

Aug. 16, 1955

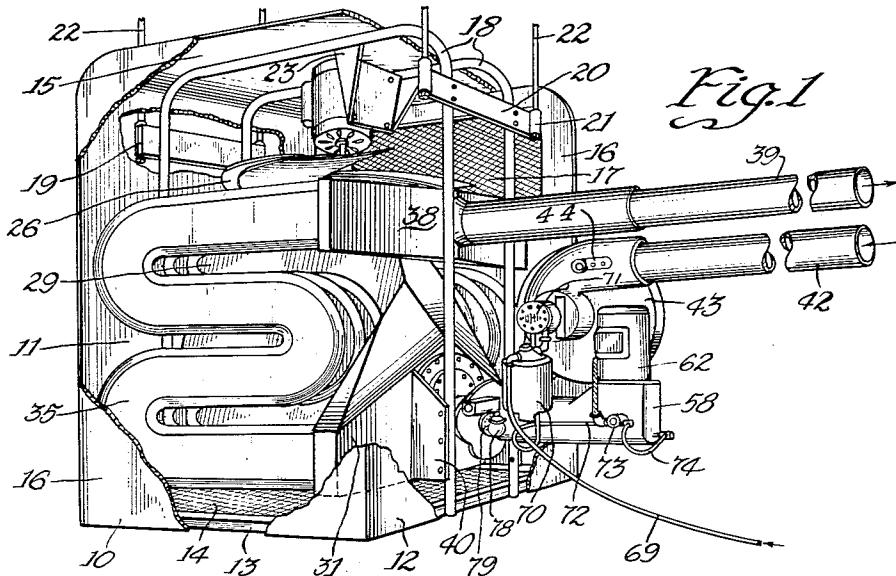
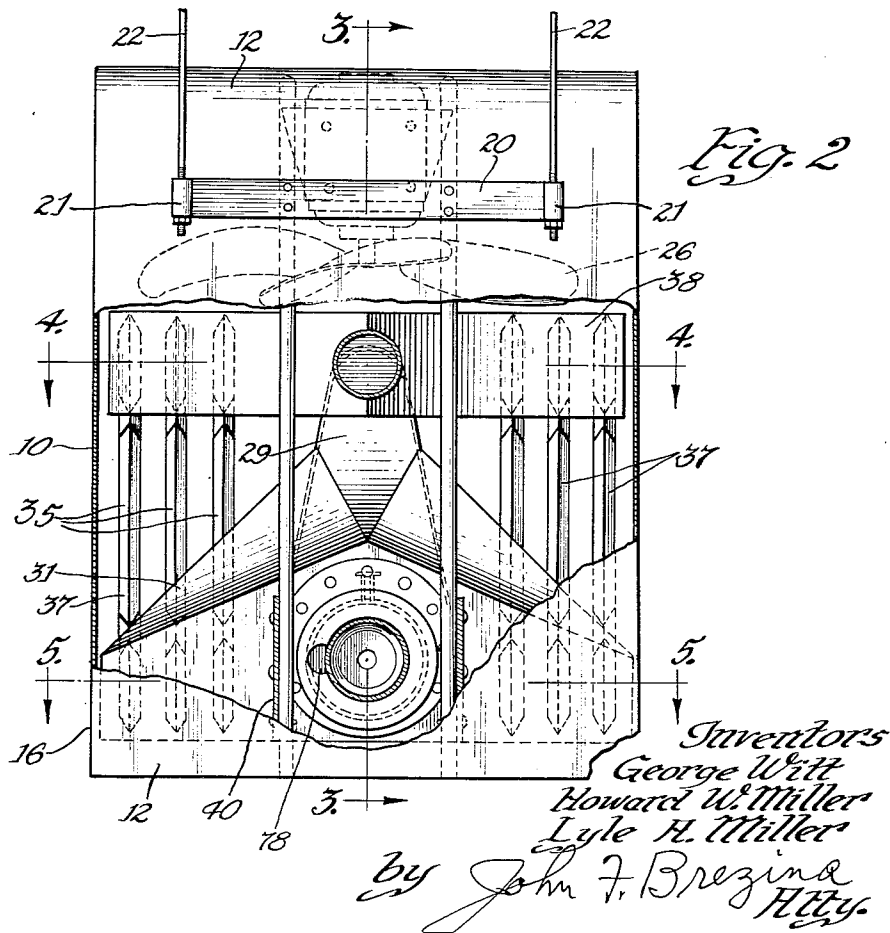
G. WITT ET AL

