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GAS FIRED SPACE HEATER

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3 Sheets-Sheet 1

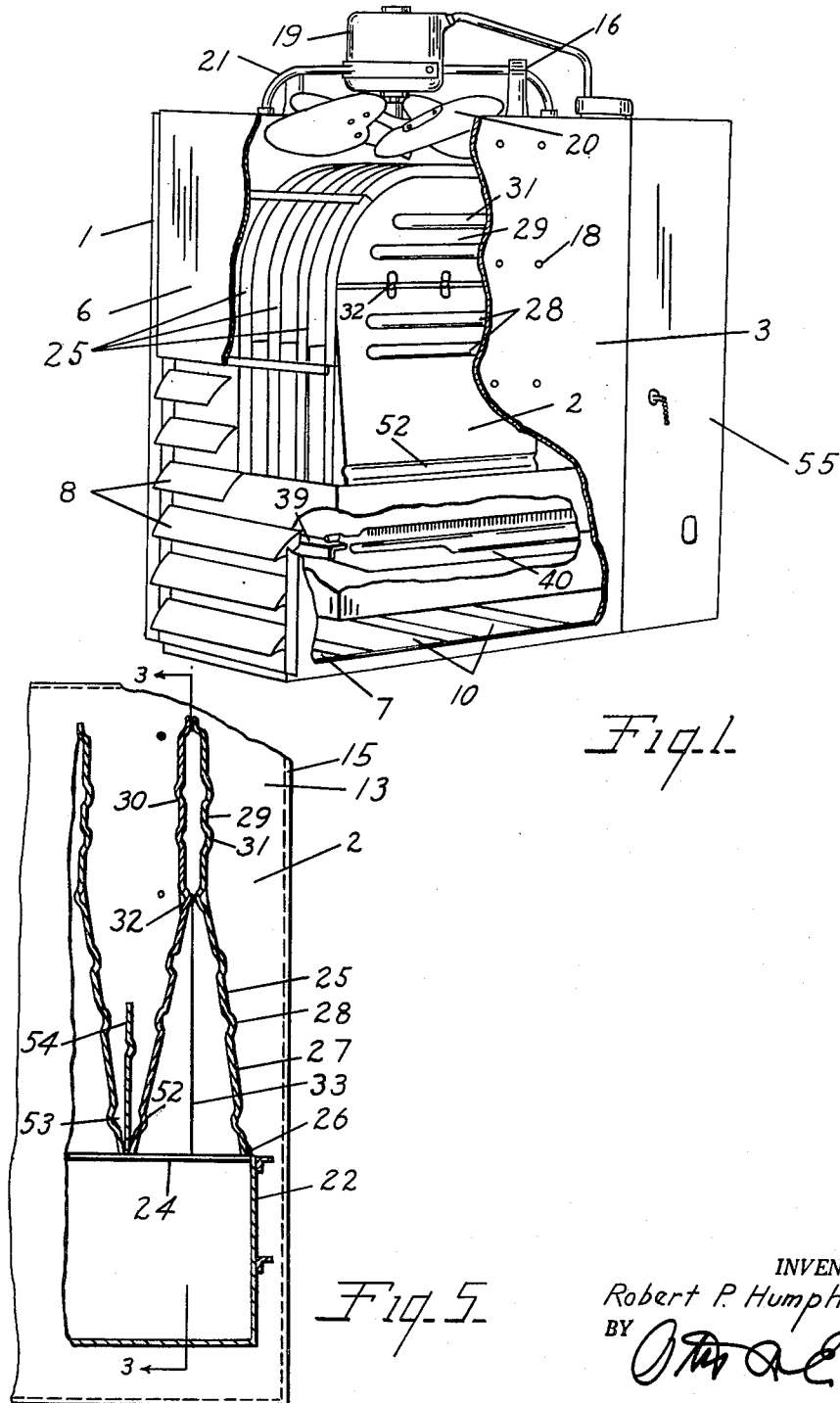


Fig. 1

Fig. 5

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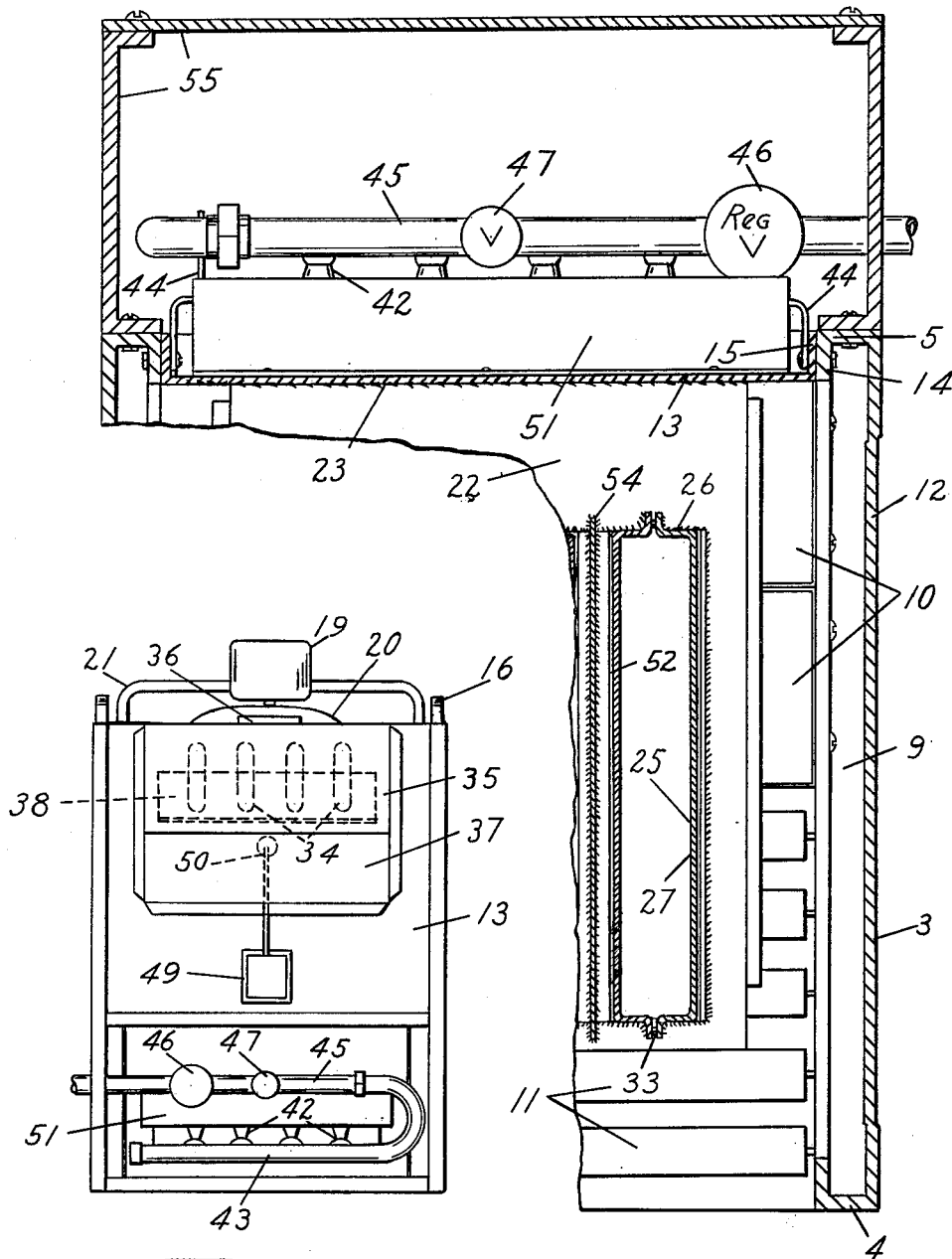


Fig. 7.

Fig. 6.

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GAS FIRED SPACE HEATER

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This invention relates to improvements in gas fired space heater. The principal objects of this invention are:

First, to provide a space heater which utilizes gaseous fuel burners operating under atmospheric pressure and which provides forced air circulation downwardly over the heat exchange surfaces of the heater.

