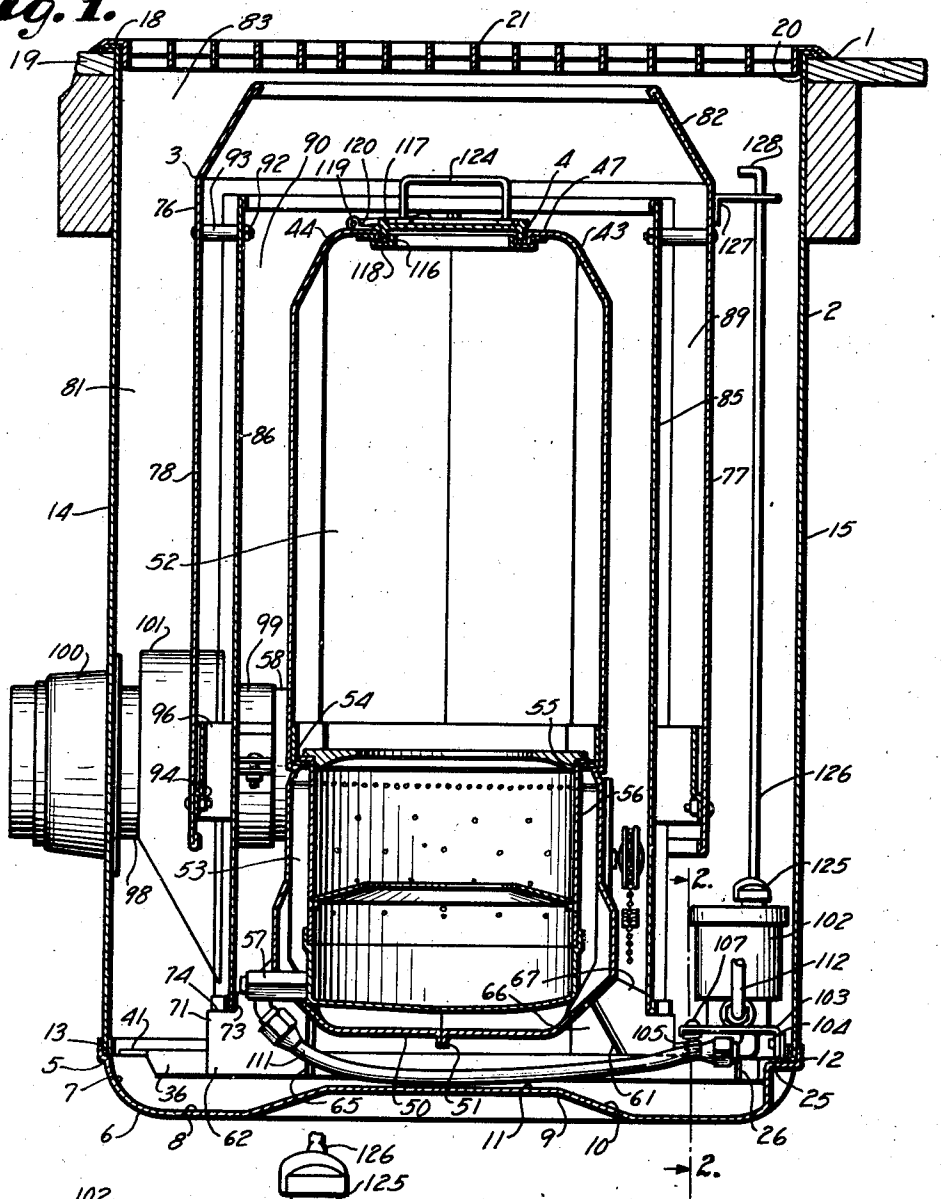
Sept. 10, 1946. R. MARTIN 2,407,375

FURNACE ASSEMBLY

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Fig. 1.



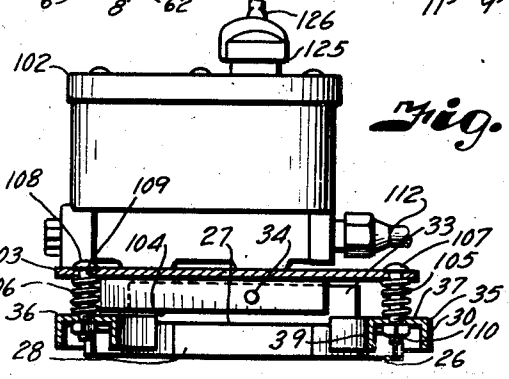


Fig. 2.

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FURNACE ASSEMBLY

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Fig. 3.