2,715,399

FUEL BURNING SPACE HEATER

Filed Aug. 22, 1950

3 Sheets-Sheet 1



Aug. 16, 1955

G. WITT ET AL

2,715,399

FUEL BURNING SPACE HEATER

Filed Aug. 22, 1950

3 Sheets-Sheet 2

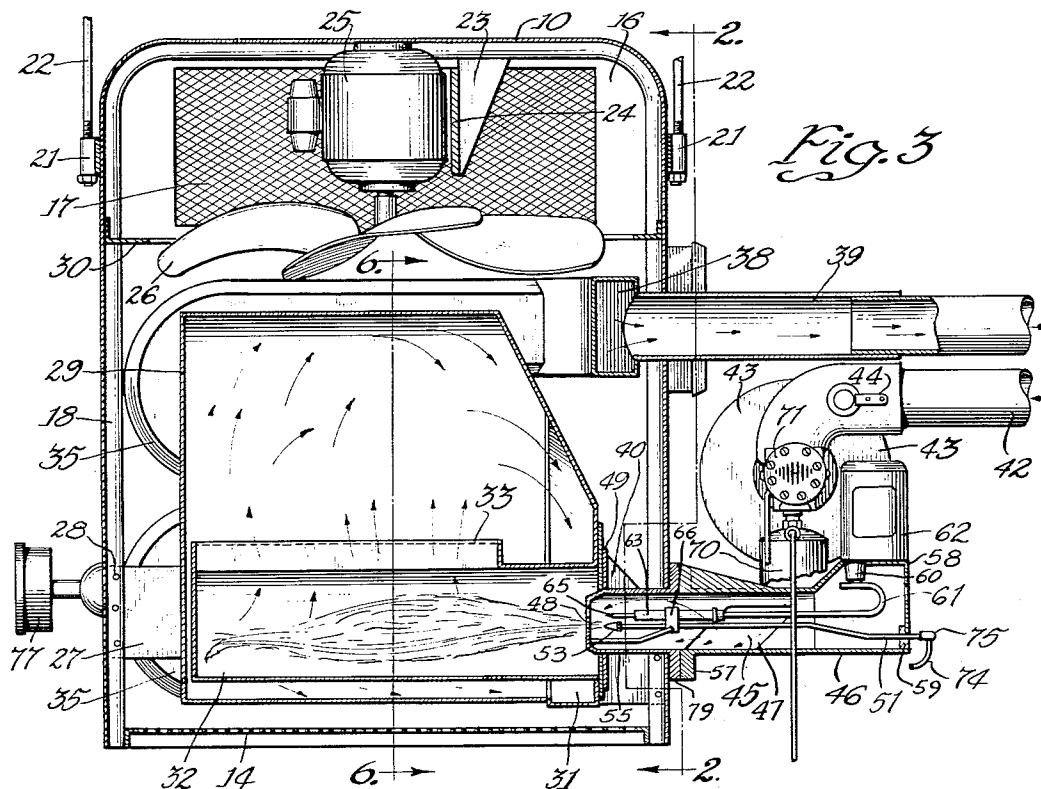


Fig. 3

