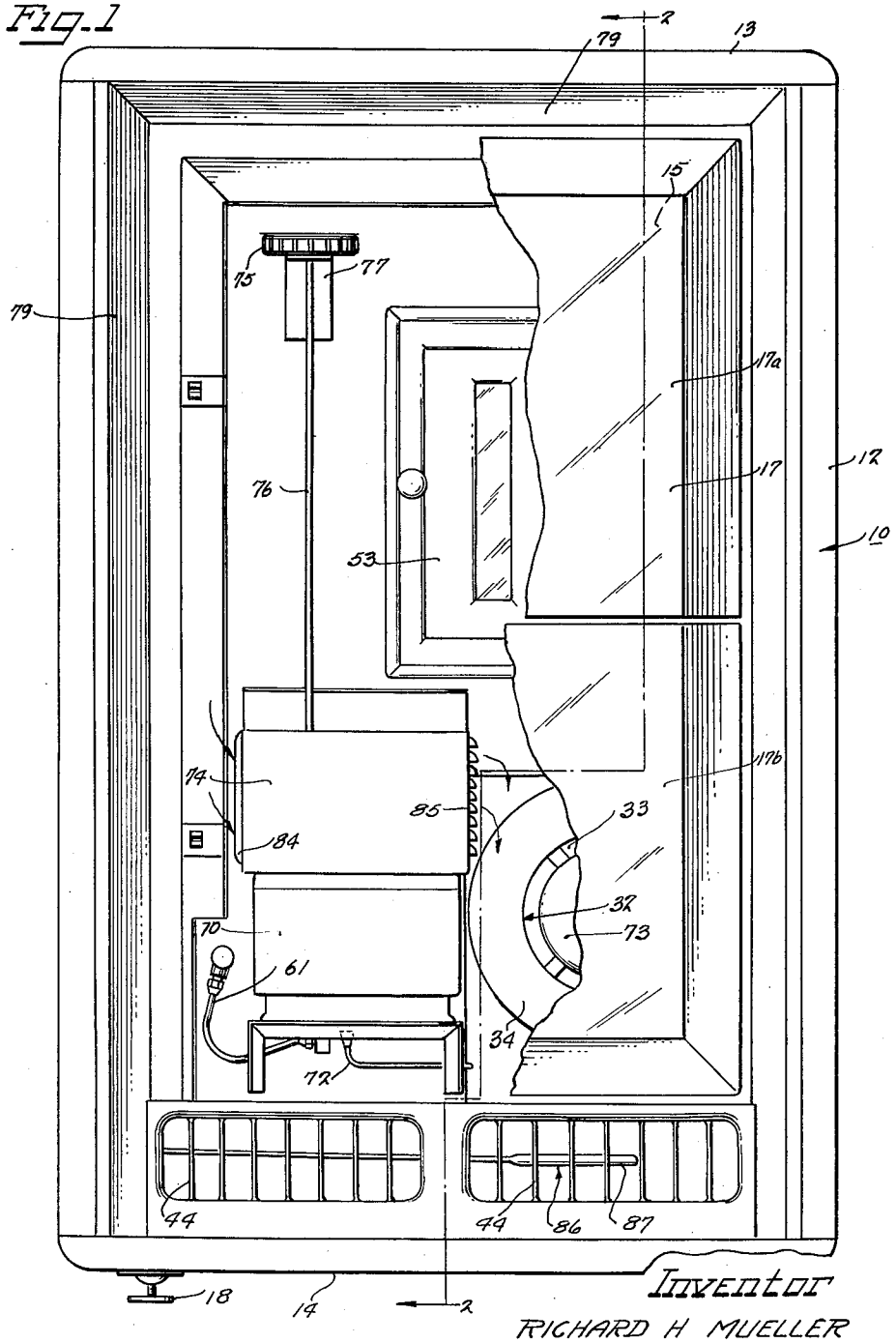
Feb. 26, 1963 R. H. MUELLER 3,078,837

HEATER

Filed Feb. 24, 1960 4 Sheets-Sheet 1

Fig. 1



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HEATER

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Fig. 2

