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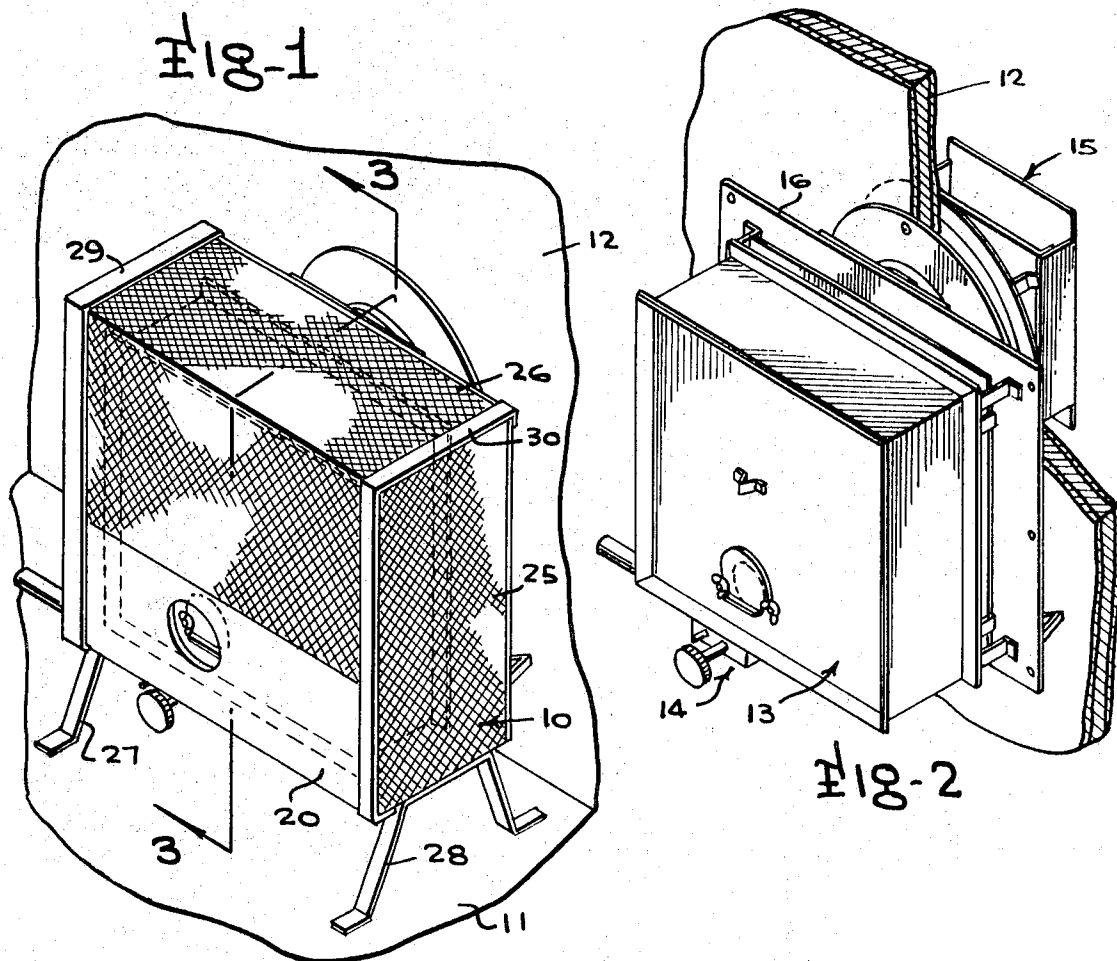
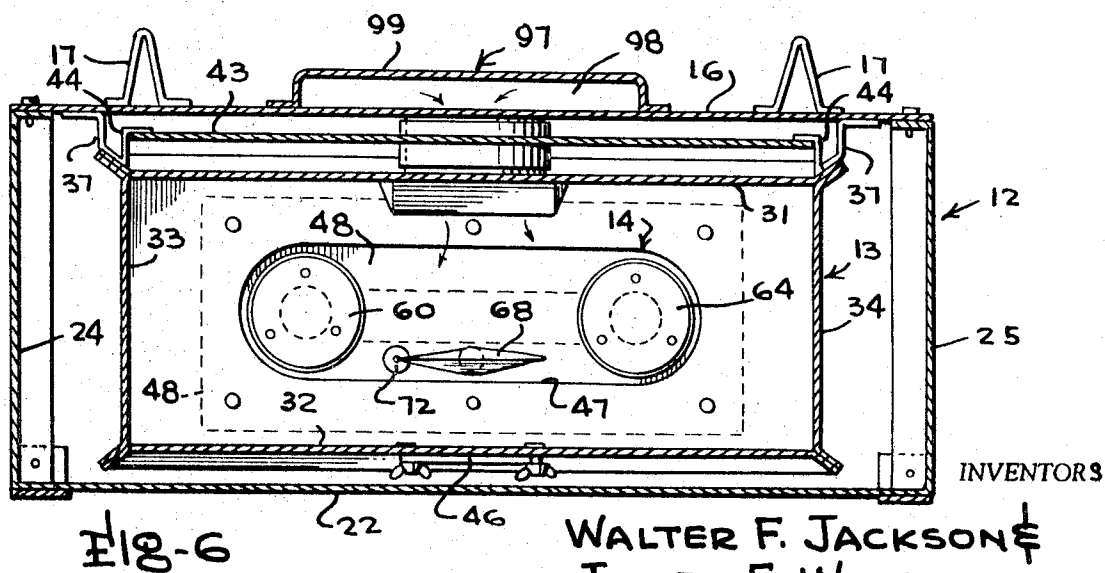
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3,614,948