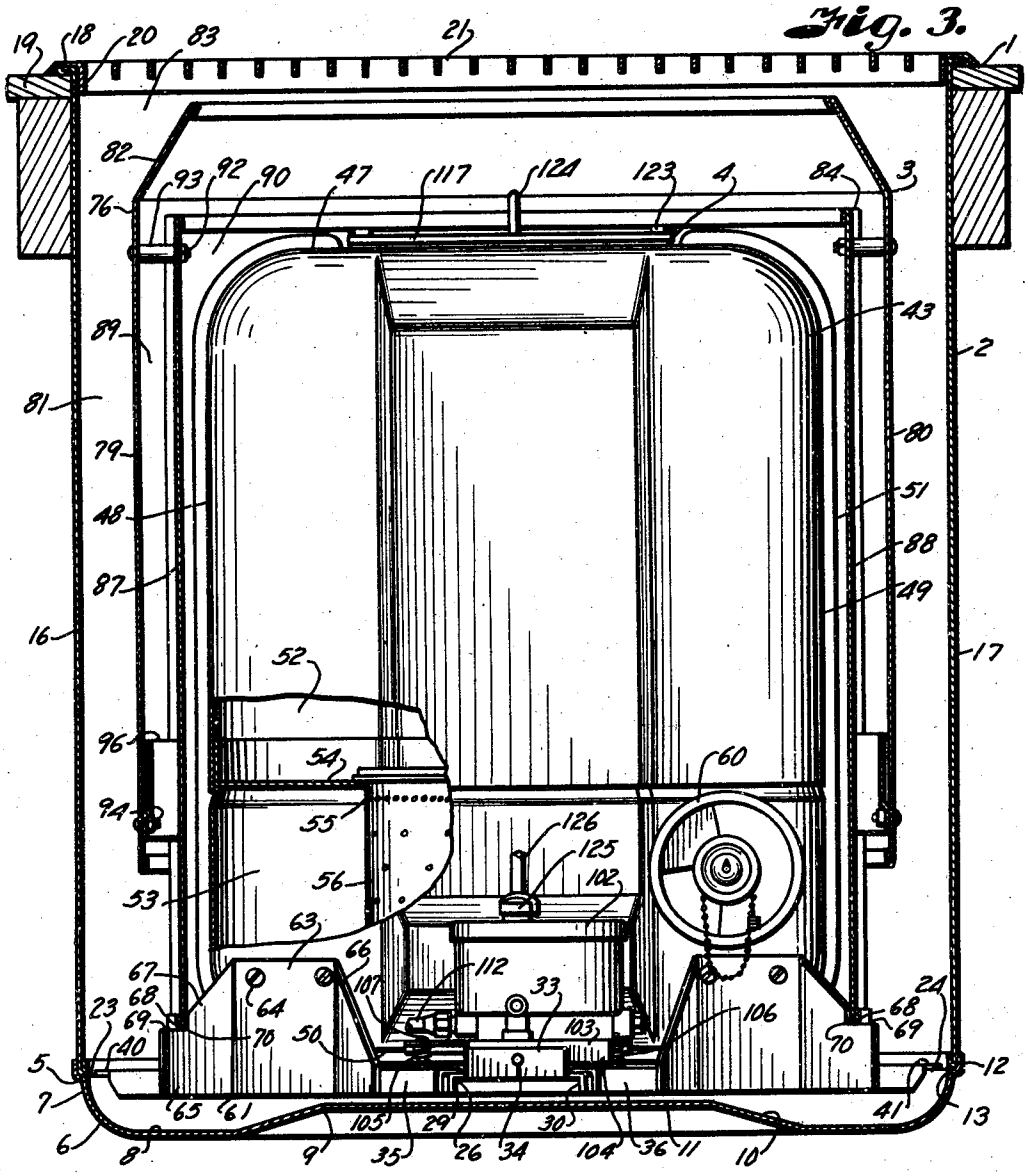
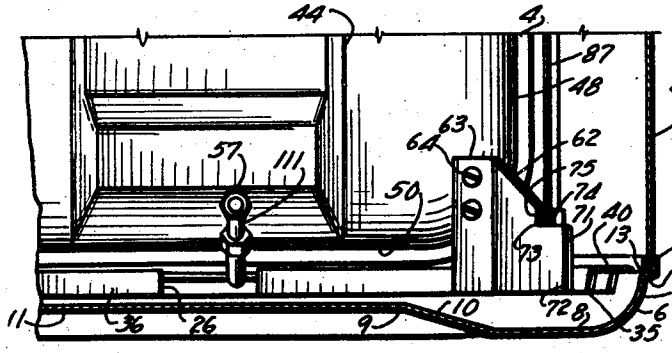


Fig. 4.



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FURNACE ASSEMBLY

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Fig. 5.

