Aug. 10, 1948. W. H. DE LANCEY 2,446,744

FAN HOUSING CONSTRUCTION FOR OIL BURNERS

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Fig. 1.

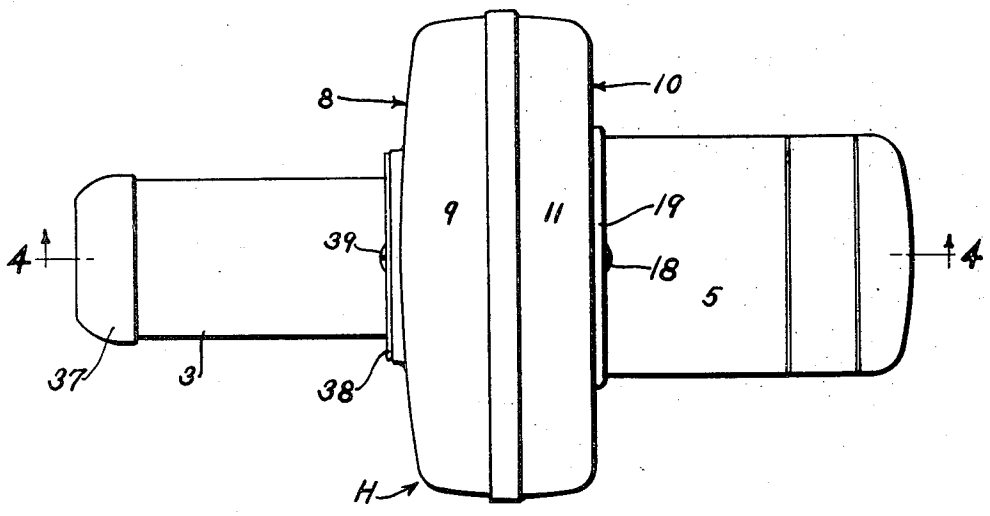
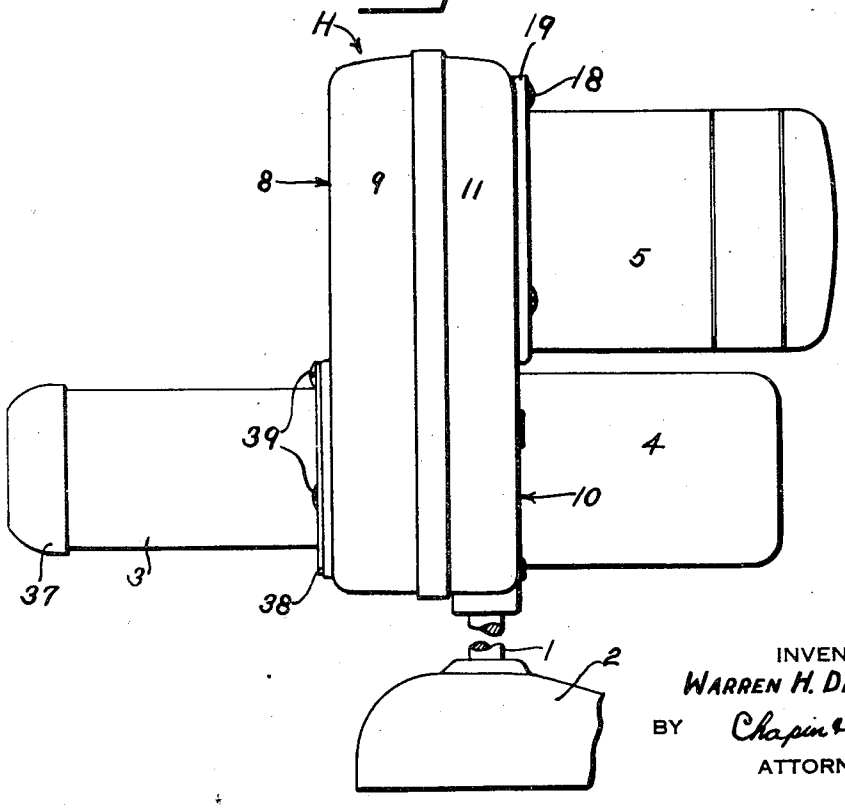


Fig. 2.



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Fig. 3.