Second, to provide a gas fired space heater of the type that is suspended over the space to be heated and which can be adjusted to discharge hot air downwardly or laterally in different directions.

Third, to provide a burner box and heat exchange flue structure for a space heater in which spaced flues are arranged to have air blown downwardly therebetween to heat the air and to keep all surfaces of the flues from becoming over heated by the products of combustion within the flues.

Fourth, to provide a space heater in which a plurality of longitudinally elongated gaseous fuel burners are positioned in a burner box to operate under atmospheric pressure so that a single pilot light or igniter can function to light all of the burners and so that the burners operate without interference from the forced air circulated over the heat exchange surfaces of the heater.

Other objects and advantages of the invention will be apparent from a consideration of the following description and claims. The drawings, of which there are three sheets, illustrate a highly practical form of the space heater and two variations in the louver arrangement of its casing.

FIG. 1 is a perspective view partially broken away in cross section of the assembled space heater with one arrangement of discharge louvers in the case.

FIG. 2 is a perspective view of the space heater partially broken away with a second form of louver arrangement in its case.

FIG. 3 is a vertical longitudinal cross sectional view through the heat exchange element of the heater taken along the plane of the line 3—3 in FIG. 5.

FIG. 4 is a transverse cross sectional view through one of the burners taken along the plane of the line 4—4 in FIG. 3.

FIG. 5 is a fragmentary transverse vertical cross sectional view through the heat exchange unit taken along the plane of the line 5—5 in FIG. 3.

FIG. 6 is a fragmentary horizontal cross sectional view through the assembled heat exchanger and casing taken along a plane corresponding to the plane of the line 6—6 in FIG. 3.

FIG. 7 is a rear elevational view of the space heater with the rear cover walls removed.

The heater consists generally of a box-like casing 1 having a heat exchanger generally indicated at 2 mounted therein. More specifically the casing 1 consists of side panels 3 with laterally turned front flanges 4 and rear flanges 5. At the front edges of the side panels the upper portions of the lateral flanges 4 are connected by an upper front panel 6 and a selectively removable lower front panel 7 appearing in FIG. 2. The space below the upper front panel 6 or alternatively below the removable panel 7 is partially closed by a series of adjustable air directing louvers 8. The bottom of the side walls 3 have laterally inwardly turned flanges 9 thereon which support removable bottom panels 10. When the front panel 7 is removed for the addition of

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extra louvers 8 in the front wall of the casing it is normally replaced in the bottom of the casing as shown in FIG. 1 to replace bottom louvers 11 removed from the bottom wall of the casing. Partially offset knock out panels 12 in the side walls 3 permit the alternative mounting of air discharge louvers in the side walls of the casing.

The rear of the casing 1 is closed by a relatively heavy back plate 13 which forms a support for a burner and heat exchange assembly 2 to be described. The lateral flanges 5 on the rear edges of the side plates 3 have forwardly turned flanges 14 that are lapped alongside of and are secured to rearwardly turned flanges 15 on the back plate 13. The side walls 3 of the casing thus support all of the elements of the heater and hanger rods 16 which are secured to the side panels as by the straps 17 and rivets 18 in FIG. 2 suspend the heater in any desired operating position. It will be noted that the laterally turned flanges 5 on the side panels space the heat exchanger 2 from the inside of the casing. A motor 19 and fan 20 are supported over the open top of the casing by means of suitable brackets 21 to discharge air to be heated downwardly through the casing and over the heat exchanger 2.

The heat exchanger 2 consists of a rectangular box 22 open at its rear end and welded to the edges of a rectangular hole in the back plate 13 as at 23. The top wall of the burner box 22 defines a rectangular opening 24 which is closed by the lower ends of a series of flues 25. The lower ends of the flues 25 are welded to each other and to the edges of the opening 24 as at 26 (see FIGS. 5 and 6) to form a gas tight joint between the flues and the burner box.