SPACE HEATER

Filed Dec. 20, 1968

3 Sheets-Sheet 1



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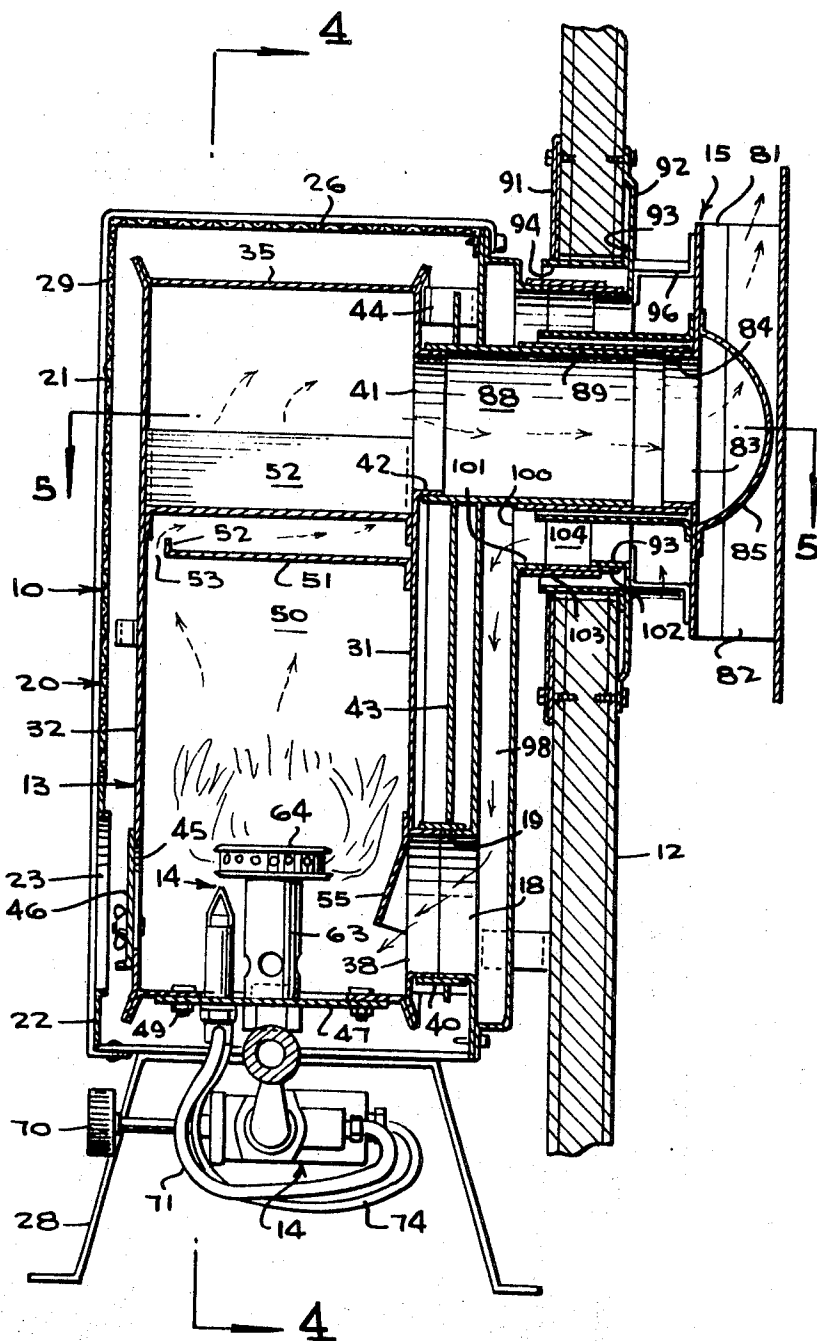
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SPACE HEATER