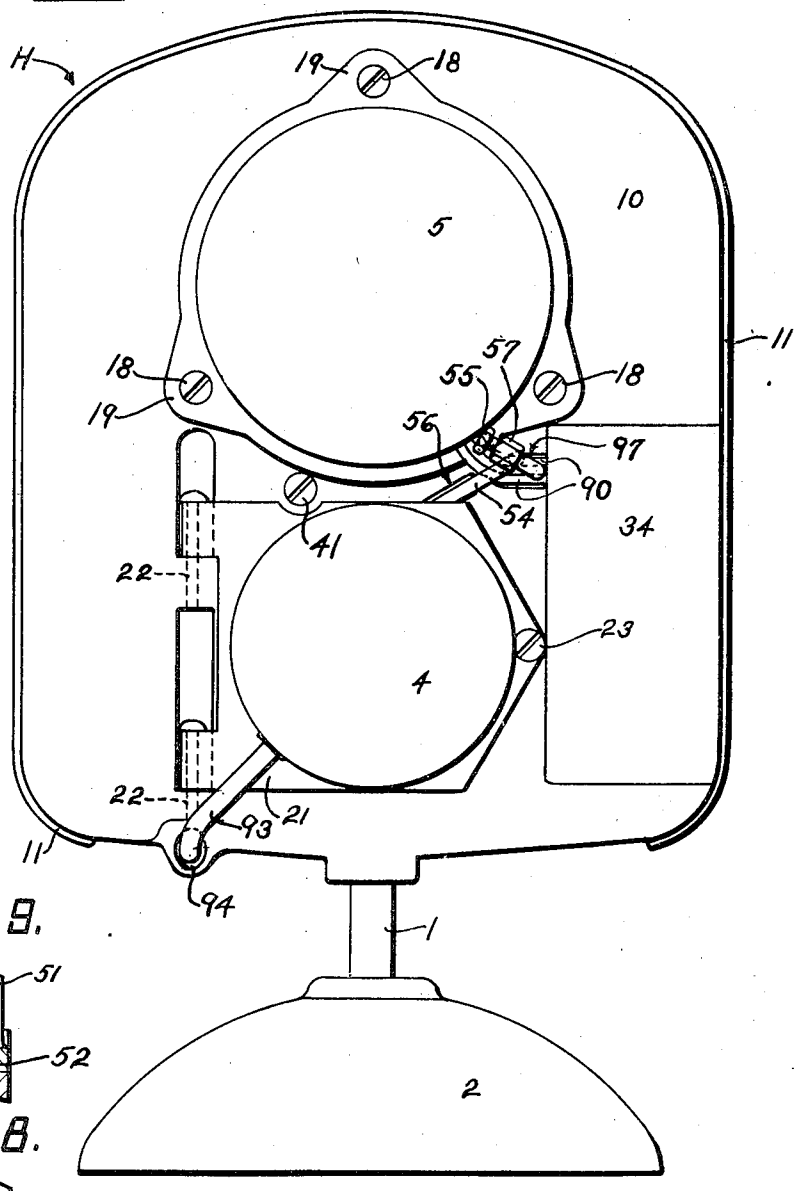


Fig. 9.

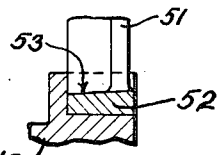
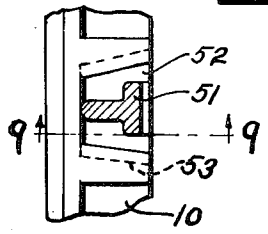


Fig. 8.



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Fig. 4.