As appears most clearly in FIGS. 5 and 6, the flues 25 consist of sheet metal stampings forming upwardly converging side walls 27 with longitudinal reinforcing ribs 28 formed therein. At their upper edges the side walls 27 merge with spaced parallel side walls 29 of horizontally extending exhaust ducts 30. The exhaust duct walls may have other reinforcing ribs 31 stamped therein and at spaced points along the junction of the flue walls and exhaust duct walls the spaced walls are stamped and welded together as at 32. It has been found that the combination of the reinforcing ribs 28 and 31 and the cross connections 32 eliminates objectionable noises due to flexing of the flue walls as they expand and contract upon heating and cooling.

The ends of the side walls of the flues 25 are turned laterally and welded together as at 33 and the front ends of the exhaust ducts 29 are similarly closed. With reference to FIG. 3 it will be noted that the front ends of the exhaust ducts 29 are curved rearwardly and that the rear ends of the exhaust ducts project substantially to the rear of the flues 25. The rear ends of the exhaust ducts register with and are welded to the edges of exhaust ports 34 in the upper portion of the back plate 13. A continuous gas tight passage is thus formed from the open rear end of the burner box 22 through the several flues 25 and exhaust ducts 29 to the back side of the back plate 13. Products of combustion exhausted through the ports 34 are collected in a smoke box 35 mounted on the back side of the back plate over the ports. The smoke box 35 has a connection 36 for a smoke pipe and its lower portion is provided with a back draft equalizing opening 37. A baffle 38 within the smoke box prevents the hot products of combustion from escaping from the opening 37.

A rail 39 secured along the inside of the front wall of the burner box 22 supports the front ends of the elongated gas burners 40. The gas burners have a series of burner ports 41 formed along their upper edges and downwardly inclined mixer tubes 42 at their rear ends.

The rear ends of the mixer tubes are connected to and supported by suitable gas supply nipples on a manifold 43. The manifold 43 is supported by brackets 44 projecting rearwardly from the back plate 13. The manifold is curved upwardly and connected to a supply pipe 45 and the supply pipe is provided with a suitable pressure regulator 46 and a solenoid controlled shutoff valve 47. A single pilot light or other ignitor 48 is positioned in the burner box adjacent to one of the burners and a suitable thermostatic and electrical control for the valve 47 and the fan motor 19 is mounted on the back panel 13 as at 49. The thermostatic element 50 of the control projects through a hole provided therefor in the back panel to sense the temperature adjacent to the flues 25.

A downwardly and rearwardly inclined baffle plate 51 overlies the open rear end of the burner box to below the level of the burner ports 41 to prevent gases from leaking out the back end of the burner box. All of the flame and other gases are directed upwardly into the heat exchange flues 25 and since one burner 40 is positioned under each flue, there is little tendency for the gases to escape to the rear. The lower ends of the heat exchange flues 25 being more closely adjacent to the flame of the burners are heated to the highest temperature and unless this heat is satisfactorily transferred and carried away by the air circulating through the casing the flues will become overheated and will deteriorate rapidly. It is an important feature of the invention that the side walls 27 of the flues are provided with radially inwardly turned horizontal ribs 52 adjacent their lower edges. With reference to FIGS. 5 and 6 it will be noted that the downwardly converging space between adjacent flues is locally widened or enlarged as at 53 by the gaps formed by these ribs 52. Since the fan 20 creates a velocity pressure in the casing that builds up between the adjacent flues and the burner box, there is a tendency for the air to spill out from between the flues at the front and back at the areas of least resistance or above the lower edges of the flues leaving bands of little or insufficient air circulation along the lower edges of the flues. By creating the horizontal enlarged passages 53 the area of increased pressure created immediately above the ribs 52 functions to insure the discharge or flow of a continuous volume of air into and through the enlarged passages 53 to keep the lower edges of the fins cooled to a satisfactory temperature. It was found that the temperature of flue walls without the lower ribs 52 rose to over 1100° F. whereas flues with the ribs 52 functioning with the same burner did not rise above 650° F. The vertical divider plates 54 positioned between adjacent flues act as heat exchange ribs to pick up heat at their lower edges and conduct it into the air stream between the flues but they do not interfere with the air flow increasing function of the ribs 52.