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Fig-3



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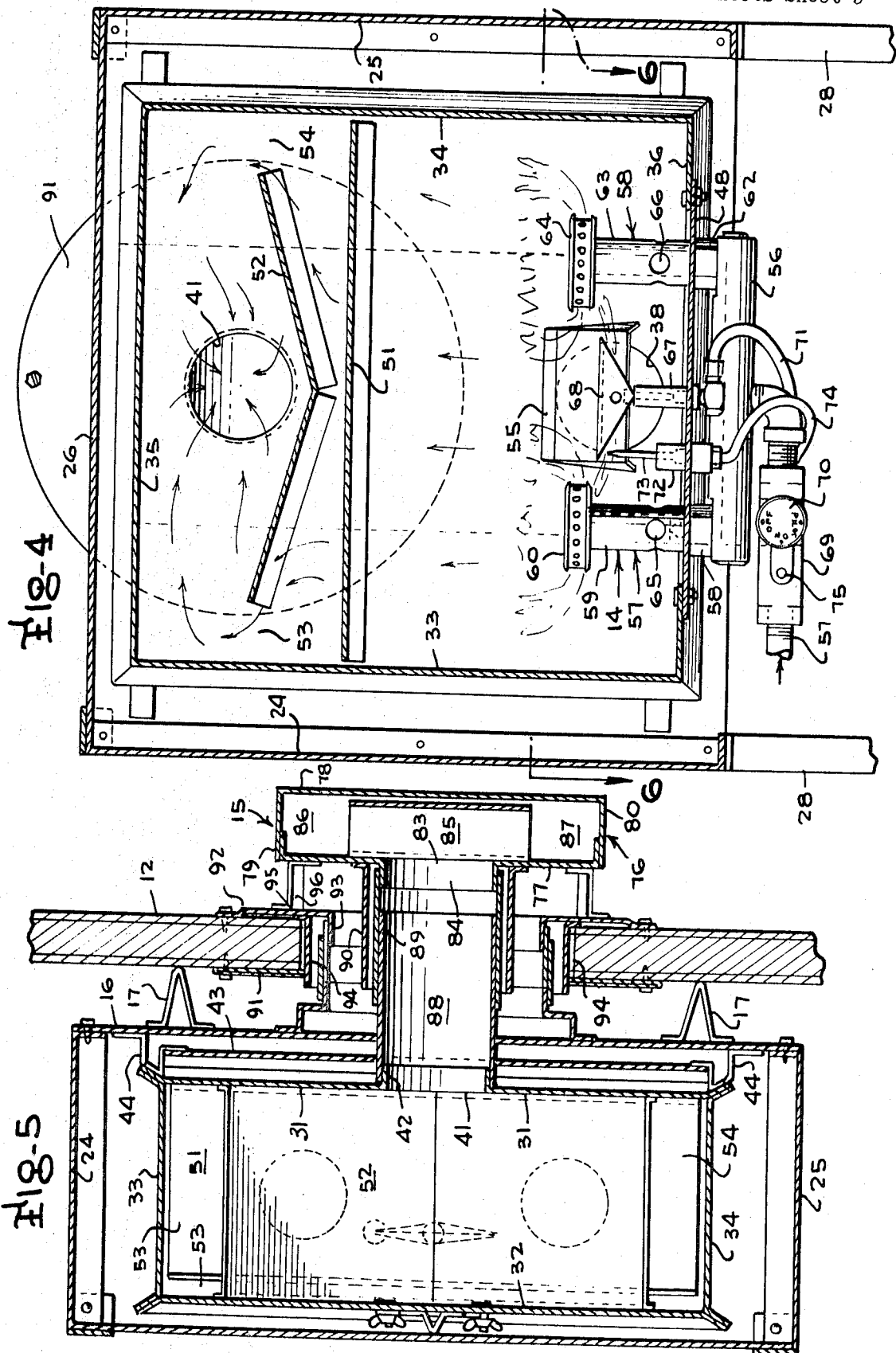
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SPACE HEATER

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3,614,948

SPACE HEATER

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ABSTRACT OF THE DISCLOSURE

A space heater comprising a casing defining a combustion chamber, the casing having an inlet opening and an outlet opening, a burner unit mounted in the combustion chamber, first baffle means disposed in the combustion chamber between the burner unit and the outlet opening directing air heated by the burner unit longitudinally and second baffle means disposed between the burner unit and the outlet opening directing air heated by the burner unit transversely.

This invention relates to space heating apparatus and more particularly to a novel space heater adapted for use in mobile units such as trailer homes, campers and the like.