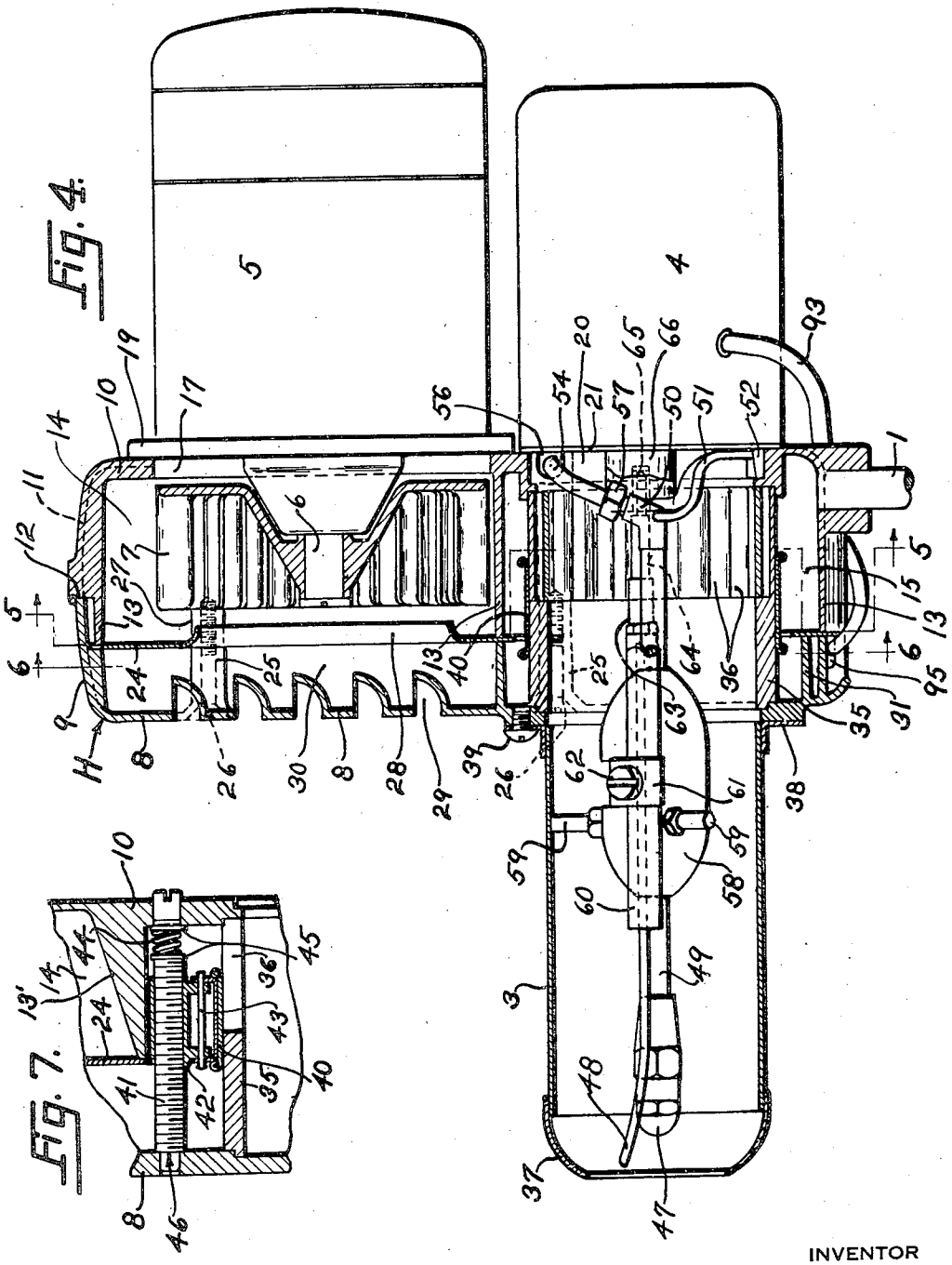


Fig. 7.

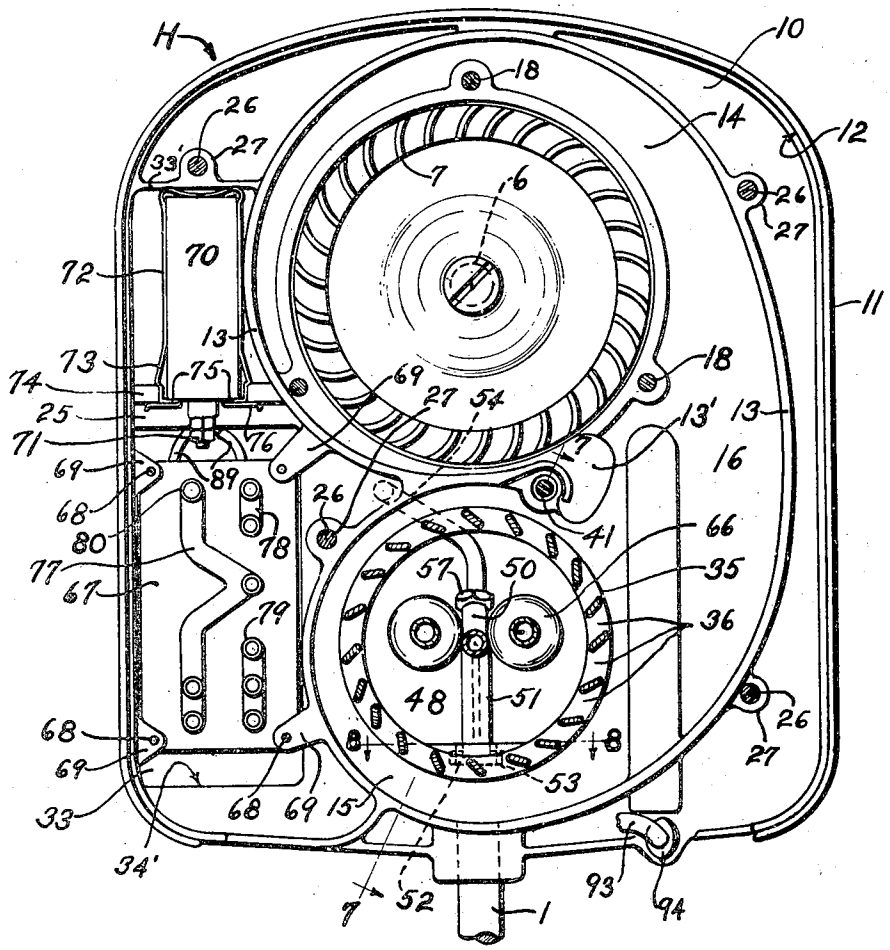
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Fig. 5.



