

Oct. 24, 1967

M. O. WILHOITE

3,348,533

BASEBOARD HEATER

Filed June 23, 1965

3 Sheets-Sheet 1

Fig. 1.

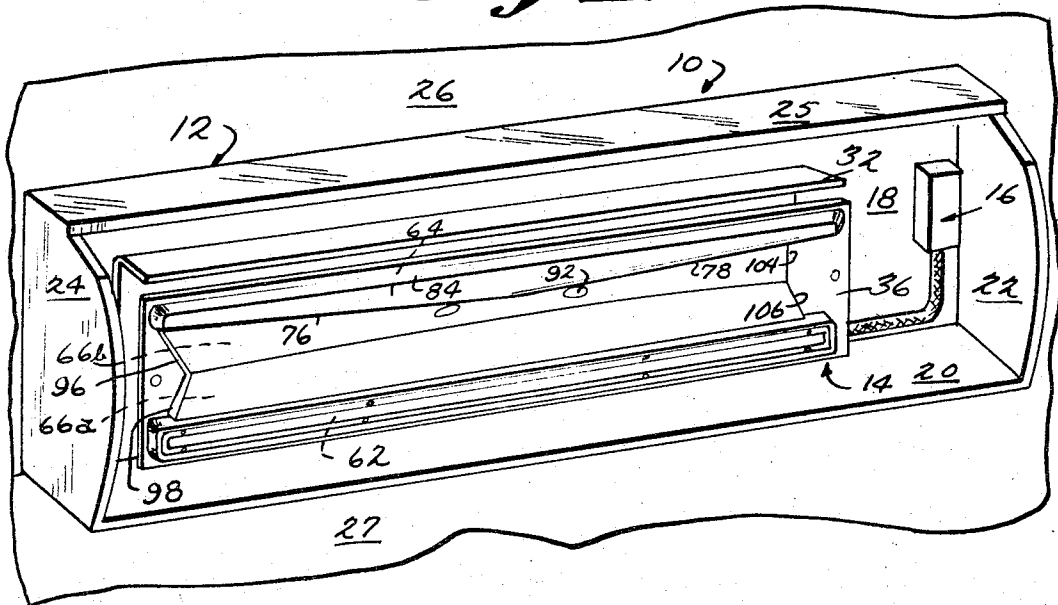


Fig. 3.

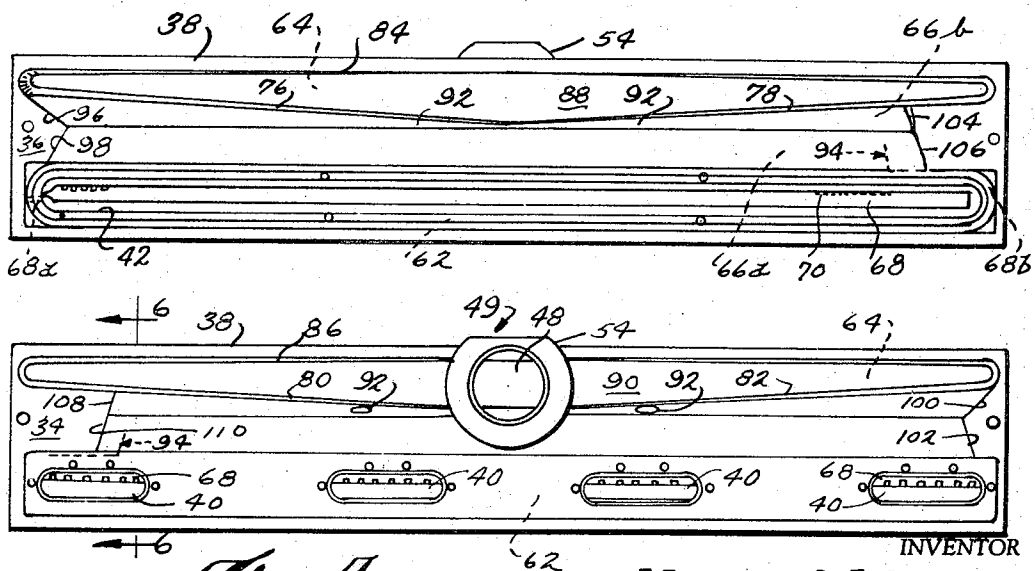


Fig. 4.

