions of said air tubes and of the walls of said combustion drum carrying vertical fins in the path of the fresh air for facilitating transfer of heat to the fresh air.

2. A hot air furnace as claimed in claim 1, wherein the air chest has a bottom wall with a central opening and the fresh air blower is carried below this bottom wall and discharges air through the opening.

3. A hot air furnace comprising a vertical cylindrical housing having a bottom plate provided with a central opening, means including a blower discharging air upwardly through said opening, a combustion drum of smaller diameter than the housing and having a bottom plate spaced above the first mentioned bottom plate to form an air chest to receive the air discharged by the blower, an upper plate and an intermediate plate, all three of the plates of said combustion drum being provided with aligned openings, air tubes extending through said openings to admit air from the air chest and discharge it above the combustion drum, the bottom plate of the combustion drum having a central opening, a fuel burner mounted in said central opening and discharging flame and combustion products into the lower zone of the combustion drum, said burner including means to direct flame against the tubes and drum wall, the intermediate plate having a central opening, a pipe extending from the opening in the intermediate plate to the upper plate and having a laterally opening slot to discharge the gases laterally for circulation in the space above the intermediate plate, and a smoke pipe opening into the space between the upper and intermediate plates and located on the side opposite the slot.

4. A hot air furnace comprising an upwardly opening, outer, vertical housing closed at the

bottom except for a fresh air inlet opening, blower means for forcing fresh air into the housing through said opening, a combustion drum having its side wall spaced from the housing and a bottom plate above the closed bottom of the housing to form an air chest, the bottom plate of the combustion drum having a central opening, a fuel burner mounted in said central opening and discharging products of combustion into the drum, the drum having a top plate below the top of the housing, and intermediate plate and vertical tubes extending through the three plates to conduct fresh air from the air chest up through the drum and discharge it into the housing above the drum, the intermediate plate dividing the drum into a lower relatively deep space for combustion and an upper relatively shallow space for circulating combustion gases, the intermediate plate being apertured to allow products of combustion to pass from the combustion space to the circulation space, a smoke pipe extending through the outer housing and combustion drum wall above the intermediate plate, baffle means in the path of the products of combustion between the combustion space and the smoke pipe, flame diverting means to direct flame onto the tubes and the combustion drum wall, and cooling fins in the tubes and on the outside of the drum wall in the zone reached by the flame and adapted to rapidly transfer heat to the fresh air passing the same.

5. A hot air furnace as claimed in claim 4, wherein the flame directing means is in the form of burner carried flame spreader which causes the flame to impinge on the lower portions of the tubes and drum wall.

6. A hot air furnace as claimed in claim 4, wherein the flame directing means is in the form of burner carried flame spreader which causes the flame to impinge on the lower portions of the tubes and drum wall, the intermediate plate is centrally apertured for said products of combustion, and the baffle means is in the form of a tube extending from the top wall to the intermediate wall and having an opening in the side opposite the smoke pipe.

7. A hot air furnace as claimed in claim 4, wherein the central portion of the intermediate plate is closed, the burner delivers an upright flame which reaches the intermediate plate to be spread thereby so as to impinge on the tubes and drum wall adjacent the intermediate plate, the apertures for combustion gases are about each fresh air tube, and wherein the baffle means includes tubes spaced from the fresh air tubes and extending from the intermediate plate part way to the upper plate.

8. In a heating furnace, the combination with a housing having a side wall and a bottom wall having a central opening, means to support the housing with the bottom wall above the floor, fresh air blower means below the bottom wall and having its discharge outlet extending to the opening in the bottom wall, a coaxial combustion drum of smaller diameter than the housing wall to provide an air space about the periphery of the drum, the top of the drum being at substantially the level of the top of the housing wall, the bottom of the drum being spaced above the bottom of the housing to form an air chest and having a central opening, a fuel burner received in the opening in the bottom wall of the drum, the fuel burner having means to deflect the flame toward the lower part of the drum wall and an air supply duct extending laterally of the air chest, forced draft producing means including a blower connected to the supply duct, the combustion drum having an intermediate wall which divides it into a lower combustion chamber and an upper flue gas circulation chamber, the intermediate wall having a central opening, a laterally opening tube between the top wall and the intermediate wall to receive products of combustion through the opening in the intermediate wall and discharge the same laterally into the circulation chamber, a smoke pipe extending through the wall of the combustion drum and the outer wall and disposed on the side of the tube opposite the lateral opening, fresh air tubes extending upwardly through the bottom, intermediate and top walls of the combustion drum, vertical fins inside the lower portions of the vertical tubes, and vertical fins carried by the lower outer portions of the combustion drum wall.

RALPH W. DE LANCEY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
173,173	Lanphere	Feb. 8, 1876
508,475	Hornish	Nov. 14, 1893
927,792	Harmon	July 13, 1909
1,780,984	Shelton	Nov. 11, 1930
2,056,465	Juhnke	Oct. 6, 1936
2,128,245	Hager	Aug. 30, 1938
2,158,742	Cook	May 16, 1939
2,196,703	Livar	Apr. 9, 1940
2,286,665	Blair	June 16, 1942
2,420,875	Frentzel et al.	May 20, 1947