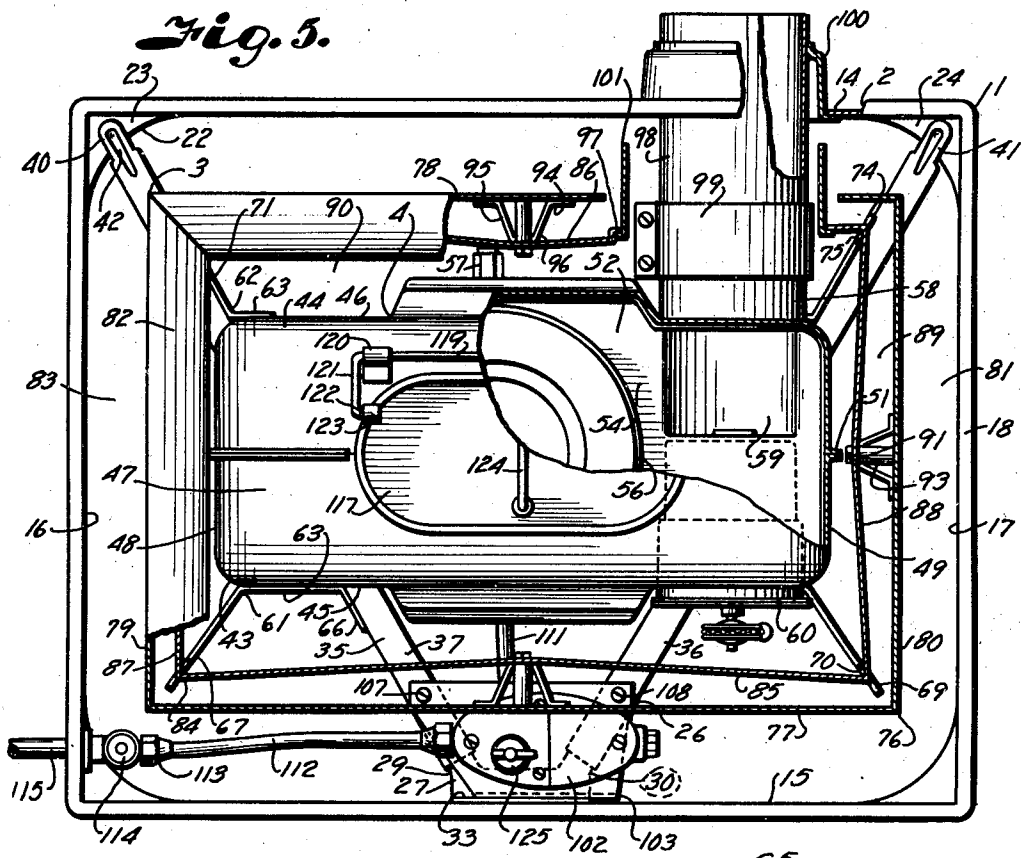
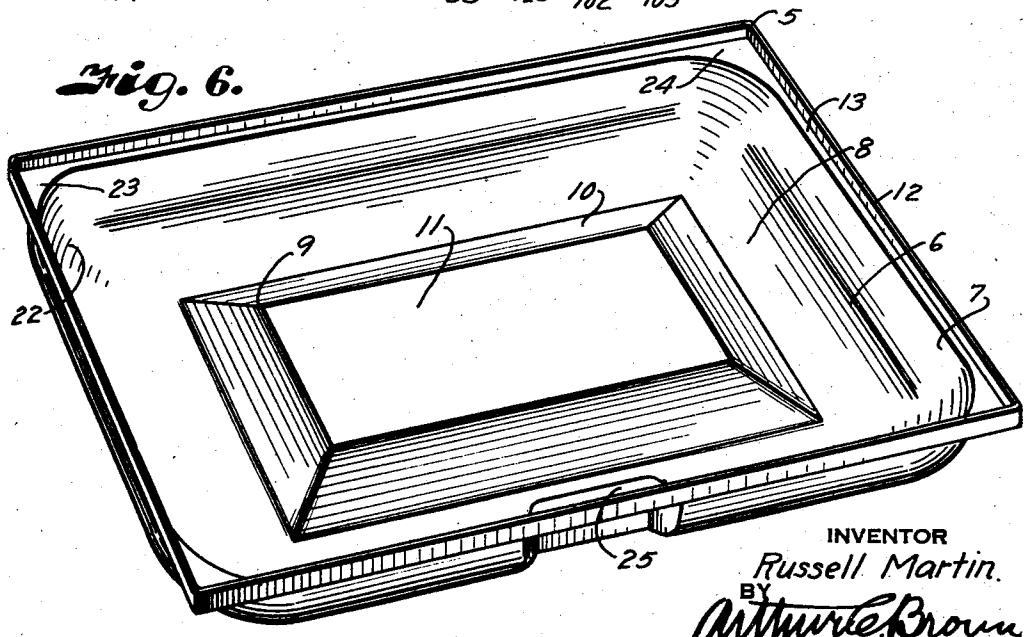


Fig. 6.



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FURNACE ASSEMBLY

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Fig. 7.