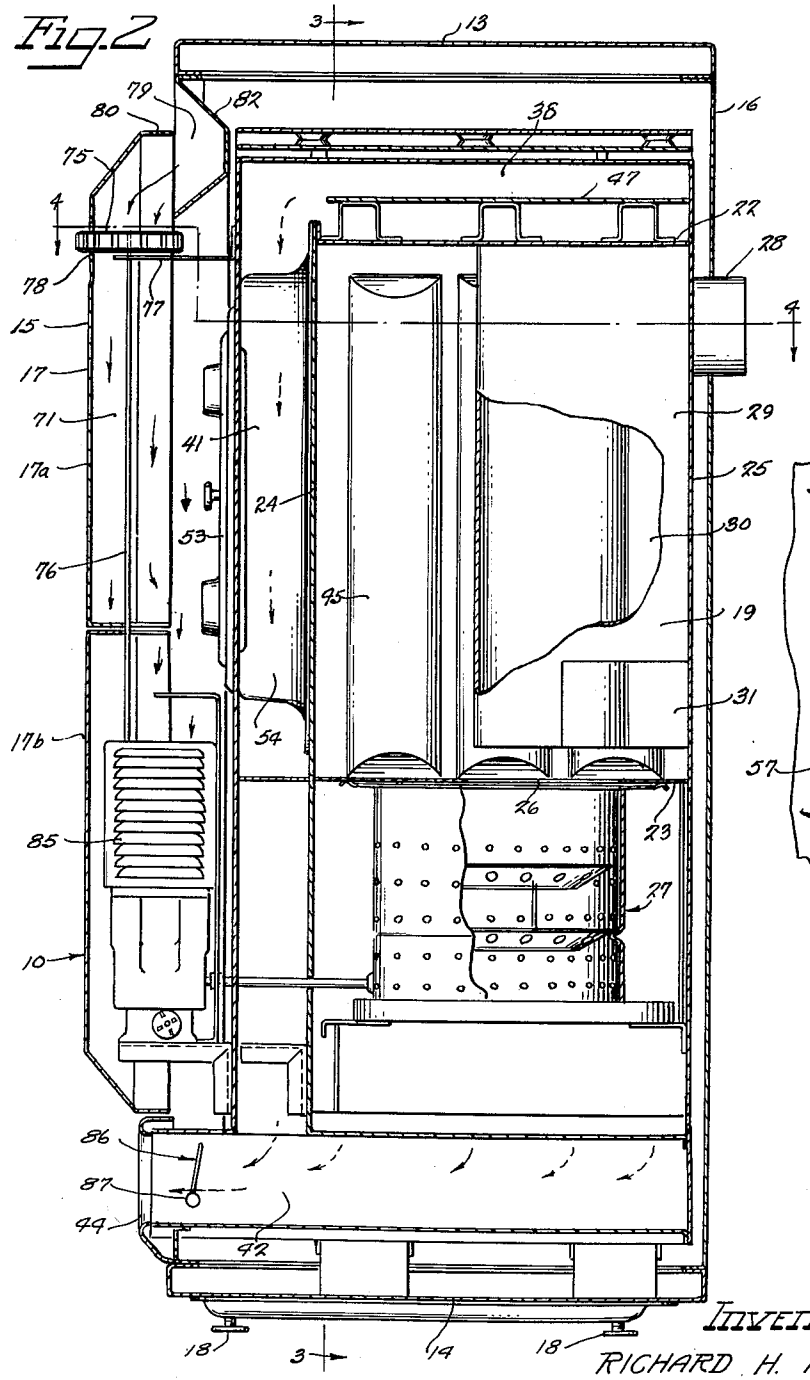
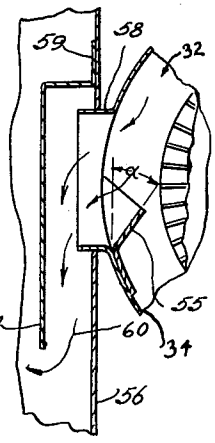


Fig. 7



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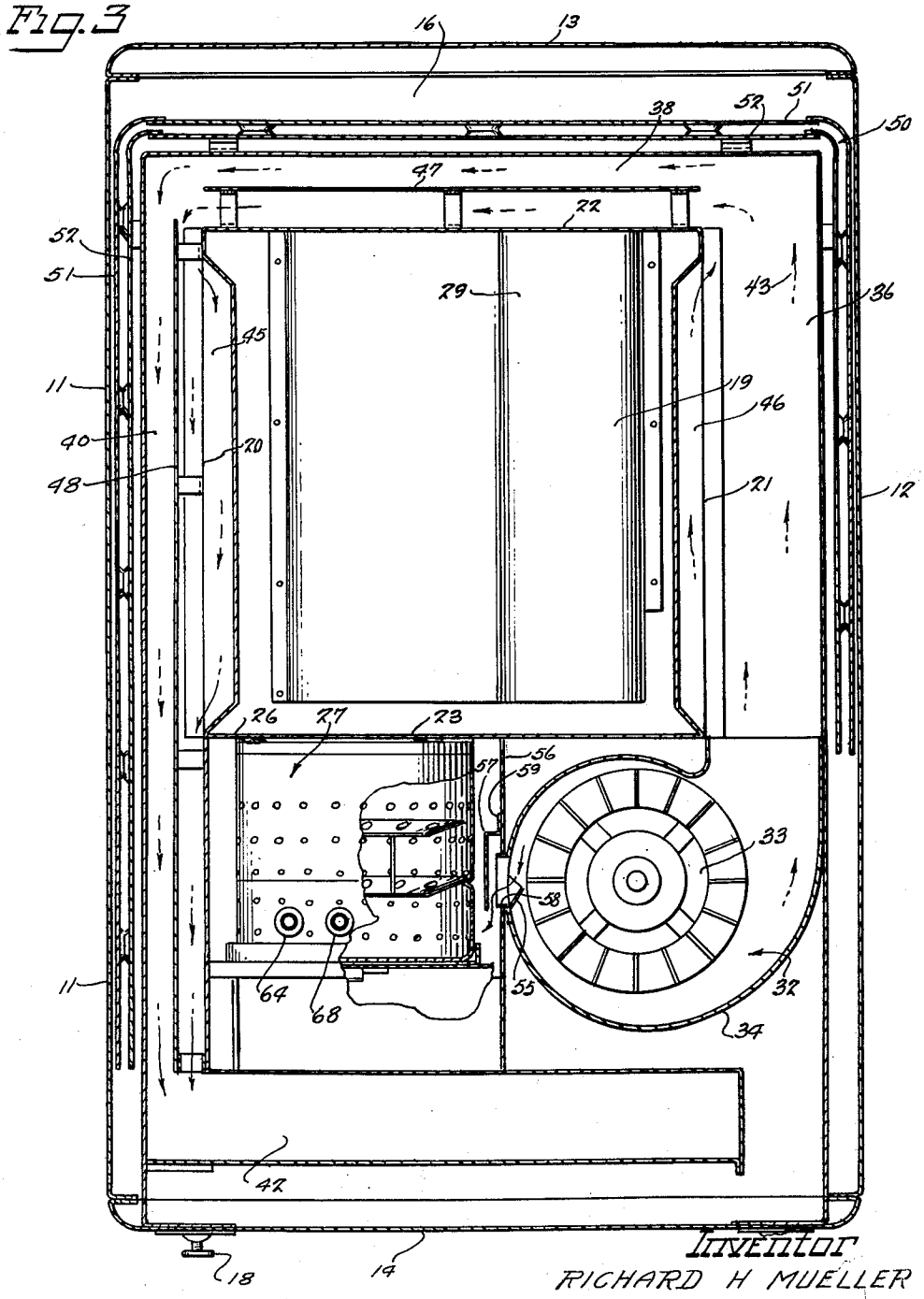
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HEATER