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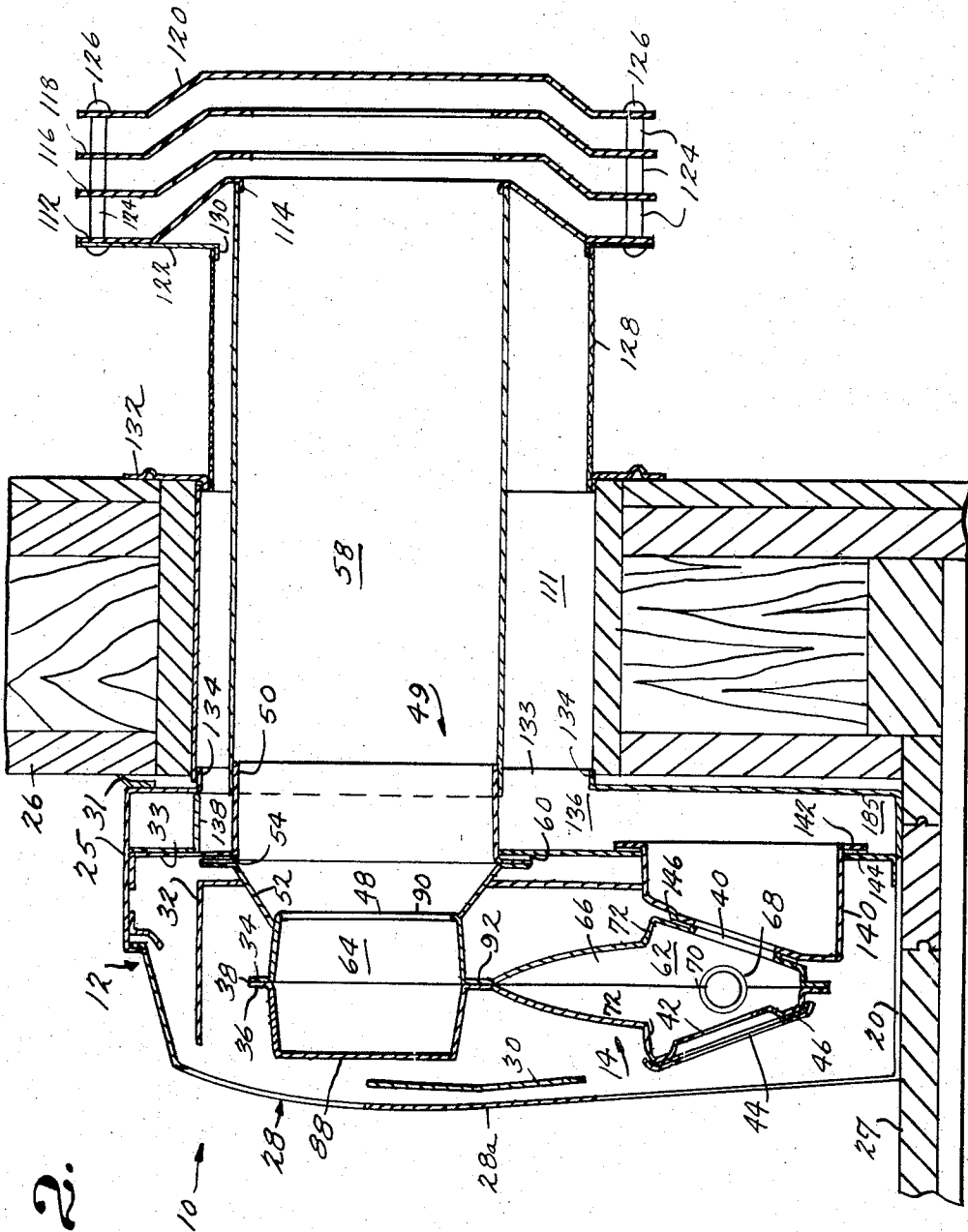


Fig. 2.