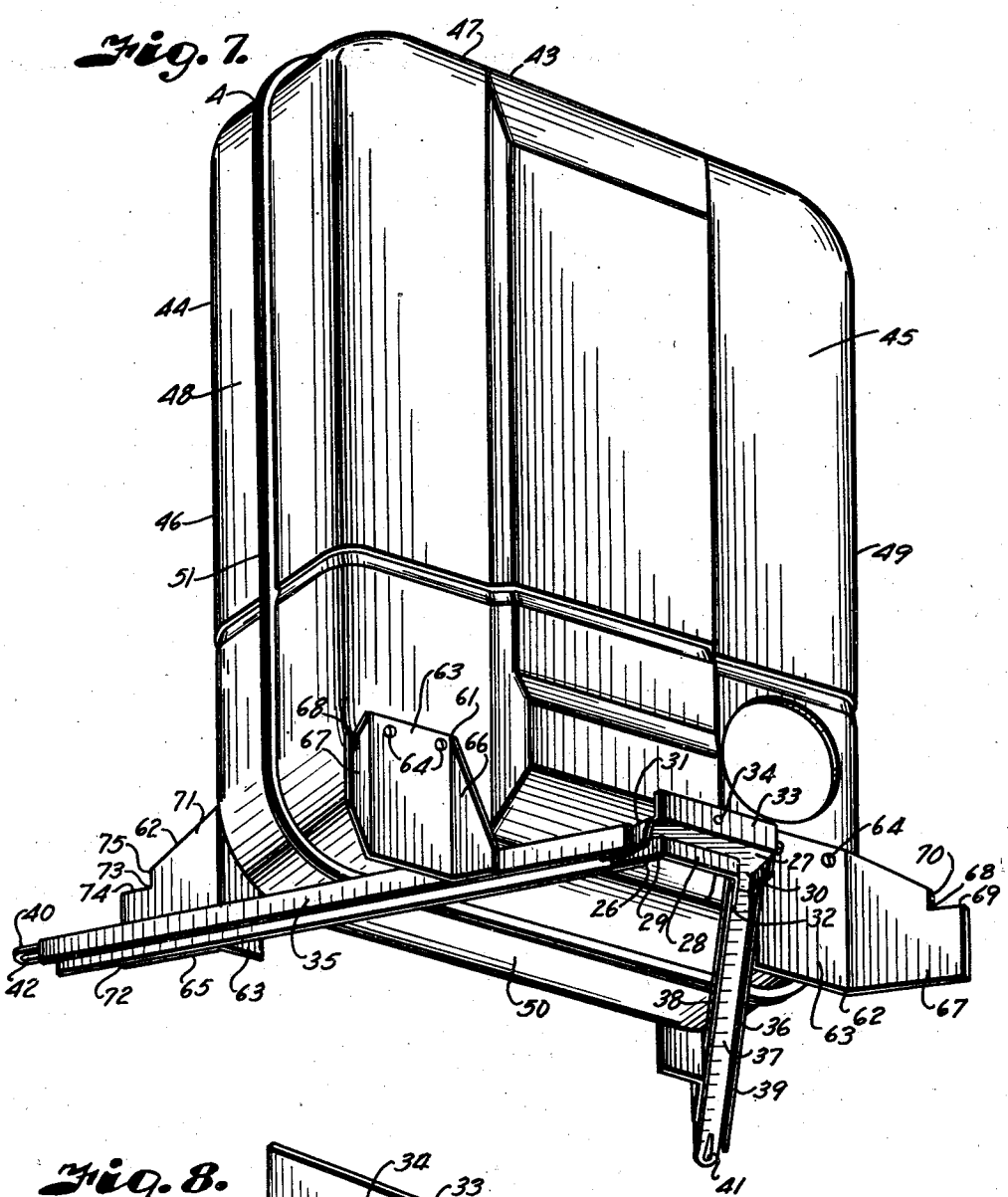
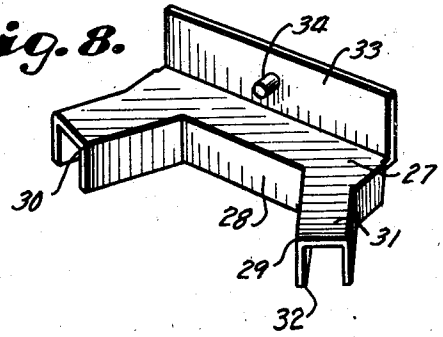


Fig. 8.



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UNITED STATES PATENT OFFICE

2,407,375

FURNACE ASSEMBLY

Russell Martin, Wichita, Kans., assignor to The Coleman Lamp and Stove Company, Wichita, Kans., a corporation of Kansas

Application November 6, 1941, Serial No. 417,993

12 Claims. (Cl. 126—116)

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This invention relates to furnaces, particularly those adapted for support in the floor of a room to be heated and known as floor furnaces. Furnaces of this character usually consist of a grill covered outer jacket or casing, and an inner jacket forming down and up draft passages for circulating air in contact with a heater unit which is supported in the inner jacket. Since the furnaces are usually installed in relatively small, out-of-way places, and in homes without basements, they are of relatively small size and the parts are arranged compactly so that they are difficult to install and service after installation. Consequently it is desirable to design the inner parts for ready removal from the outer jacket as disclosed in my copending application Serial No. 378,698, which has matured into Patent No. 2,324,862, dated July 20, 1943, on "Floor furnace." However, this requirement offers manufacturing problems as to construction, assembly and support of the parts so that they are of stable, strong and rigid construction, free of expansion and contraction noises, and at the same time produced at relatively low cost.

Therefore, the objects of the present invention are to provide a floor furnace structure that is of strong, rigid construction and capable of being produced at relatively low cost; to provide a simplified support of the heater and inner jacket units which facilitates mounting thereof so that they may be readily removed for servicing after installation; to provide the outer casing with supports drawn integral with the bottom member thereof; to provide a three-point support for the heater unit and inner jacket carrying frame which, in itself, is formed of easily welded pressed metal parts; to provide a slip collar vent connection to the combustion chamber outlet which telescopes into the outside venting pipe; to provide a structure which tends to eliminate expansion and contraction noises; and to provide a construction which reduces the over-all depth of the furnace.

In accomplishing these and other objects of the invention, as hereinafter pointed out, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein;

Fig. 1 is a vertical section through a floor furnace constructed and assembled in accordance with the present invention.