Filed Feb. 24, 1960 4 Sheets-Sheet 3

Fig. 3



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HEATER

Filed Feb. 24, 1960 4 Sheets-Sheet 4

Fig. 4

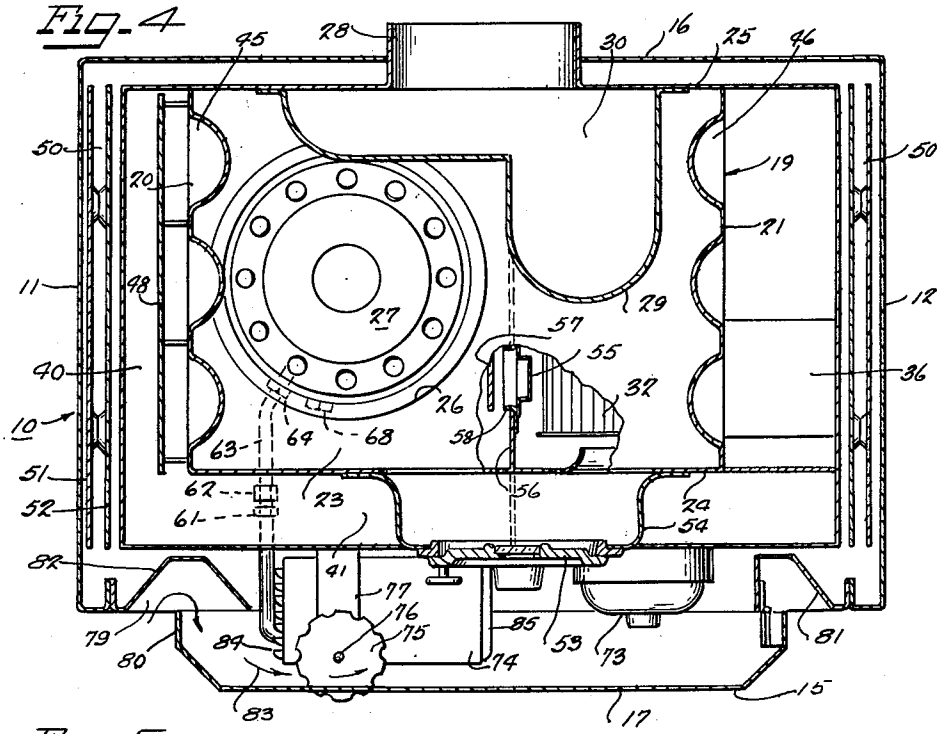


Fig. 5

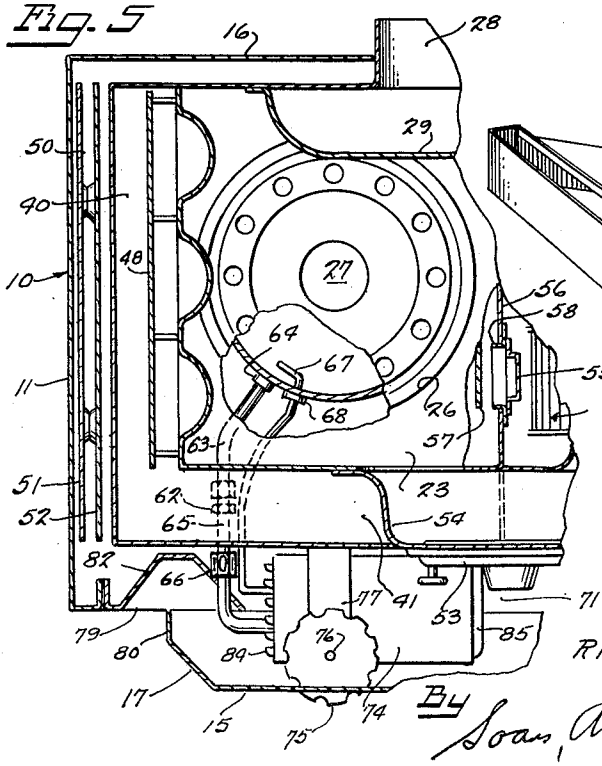
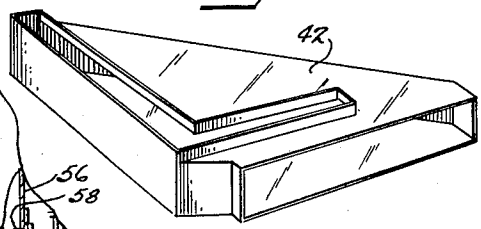