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Fig. 6.

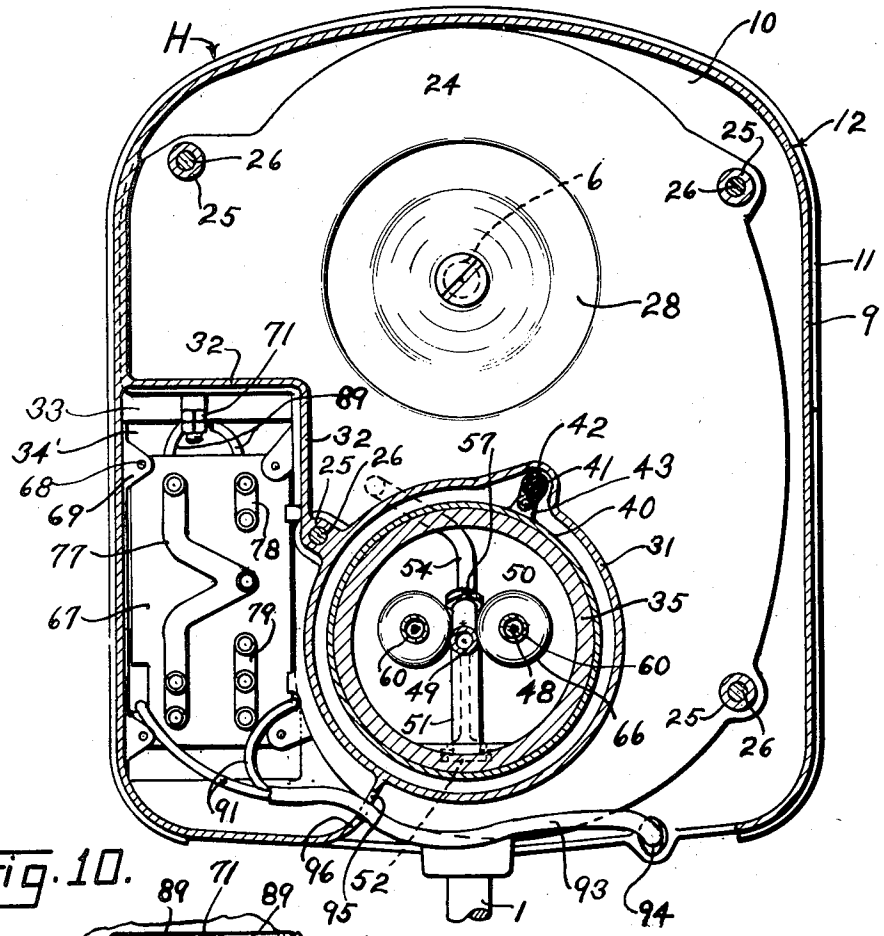
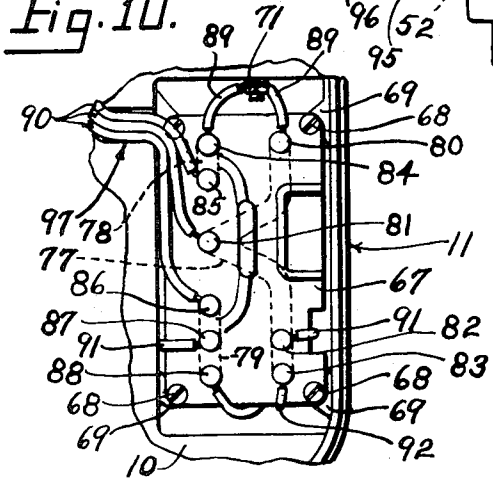


Fig. 10.



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UNITED STATES PATENT OFFICE

2,446,744

FAN HOUSING CONSTRUCTION FOR OIL BURNERS

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Application December 3, 1945, Serial No. 632,420

5 Claims. (Cl. 158—76)

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This invention relates to improvements in fan housing constructions for oil burners and more particularly for burners of the general type disclosed in my copending application Serial No. 573,697, filed January 20, 1945.

The invention has for an object the provision of an improved construction of the housing, which has within it a scroll chamber for the air-supply fan, a plenum chamber encompassing the air tube of the burner and a passage interconnecting the chambers—the housing being made up of a plurality of sections and the construction being characterized in that it may be economically manufactured—the sections being such that they may be formed by die casting with no machining required other than the drilling, tapping or reaming of a few holes.