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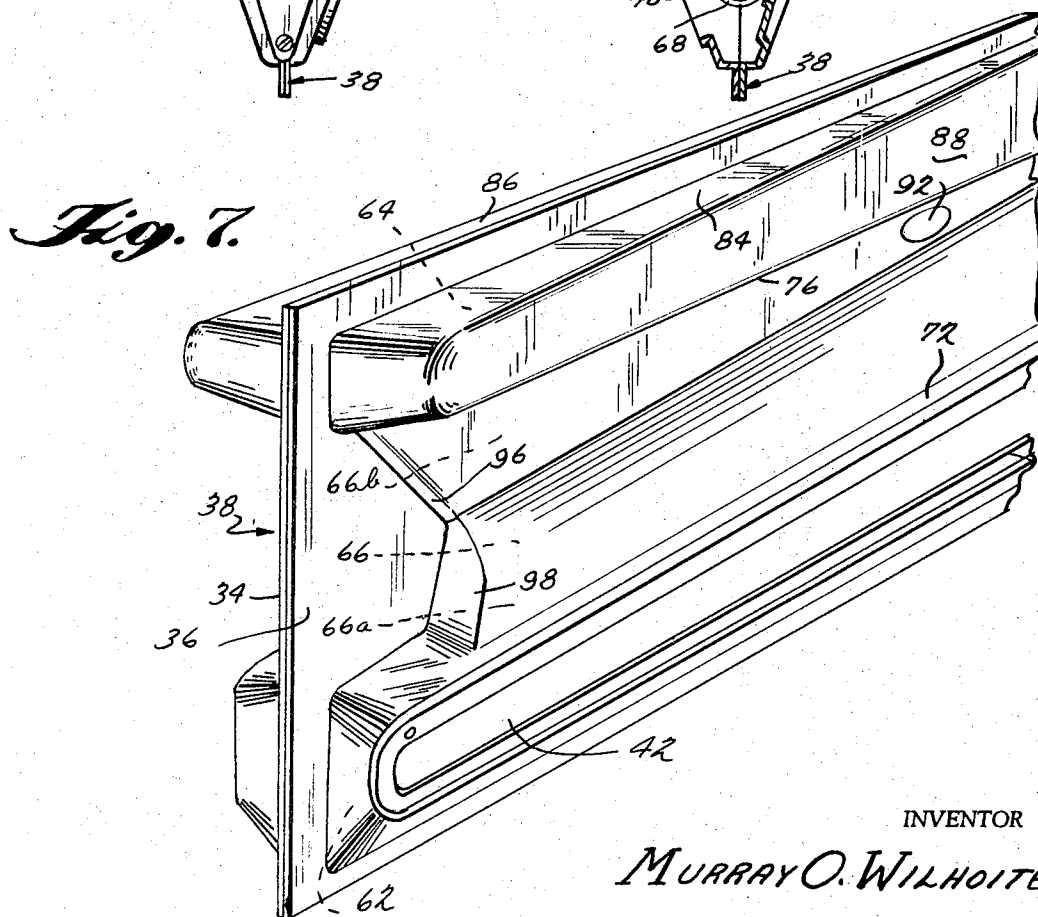
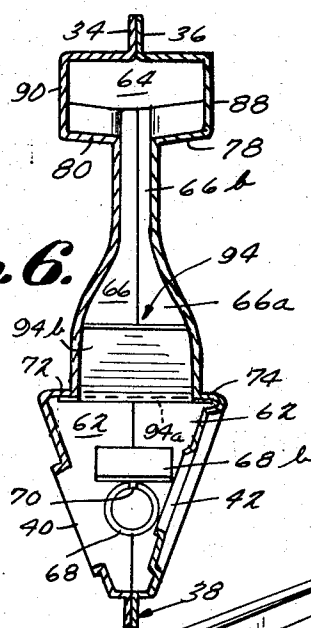
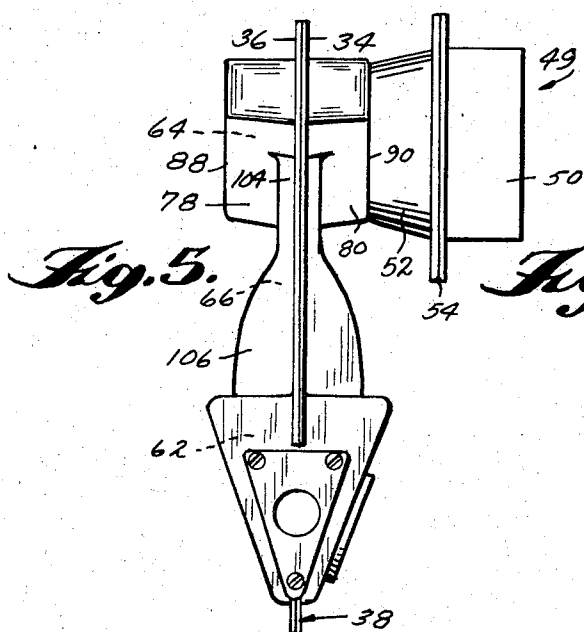
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BASEBOARD HEATER