Fig. 2 is a section through the supporting frame on the line 2—2 of Fig. 1, particularly illustrating mounting of the constant level fuel control valve thereon.

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Fig. 3 is a cross-section through the furnace taken at right angles to the section shown in Fig. 1.

Fig. 4 is a fragmentary section through the lower portion of the furnace, particularly illustrating support of the heater and inner jacket units.

Fig. 5 is a plan view of the furnace with the cover grill removed and parts broken away and shown in section to better illustrate the construction.

Fig. 6 is a perspective view of the bottom member of the outer casing.

Fig. 7 is a perspective view of the heater unit and its supporting frame.

Fig. 8 is a perspective view of the front member of the supporting frame.

Referring more in detail to the drawings:

1 designates a floor furnace constructed in accordance with the present invention and which includes an outer jacket or casing 2, an inner jacket unit 3, and a heater unit 4, all of which are designed to facilitate manufacture, ease of assembly and in general to provide a better, more satisfactory construction. The outer casing 2 includes the bottom member 5, preferably formed of a single stamping shaped to enhance the rigidity thereof and form surfaces for directing air circulated through the furnace. The bottom member 5 includes a marginal portion 6, curved upwardly, as at 7, from the floor portion 8 which has the central portion thereof crowned upwardly as at 9, the sides 10 of the crown sloping upwardly and terminating in a horizontal portion 11 underlying the heater unit as shown in Fig. 1. The marginal portion of the bottom member terminates in an outset marginal flange 12, forming a shoulder-like seat 13 for the vertical sheet metal walls 14—15 and 16—17, the lower edges of which engage within the flange 12 and are spot welded or suitably attached thereto to form a unit construction. The upper edges of the vertical walls terminate in laterally extending flanges 18 which are adapted to rest upon the marginal edge of the floor 19 having an opening 20 therethrough in which the casing 2 is supported. The top of the casing is covered by a grill 21 which extends over the flanges 18 and is removable to permit access to the interior of the casing. The junctures of the curved portions 7 of the bottom member are rounded, as at 22, to form seats 23 and 24 to cooperate with an instruck seat 25 located at the mid point of the opposite side of the body member, the seat 25 being of elongated shape to better cooperate with the triangular-shaped seats of the

corners for the stable support of a carrying frame 26.

The carrying or supporting frame includes a front member illustrated in Fig. 8 and which is formed of pressed metal shaped to provide a horizontal web portion 27 and a vertical flange portion 28 terminating at the ends thereof in substantially channel-shaped diverging arms 29 and 30, having horizontal portions 31 forming continuations of the web 27 and depending flanges 32 forming continuations of the flange 28. The side of the web 27 opposite the flange 28 includes an upturned flange 33 carrying an inwardly extending stud or trunnion 34 for a purpose later described. The supporting frame also includes side members or rails 35 and 36 formed of pressed metal and having channel-like shape to provide horizontally arranged web portions 37 and depending flanges 38 and 39. The ends of the side members are inserted over the diverging arms 29 and 30 and the web and inner flanges thereof are welded to the corresponding parts of the front frame member. When the web portion of the front member is mounted on the seat 25 of the bottom member the side members diverge toward the corners of the outer casing and the web portions thereof terminate in extensions 40 and 41 reinforced by corrugations 42, and which bear upon the seats 23 and 24 of the bottom member.

The heater unit 4, which is illustrated in the drawings, is constructed as described in my copending application on "Oil burning heating units," Serial No. 409,223, filed September 2, 1941, which has matured into Patent No. 2,332,736, dated October 26, 1943, and specifically forms no part of the present invention, but briefly it includes a pair of mating sheet metal sections 43 and 44 shaped to provide front and rear walls 45 and 46 having inwardly flanged marginal portions 47—48 and 49—50 which terminate in laterally extending rims 51 that are welded together to form a substantially elongated combustion chamber 52 and a lower burner chamber 53 that is separated therefrom by a horizontal partition 54. The partition 54 has a central opening 55 to suspendingly support a burner or firepot 56 within the burner chamber and which is supplied with liquid fuel through a pipe connection 57 extended through an opening in the rear wall of the burner chamber, as shown in Fig. 1. The rear wall of the combustion chamber is provided in laterally offset relation with the burner pot with a flue outlet collar 58 at a relatively low point in the combustion chamber so that it registers with a depressed portion 59 of the partition member and facilitates mounting of an air governor 60 disclosed in said last named copending application, and which is actuated responsive to a pressure differential for admitting combustion supporting air.

The supporting frame previously described is rigidly attached to the heater unit by means of brackets 61 and 62 including plate portions 63 secured to the front and back walls 45 and 46 of the heater unit, as indicated at 64, and which have depending portions 65 extending to the bottom of the flanges 38 and 39 as best shown in Fig. 7, the plate portions being so attached that those at the front of the heater unit are located on the outer sides of the supporting frame and those attached to the rear of the heater unit are on the inner sides as shown in Fig. 7. The side edges of the plate portions 63 of the front bracket members 61 having wing-like flanges 66 which are suitably attached as by welding to the outer depending flanges 39. The opposite side edges of the brackets have wings 67 extending forwardly in angular directions and these wings have notches 68 forming horizontal seat portions 69 and vertically arranged stops 70 for centering and supporting the inner jacket unit 3 as later described.