The invention has for another object to provide in an oil burner housing, of the type wherein an air chamber is formed by a pair of mating sections one of which forms the front wall and the other the back wall of such chamber and wherein the front wall has an air outlet opening from the chamber to which the air tube of the burner is connected, a tubular air director having through its periphery a circular series of angularly-spaced slots extending from one end part way toward the other end—said air director being constructed separately from said sections and being capable of manufacture by die casting—the air director being located in the air chamber in coaxial relation with the outlet opening and having its ends clamped between said front and back walls.

The invention has for another object the provision of an air tube for the burner, having an open outlet end and an opening at its opposite end normally closed by a door—an assembly of the oil nozzle, ignition electrodes and oil pipe in said tube, which assembly is removable as a unit through the door when opened, and a rear support for such assembly including a single radial bracket having a foot of inverted T-shape engaged in a slot of corresponding shape and being held in such slot by the door when closed.

The invention will be disclosed with reference to the accompanying drawings, in which—

Figs. 1, 2 and 3 are respectively top plan, side elevational and end elevational views of a burner embodying the invention;

Fig. 4 is a sectional elevational view of the burner taken on the line 4—4 of Fig. 1;

Figs. 5 and 6 are cross sectional views taken on the lines 5—5 and 6—6, respectively, of Fig. 4;

Fig. 7 is a fragmentary sectional view taken on the line 7—7 of Fig. 5;

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Fig. 8 is a fragmentary sectional plan view taken on the line 8—8 of Fig. 5;

Fig. 9 is a fragmentary sectional view, taken on the line 9—9 of Fig. 8; and

Fig. 10 is a fragmentary view taken in the same direction as Fig. 3 but showing the junction box open.

Referring to these drawings, the burner includes a hollow upstanding housing (Figs. 1, 2 and 3), represented generally by H, from which all the burner parts are supported. This housing has fixed to its under side a post 1, having a floor-engaging flange 2. From the front wall of the housing projects the air tube 3 of the burner. From the rear wall of the housing project the ignition transformer 4 and the motor 5, the latter having built into it the pump (not shown) for supplying oil to the burner and carrying on its drive shaft 6 (Fig. 4) the fan 7, which supplies air to the burner. The unit comprising the motor, pump and fan is fully disclosed and claimed in my copending application Serial No. 548,021, filed August 4, 1944.

This hollow housing H is made up of two mating half sections (Fig. 4), one forming a front wall 8, having a marginal flange 9, embordering its top, sides and part but not all of its bottom, (see also Fig. 6) and the other forming a back wall 10, also having a marginal flange 11, embordering its top, sides and part but not all of its bottom (see also Fig. 5). The flange 11 preferably has a seat 12 to receive the flange 9, as best shown in Figs. 4 and 5. The back wall 10 also has a second flange 13 located wholly within the confines of flange 11. As will be seen in Fig. 4, this flange 13 projects in the same direction as flange 11 but is somewhat wider. This flange 13 is shaped as best shown in Fig. 5 and forms the peripheral walls of a scroll chamber 14 for fan 7, a plenum chamber 15 and a passage 16 which interconnects the chambers 14 and 15 and through which air is forced tangentially into the plenum chamber. The back wall 10 forms one end wall for the chambers 14 and 15 and passage 16. However, the back wall 10 has an upper cylindrical opening to receive the pilot flange 17 of motor 5, which is secured by screws 18 passing through ears 19 and threaded into the back wall, and a lower cylindrical opening 20 located coaxially of air tube 3. This opening 20 is normally closed by a door 21 (Fig. 3), hinged to plate 10 by pins 22 and normally held in closed position by a screw 23. The transformer 4 is suitably fixed to door 21.

The front wall of the chambers 14 and 15 and

of the passage 16 is formed by a thin sheet metal plate 24 which on one side abuts the flange 13. The front wall 8 has a plurality of tubular bosses 25, two of which are shown completely in Fig. 4 and all of which are shown in cross section in Fig. 6. All these bosses abut plate 24 in the same manner shown in connection with the two bosses in Fig. 4. Screws 26 pass through the hollow bosses and thread into corresponding bosses 27 on wall 10, see Fig. 4. The plate 24 has an upper circular opening 28, coaxial with shaft 6, through which air enters the scroll chamber 14. Louvers 29 in the front wall 8 admit air therethrough into a chamber 30 within flange 9 and thence to the opening 28. The front wall also has a flange 31 (Figs. 4 and 6) of substantially annular form and located coaxially of the air tube 3. This flange 31 is of the same dimension (taken axially of tube 3) as the bosses 25. This flange 31 also abuts plate 24 as shown in Fig. 4. This plate has an opening therethrough of about the same diameter as the internal diameter of flange 31. The space inside flange 31 provides an axial extension of the plenum chamber 15.