In the prior art, numerous types of space heaters have been developed for use in mobile units. Such units generally consist of a gas fired heater adapted to be mounted adjacent an exterior wall and vented to the atmosphere through the exterior wall. It is desirable that such units be compact in size, capable of high heat output, safe in operation and consistently operable under all weather conditions. Most of the units in the prior art, however, have been found not to be entirely satisfactory in all of the aforementioned respects.

Accordingly, it is the principal object of this invention to provide a novel space heating apparatus.

Another object of the present invention is to provide a novel space heater particularly adapted for use in mobile units such as trailer homes, campers and the like.

A further object of the present invention is to provide a novel space heater adapted to be vented to the atmosphere, which is compact in size, capable of high heat output, safe in operation and continuously operable under all weather conditions.

A still further object of this invention is to provide an improved space heater having a novel burner unit.

Another object of the present invention is to provide an improved space heater having a novel vent assembly.

A further more specific object of the present invention is to provide a novel space heater wherein a constant supply of fresh air is supplied to the combustion chamber thereof and recirculation of the air in the combustion chamber is prevented.

A further more specific object of the present invention is to provide a novel space heater having a vent assembly capable of providing a constant draft under all weather conditions.

A still further object of the present invention is to provide a novel space heater which is simple in construction, comparatively inexpensive to manufacture, and which requires minimum maintenance.

Other objects and advantages of the invention will become more apparent to those persons having skill in the art to which the present invention pertains, from the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of an embodiment of the invention;

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FIG. 2 is a perspective view of the embodiment illustrated in FIG. 1, having the enclosure thereof removed;

FIG. 3 is an enlarged cross-sectional view taken along line 3—3 in FIG. 1;

FIG. 4 is a cross-sectional view taken along line 4—4 in FIG. 3;

FIG. 5 is a cross-sectional view taken along line 5—5 in FIG. 3; and

FIG. 6 is a cross-sectional view taken along line 6—6 in FIG. 4.

Briefly described, the present invention relates to a space heater generally including a casing having front and rear walls, side walls and top and bottom walls defining a combustion chamber, the rear end wall having an inlet opening and an outlet opening, a burner unit mounted in the combustion chamber, a first baffle plate disposed in the combustion chamber between the burner unit and the outlet opening, the first baffle plate having a front edge spaced from the front casing wall to provide a vertical passageway for air heated by the burner unit, and a second baffle plate disposed between the burner unit and the outlet opening, and the second baffle plate having side edges spaced from the side walls of the casing to provide vertical passageways for the heated air. Preferably, a third baffle plate is disposed in the combustion chamber to prevent recirculation of heated air through the inlet opening, the casing is mounted in a partly perforated enclosure unit, and a vent assembly is provided which communicates with the outlet opening.

Referring to the drawings, there is illustrated an embodiment of the invention. The embodiment generally includes an enclosure unit 10 adapted to be positioned on a floor 11 adjacent an exterior wall 12, a casing 13 mounted in the enclosure unit, a burner unit 14 mounted in the lower end of the casing 13, and a vent assembly 15 mounted on the exterior wall 12 which communicates with the casing 13. The enclosure unit 10 includes an imperforate rear panel 16 having a plurality of brackets 17 for spacing the rear panel from the exterior wall 12 and a lower opening 18 provided with a forwardly projecting annular flange 19, a front panel 20 including an upper perforate portion 21 and a lower imperforate portion 22 having an access opening 23, side perforate panels 24 and 25 and an upper perforate panel 26. The enclosure unit is supported on a pair of leg units 27 and 28 and is provided with a pair of peripheral trim strips 29 and 30 to which the various enclosure panels are secured. The leg units 27 and 28 are of a sufficient height to permit cold air to be drawn from the space to be heated through the lower open end of the enclosure unit in contact with the casing 13. When such air is heated by the casing 13 it is caused to flow upwardly and outwardly through the perforate panels of the enclosure unit by convection.

The casing 13 provides a sealed combustion chamber which is adapted to heat air circulating through the enclosure unit 10 by radiation. The casing 13 consists of a rear panel 31, a front panel 32, side panels 33 and 34, an upper panel 35, and a lower panel 36. The rear panel 31 is spaced from and secured to the rear panel 16 of the enclosure unit by means of a plurality of spacer brackets 37, as best illustrated in FIGS. 5 and 6. The rear panel 31 is provided with a lower opening 38 having an annular flange 39 disposed in alignment with the annular flange 19 of the rear panel 16 of the enclosure unit to communicate openings 38 and 18. The annular flanges 39 and 19 are provided with a connector conduit 40, as best illustrated in FIG. 3. An outlet opening 41 having a rearwardly projecting annular flange 42 also is provided in the upper end of the rear end wall 31. It will be appreciated that fresh air is adapted to be drawn into the

combustion chamber through the lower inlet opening 38, and the gaseous products of combustion are adapted to be discharged through the upper outlet opening 41. Spaced between the rear panel 31 of the casing and the rear panel 16 of the enclosure unit is a heat reflecting panel 43. The panel 43 is maintained in spaced relation with respect to panels 31 and 16, by means of a plurality of brackets 44.