The rear bracket members also have angularly extending wings 71 with their lower edges welded to the inner flanges 38, as at 72, and the upper edges have notches 73 forming horizontal seats 74 and vertical stops 75 to cooperate with the similar portions of the front brackets 61. It is thus obvious that when assembled the heater unit and supporting frame form a unitary construction and that the supporting frame is inserted and removed to and from the outer casing for support on the seat portions 23, 24 and 25 upon insertion of the heater unit.

The inner jacket unit includes an outer sheet metal member 76 having front and rear walls 77—78 and side walls 79—80 spaced from the corresponding walls of the outer casing to provide downdraft air passages 81 therebetween. The upper edges of the vertical walls of the outer member terminate in inwardly inclined portions 82 cooperating with the outer casing to form widened inlets 83 to facilitate movement of air from the marginal edges of the grill to the downdraft passages 81 and to provide means for directing updraft air toward the central portion of the grill. The walls of the outer member are relatively short and terminate at a material distance above the bottom of the outer casing, as clearly shown in Figs. 1 and 3. The inner jacket further includes an inner member 84 having front and rear walls 85—86 and side walls 87—88 spaced inwardly from the corresponding walls of the outer member to provide secondary updraft passages 89 for flow of a portion of the air moving through the downdraft passages, upwardly, therethrough, to carry off heat radiated from the heater unit and prevent heating of the downdraft air prior to its passage under the lower edges of the respective inner jacket members, as set out in my copending application Serial No. 386,595, on "Furnace." The upper edges of the inner walls terminate substantially in plane with the lower parts of the inclined portions 82, but the bottom portions of the inner walls extend below the outer walls and in substantially coextensive relation with the heater unit 4 so that the lower edges seat within the notches 68 and 73 of the brackets previously described. As disclosed in this application, the inner member 84 is preferably formed of heat absorbing material and the outer member of heat reflecting material so that the heat radiated from the heater unit is absorbed by the inner member and transformed to convectional heat which is carried away by the air moving through the passageway 89. The main portion of air moving downwardly through the downdraft passageway, however, is directed by the curved surfaces 7 of the bottom member and under the inner jacket member for upward movement in the main updraft passageway 90 in heat exchange relation with the walls of the heater unit 4. Since the members of the inner jacket are subject to heating and cooling, it is difficult to construct them so they will not produce noises. If the members are rigidly mounted at the corners, as in conventional practice, the side walls, upon heating, expand in the direction of the rigidly mounted corners, but the expansion

is resisted thereby with the result that the expansive forces are stored up in the sheet metal until such a time that the central portions thereof are forced out of their normal plane which produces a snapping or booming noise. Consequently there is a similar movement in the opposite direction upon cooling of the metal. However, with the present construction where the corners of the inner member are free to expand in the planes thereof due to the fact that they are mounted to the inner casing in the center of the sheets, the lower portion remains comparatively cool and there is practically no noise produced by their sliding on the brackets on which they rest. In order to further avoid the booming noises, the central portions of the side walls of the inner member are bowed inwardly at the vertical median points thereof, as clearly shown at 91 in Fig. 5, so that any expansion forces which might occur cause the sheets to flex in the direction in which they are bowed. Consequently, there is no snapping action as when the sheets reverse their positions.

In order to provide free expansion and contraction of the inner member in a vertical direction it is attached to the outer member at medial points near its upper edges by stud bolts 92 extending through spacing sleeves 93 best illustrated in Figs. 1, 3 and 5, the bolts being drawn up to bring the sheet portions into abutting relation with the ends of the sleeves. However, the bolts and tubes can assume an inclined position when a difference of vertical expansion of the inner and outer members occurs. The lower portions of the outer member are fixed to foot portions 94 on the diverging legs 95 of brackets 96 that are fixed to the mid-point of the inner walls in substantially vertical alignment with the upper supports. With this arrangement, it is obvious that the outer member is rigidly attached to the inner member at the vertical centers of the walls, but the corners are unsupported and free to expand and contract in the plane thereof with the result that the snapping and booming noises are eliminated.

The rear wall of the inner member is provided with a notch-like opening 97 through the lower edge thereof to permit passage of the inner jacket unit over a pipe 98 which extends through the rear wall of the outer casing and is adapted to be connected with the flue collar 58 by a contractable band 99, the pipe 98 being reciprocably supported in a collar 100 carried by the rear wall of the outer casing as shown in Fig. 5. The collar 100 is removable for crating and is installed in the furnace wall after the casing has been lowered through the hole in the floor.

In order to direct the downdraft air away from the pipe 98, the notch-like opening 97 carries a hood 101 which extends over the pipe and has ends projecting downwardly at the sides of the notch as shown in Figs. 1 and 5.