The wall 8 also has a flange 32, (shown in section in Fig. 6) which flange abuts plate 24 and forms the top and one side wall of the front portion of a junction box 33, the other side wall and the front wall of the box being formed by part of the flange 11 and part of wall 10, respectively. The rear portion of the junction box is formed by the space between the left hand side portion of flange 11 (Fig. 5), the adjacent portion of flange 13 and a short horizontal flange 33'. The rear portion of the junction box, i. e. the portion toward wall 10, is somewhat larger than the front portion and particularly it is higher (see Fig. 5). An opening 34' (Fig. 5) in the back wall 10 provides access to the junction box. This opening is normally closed by a suitable cover 34 (Fig. 3).

Within the plenum chamber 15 (Figs. 4 and 5) is an air director comprising a tubular member 35 having a plurality of slots 36 therethrough. This member is made separate from the front and back walls to which it is attached in order to enable the slots to be more easily formed therein. These slots extend from the back end part way toward the front end so that the slots and the entire member may be formed by die casting. This member 35 requires no machining. Its ends are received in seats, one in each of the walls 8 and 10, and the member is clamped between such walls by means of the screws 26, above described. All communication between the plenum chamber 15 and the interior of member 35 is by way of the slots 36. The air enters these slots 36 substantially tangentially (Fig. 5) and is whirled inside the tubular member 35. The air director 35 is located coaxially of the air tube 3. Both these parts 3 and 35 have the same internal diameter (Fig. 4) and they abut end to end, thereby forming one continuous, smooth, unbroken passage through which the air advances in a whirling stream to the outlet end of the tube, which has a suitable air-directing end 37. The other end of tube 3 fits over an opening in front plate 8. The tube has a flange 38 which is secured to wall 8 by screws 39.

The short inner wall 13' (left hand as viewed in Fig. 5) of the passage 16 is made considerably thicker at the back than at the front and has a substantial slant (Fig. 7), rather than being substantially at right angles to wall 10 as is the rest of flange 13. The special form of this wall 13' was derived by experiment and its sole purpose is to stop the noise which occurs when this wall is made at right angles to wall 10. The wall 13' has no other function. The flow of air from the fan to plenum chamber 15 is governed by the outer (right hand as viewed in Fig. 5) and long wall of passage 16. The inner wall 13' has no effect on the direction of air flow.

The air flow into tube 3 is regulable by a sleeve valve 40 (Figs. 4, 5 and 7) slidably mounted on the air director 35 and capable of closing off any desired portion of the slots 36. The valve may be moved from outside the housing by turning a screw 41, the slotted head of which is rotatably mounted in and projects through back wall 10 (Figs. 3 and 7). The other end of screw 41 is shouldered down and rotatably mounted in the front wall 8 (Fig. 7). The screw carries a nut 42, which has depending ears, pivotally connected by a pin 43 to upstanding ears on the sleeve valve. A spring 44, encompassing a smooth shank portion of the screw 41 near the head thereof, acts between two washers 45 one of which abuts wall 10 and the other of which abuts a shoulder on the screw to press another shoulder 46 on the screw against wall 8, thereby yieldingly holding the screw in proper axial position.

Within the air tube (Fig. 4) are the oil atomizing nozzle 47, which is or may be of the pressure-atomizing type, and a pair of ignition electrodes 48, properly located to ignite the combustible mixture of oil and air which issues from the tube. The nozzle 47 is fixed to one end of an oil supply pipe 49 the other end of which is connected to one branch of an elbow 50, formed integrally with, and at the upper end of, a supporting bracket 51 (Figs. 4 and 5). This bracket has a foot 52 (Figs. 8 and 9) which is of inverted T-shape and which has converging sides and preferably also converging top and bottom surfaces to form a blunt wedge for insertion in a slot 53 of inverted T-shape having correspondingly tapered surfaces and formed in the lower wall of the air tube near the door opening in back wall 10. The foot wedges tightly in its slot. The door 21, when closed, abuts one end of this foot 52 and holds it in its slot. The rear end of pipe 49 is held firmly and accurately in central position in the air tube against displacement radially, laterally or axially thereof. A flexible pipe 54, such as copper tubing, interconnects the other branch of the elbow 50 to the outlet 55 (Fig. 3) of the oil pump. This tubing passes out of the air tube through a groove 56 in the outer face of wall 10 and is held in this groove by the door 21 when closed (Fig. 4). Unions 57, one of which is shown in Fig 6 and the other in Fig. 3, connect the ends of the tubing 54 one to the elbow and one to the pump outlet 55. Near the nozzle 47 (Fig. 4), there is mounted on pipe 49 a member 58 which has three radially extending pins 59 to engage the inner periphery of the tube 3 and support the nozzle 47 in coaxial relation in the tube. This member 58 is grooved to receive insulators 60, one on each electrode 48, and these insulators are suitably held in place on member 58 as by a strap 61 and screws 62. The detailed construction and mounting of the electrodes is fully disclosed and claimed in my first named application. The end of each electrode carries a hollow cap nut 63. These hollow members 63 carry spring-pressed plungers 64 to engage, one with each of, the high tension terminals 65 of the ignition transformer 4. Such terminals are mounted in insulators 66, which extend from the transformer through the door 21. When this door is opened, the connection between