The lower end of front panel 32 is provided with an access opening 45 disposed adjacent the burner unit 14 and registering with the access opening 23 in the lower imperforate portion 22 of the front enclosure panel 20. The opening 45 is provided with a swinging door 46 which may be swung open for the purpose of lighting the pilot of the burner unit.

The bottom panel 36 of the casing 13 is provided with an elongated transverse opening 47 which is normally closed by a burner unit mounting plate 48. The mounting plate 48 is detachably secured to the bottom panel 36 of the casing by means of a plurality of threaded fasteners 49.

The various panels of the casing 13 define a combustion chamber 50 which is adapted to receive fresh air through the lower inlet opening 38, heat the incoming air by means of the burner unit 14, and discharge the gaseous products of combustion through the upper outlet opening 41. The combustion chamber is provided with a first horizontal baffle plate 51 in the upper end thereof which is secured at its rear end to the rear panel 31 of the casing. The baffle plate 51 is provided with an upturned flange 52 at the forward end thereof which is spaced from the front panel 32 of the casing to provide a vertical passageway 53 extending across the entire width of the combustion chamber. The horizontal baffle plate 51 is disposed in the combustion chamber 50 between the burner unit 14 and the outlet opening 41 so that air heated by the burner 14 will be caused to flow upwardly and forwardly through the vertical passageway 53 in heat transfer relation with the front panel 32 of the casing.

The upper end of the combustion chamber 50 also is provided with a second V-shaped baffle plate 52 having the front and rear sides thereof secured to the front and rear panels of the casing 13. The side edges of the V-shaped baffle plate 52 are spaced from the side walls 33 and 34 of the casing to provide a pair of vertical openings 53 and 54 extending the full length of the casing. As best illustrated in FIGS. 3 and 4, the V-shaped baffle plate 52 is disposed between the baffle plate 51 and the outlet opening 41 so that the gaseous products of combustion flowing through passageway 53 will be caused to flow laterally and through passageways 53 and 54 in heat transfer relation with side panels 33 and 34 of the casing. The combustion chamber 50 also is provided with a third baffle plate 55 which is secured to the rear panel 31 of the casing and extends downwardly and forwardly across the upper portion of the inlet opening 38. The function of the baffle 55 is to direct fresh air introduced into the combustion chamber toward the burner unit 14 and to prevent recirculation of heated air in the combustion chamber through the inlet opening 38.

The burner unit 14 consists of a manifold 56, burners 57 and 58 communicating with the manifold 56, and a fuel supply line 57 for supplying fuel to the manifold. The burner 57 includes an orifice 58 threaded into the manifold 56 and having a threaded portion extending through an opening in the mounting plate 48, a venturi 59 threaded on the threaded portion of the orifice 58 extending through the mounting plate 48 to rigidly secure the mounting plate between the orifice 58 and the venturi 59, and burner head 60 mounted on the upper end of the venturi 59. Similarly, the burner 58 includes an orifice 62 threaded into the opposite end of the manifold 56 and having a threaded portion extending through an opening in the mounting plate 48, a venturi 63 threaded on the threaded portion of the orifice 62 extending through the mounting plate 48 to secure the burner 58 to the mounting plate 48, and a burner head 64 mounted on the upper end of the venturi 63. The venturi 59 is provided with a plurality of primary

air inlet ports 65, and the venturi 63 is provided with a similar plurality of primary air inlet ports 66 which are disposed below the lower edge of the baffle 55 to receive fresh air introduced into the combustion chamber through the inlet opening 38 and diverted downwardly and forwardly by the baffle plate 55. The burner heads 60 and 64 are provided with a plurality of openings about the circumferences thereof through which mixtures of primary air and fuel are ejected to combine with secondary air for combustion.

Mounted on the plate 48 and disposed between the burners 57 and 58 is a pilot burner 67. A diverting baffle 68 is mounted on the upper end of the pilot burner 67 which functions to divert the flame of the pilot burner toward the burner heads 60 and 64 to assure constant ignition of either of the burners 57 and 58.