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3 Sheets-Sheet 3



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BASEBOARD HEATER

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2 Claims. (Cl. 126-90)

This invention relates to sealed gas fired space heaters and in particular to a sealed combustion chamber for use in such a heater.

It is the primary object of the present invention to provide an elongated sealed combustion unit suitable for use in a gas fired baseboard heater, the combustion unit being of improved construction to provide more efficient burning of the fuel.

It is a more specific object to provide an elongated gas combustion unit of the above type whose inner contours and baffle arrangement effect an even flow of exhaust gases along the length of the unit toward a central exhaust gas vent. The improved construction also limits recirculating movement of gases at the ends of the unit in a manner to prevent blowing out of the burner flame at the ends of the unit.

The invention will be further understood from the following detailed description taken with the drawings in which:

FIGURE 1 is a simplified perspective view of a gas fired baseboard heater in a partially disassembled condition;

FIGURE 2 is a vertical transverse sectional view taken through the middle of the heater of FIGURE 1;

FIGURE 3 is a front elevational view of the combustion unit of FIGURE 1;

FIGURE 4 is a rear elevational view of the combustion unit of FIGURE 1;

FIGURE 5 is an end elevational view of the combustion unit of FIGURE 1 viewed from the right;

FIGURE 6 is a sectional view taken on the line 6-6 of FIGURE 4; and

FIGURE 7 is a fragmentary perspective view of the end of the combustion unit viewed from the left.

Referring to FIGURE 1 there is shown a baseboard heater 10 including as its major elements an open front cabinet or casing 12, a sealed combustion unit 14 embodying the principles of the present invention and suitable automatic controls 16 for the flow of fuel gas to the combustion unit 14. The casing 12 may be of any suitable construction and as shown includes a rear wall 18, a bottom wall 20, end walls 22 and 24 and a narrow top wall 25. The rear wall 18 is positioned against an exterior wall 26 of a building, and the bottom wall 20 rests on the floor 27. In a completely assembled installation, as shown in FIGURE 2, there is also provided a front panel 28 which is releasably secured in place. The panel 28 is imperforate along its entire central horizontal portion 28a and is of open or louvered construction above and below the central portion 28a.

Directly behind the imperforate panel portion 28a and spaced apart from the panel 28 and the combustion unit 14 is a vertical heat shield 30 which has substantially the same length and width as the imperforate panel portion 28a. A rear heat shield 32 of inverted L shape is provided between a vertical partition 33 and the combustion unit 14, the horizontal portion of the L overlying the combustion unit 14 in spaced apart relationship. The top and ends of the casing are sealed to the wall 26 with a gasket 31. The combustion unit 14 is constructed of two pressed metal plates 34 and 36 having their edges secured together as by welding to form an outwardly projecting circumscribing flange 38 on the unit 14. The rear plate 34 is provided with four equi-spaced air inlet holes 40 disposed in a row along the lower part of the

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plate, each hole 40 being of elongated shape as seen in FIGURE 4. The front plate 36 is provided with a single elongated aperture 42 which in a complete installation is covered with a removable inspection plate 44 (FIGURE 2) and cooperating gasket 46.

An exhaust outlet opening 48 is located in the upper part of the combustion unit 14 on a vertical median line. As seen in FIGURES 2 and 4 the outlet opening 48 is provided in the rear plate 34 and is surrounded laterally with a rearwardly projecting flue collar 49. The collar 49 is constructed of a rear tubular part 50 of circular cross section and a forward tapered tubular part 52 which is welded to the plate 34 along the periphery of the opening 48. Each of the parts 50 and 52 has a radially outwardly projecting flange, and the flanges are welded together to form a rigid circumferential flange 54 intermediate the ends of the collar 49. In an assembled heater the rear part 50 of the collar 49 extends through the vertical partition 33 into communication with a horizontal flue 58, and the rear face of the flange 54 is sealed to the front of the partition 33 with a gasket 60.