the electrodes and the high tension terminals is broken. Then, if the union 57 at outlet 55 has been disconnected, the assembly of nozzle 47, oil pipe 49, member 58, electrodes 48, their insulators and connected parts, the pins 59, elbow 50, tubing 54 and bracket 51 may be removed as one unit by pulling outwardly, using the bracket 51 as a handle, the tubing 54 riding out of groove 56 and the pins 59 sliding along the inner wall of tube 3 and later along the inner wall of member 35.

The junction box 33 contains a panel 67 (Fig. 5) of insulation secured by screws 68 to lugs 69 on the back housing section. Above this panel is a capacitor, sealed within a case 70 and having terminals 71. This capacitor is used in connection with motor 5 for starting purposes. The case 70 is frictionally held in a spring clip 72 which encompasses an end and two sides thereof. The lower ends of the two vertical arms of this clip diverge outwardly as at 73, and beyond the parts 73 are seats to engage one with each of two lugs 74 which project inwardly from opposite sides of the junction box. Below these seats on the clip are inturned parts 75, to underlie the lower end of the capacitor, and finger pieces 76, whereby one can press the seats and diverging parts 73 toward one another to release the clip from lugs 74 and enable removal of the capacitor. On one side of the panel 67 are bus bars 77, 78 and 79. On the other side of the panel (Fig. 10) are terminals 80, 81, 82 and 83 which are connected to bus bar 77; terminals 84 and 85 which are connected to bus bar 78; and terminals 86, 87 and 88 which are connected to bus bar 79. The terminals 71 of capacitor are connected to terminals 80 and 84 by wires 89. The terminals 81, 85 and 86 are connected to motor 5 by wires 90; the terminals 82 and 87 are connected to the primary of transformer 4 by wires 91; and the terminals 83 and 88 are connected to wires 92 which lead to the supply through a suitable switch or relay not shown. The cable 93, which includes the wires to the primary of the ignition transformer 4, extends from the latter through a hole 94 in wall 10, which hole is located vertically below the axis of hinge of door 21. The cable 93 then extends backwardly between the walls 8 and 10 and enters the junction box 33 through a notch 95 in an extension 96 of one lower end of the marginal flange 9, which extension merges with the annular flange 31 above described. When the door 21 is swung on its hinges, the cable 93 will bend approximately on the same axis around part of the wall of hole 94. The wires 90 from the motor 5 enter the junction box 33 by way of a groove 97 in the outer face of wall 10. The junction box 33 and the terminal board 67 therein, facilitate the connection of the various electrical parts. There is room in the junction box between the panel 67 and wall 8 to house other controls, such as the relay for the motor and the combustion safety switch but these controls have not been shown herein.

In operation of the burner, the fan draws air through the louvers 29, chamber 30 and opening 28 into the scroll chamber 14 and forces it out through passage 16 into the plenum chamber 15. From the latter, the air is distributed by the air director 35 and enters through the slots 36 tangentially into the smooth, straight, cylindrical passage of uniform diameter formed by the tube 3 and member 35. The air is whirled in this passage and advances in a whirling stream to the outlet end of the tube 3 where it is forced inwardly by the director 37 to mix with the oil spray. The oil pump, contained in the back end of the casing of motor 5 as disclosed in my second-named copending application, forces oil through pipe 54, elbow 50, and pipe 49 to nozzle 47, from which the oil issues in a finely divided spray to mix with the air and be ignited by the electrodes 48.

The housing construction is such that it may be manufactured in quantities at low unit cost. The two mating half sections of the housing may be formed by die casting. The various flanges and projections from the front wall 8 and the back wall 10 taper to provide the necessary draft for the casting operation. On the front half section, the only machining required is the tapping of the holes for the screws 39 and the reaming of the hole for the air valve screw 41. On the rear half section, it will be necessary to drill the holes for the hinge pins 22, to tap the holes for screws 18, 23, 26 and 68 and to ream the hole for the air valve adjusting screw 41 and the hole for post 1. The air director 35 is formed by die casting with no machining required. The plate 24 is stamped out of sheet metal and the screw holes formed therein at the same time. All that is necessary is to lay the plate 24 on flange 13 of the back half section, place one end of the air director 35 in its seat with the air valve 40 and its actuating screw 41 in place on the air director, then place the front half section on the back half section so as to have the other end of the air director enter its seat in wall 8 and the other end of the air valve screw 41 enter its hole in wall 8. The screws 26 are then applied to hold the housing sections together with plate 24 and director 35 clamped therebetween. The parts of the housing may thus be made and assembled at low cost.