A valve unit 69 is provided in the fuel supply line 57 which is operable to regulate the supply of fuel to the burners 57 and 58 and to shut off the entire supply of fuel to the manifold 56 when the pilot burner flame has been extinguished. The valve unit 69 is provided with a control knob 70 which operates a valve within the unit to supply fuel to the pilot burner and regulate the supply of fuel to the manifold 56. Fuel is supplied to the pilot burner 67 through a line 71 interconnecting the valve unit 69 and the lower end of the pilot burner 67. A shut-off valve in the unit 69 is operable in response to a thermocouple 72 mounted on the plate 48. The thermocouple has a thermoelectric element 73 disposed in heat transfer relation with the flame of the pilot burner and a lead line 74 connected to the shut-off valve in the control unit. The shut-off valve of the control unit is adapted to shut off the entire supply of fuel to the burner unit when the pilot burner is inoperative. The control unit also is provided with a shut-off valve reset button 75 which may be depressed to reopen the shut-off valve.

To operate the burner unit, the shut-off valve reset button is depressed to open the shut-off valve, and the control knob 70 is positioned to supply fuel through line 71 to the pilot burner 67. The pilot burner is then ignited manually through access opening 45 in the front panel 32 of the casing. Once the pilot burner 67 is operating, the shut-off valve of the control unit will remain open to supply fuel to the pilot burner. In the event the pilot burner flame is extinguished, such condition will be sensed by the thermocouple 72 which will operate to close the shut-off valve, thus shutting off the supply of fuel to the burner unit. The flame of the burner unit is diverted by the diverter baffle 68 toward the burner heads 60 and 64 of the burners 57 and 58. If the control knob 70 is then turned to the on position to provide a supply of fuel through the manifold 56 to the burners 57 and 58, the mixture of fuel and primary air emanating from the burner heads 60 and 64 will be ignited to heat the air drawn into the combustion chamber through the inlet opening 38.

The vent assembly 15 consists of a vent box 76 including a front vertical wall 77, a rear vertical wall 78 spaced from the front vertical wall 77 and side vertical walls 79 and 80 providing aligned upper and lower openings 81 and 82 in the vent box. The front wall 77 of the vent box is provided with an opening 83 having a forwardly projecting annular flange 84. Mounted in the vent box 76 across the opening 23 is an arcuately shaped baffle 85. The upper and lower ends of the baffle 85 are secured to the front wall 77 of the vent box above and below the opening 83 therein. As best illustrated in FIG. 5, the rearward end of the baffle 85 is spaced from the rear wall 78 of the vent box and the side edges thereof are spaced from the side walls 79 and 80 of the vent box to provide vertical passageways 86 and 87 communicating with the upper and lower openings 81 and 82. It thus will be seen that flue gases entering the vent box through the opening 83 will be caused to flow first laterally within the baffle 85 and then vertically through vertical pas-

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sageways 86 and 87 to be discharged into the atmosphere through vertical openings 81 and 82.

As best shown in FIGS. 3 and 5, the opening 41 in the rear panel of the casing 13 and the opening 83 of the vent box 76 are intercommunicated by means of a flue conduit 88 mounted on annular flange 42 of rear panel 31 and conduit 89 interconnecting the flue conduit 88 and the annular flange 84 of front wall 77 of the vent box. Disposed coaxially with the conduits 88 and 89 is a heat shield conduit 90 which is secured at its rearward end to the front wall 77 of the vent box, and is spaced from the connector conduit 89.

The vent assembly is secured to the exterior wall 12 by means of an annular mounting plate 91 secured to the inner side of exterior wall 12 with threaded fasteners, and an annular mounting plate 92 secured to the outer side of the exterior wall 12 also with threaded fasteners. The annular mounting plate 92 is provided with a forwardly projecting annular flange 93 which extends into the opening 94 in the exterior wall 12 and is spaced between the wall of the opening 94 and the heat shield conduit 90. Also mounted in the opening 94 in the exterior wall 12 is a conduit 95 having an outwardly annular flange interposed between the exterior wall 12 and the mounting plate 92. The vent box 76 is spaced from and secured to the mounting plate 92 by means of a plurality of circumferentially spaced spacer brackets 96.

Mounted on the back side of the rear enclosure panel 16, is a vertically disposed channel member 97 having closed upper and lower ends to provide a vertical fresh air passageway 98. The lower end of the channel shaped member 97 extends below the opening 18 in the rear enclosure panel 16 so that the lower end of the fresh air passageway 98 communicates with the inlet opening 38 and the combustion chamber 50. The rear wall 99 of the channel shaped member 97 is provided with an opening 100 at the upper end thereof, having a rearwardly projecting annular flange 101 disposed coaxially with flue conduit 88 and connector conduit 89. The annular flange 101 and the flange 93 of mounting plate 92 are connected by means of a fresh air conduit 102 and connector conduit 103 to provide an annular passageway 104 intercommunicating the fresh air passageway 98 with the atmosphere.