Since the furnace illustrated is adapted for burning liquid hydrocarbon fuels, it is provided with a constant level control valve 102 which is fixed to a base plate 103, having a depending flange 104 pivotally supported on the trunnion 34, previously mentioned, as shown in Figs. 1 and 2. The opposite side of the base plate extends over the side members of the supporting frame and is supported on coil springs 105 and 106 having their lower ends bearing upon the supporting frame and their upper ends against the plate. Since the constant level valve must be level for properly metering fuel in the fire-pot, adjusting screws 107 and 108 are provided with their shanks extending through openings 109 in the base plate, through the springs, through registering openings in the arms, and into nuts 110 attached to the under face of the web portions of the supporting frame. It is obvious that by adjusting the screws within the nuts, the base plate may be rocked laterally on the trunnion to adjust the constant level valve in one direction and that like adjustment of both screws dips the base plate to adjust the constant level valve in the opposite direction. Thus by merely manipulating the screws 107 and 108 the constant level valve may be adjusted to a level position when the frame or casing is out of level.

The constant level valve is connected with the fitting 57 by a pipe 111 through which fuel is passed to the burner pot. The constant level valve is supplied with liquid fuel through a pipe 112 that is connected by a union 113 with a stop valve 114 located in the upper portion of the furnace in convenient reach through the floor opening and which is connected with a service pipe 115. In order to facilitate lighting of the fuel and permit access to the interior of the heater unit, the top thereof is provided with an elongated opening 116 adapted to be closed by a door 117 which is seated upon a gasket 118 encircling the opening. The door is adapted to be swung to open position on a hinge comprising a rocker shaft 119 which is oscillatably mounted in brackets 120 at the sides of the opening and attached to the combustion chamber. The ends of the shaft terminate in arms 121 having laterally directed ends 122 pivotally mounted in ears 123 attached to the door. The door is further provided with a handle 124 by which it may be lifted from the opening, rocking the hinge shaft 119 in the brackets 120 with the door trunnioning on the terminal ends 122 of the arms 121. The door, after clearing the brackets 120, may then be swung retractively to clear the opening completely without turning the under side of the door outermost. With this arrangement, a relatively large door opening may be provided and give ample room for the door to be opened in the space provided under the grill, since the door, in moving to open position, is raised only a distance substantially equivalent to the length of the arms 121 of the shaft 119. In order to adjust the rate of oil flow from the constant level valve, the adjusting head 125 thereof is connected by a rod 126, having its upper end pivotally mounted in an angular-shaped bracket 127 extending laterally from the jacket unit at a point below the grill. The stem is of sufficient length to extend through the bracket and be provided with a laterally extending handle 128 whereby the stem may be readily rotated by use of a key extending through the grill.

The parts comprising the outer casing, inner jacket and heater unit and supporting frame are assembled into sub-assemblies. The supporting frame 26 and the brackets 61 and 62 are secured on the heater unit. The constant level valve 102 is mounted on the base plate 103, and connected to the heater unit by the pipe 111. With the various fittings attached to the respective units, the heater unit carrying the supporting frame is lowered into the outer casing so that the extensions 40 and 41 engage the seats 23 and 24 and the web 27 engages the elongated seat 25. The heater unit may then be secured or blocked within the casing. The inner jacket unit carrying the adjusting rod 126 is inserted through the open top

of the casing and over the heater unit so that the lower edges of the inner member engage the notch-like seats of the brackets 61 and 62, the vertical or stop portion of the notches guiding the inner jacket unit into centered position. The flue collar 100 is packed within the furnace to reduce the crate size. The grill may then be attached to the open top of the outer casing and the assembled parts crated for shipment to the purchaser.

Upon receipt of the furnace, it is uncrated and the inner jacket unit is first removed, followed by the heater unit. An opening 20 is then prepared in the floor 19 at the location where the furnace is to be installed and the opening is suitably framed. The outer casing is then dropped through the floor opening to be supported therein by engagement of the flanges 18 with the floor. The outside flue collar is secured to the outer casing and connected with a suitable chimney by the usual vent pipe. The pipe 98 is then inserted into the outer collar and slid retractively into the vent pipe to permit passage of the flue collar 58 when the heater unit is inserted. The supply pipe 115 is connected with the stop valve 114 which is located within the outer jacket near the open top thereof so that it is in convenient reach through the floor opening. The heater unit is inserted through the open top of the casing for support upon the seats 23, 24 and 25 therein. The pipe 112 is connected with a stop valve 116 by means of the union 113. The constant level control valve is adjusted to a level position. The pipe 98 carrying the contractable band 99 is shifted toward the heater unit with the band sliding over the collar 58. The band is then tightened in position establishing a flue connection between the heater unit and the vent pipe leading to the chimney. The inner jacket unit is then moved through the open top of the casing and telescoped over the heater unit so that the lower edges of the inner member engage the notch-like seats of the brackets 61 and 62. After connecting the actuating rod 126 with the adjusting head 125 of the constant level valve, the furnace is ready for operation. The constant level valve is opened so that fuel flows into the burner pot. The door 117 is opened and a lighted match or other burning substance is dropped into the fire-pot, which ignites the fuel. The door is then closed and the grill 21 is applied to the open top of the casing, completing the assembly.

After the furnace has been in operation for some time and in need of service, the parts are readily removed to a point above the floor so that they may be readily cleaned and adjusted, after which they are returned to the outer jacket and readily centered therein. With the inner jacket constructed as described, there are no points to obstruct free expansion and contraction and noises usually caused by furnaces are eliminated.