Fig. 6



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United States Patent Office

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HEATER

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5 Claims. (Cl. 126—110)

The present invention relates to heaters and more particularly to an improved space heater.

Space heaters have been very effective in heating rooms, offices, stores, etc. However, space heaters have required a relatively large amount of floor space and thus have been conspicuous. A large area of floor space has been required because the jacket or outer wall temperature of previously available space heaters has been 250° F. or more. Consequently, it has been necessary to locate space heaters a considerable distance away from walls. For example, Underwriter's Laboratory requires a space heater which has an outer wall temperature of 300° F. to be spaced from the wall a sufficient distance to maintain a 90° F. rise or less on the wall surface. This is usually 12 inches from walls at its side and 36 inches from a wall at its rear. Moreover, the walls of space heaters being hot to the touch, have caused space heaters to be a potential source of burns.

In addition, while previously available space heaters have ordinarily provided their rated output, to provide such an output, space heaters have required a relatively large heating surface, and hence have been relatively bulky. Also, the external mounting of eletrical controls and firing controls has detracted from the appearance of space heaters.

It is an object of the present invention to provide an improved space heater. Another object of the invention is the provision of a space heater which can be located relatively close to walls and is cool to the touch. Still another object is the provision of a space heater in which electrical and firing controls are enclosed within the housing of the space heater. A further object is the provision of a space heater which can be readily converted from oil type of firing to gas type of firing. Still a further object of the invention is the provision of a highly efficient space heater which is relatively inexpensive to manufacture.

Other objects and advantages of the present invention will become apparent by reference to the following description and accompanying drawings.

In the drawings:

FIGURE 1 is a front elevational view of a space heater showing various features of the present invention, portions of the front doors of the space heater being cut away to show the internal construction thereof;

FIGURE 2 is a vertical cross-sectional view taken generally along line 2—2 of FIGURE 1, portions being broken away to illustrate various features of the invention;

FIGURE 3 is a vertical cross-sectional view, with portions being broken away, taken generally along lines 3—3 of FIGURE 2;

FIGURE 4 is a horizontal cross-sectional view taken generally along lines 4—4 of FIGURE 2;

FIGURE 5 is a fragmentary horizontal cross-sectional view, generally similar to FIGURE 4, showing another embodiment of the invention;

FIGURE 6 is a reduced perspective view of the outlet conduit of the space heater shown in the previous figures, and

FIGURE 7 is an enlarged fragmentary cross-sectional view of a portion of FIGURE 3.

In general, a space heater in accordance with the present invention comprises a housing having therein a heat exchanger, and means for heating the heat exchanger. Conduit means are provided within the housing in such

a position that air, which is circulated through the conduit by a blower means, is heated by the heat exchanger and at the same time cools the walls of the housing. Accordingly the walls of the housing are relatively cool to the touch and the housing can be located relatively close to walls.

In the illustrated embodiment, the parts of the space heater are enclosed within a housing or casing, which is indicated by the reference numeral 10. The housing 10 is generally rectangular in cross-section, and includes left hand, right hand, top, bottom, front and rear interconnected walls 11, 12, 13, 14, 15 and 16, respectively. A hinged or otherwise removable door 17 which is divided horizontally into two sections 17*a* and 17*b*, is provided in the front wall 15 to permit access to the interior of the housing 10. The housing 10 is provided at its lower end with corner supports or legs 18 for mounting the casing 10 on a floor or foundation (not shown).

Disposed within the upper portion of the housing 10 in spaced relationship to the walls of the housing 10 is a relatively rectangular combustion chamber 19. The combustion chamber 19 includes left hand, right hand, top, bottom, front and rear inter-connected walls 20, 21, 22, 23, 24 and 25, respectively. As shown particularly in FIGURE 4, the left hand side portion of the lower wall 23 of the combustion chamber 19 is provided with a large circular opening 26 which communicates with a heating means 27.

As illustrated particularly in FIGURES 2 and 3, the heating means 27 is a conventional pot type oil burner. The burner 27 is suitably supported within the housing 10 so that the upper end thereof communicates with the opening 26.

As shown in FIGURE 2, a flue connection 28 is connected to the upper portion of the rear wall 25 of the combustion chamber 19 and extends through the rear wall 16 of the housing 10. The flue connection 28 is adapted to be connected to a conventional flue (not shown) whereby products of combustion are carried from the combustion chamber 19 to the atmosphere.

To increase the amount of heat removed from the products of combustion, the path of travel of the products of combustion through the combustion chamber 19 is made as long as possible. This is accomplished in the illustrated embodiment by providing a baffle plate 29 in front of the flue connection 28 which baffle 29 defines a vertically extending passageway 30 having an opening at its lower end. The baffle 29 is so shaped that the products of combustion flow upwardly from the burner 27, downwardly under the baffle 29, thence upwardly through the passageway 30 and out through the flue connection 28.