In the operation of the embodiment as described, the control knob 70 first is turned to the correct position to permit fuel to flow through line 71 to the pilot burner 67. After the pilot burner has been manually lit through access opening 45, the door 46 is closed to seal the combustion chamber, and the knob 70 is turned to open the valve and permit fuel to be supplied through the manifold 56 to burners 57 and 58. As the fuel flows through the venturi 59 and 63 it will mix with primary air received through openings 65 and 66 and then be ejected through the openings of burner heads 60 and 64 to combine with secondary air and be ignited by the deflected flame of the pilot burner.

As the air in the combustion chamber begins to heat, a draft is created so that fresh air is drawn through annular passageway 104, fresh air passageway 98, and into the lower end of the combustion chamber. The baffle 55 in the combustion chamber causes fresh air to be directed downwardly and forwardly toward the burners 57 and 58. As the fresh air becomes heated, it rises and is directed forwardly through vertical passageway 53 into the upper end of the combustion chamber. Recirculation of hot air through inlet opening 38 is prevented by the baffle plate 55.

The hot gases passing through vertical opening 53 heat the front panel 32 of the casing and are caused to flow laterally by the V-shaped baffle plate 52 to pass in contact and heat the side walls 33 and 34 of the casing 13. The flue gases then pass through vertical openings 53 and 54 inwardly across the upper portion of the casing 13 in heat transfer relation with the upper panel 35 and

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are exhausted through outlet opening 41 into flue conduit 88. The flue gases eventually pass through opening 83 and enter the vent box 76. The arcuately shaped baffle 85 then causes the flue gases to flow first laterally and then vertically through vertical passageways 86 and 87 to be discharged through openings 81 and 82 into the atmosphere.

The construction of the vent assembly prevents any interference with the draft of the space heater by adverse weather conditions. The baffle arrangement in the casing 13 functions to direct the heated air emanating from the lower end of the combustion chamber in maximum heat transfer relation with the various panels of the casing 13 to provide maximum heat output of the heater. The baffle arrangement further functions to prevent recirculation of air in the heater, which is undesirable. The construction of the burner unit provides maximum and constant heat output and safety in operation. It readily can be seen that the burner unit may be easily removed from the casing 13 for replacement or maintenance purposes, merely by removing the mounting plate 48 on the bottom panel of the casing. Air drawn upwardly through the enclosure unit 10 will be heated by radiation as it flows past the heated casing 13. The temperature in the space to be heated may be controlled simply by turning the control knob 70 to regulate the supply of fuel to the burners of the burner unit.

It thus will be seen that the embodiment of the invention as described provides a novel space heater particularly adapted for use in mobile units, which is compact in size, capable of high heat output, safe and reliable in operation, and consistently operable under all adverse weather conditions.

Having thus described an embodiment of our invention, we claim:

1. A space heater comprising a casing defining a combustion chamber, said casing having an inlet opening and an outlet opening, a burner unit mounted in said combustion chamber, first baffle means disposed in said combustion chamber between said burner unit and said outlet opening for directing air heated by said burner unit longitudinally toward an end wall of said casing and second baffle means disposed between said first baffle means and said outlet opening for directing air heated by said burner unit transversely toward side wall of said casing.

2. A space heater according to claim 1, including third baffle means disposed in said combustion chamber for preventing recirculation of heated air through said inlet opening.

3. A space heater according to claim 1, including at least a partly perforated enclosure unit having said casing mounted therein.

4. A space heater according to claim 1, including a vent assembly communicating with said outlet opening of said casing.

5. A space heater according to claim 1, including third baffle means disposed in said combustion chamber for preventing recirculation of heated air through said inlet opening, at least a partly perforated enclosure unit having said casing mounted therein and a vent assembly communicating with said outlet opening of said casing.

6. A space heater according to claim 1, wherein said burner unit includes a manifold having a fuel supply line, at least two main burners communicating with said manifold, a pilot burner communicable with said fuel supply line and baffle means for directing the flame of said pilot burner to ignite said main burners.

7. A space heater assembly according to claim 6, wherein said burner unit includes a valve for regulating the supply of fuel to said main burners.

8. A space heater according to claim 6, wherein each of said main burners includes a venturi having at least one primary air inlet port.

9. A space heater according to claim 8, wherein said third baffle means is positioned to direct air introduced

through said inlet opening of said casing toward said primary air inlet ports.

10. A space heater according to claim 6, including a thermocouple disposed in heat transfer relation with the flame of said pilot burner and a safety shut-off valve disposed in said fuel supply line operative responsive to the operation of said thermocouple.

11. A space heater according to claim 6, wherein said burner unit includes a valve for regulating the supply of fuel to said main burners, each of said main burners includes a venturi having at least one primary air inlet port and said third baffle means is positioned to direct air introduced through said inlet port of said casing unit toward said primary air inlet ports.