In operation of the heater the fan 20 functions to build up a static pressure within the casing 1 so that the heated air can be discharged through louvers positioned either in the bottom, side or front walls of the casing or in any combination of positions. The element of the heat exchange flues and particularly the air flow inducing ribs 52 permits the burners 40 to be positioned closely adjacent the lower ends of the flues so that sufficient natural draft is created in the relatively short flues to carry away the products of combustion by natural atmospheric draft. The combined height of the flues 25 and exhaust ducts 29 may be as little as 16 to 18 inches and still provide sufficient draft for a high capacity burner. While it does not enter into the functioning of the burners or the air circulating fan and casing, it is usually found desirable to enclose the controls and smoke box on the rear of the heater by suitable panels 55.

Having thus described the invention, what is claimed as new and is desired to be secured by Letters Patent is:

1. A gas fired space heater comprising: burner box means having an opening in the top thereof; a plurality

of flues disposed adjacent each other and in communication at one end thereof with said opening, each of said flues having upwardly converging side walls; smoke pipe means in communication with the opposite ends of said flues; burner means disposed within said burner box means; a casing in spaced relationship to and surrounding said flues and said burner box means, said casing defining air passageways along the sides of said burner box means; louver means disposed in said casing means below said burner box means; the lower contiguous edges of the adjacent side walls of adjacent flues being joined together; fin means extending upwardly from said joined edges for conducting excess heat therefrom; and means mounted adjacent the top of said flues to force air to be heated downwardly between said flues, horizontally along said joined edges and through said passageways to be directed downwardly through said louver means to heat the space surrounding said heater.

2. A gas fired space heater comprising: burner box means having an opening in the top thereof; a plurality of flues disposed adjacent each other and in communication at one end thereof with said opening; smoke pipe means in communication with the opposite ends of said flues; burner means disposed within said burner box means; a casing in spaced relationship to and surrounding said flues and said burner box means, said casing having side walls, a front wall and a bottom wall; means forming a part of said bottom wall defining an opening adapted to receive both louvers and removable panels; means forming a part of said front wall defining an opening adjacent the bottom thereof and adapted to receive both louvers and removable panels, said opening in said front wall having the same dimensions as said opening in said bottom wall; means mounted adjacent the top of said flues and adapted to force air to be heated downwardly between said flues and forwardly of said flues near the bottom thereof and through said openings in said casing; louvers disposed in one of said openings; and removable panels disposed in the other of said openings, whereby said louvers and removable panels may be interchanged in said openings to vary the direction of flow of heated air from said heater.

3. Apparatus as claimed in claim 2 wherein both of said two openings are adapted to receive and retain louvers in a position wherein each louver is disposed parallel to the edge of said casing between said two openings.

4. Apparatus as claimed in claim 2 further comprising: means forming a part of said casing defining an opening in at least one of said side walls adjacent the bottom thereof, said opening adapted to receive both louvers and a knock-out panel; and a knock-out panel removably disposed in said opening, whereby when it is desired to direct heated air from the side of said heater said knock-out panel may be removed and replaced by louvers.

5. In a heater comprising burner box means having an opening in the top thereof, and a plurality of adjacent flues disposed in communication with said opening, said flues having upwardly converging side walls, and the lower contiguous edges of the adjacent side walls of adjacent flues being joined together, said heater including means adjacent the top of said flues and adapted to force air to be heated downwardly between said flues and horizontally along said lower contiguous edges, the improvement comprising: inwardly directed offset portions disposed in opposed relationship in the side walls of said flues adjacent the lower edges thereof and substantially parallel thereto, thereby defining an enlarged passageway along the junction of each pair of adjacent flues to allow air to circulate therealong to receive and thereby utilize the excess heat present at said junction and also to prevent overheating of the flues at said junction.

6. The improvement as claimed in claim 5 further comprising fin means extending upwardly from said junction

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into said passageway between adjacent flues, to conduct excessive heat from said junction.

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