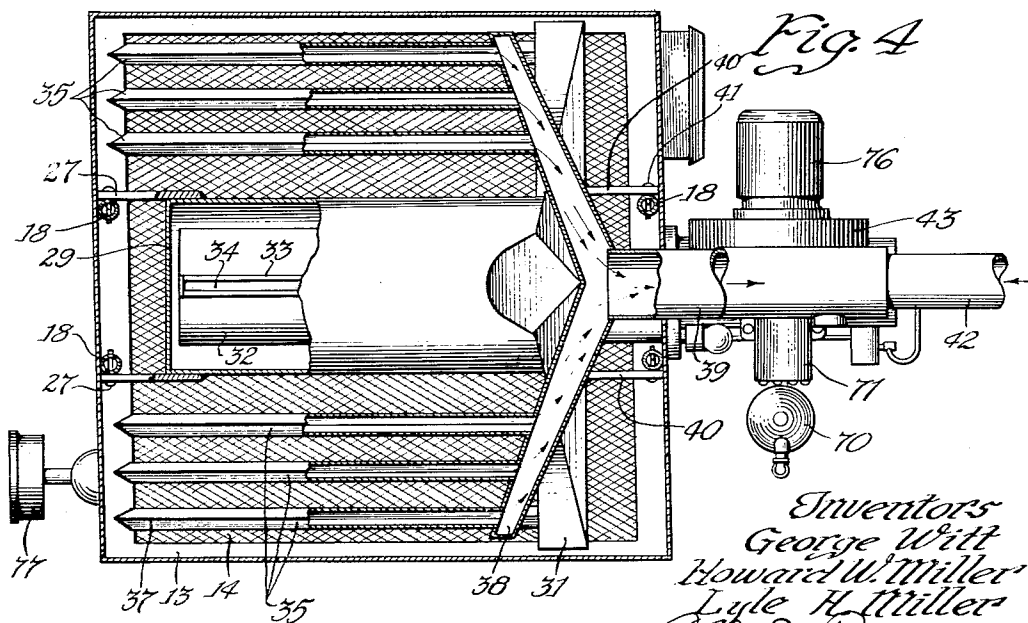


Fig. 4

Inventors
George Witt
Howard W. Miller
Lyle H. Miller
by John F. Brezina
Atty.

Aug. 16, 1955

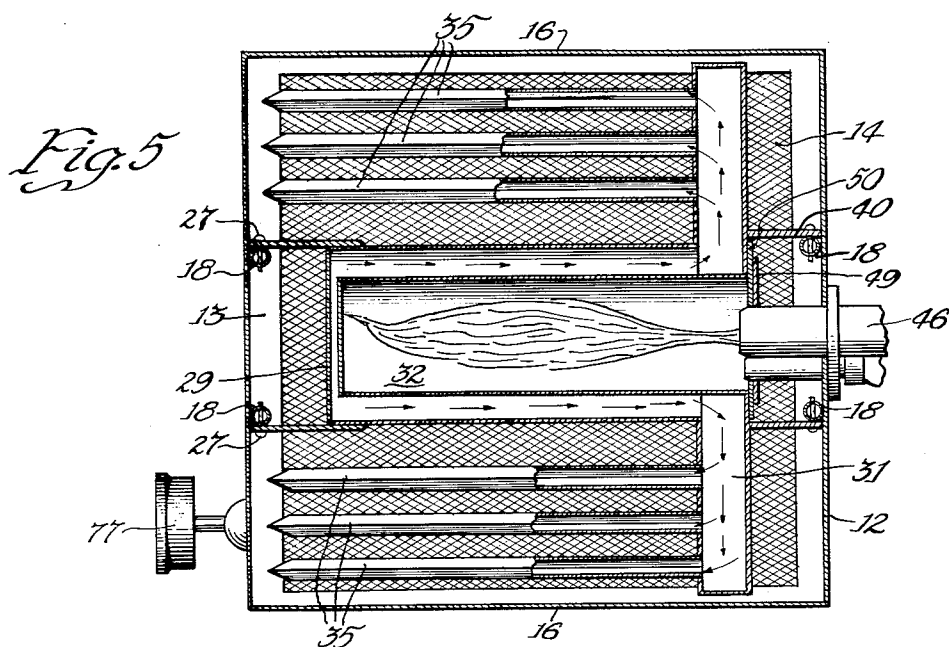
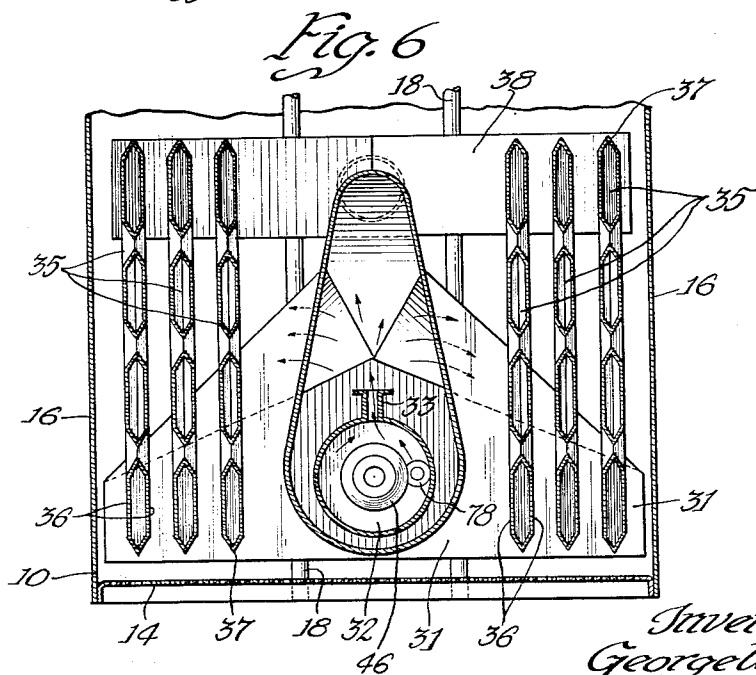
G. WITT ET AL