Referring more specifically to the construction of the combustion unit 14 it will be seen that the contours of the front and rear plates 36 and 34 provide an enlarged lower chamber 62, an enlarged upper chamber 64 each of which extends substantially the length of the unit 14 and an intermediate restricted chamber 66 providing communication between the other two chambers.

A straight burner tube 68 is disposed adjacent the air inlet openings 40 and extends substantially the entire length of the chamber 62. The left end of the burner tube 68, as viewed from the front, is closed and the right end is open for receiving a supply of gas from a suitable connection (not shown), the latter being mounted on a plate 69 (FIGURE 5) secured to the end of the unit. The burner tube is supported by means of end brackets 68a and 68b which are welded to the inner surfaces of the chamber 62. The upper surface of the tube 68 is provided with a large number of gas openings 70 whereby in operation a flame will occupy most of the space within the chamber 62.

As seen in FIGURES 2, 5 and 6, the chamber 62 in cross section is shaped throughout its length generally as an inverted isosceles triangle, the upper limit thereof being defined by the restricted chamber 66. The junction between these two chambers 62 and 66 occurs along generally horizontal portions of the plates 34 and 36 identified at 72 and 74 in the drawings.

The upper or exhaust chamber 64 within the combustion unit 14 extends substantially the entire length of the combustion unit 14 and has a cross sectional shape of gradually increasing area from the ends toward the middle. The front to rear dimension, or thickness of the chamber 64 is constant throughout its length, and the increasing cross section is effected by two inclined walls 76 and 78 on the front plate 36 and two corresponding inclined walls 80 and 82 on the rear plate 34. The greatest vertical dimension of the exhaust chamber 64 occurs at the intersections of the wall 76 with wall 78 and the wall 80 with wall 82, the exhaust outlet opening 48 being disposed at this location. The remainder of the chamber 64 is defined by horizontal flat plate portions 84, 86 and by vertical flat plate portions 88 and 90, the latter portions being generally triangular and defining, respectively, the front and back walls of the chamber 64.

As best shown in FIGURES 6 and 7, the intermediate restricted chamber 66 is formed of outwardly bulging portions of the plates 34 and 36, the bulges defining a lower chamber section 66a and an upper chamber section 66b. The lower section 66a communicates directly with the upper end of the flame chamber 62. In an upward direction the front to rear dimension of the section 66a de-

creases due to the inwardly curving shape of the plates 34 and 36 in this area. As seen in FIGURES 3 and 7 the section 66a has a uniform vertical dimension along its length. The upper chamber 66b, on the other hand, is of uniform front to rear dimension, or thickness, along its length and of varying vertical dimension. The varying vertical dimension is effected by the inclined walls 76, 78, 80 and 82 as seen, for example, in FIGURES 6 and 7. Rigidity is imported to the section 66b by two indentations in the walls thereof which project inwardly into contact with each other as at 92 (FIGURES 2 and 7). It will be seen, then, that the section 66b is in the form of a rather narrow slot which provides communication between the upper, or exhaust chamber 64 and the chamber section 66a.

It will be seen in FIGURES 1, 3 and 4 that the ends of the chamber sections 66a and 66b terminate short of the ends of the exhaust chamber 64 and the flame chamber 62 and differ from each other in shape. The arrangement together with an internal recirculation baffle 94 at one end is designed to achieve uniform flow of exhaust gases upwardly and centrally toward the flue collar 49. As best seen in FIGURES 1, 3 and 7, the left end of the chamber 66 as viewed from the front is wing-shaped in that the front plate 36 has inclined walls 96 and 98 which intersect each other at the junction of the chamber section 66b with the chamber section 66a. The wall 96 slopes downwardly and centrally from the end of the wall 76, the latter defining the bottom of the exhaust chamber 64. The wall 98 slopes upwardly and centrally from a location spaced from the end of the top wall 72 of the flame chamber 62. The rear plate 34 has corresponding inclined walls 100 and 102 which, as seen in FIGURE 3, are the mirror images of the walls 96 and 98.