As illustrated in FIGURES 2, 3 and 4, the baffle 29 is suitably mounted to the rear wall 25 of the combustion chamber 19 with its upper end in abutting relationship with the upper wall 22 of the combustion chamber 19. The lower edge of the baffle 29 is spaced slightly above the lower wall 23 of the combustion chamber 19. The baffle 29 extends across the major portion of the rear wall 25 of the combustion chamber 19 and defines the passageway 30 therebetween. As shown in FIGURE 4, the baffle 29 is extended further into the combustion chamber 19 at the right hand side of the combustion chamber 19 than on the left hand side.

A notch 31 (FIGURE 2) is provided in the lower edge of the baffle 29 at the farthest point from the burner 27.

Air to be heated by the space heater is circulated in passageways between the combustion chamber 19 and the walls of the housing 10. In this way, while air is being heated by the combustion chamber 19, it also serves to cool the walls of the housing 10.

As shown particularly in FIGURE 3, a centrifugal fan or blower 32 is suitably mounted within the housing 10

below the combustion chamber 19 adjacent the burner 27. The inlet 33 of the scroll or blower housing 34 is directed toward the front of the housing 10. The outlet of the blower housing 34 is connected to the lower end of a generally rectangular conduit forming an air passageway 36 extending upwardly along the right hand side wall 21 of the combustion chamber 19 in spaced relation to the right hand side wall 12 of the housing 10. The upper end of the right hand conduit 36 is connected to the right hand end of a generally rectangular upper conduit forming a passageway 38 which extends along the upper wall 22 of the combustion chamber 19 and in spaced relation to the upper wall 13 of the housing 10. The left hand end of the upper conduit 38 is connected to the upper end of a generally rectangular conduit forming a passageway 40 extending downwardly along the left hand side wall 20 of the combustion chamber 19 and in spaced relation to the left hand side wall 11 of the housing 10. The front side of the upper conduit 38, which is open, is connected to the upper end of a generally rectangular conduit forming a passageway 41 (see FIGURE 2) extending downwardly along the front wall 24 of the combustion chamber 19 and in spaced relation to the doors 17 of the housing 10. The front conduit 41 is indented at its lower right hand corner so as to permit the lower portion thereof to be disposed adjacent the left side of the blower housing 34. The lower ends of the left hand and front conduits 40 and 41, are extended downwardly and are connected to a horizontally extending bottom conduit 42 which is disposed below the burner 27 and fan 32. The bottom conduit 42 communicates with the atmosphere at the lower portion of the front wall 15, of the housing 10. The outlet of the bottom conduit 42 is divided centrally and a suitable pair of grills 44 are disposed over the outlet. As illustrated, common walls serve for the inner walls of the conduits and the walls of the combustion chamber 19.

Air, which is circulated by the blower 32, is moved upwardly, as indicated by the arrows 43, through the right hand conduits 36, horizontally through the upper conduit 38, thence downwardly through the front conduit 41 and the left hand conduit 40, and outwardly through the bottom conduit 42. Heated high velocity air thus spills out along the floor of the room to provide heated air where it is needed to adequately heat the room.

As can be seen from the above, the hot walls of the combustion chamber 19 are thoroughly scrubbed by high velocity air moving thereover, thereby providing a high heat transfer to the air. Moreover, high velocity air, while being heated, serves to cool the walls of the housing 10.

To further increase the heated surface area provided by the combustion chamber 19, a plurality of vertically extending indentations 45 and 46 which are semicircular in cross-section, are disposed respectively in the left and right hand side walls 20 and 21, of the combustion chamber 19.

An additional conduit or air passageway (not shown) may be extended along the rear wall 25 of the combustion chamber 19 and in spaced relation to the rear wall 16 of the housing 10 to further increase the capacity of the heater and also to cool the rear wall 16. However, it is generally not necessary to have the rear wall at as cool a temperature as the side walls because the required spacing for the flue prevents the heater from being located close to a rear wall. The rear conduit may connect at its upper end to the upper conduit 38 and at its lower end to the bottom conduit 42.

It has been found that while air, which is circulated between the combustion chamber 19 and the walls of the housing 10, substantially cools the walls of the housing 10, the temperature of the walls may be further reduced by reducing radiant heat impinging on the walls. This is especially important in the passageways where the circulated air has been heated and hence has reduced cooling capabilities. Radiant heat is intercepted, in the illustrated embodiment, by disposing a horizontally extending baffle plate 47 in the upper passageway 38 in spaced relation to the upper wall 22 of the combustion chamber 19. In addition, a vertically extending baffle plate 48 is disposed in the left hand passageway 40 in spaced relation to the left hand side wall 20 of the combustion chamber 19. The baffle plates 47 and 48 are suitably mounted to their respective combustion chamber walls 22 and 20. Baffle plates (not shown) may also be disposed in the other passageways to further reduce the temperature of the walls adjacent such passageways.