2,715,399

FUEL BURNING SPACE HEATER

Filed Aug. 22, 1950

3 Sheets-Sheet 3



Inventors
 George Witt
 Howard W. Miller
 Lyle H. Miller
 by John F. Brezina
 Atty.

1

2,715,399

FUEL BURNING SPACE HEATER

George Witt, Howard W. Miller, and Lyle A. Miller,
Wausau, Wis.

Application August 22, 1950, Serial No. 180,840

7 Claims. (Cl. 126—119)

This invention relates to the heater art and more particularly is directed to improvements in a unit heater. It is an object of this invention to provide a heater having an air intake stack and an exhaust stack on which the static pressure against the air intake and exhaust stacks is substantially identical, the heater being so constructed that a uniform flame for combustion can be maintained independently of any outside pressures. It is additionally an object of this invention to provide a heater which may be used without a chimney.

A further object of this invention is to provide a plurality of relatively flat or elongated narrow heat exchanger tubes through which the exhaust material is conducted to thereby provide large heat exchange surfaces. Additionally, it is an object of my invention to provide a plurality of connected flat-faced heat exchange tubes which have their flat faces disposed in the direction of the flow of the circulated air to thereby reduce the resistance of the heat exchange tubes to the forced air and permit maximum efficiency in the heat exchange operation.

Other and further objects of this invention will become apparent from the following description and appended claims, reference being had to the accompanying drawings and numerals of reference thereon.

On the drawings:

Fig. 1 is a perspective view of the heater, portions of the outer wall or casing being broken away for the purpose of illustration.

Fig. 2 is a rear view of the heater taken substantially on the line 2—2 of Fig. 3 and looking in the direction of the arrows, a portion of the casing having been removed for the purpose of illustration.

Fig. 3 is a view taken substantially on the line 3—3 of Fig. 2 and looking in the direction of the arrows.

Fig. 4 is a view taken substantially on the line 4—4 of Fig. 2 and looking in the direction of the arrows.

Fig. 5 is a sectional view taken substantially on the line 5—5 of Fig. 2 and looking in the direction of the arrows.

Fig. 6 is a view taken substantially on the line 6—6 of Fig. 3 and looking in the direction of the arrows.