12. A space heater according to claim 11, including a thermocouple disposed in heat transfer relation with the flame of said pilot burner and a safety shut-off valve disposed in said fuel supply line operative responsive to the operation of said thermocouple.

13. A space heater comprising a casing defining a combustion chamber, said casing having an inlet opening and an outlet opening, a burner unit mounted in said combustion chamber, first baffle means disposed in said combustion chamber between said burner unit and said outlet opening for directing air heated by said burner unit longitudinally, second baffle means disposed between said burner unit and said outlet opening directing air heated by said burner unit transversely, and a vent assembly communicating with the outlet opening of said casing, said vent assembly including a housing unit having upper and lower vertical openings and an interior wall disposed between said vertical openings, said interior wall having an inlet port, conduit means interconnecting said outlet opening of said casing and said inlet port of said interior wall of said vent assembly housing unit and baffle means disposed in said housing unit across said inlet port and between said upper and lower openings.

14. A space heater according to claim 13, wherein said upper and lower vertical openings of said housing unit are vertically aligned and said interior wall is vertical.

15. A space heater according to claim 13, wherein said baffle means disposed within said vent assembly housing unit is spaced from interior side walls of said vent assembly housing unit to permit lateral and then vertical flow of flue gases discharged into said vent assembly housing unit through said inlet port in said interior wall of said vent assembly housing unit.

16. A space heater according to claim 13, wherein said baffle means in said vent assembly housing unit has an arcuate configuration and is secured at its ends to said interior wall above and below said inlet port in the interior wall of said vent assembly housing unit.

17. A space heater according to claim 13, wherein said upper and lower vertical openings of said housing unit are vertically aligned and said interior wall is vertical, said baffle means disposed within said vent assembly housing unit is spaced from interior side walls of said vent assembly housing unit to permit lateral and then vertical flow of flue gases discharged into said vent assembly housing unit through said inlet port in said interior wall of said vent assembly housing unit and said baffle means disposed in said vent assembly housing unit has an arcuate configuration and is secured at its ends to said interior wall of said vent assembly housing unit above and below said inlet port in said interior wall.

18. A space heater comprising a casing, including front and rear walls, side walls and top and bottom walls defining a combustion chamber, said rear wall having an inlet opening and an outlet opening, a burner unit mounted in said combustion chamber, a first baffle plate disposed in said combustion chamber between said burner unit and said outlet opening, said first baffle plate having a front end spaced from said casing front wall to provide a vertical passageway for air heated by said burner unit

and a second baffle plate disposed between said first baffle plate and said outlet opening and said second baffle plate having sides spaced from said casing unit side walls to provide vertical passageways for said heated air.

19. A space heater according to claim 18, wherein said second baffle plate has a V-shaped configuration.

20. A space heater according to claim 18, including a third baffle plate disposed in said combustion chamber for preventing recirculation of heated air through said inlet opening.

21. A space heater according to claim 18, including a partly perforated enclosure unit having said casing mounted therein.

22. A space heater unit according to claim 18, including a vent assembly communicating with said outlet opening of said casing.

23. A space heater according to claim 18, including a third baffle plate disposed in said combustion chamber for preventing recirculation of heated air through said inlet opening, a partly perforated enclosure unit having said casing mounted therein and a vent assembly communicating with said outlet opening of said casing.

24. A vent assembly for a space heater including a casing defining a combustion chamber having inlet and outlet openings, and a burner unit mounted in said combustion chamber, comprising a housing unit having upper and lower vertical openings, said housing unit having an interior wall disposed between said vertical openings, said interior wall having an inlet port, conduit means mounted on said housing unit for intercommunicating said outlet opening of said casing and said inlet port of said interior wall and baffle means disposed in said housing unit across said inlet port of said interior wall and between said upper and lower vertical openings of said housing unit.

25. A vent assembly according to claim 24, wherein said upper and lower vertical openings of said housing unit are vertically aligned and said interior wall is vertical.

26. A vent assembly according to claim 24, wherein said baffle means disposed within said housing unit is, spaced from interior side walls of said housing unit to permit lateral and then vertical flow of flue gases introduced into said housing unit through said inlet port in said interior wall of said housing unit.

27. A vent assembly according to claim 24, wherein said baffle means has an arcuate configuration and is secured at its ends to said interior wall above and below said inlet port.

28. A vent assembly according to claim 24, wherein said upper and lower vertical openings of said housing unit are vertically aligned and said interior wall is vertical, said baffle means disposed within said housing unit is spaced from interior side walls of said housing unit to permit lateral and then vertical flow of flue gases introduced into said housing unit through said inlet port of said interior wall, and said baffle means has an arcuate configuration and is secured at its ends to said interior wall above and below said inlet port.

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