The right end of the restricted chamber 66 as viewed from the front is defined by inclined walls 104 and 106 on the front plate 36, as seen in FIGURES 1 and 3. These walls lie in substantially the same plane and slope upwardly and centrally from a location spaced from the end of the lower chamber 62 to a location spaced from the end of the exhaust chamber 64. As seen in FIGURE 4, the rear plate 34 is provided with inclined walls 108 and 110 which are the mirror images of the walls 104 and 106, respectively.

Still referring to the right end of the restricted chamber 66 it will be seen in FIGURES 3, 4 and 6 that the recirculation baffle 94 is a generally L-shaped member disposed so as to extend across the front-to-rear dimension of the chamber 66a. The baffle includes a horizontal leg portion 94a located in the plane of the junction between the lower chamber 62 and the chamber section 66a and an upwardly extending leg portion 94b which projects into the chamber section 66a. The edges of the horizontal portion 94a extend beyond the width of the upstanding portion 94b and are secured as by welding to the inner surfaces of the walls 72 and 74 as seen in FIGURE 6. The upstanding portion is spaced from the inclined walls 106 and 110 and slopes slightly toward the center of the heating unit 14. The free upper edge of the upstanding portion 94b terminates slightly below the junction of the chamber section 66a with the chamber section 66b. As seen in FIGURE 3, that portion of the burner tube 68 directly below the baffle 94 is not provided with gas apertures.

The construction of the flue 58 and related parts is shown in FIGURE 2 and is of the type fully disclosed in Nordholt et al. Patent 2,964,034. The rear end of the flue collar 49 fits tightly into the flue 58 which is a cylindrical conduit passing horizontally through a hole cut in the building wall 26 and defining therewith an annular air inlet passage 111. The outer end of the flue 58 is fitted with a dish-shaped member 112 having a central aperture defined by an intumed flange 114, the latter engaging the flue 58. Outwardly of the member 112 are two centrally apertured spaced-apart baffles 116 and 118 and an end plate 120. The baffles and end plate together with

an annular plate 122 are assembled by means of tubular spacer members 124 and rivets 126. A cylindrical air inlet screen 128 eccentrically surrounds that portion of the vent 58 which is disposed outside the building wall 26 and is supported at one end by a flange 130 on the plate 122 and at the other end by an annular mounting plate 132, the latter being secured to the exterior surface of the building wall 26.

The rear wall 18 of the heater casing 12 is provided with central air inlet opening 133 having a flanged periphery 134 which engages the periphery of the hole in the building wall 26. There is thereby provided communication between the annular air inlet passage 111 and a chamber 136 defined by the rear wall 18 and the vertical partition 33. An L-shaped baffle 138 secured to the partition 33 is disposed in the chamber 136 along the top of the opening 133 to direct incoming air downwardly. A series of connecting pipes 140 place the bottom of the chamber 136 in communication with the air inlet holes 40 in the combustion unit 14. The rear end of each of the pipes 140 passes through the partition 33 and is sealed thereto by a flange 142 and gasket 144. The forward end of each of the pipes 140 is sealed to the periphery of one of the air inlet holes 40 by a gasket 146.

In operation of the heater 10, assuming that fuel gas is being delivered to the burner tube 68 and burned just above the apertures 70 in the chamber 62, combustion gases pass upwardly through the intermediate chamber 66 into the exhaust chamber 64. The gases flow from the ends of the chamber 64 toward its center, then rearwardly into the flue collar 49 and then into the flue 58. The rear end arrangement of the latter discharges the combustion gases in a radial direction between the baffles 116 and 118, the latter together with the end cap 120 and the dish-shaped member 112 preventing variations of exhaust flow with changes in external wind conditions.

The draft created by the flow of combustion gases draws outside air through the passage 111 into the chamber 136 and thence through the connecting pipes 140 into the combustion unit by way of the holes 40.

The air within the heater casing 12 becomes heated by contact with the exterior surfaces of the combustion unit 14 and rises so as to flow through the upper part of the front panel 28 after having been directed forwardly by the baffle 32. Room air is simultaneously drawn rearwardly into the casing 12 through the lower part of the front panel 28.