Referring to the drawings, it will be seen that numeral 10 designates an outer housing, casing or shell having a front wall 11, a rear wall 12, a base or bottom wall 13 which carries a screen 14 to permit the passage of air therethrough, a top wall 15 and a pair of side walls 16, one of which is illustrated in Figs. 1 and 3 as having an enlarged opening covered by a screen or apertured plate 17. The relationship of these various elements above described is clearly illustrated in Fig. 1. Secured to the housing 10 by any suitable means is a frame which includes a pair of bent bars, frame members or supports 18 to which are connected by means of rivets or the like a front bracket 19 and a rear bracket 20, each of which brackets carries at its opposite end preferably internally threaded apertures or hanger supports 21. Numeral 22, illustrated in Figs. 1 and 3, designates a plurality of support bars or rods which have threaded ends and on which

2

threaded ends the hanger supports 21 are respectively adjustable to thereby permit proper positioning of the heater. The support members or rods 22 are rigidly supported on a portion of a building frame, wall or ceiling or the like (not shown).

As illustrated in Figs. 1 and 3, a bracket, plate or support 23 is secured to the upper wall 15 in any suitable manner and in depending position, and said bracket 23 has secured thereto by bolts or pins or the like the base 24 of a motor 25. The central shaft of the motor 25 carries an enlarged propeller or blower 26 which is mounted in an upper portion of the housing so that air will be drawn through the screen 17 and forced from the housing through the lower apertured plate or screen 14.

As illustrated in Figs. 3, 4 and 5, numeral 27 designates a pair of gusset plates or brackets which are connected by means of bolts or the like 28 to the forward portions of the frame members 18, said frame members each being secured in the lower portion of the housing 10 as indicated in Fig. 3. By means of welding or the like the inner end portions of the gusset plates or brackets 27 are secured to an enlarged housing or casing which provides the external combustion chamber 29. It will be noted that the external combustion chamber is enlarged and extends from a position slightly spaced from the screen or expanded metal plate 14 to a position slightly spaced from and below the propeller or fan blade 26. As illustrated in Fig. 3, a flanged annular baffle, deflector, ring or shroud 30 is secured by its annular flange to the housing 10 about the propeller blade 26 and acts to deflect air driven by the blade 26 downwardly to thereby achieve an efficient flow through the casing 10.

As illustrated in Figs. 1, 2, 3, 4, 5 and 6, a manifold or combustion gas collector 31 is communicatively connected to the external combustion chamber as illustrated in the drawings to collect the gases flowing from the external combustion chamber. A housing, closed-ended tube or pipe 32, providing an inner combustion chamber, extends through the manifold 31 and into the internal combustion chamber, said tube 32 being connected at its open end to the outer wall of the manifold 31 and being connected to the inner wall of the manifold as illustrated in Figs. 3 and 6. It will be noted that the housing 32 or inner combustion chamber is constricted at a portion of its upper end 33, and is illustrated in Figs. 3, 4 and 6. The internal combustion chamber is communicatively connected with the external combustion chamber through an elongated slot or opening 34 in the constricted portion 33 of said internal combustion chamber.

It will be noted that the internal combustion chamber is substantially of circular cross-section and that the external combustion chamber is substantially ovate in cross-section.

Referring to Figs. 1, 2, 3, 4, 5 and 6, it will be seen that a plurality of heat exchangers 35 are provided. Heat exchangers 35 are disposed in two sets on opposite sides of the external combustion chamber 29. It is observed also that the heat exchangers 35 are curved tubes which are connected at their lower ends to the manifold 31 as illustrated in Figs. 1 and 5 from which the heated gases enter into the heat exchangers 35. It will be noted that the curves in the heat exchangers are elongated and that the tubes which form each curved heat exchanger comprise a pair of flat, elongated plates 36 which are connected at their upper and lower ends in any suitable manner to provide fins or angularly shaped ribs 37. The disposition of the heat exchanger tubes 35 is such that the faces 36, illustrated in Fig. 6, are parallel to the main flow of air being forced around the tubes 35 by the fan or propeller 26. The angularly shaped upper and lower portions of the tubes 35 result in lower resistance to the flow of air around the heat exchanger tubes.