The baffle plates 47 and 48 essentially prevent radiant heat, which is being emitted by the combustion chamber 19, from striking and thereby heating the walls of the housing 10. The baffle plates 47 and 48 absorb the radiant heat and become heated to an elevated temperature. Consequently, air passing over the baffle plates 47 and 48 is heated by the baffle plates 47 and 48. Thus, the baffle plates 47 and 48 not only reduce the temperature of the adjacent outer walls of the housing 10, but also add to the efficiency of the heater.

It has been found for best efficiency that the upper end of the left hand baffle plate 48 preferably should be spaced from the adjacent left hand end of the upper baffle plate 47. It is believed that this spacing causes increased turbulence and interchange of air at the corner of the housing 10 which increases the scrubbing action of air.

In the illustrated embodiment, to further reduce the temperature of the walls of the housing 10, a wraparound insulator 50 is disposed along the outer walls of the left hand, right hand, and top air conduits 40, 36 and 38, respectively. As shown particularly in FIGURE 3, the wraparound insulator 50 includes a pair of parallel, spaced apart metal plates 51 and 52 which are suitably mounted to the conduits 36, 38 and 40.

As shown in FIGURE 4, a hinged access door 53 is provided in the front conduit 41 to permit access into the combustion chamber 19 for maintenance and lighting the burner 27. A casing 54 is provided around the door 53 and extends from the door 53 to the front wall 24 of the combustion chamber 19 in order to isolate the products of combustion from the air passageway 41.

The above described construction provides a space heater having relatively cool walls. For example, in one embodiment of the space heater, for a temperature in the combustion chamber of approximately 1200° F. and an air velocity at the outlet from the bottom conduit of 1200 f.p.m., the temperature of the side walls of the housing is approximately 90° F. above room temperature. Consequently, the space heater may be located 1 inch away from walls at its sides and 8 inches from a wall at its back. Approximately 79 percent of the heat output from the heater is provided at the bottom conduit outlet.

In the illustrated embodiment, a portion of the air in the scroll or blower housing 34 is diverted into the burner 27 to thereby create a high static pressure within the burner 27. The high static pressure increases the combustion efficiency substantially above that which can be obtained from a natural draft and also permits the same burner to be employed for liquid or gas fuel. In addition, by utilizing air circulated by the fan 32 to provide static pressure in the burner 27, when less heat is required and the fuel input to the burner is therefore reduced, the static pressure may be correlatively reduced by decreasing the speed of the fan 32. In this way, the proper static pressure is provided in the burner 27 for the amount of fuel supplied.

As shown particularly in FIGURES 3 and 7, air is diverted from the scroll 34 by an air scoop 55 which extends into the scroll 34. Air picked up by the scoop 55 flows into a housing 56, which encloses burner 27, through a conduit 58 connecting the scroll 34 and the burner housing 56. To prevent the stream of air from directly impinging on the burner 27, a baffle 57 is disposed in spaced

relation to the outlet of the conduit 58. The baffle 57 is mounted to the burner housing 56 at its upper end by a flange 59 connected thereto. Accordingly, air from the fan scroll 34 flows into the burner housing 56 as indicated by the arrows 60 in the FIGURES 3 and 7.

The angle of the air scoop 55 (angle α in FIGURE 7) depends upon the amount of static pressure desired in the burner 27. Generally, for a given fan and burner, the greater the angle, the greater the static pressure provided in the burner 27. For oil type of firing, a static pressure of approximately 0.14 inch water column at the burner 27 provides the highest combustion efficiency and lowest smoking.

As an example, a fan handling approximately 295 c.f.m. of air at a static pressure of 0.5 inch water column and a temperature of 120° F. is employed in the embodiment of the space heater mentioned above. With such a fan, an angle α of approximately 20 degrees serve to provide 0.14 inch water column at a conventional 8 inch pot type oil burner (approximately 80,000 B.t.u. per hr. input).

As previously indicated, the presence of pressure at the burner 27 permits the space heater to be readily converted from liquid type of firing to gas type of firing. As shown in FIGURE 4, for oil type of firing, an oil supply pipe 61 is connected through a union 62 to a nipple 63 which, in turn, is connected to a coupling 64 in the burner 27. When it is desired to convert to gas firing, the oil supply pipe 61 is disconnected at the union 62 and a main gas line 65 (see FIGURE 5) having a suitable orifice 66 and controls (not shown) is connected to the union 62. A conventional gas pilot and flame sensing device 67 are connected through an auxiliary coupling 68 disposed in the burner 27 adjacent the coupling 64. It has been found that with the high static pressure, gas burns efficiently in the same fire pot as is used with oil firing.

As illustrated in FIGURES 1 and 2, the oil supply pipe 61 is connected to a conventional oil float chamber 70 suitably mounted in the lower portion of a passageway 71 extending between the front conduit 41 and the door 17. The float chamber 70, in turn, is connected to a source of oil (not shown) by a pipe 72. A motor 73 to drive the fan 32 is also disposed in the passageway 71. Electrical controls to control speed of the fan 32 and controls for the burner 27 are located in a housing 74 which is disposed above the float chamber 70 within the passageway 71. The rate of oil flow through the float chamber 70 and the speed of the fan motor 73, which is correlated with the oil flow, are controlled by a horizontally extending control knob 75. The control knob 75 is connected to the electrical controls 74 and float chamber 70 by a vertically extending shaft 76 which is journalled in a bearing 77 mounted to the front conduit 41. The control knob 75 extends partially through an aperture 78 in the upper door 17*a* so that the knob may be adjusted with the door 17*a* closed.