It will be appreciated that the elongated shape of the combustion unit, for example $4\frac{1}{2}$ feet long by 9 inches tall by $2\frac{1}{2}$ inches maximum thickness, presents opportunities for the creation of stagnant zones and unpredictable recirculation currents either of which reduces the efficiency of the unit. The primary concern of the present invention is the configuration of the unit 14 which achieves uniform burning of the gas and continuous free flow of the incoming fresh air and outgoing combustion gases. One feature which is of importance is the shape of the exhaust chamber 64 which increases in cross sectional area from the center toward its ends. This has the effect of equalizing the rate of combustion gas flow at the center and ends of the chamber. The gases tend to flow more rapidly through the smaller cross sections at the ends and thereby move quickly toward the flue collar 49, whereas the gases near the center have a lesser distance to travel to reach the collar and can move more slowly through the greater cross section at this location.

Another feature which aids in efficient operation is the shape and end construction of the intermediate chamber 66. This chamber is purposely made of restricted cross section relative to the other chambers 62 and 64 because this construction is effective in reducing the short circuiting of combustion gas from the upper chamber 64 back into the lower chamber 62. Recirculation of this type is especially likely to occur in an elongated combustion unit and tends to blow out the flame at the ends of the burner tube. It has been found that in addition to the restricted

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cross section it is desirable to provide the baffle 94 above the gas inlet end of the burner tube to further reduce recirculation. The shape of the ends of the restricted chamber 66 is also important from this standpoint.

While a specific embodiment has been described and illustrated by way of example, the invention is not limited to the details thereof except as they appear in the appended claims.

What is claimed is:

1. A gas-fired horizontally elongated combustion unit for a space heater, the length of said unit being substantially greater than the vertical and transverse dimensions, said unit having walls defining three elongated chambers extending longitudinally of said unit and disposed one above the other, the lowermost chamber having a generally uniform transverse cross sectional area along its length and communicating along its length with the bottom of the intermediate chamber, said lowermost chamber having at least one air inlet opening therein and carrying an elongated gas burner tube which extends substantially the length of said lowermost chamber, the uppermost chamber having a vertical dimension which increases from each end toward the middle thereby effecting a transverse cross sectional area which is greatest at the middle, the wall at the location of greatest vertical dimension having a horizontally facing combustion gas outlet opening, said intermediate chamber being of lesser length and lesser transverse dimension than said lowermost chamber and said uppermost chamber, said intermediate chamber tapering upwardly and inwardly toward the longitudinal center line of said unit thereby forming a slot of relatively small width extending the length of said intermediate chamber, said slot communicating along its length with the bottom of said uppermost chamber, said gas burner tube being sealed at one end and open at the other end to receive gas, the wall of said unit which defines the end of said intermediate chamber remote from the open end of the burner tube being inclined upwardly and inwardly toward the transverse center line of said unit from the bottom of said intermediate chamber to the lowermost edge of said slot and then inclined upwardly and outwardly away from

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said transverse center line, said unit further comprising a small generally L-shaped baffle disposed in said intermediate chamber near the open end of said gas burner tube, said baffle having a horizontal leg portion blocking communication between said intermediate chamber and said lowermost chamber, said baffle having an upstanding portion remote from the open end of said burner tube.

2. A gas-fired combustion unit for a space heater, said unit being defined by front and rear walls sealed to each other along their edges and defining between them a lower longitudinally extending chamber carrying within it an elongated gas burner tube, an intermediate chamber communicating along its length with said lower chamber, said intermediate chamber being parallel to and spaced closely above said lower chamber and said burner tube and being of lesser length than said lower chamber, both ends of said intermediate chamber terminating longitudinally inwardly of the corresponding ends of said lower chamber, and an upper chamber communicating along its length with said intermediate chamber, said upper chamber being substantially coextensive with said lower chamber and extending longitudinally beyond both ends of said intermediate chamber, an end of said intermediate chamber being defined by two inclined end walls one of which extends upwardly and longitudinally inwardly from the junction of said intermediate chamber with said lower chamber and the other of which extends downwardly and longitudinally inwardly from the junction of said intermediate chamber with said upper chamber and merges with said first-mentioned end wall, whereby said inclined end walls lie closely adjacent the corresponding end of said burner tube so that said one other end wall prevents any appreciable recirculation of combustion gases downwardly toward said tube.

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FREDERICK KETTERER, *Primary Examiner*.