As illustrated in Figs. 1, 2, 3, 4 and 6, an upper or exhaust manifold 38 is connected to the upper ends of the tubes 35 and collects the gases from tubes 35 as illustrated in Fig. 4. An exhaust stack or pipe 39 is connected to manifold 38 to discharge the exhaust gases.

To add support to the combustion manifold, gusset plates or brackets 40 are secured to the rear portions of the frame 18 by means of bolts or the like 41, and at their inner portions the gusset plates 49 are secured by welding or the like to the housing of the manifold 31. Numeral 42 designates an air intake tube or casting. It will be noted that the end of the air intake tube 42 is adjacent the end of the exhaust tube 39 so that the static pressure of air flowing past the air intake and the exhaust will be substantially the same, and also that these tubes are of substantially the same diameter. In other words, the burning of the flame will not be influenced by wind passing the air intake or exhaust, regardless of the velocity or pressures which are build up, as such pressures or pressure effects will be substantially the same in the air intake tube 42 and the exhaust 39. The tube or conduit 42 is communicatively connected with a housing or casing 43 which houses a propeller (not shown) which forces air from the intake tube 42 into the system to permit combustion of the oil or fuel as will hereinafter become apparent.

As illustrated, numeral 44 represents the operable means for a damper (not shown) which is in the air intake conduit 42 and by means of which the amount of air entering through the tube may be controlled. Through a communicating conduit designated as 45 the housing 43 is communicatively connected to an elongated housing 46 which houses burner assembly, to be hereinafter described; and as illustrated in Fig. 7, the communicating conduit 45 terminates in the aperture 47 in said housing 46. A blast tube or pipe section 55 is secured to flange 57 of the burner housing 46. At its inner end the blast tube 55 is apertured as designated at 48 in Figs. 3 and 7, and as illustrated in Figs. 3 and 5 a small portion of the inner end of said blast tube 55 extends into the internal combustion chamber and in such position the housing 46 is secured by the means of an apertured securing plate or flange 49 which is connected or carried by the tube 55, said flange 49 being secured in any suitable fashion to the apertured closure plate 50 which is connected to the combustion manifold housing 31.

As illustrated in Figs. 3 and 7, the burner assembly comprises a plurality of parts as follows:

A fuel or oil tube line 51 extends through the housing 46 into tube 55 and is communicatively connected to valve body or nozzle 53. The nozzle 53 may be an adjustable needle valve or the like for adjustably permitting the flow of fuel oil. Said nozzle 53 is mounted at the end of oil line 51.

At the end of the housing 46 there is mounted an apertured back closure plate 58 through which the oil line 51 extends, and it will be noted that at the rear of the housing 46 an anchoring plate 59 is provided for the end of the oil line 51. Extending through the housing is truncated cone, conductor or transformer terminal 60 which provides a connection between the bus bar or electrical conduit bar 61 and the step-up transformer 62 which is illustrated in Fig. 1 and which is rigidly mountable on the top of the burner housing 46. At its inner end the bar 61 is securely connected to a porcelain insulated electrode 63. A terminal end element or wire 65 extends from the end of the electrode 63 adjacent the nozzle 53 to cause a spark to ignite the oil or fuel being ejected from the nozzle. Numeral 66 designates a clamp or collar which holds the oil line 51 and electrode 63 in desired adjacent positions.

Referring to Fig. 1, it will be seen that the oil or fuel is introduced into the system through conduit 69 and then is drawn through the oil strainer 70, illustrated in Figs. 1 and 3. From here the fuel or oil is pumped by

pump 71 through conduit 72 through a solenoid operated valve 73 and then into the oil line 51 which is connected to conduit 74 by means of a connection fitting 75.

As illustrated in Fig. 4, motor 76 is mounted adjacent housing 43 to drive the propeller therein.

As illustrated in Figs. 3, 4 and 5, a manually operable handle 77 is mounted on the housing 10 to operate the warm air or fan limit control.