Since the electrical controls 74 and float chamber 70 are located within the housing in adjacent relationship to the front conduit 41, without adequate cooling, the controls and float chamber will be damaged by excessive heat. For example, the maximum allowable temperature rises for conventional electrical controls, float chambers and control knobs are approximately 63° F., 135° F., and 80° F., respectively. Air being circulated through the front conduit 41 is at a temperature of approximately 315° F. Consequently, without adequate cooling the knob 75, controls 74 and the float chamber 70 will be heated substantially above their allowable temperature rise.

In the illustrated embodiment, in order to keep the controls 74, float chamber 70, and knob 75 within their maximum allowable temperature rise, cool air is constantly circulated over the controls 74, the float chamber 70 and knob 75. This is accomplished by providing air inlets 79 along the edges of the door 17 which are so constructed and disposed that cool high velocity air drawn in by the fan is directed across the electrical controls 74, knob, 75, and the float chamber 70.

In the illustrated embodiment, air inlets 79 are provided along the upper and left hand edges of the door 17. In order to prevent air from by-passing the portion of the control 74, knob 75, and float chamber 70 adjacent the inner surface of the door 17, the air inlets 79 are shaped to direct air against the door's inner surface. As illustrated particularly in FIGURES 2 and 4, and air inlets 79 are defined by a rearwardly directed flange 80 on the edges of the door 17 and a cove 82 disposed in the front wall 15 rearwardly of the flange 80. The cove 82 is generally trapezoidal in cross section and is positioned relative to the flange 80 so as to be generally bisected thereby. Air, therefore, is directed over the knob 75, controls 74, and float chamber 70 as indicated by the arrows 83.

The portion of the front wall 15 along the right hand edge of the door 17 is provided with a simulated cove 81 so as to enhance the appearance of the space heater.

To further direct the air over the electrical control 74, the left side of the control housing 74 is provided with rearwardly turned, vertically extending louvers 84 and the right side of the control housing 74 is provided with horizontally extending, downwardly turned louvers 85.

An air flow sensing means 86 is suitably mounted in the output of the lower conduit 42, to reduce the oil flow to low fire, if there is a stoppape in the air flow. The air flow sensing means 86 illustrated includes a temperature sensitive bulb 87 which is connected to the float chamber 70 so as to reduce the oil flow if the temperature within the outlet drops below a set limit.

A heater constructed in accordance with the present invention has walls which are less than approximately 90° F. above room temperature. The heater operates at an efficiency of approximately 77 percent for oil firing and approximately 80 percent for gas firing. Also each a heater may be readily changed from oil to gas type of firing.

Various changes and modifications may be made in the above described space heater without departing from the spirit or scope of the invention. Various features of the invention are set forth in the accompanying claims.

I claim:

1. A space heater comprising a housing, a heat exchanger in said housing, means for heating said heat exchanger, an air passageway within said housing defined by said heat exchanger and one side wall of said housing, the lower end of said passageway being in communication with the surrounding air space at the front wall of said heater, a second air passageway within said housing defined by said heat exchanger and the top wall of said housing, one end of said second air passageway being connected to the upper end of said first air passageway, a third air passageway within said housing defined by said heat exchanger and the other side wall of said housing, the upper end of said third passageway being connected to the other end of said second air passageway, a fourth air passageway within said housing defined by said heat exchanger and the front wall of the said housing, the upper end of said fourth air passageway being connected to said second passageway, means defining a fifth air passageway within said housing connecting the lower end of said third and fourth passageway and communicating with the surrounding air space at the front wall of the heater, the distance between the walls of said housing and the walls of said heat exchanger being relatively small so as to subject all of the air flowing through said passageways to intimate contact with said heat exchanger, and means for drawing a mass of air into said housing and for forcing said air through said air passageway upwardly in the first passageway, horizontally in the second passageway, downwardly in the third and fourth passageways, and outwardly in the fifth passageway.

2. A space heater comprising a housing, a heat exchanger in said housing, means for heating said heat exchanger, means defining a vertically extending air passageway between said heat exchanger and one side of said housing, means defining a horizontally extending second air passageway between said heat exchanger and the top wall of said housing, one end of said second air passageway defining means being connected in fluid communication with the upper end of said first air passageway defining means, means defining a vertically extending third air passageway between said heat exchanger and the other side wall of said housing, the upper end of said third passageway defining means being connected in fluid communication with the other end of said second air passageway defining means, means defining a vertically extending fourth air passageway between said heat exchanger and the front wall of said housing, the upper end of said fourth passageway defining means being connected in fluid communication with said second passageway defining means, means defining a fifth air passageway within said housing connected in fluid communication with the lower ends of said third and fourth passageway defining means and communicating with the air space at the front wall of the housing, means defining a vertically extending sixth air passageway between said fourth air passageway defining means and the front wall of said housing, said sixth passageway defining means being connected in fluid communication with the lower end of said first passageway defining means and being in fluid communication with the air space surrounding the heater, and means for drawing a mass of air into said housing through said sixth passageway and for forcing said air upwardly in the first passageway, horizontally in the second passageway, downwardly in the third and fourth passageway and outwardly from the fifth passageway, said first, second, third, fourth and fifth passageways being constructed and arranged in heat exchange relationship with said heat exchanger.