It is obvious that the supporting frame provides a simple and inexpensive method of removably mounting the inner unit and when the units are inserted they are retained in stable position thereon. The furnace parts are all readily manufactured and assembled into units at low cost to provide a most satisfactory furnace construction.

What I claim and desire to secure by Letters Patent is:

1. In a floor furnace, a casing, a removable heater unit in the casing, a supporting frame for the removable heater unit, brackets connecting the frame with the heater unit and having seats and jacket guiding portions leading to said seats, and a jacket removably enclosing the heater unit and having support on said seats of the brackets.

2. In a floor furnace, a casing having seats in the bottom thereof arranged for tri-point mounting of a removable heater unit in the casing, a heater unit, a supporting frame engaging said seats, brackets connecting the supporting frame with the heater unit and having seats and jacket guiding portions leading to said seats, and an inner jacket enclosing the heater unit and having bearing support on said seats of the brackets.

3. In a floor furnace, an outer casing having seats in the bottom thereof arranged for tri-point mounting of a heater unit, a supporting frame including a member having a transverse portion engaging one of said seats and provided with angularly extending arms, side members connected with said arms and having ends bearing on the other seats, a heater unit, and brackets connecting the heater unit with the side members of said frame.

4. In a floor furnace, an outer casing having seats in the bottom thereof arranged for tri-point mounting of a heater unit, a supporting frame including a pressed metal member having a transverse portion engaging one of said seats and provided with diverging arms, channel members connected with said diverging arms and having extensions on the webs of said channel members bearing on the other seats, a heater unit, and brackets connecting the heater unit with the channel members of said frame.

5. In a floor furnace, a substantially rectangular casing having a bottom member provided with impressed seats in adjacent corners thereof and an elongated seat impressed in the side opposite said corner seats for tri-point mounting of a heater unit in said casing, a supporting frame including a member having a transverse portion engaging said elongated seat and provided with angularly extending arms, side members connected with said arms and having ends bearing on the corner seats, a heater unit, and brackets connecting the heater unit with the side members of said frame.

6. In a floor furnace, an outer casing having seats in the bottom thereof arranged for tri-point mounting of a heater unit, a supporting frame including a member having a transverse portion engaging one of said seats and provided with angularly extending arms, channel-like side members connected with said arms and having ends bearing on the other seats, a heater unit, and brackets connecting the heater unit with the channel-like side members of said frame.

7. In a furnace, a rectangular outer casing, a rectangular inner jacket, a removable heater assembly including a burner, a removable frame seated on the bottom of the casing and removably supporting both the inner jacket and the heater assembly, and brackets connecting the heater assembly to the frame and having downwardly inclined portions for guiding the inner jacket to its support on the frame.

8. In a floor furnace, a casing having seats in the bottom thereof arranged for tri-point mounting of a heater unit assembly, a removable supporting frame, said assembly including a member having a transverse portion engaging one of said seats and provided with angularly extending arms, side members connected with said arms and having ends bearing on the other seats, a trunnion carried by said frame member, a liquid fuel control valve, a base plate carrying said valve and having one marginal side engaging said trunnion, springs supporting the opposite marginal side of said base member on said arms,

means adjusting length of said springs under compression to level the liquid fuel control valve, a heater unit, and brackets connecting the heater unit with the side members of said frame.

9. In a furnace, an outer casing, a heater unit in the casing, a jacket for the heater unit including an inner shell having interconnected front, rear and side walls facing the heater unit to absorb radiant heat and transmit said heat to upwardly moving columns of air, an outer shell spaced from the inner shell to provide a passageway of a size to promote free flow of columns of air moving upwardly between the shells, said inner walls of the inner shell each having central portions offset from planes defined by the connections of said walls, and means supporting the outer shell from the inner shell at said central offset portions, said connection being arranged to provide for vertical expansion.

10. In a floor furnace, a casing, a heater unit in the casing, an inner jacket in the casing including a heat transformer within said jacket to absorb radiant heat and transmit said heat to upwardly moving columns of air, said heat transformer having interconnected front, rear and side walls spaced from corresponding outer walls of said jacket to provide ample passageways for free air flow and having offset portions diverging from the vertical centers of the walls to the interconnections of said walls, means supporting the inner walls from the outer walls of said jacket and means supporting the jacket near the vertical centers of said walls.

11. In a floor furnace, a casing, a heater unit in the casing, an inner jacket, a heat transformer within said jacket and spaced therefrom to provide freely moving columns of air on sides of the heat transformer for absorbing radiant heat from the heater unit and for transmitting said heat to the columns of air, said heat transformer including interconnected front, rear and side walls, each of said walls diverging from the vertical centers thereof to the connections of said walls.

12. In a floor furnace, a casing, a heater unit in the casing, a jacket in the casing including a heat transformer within said jacket and having interconnected front, rear and side walls facing said heater unit and spaced from corresponding walls of the jacket to provide upward flow of columns of air along the sides thereof to absorb radiant heat and transmit said heat to said columns of air and having portions diverging from the vertical centers thereof to the interconnections of the transformer walls, means supporting the heat transformer walls solely at the lower edges of said interconnections, and means supporting the walls of said jacket from the vertical centers of the heat transformer walls.

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