To properly control the flow of oil to the nozzle 53, we provide a standard photo-electric eye device 78 which is positioned to be responsive to the light developed within the internal combustion chamber. The photo-electric cell or eye device 78 is mounted adjacent the blast tube by means of flange 79 as illustrated in Fig. 1.

As many changes could be made in the above construction, and as many apparently widely different embodiments of my invention within the scope of the claims could be constructed without departing from the spirit and scope thereof, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. In a fuel burning heater adapted for use in space heating, a housing having front and back walls; means forming a vertically elongated outer combustion chamber mounted within said housing and extending between said front and back walls, said chamber having upwardly and inwardly inclined flat side walls joined by curved top and bottom walls; a substantially cylindrical inner combustion chamber disposed within and arranged in the lower part of said outer combustion chamber, said inner chamber extending substantially from one wall of said outer combustion chamber to an oppositely facing wall thereof and being provided with an elongated, constricted passage opening upwardly into said outer chamber; a plurality of vertically disposed, serpentine heat exchange tubes arranged in sets on opposite sides of said outer combustion chamber; a gas collecting manifold arranged in the lower part of said housing adjacent said front wall and communicatively connected to one end of said outer combustion chamber and to a lower end of each of said heat exchange tubes, a portion of said inner combustion chamber extending through said gas collecting manifold; an exhaust tube connected to and extending from said front wall of said housing; an outlet manifold vertically spaced above and being substantially in alignment with said gas collecting manifold, said outlet manifold being communicatively connected to said exhaust tube and to an upper end of each of said heat exchange tubes; a burner housing coaxial with said inner combustion chamber and in communication with the portion thereof extending through said gas collecting manifold, said burner housing connected to and extending through said front wall of said housing; and air propelling means in said housing for driving air in a generally uninterrupted, single vertical direction through said housing.

2. The combination as set forth in claim 1, in which the vertical cross-sectional area of each heat exchange tube is elongated in a vertical direction.

3. The combination as set forth in claim 2, in which said air propelling means forces the air downwardly through said housing.

4. In a fuel burning heater adapted for use in space heating, a housing, means forming a combustion chamber mounted within said housing and spaced from both the front and rear walls of said housing, said chamber being vertically elongated; means for introducing heated gases into said combustion chamber including a mechanism within said last-mentioned means for collecting said heated gases and providing a second chamber in which combustion is initiated; means for delivery of the ingredients of combustion into said second chamber; a plurality of vertically disposed, serpentine heat exchange tubes arranged on each side of said combustion chamber, each of said tubes being positioned in a vertical

5

plane spaced from said combustion chamber; a gas collecting manifold arranged in the lower part of said housing adjacent one wall of said housing and communicatively connected to one end of said combustion chamber and to a lower end of each of said heat exchange tubes, said means for delivering the ingredients of combustion into said second chamber extending through said gas collecting manifold; an outlet manifold vertically spaced above and being substantially in alignment with said gas collecting manifold, said outlet manifold being 10 communicatively connected to an upper end of each of said heat exchange tubes and being contained within said housing; and air propelling means in said housing for driving air in a generally uninterrupted, single vertical direction through said housing.

5. The combination as set forth in claim 4, in which the vertical cross sectional area of each heat exchange tube is elongated in a vertical direction.

6. The combination as set forth in claim 5, in which the side walls of said combustion chamber are flat and 20

6

taper toward each other from the bottom to the top thereof.

7. The combination as set forth in claim 6, in which said air propelling means forces the air downwardly through said housing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,422,195	Gohmann	July 11, 1922
1,911,985	Bell et al.	May 30, 1933
2,037,070	Frentzel	Apr. 14, 1936
2,160,269	Jorolemon	May 30, 1939
2,192,920	Linch	Mar. 12, 1940
2,376,140	Henderson et al.	May 15, 1945
2,408,087	Miles	Sept. 24, 1946
2,512,384	Rush	June 20, 1950
2,517,398	McCollum	Aug. 1, 1950
2,517,446	Ryder et al.	Aug. 1, 1950
2,579,047	Luty	Dec. 18, 1951