3. A space heater comprising a housing, a heat exchanger in said housing, means for heating said heat exchanger, means defining a vertically extending air passageway between said heat exchanger and one side of said housing, means defining a horizontally extending second air passageway between said heat exchanger and the top wall of said housing, one end of said second air passageway defining means being connected in fluid communication with the upper end of said first air passageway defining means, means defining a vertically extending third air passageway between said heat exchanger and the other side wall of said housing, the upper end of said third passageway defining means being connected in fluid communication with the other end of said second air passageway defining means, means defining a vertically extending fourth air passageway between said heat exchanger and the front wall of said housing, the upper end of said fourth passageway defining means being connected in fluid communication with said second passageway defining means, means defining a fifth air passageway within said housing connected in fluid communication with the lower ends of said third and fourth passageway defining means and having an outlet in the front wall of the housing, means defining a vertically extending sixth air passageway between said fourth air passageway defining means and the front wall of said housing, said sixth passageway defining means being connected in fluid communication with the lower end of said first passageway defining means and having an inlet in the front wall of said housing, means for drawing a mass of air into said housing through said inlet and said sixth passageway and for forcing said air upwardly in the first passageway horizontally in the second passageway, downwardly in the third and fourth passageway, and outwardly through the outlet in the fifth passageway, said first, second, third, fourth, and fifth passageways being constructed and arranged in heat exchange relationship with said heat exchanger, and control means for said heating means and said air forcing means disposed in said sixth air passageway defining means, the inlet of said sixth air passageway defining means being constructed and arranged so that air being drawn into said passageway by said air forcing means passes over said control means, thereby cooling said control means.

4. A space heater comprising a housing having a door in the front wall thereof, said door being hinged to said housing along one vertically extending edge thereof, a heat exchanger in said housing, means for heating said heat exchanger, means defining a vertically extending air passageway between said heat exchanger and one side of said housing, means defining a horizontally extending second air passageway between said heat exchanger and the top wall of said housing, one end of said second air passageway defining means being connected in fluid communication with the upper end of said first air passageway defining means, means defining a vertically extending third air passageway between said heat exchanger and the other side wall of said housing, the upper end of said third passageway defining means being connected in fluid communication with the other end of said second air passageway defining means, means defining a vertically extending fourth air passageway between said heat exchanger and the front wall of said housing, the upper end of said fourth passageway defining means being connected in fluid communication with said second passageway defining means, means defining a fifth air passageway within said housing connected in fluid communication with the lower ends of said third and fourth passageway defining means and having an outlet in the front wall of the housing, means defining a vertically extending sixth air passageway between said fourth air passageway defining means and the front wall of said housing, said sixth passageway defining means being connected in fluid communication with the lower end of said first passageway defining means and having a cove-shaped inlet in the front wall of the housing which extends vertically along the other vertically extending edge of the door and horizontally along the upper edge of the door, means for drawing a mass of air into said housing through said inlet and said sixth passageway and for forcing said air upwardly in the first passageway, horizontally in the second passageway, downwardly in the third and fourth passageway, and outwardly through said outlet, said first, second, third, fourth, and fifth passageways being constructed and arranged in heat exchange relationship with said heat exchanger, and control means for said heating means and said air forcing means disposed in said sixth air passageway defining means between the inlet and the lower end of the first air passageway.

5. A space heater comprising a housing having a door in the front wall thereof, said door being hinged to the housing along one vertically extending edge thereof, and having a rearwardly directed flange on the edges thereof, a heat exchanger in said housing, a pot-type burner in said housing for heating said heat exchanger, means defining a vertically extending air passageway between said heat exchanger and one side of said housing, means defining a horizontally extending second air passageway between said heat exchanger and the top wall of said housing, one end of said second air passageway defining means being connected in fluid communication with the upper end of said first air passageway defining means, means defining a vertically extending third air passageway between said heat exchanger and the other side wall of said housing, the upper end of said third passageway defining means being connected in fluid communication with the other end of said second air passageway defining means, means defining a vertically extending fourth air passageway between said heat exchanger and the front wall of said housing, the upper end of said fourth passageway defining means being connected in fluid communication with said second passageway defining means, means defining a fifth air passageway within said housing connected in fluid communication with the lower ends of said third and fourth passageway defining means and having

an outlet in the front wall of said housing below said door, said fourth air passageway defining means being spaced from said door so as to define a sixth air passageway therebetween, the lower end of said first passageway defining means being in fluid communication with the sixth air passageway, a cove-shaped inlet to said sixth air passageway disposed in the front wall of the housing opposite the other vertically extending edge of the door and the top edge of the door, a centrifugal fan and housing disposed in the lower end of the first passageway for drawing a mass of air into said housing through said inlet and said sixth passageway and for forcing said air upwardly in the first passageway, horizontally in the second passageway, downwardly in the third and fourth passageway, and outwardly from the fifth passageway, said first, second, third, fourth, and fifth passageways being constructed and arranged in heat exchange relationship with said heat exchanger, control means for said burner and said fan disposed in said sixth air passageway,

and means defining a passage between said fan housing and said burner, and an air scoop on the fan housing end of the passage.

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