The rest of the assembly is also easily performed. The motor 5, oil pump and fan 7 are made up as one unit and then put in place on the back wall and secured by the screws 18. The air tube 3 is put in place and fastened by the screws 39. The nozzle 47, oil pipe 49, electrodes 48, insulators 60 and front and rear supports 58 and 51 are separately assembled as one unit and then this unit is thrust into the open rear end of the air tube with the foot 52 of the rear support wedged into the slot 53 in the rear end of the air tube. The connection of the oil pipe 54 to the pump is then made. The door 21, with the transformer 4 previously assembled thereon, is hung on its hinges and closed, thereby holding the oil tube 54 and foot 52 in place. With the door 21 turned at right angles to wall 10, the hinge lugs may be placed in recesses in wall 10 and then lowered to cause the hinge pins 22 to enter the holes in their supports on wall 10.

Servicing of the burner is likewise easy. The motor 5, oil pump and air fan 7 may be removed as one unit and another substituted if necessary, or the unit, when removed, may be opened to gain access to the oil pump, as more particularly disclosed in the second-named copending application. By disconnecting one union 57, usually the outer one, of the oil pipe 54 and removing screw 23, and opening door 21, the unit within the air tube 3 may be drawn out, thus bringing the nozzle 47 and electrodes 48 in proper assembled relation out for inspection, cleaning, adjustment, replacement or repair. So also the transformer 4 may be removed by lifting the door 21 off its hinges. Disconnection of the wires for the motor and the

transformer may be easily effected at the terminal board 67.

The invention provides for a burner of the class described, improved structure which enables a good burner to be manufactured much more cheaply than heretofore and in a better form.

I claim:

1. In a burner, housing means providing a scroll chamber and a plenum chamber and including separate, spaced, parallel front and back walls; a tubular member separate from each wall and mounted in said chamber with its ends engaged one with the front wall and one with the back wall, means for holding said walls together with said member clamped between them, said member having a circular series of angularly-spaced slots through its periphery for admitting air from said chamber into the interior of said member, each said slot extending from one end of said member part way toward the other end thereof and the ends of all said slots being closed by one of said walls, one of said walls having an opening therethrough coaxial with said member, an air tube secured to and projecting outwardly from the last-named wall coaxially of said member, a fan in said scroll chamber, and a nozzle mounted in said tube for emitting a spray of atomized oil to mix with the air flowing through said tube.

2. In a burner, housing means providing a scroll chamber and a plenum chamber and including separate, spaced, parallel front and back walls; the front wall having a circular opening therethrough and a coaxial circular seat on its inner face within said chamber, an air tube having its inlet end connected to said opening and being secured to and projecting from the front wall, the rear wall having on its inner face a circular seat coaxial with and confronting the first seat, and an air director comprising a tubular member separate from each wall and having a circular series of angularly-spaced slots through its periphery and extending from one end part way toward the other end, said member having its ends mounted one in each of said seats and the open ends of all said slots being closed by one of said seats, means for holding said walls together with said member clamped between said seats, a fan in said scroll chamber, and a nozzle mounted in said tube for emitting a spray of atomized oil to mix with the air flowing through said tube.

3. In a burner, a housing having two mating cast sections, one forming a front wall with a marginal flange and the other a back wall with a marginal flange, said flanges abutting and forming the top and side walls of the housing, a plurality of screws for clamping said sections together; a second flange on the back wall within and projecting in the same direction as its marginal flange and forming the peripheral wall of a scroll chamber, a plenum chamber and a connecting passage between said chambers; a thin plate abutting the second flange to form an end wall for said chambers and having openings forming an air inlet into the scroll chamber and an air outlet from the plenum chamber, projections from the front wall to abut said plate and clamp it against said second flange, the front wall having an opening therethrough communicating with the plenum chamber, an air tube coaxial with and having its inlet end connected to said opening and secured to and projecting from the front wall, said projections including a circular flange on the front wall encompassing said opening, a fan in the scroll chamber, and a nozzle mounted in said air tube for emitting a spray of atomized oil to mix with the air flowing through said tube.

4. In a burner, a housing having two cast mating half sections, one forming the front wall and having a marginal flange and the other forming the rear wall and having a marginal flange, said marginal flanges abutting and forming the top and sides of the housing, a plurality of screws for clamping said sections together, the front wall having openings therethrough including an upper air inlet opening and a lower circular air outlet opening, an air tube connected at one end to said outlet opening and fixed to and projecting from the front wall oppositely from its marginal flange, an annular flange integral with and projecting from the front wall toward the rear wall and around said outlet opening; a second flange on the back wall located within its marginal flange and projecting toward the front wall and forming the peripheral walls of a scroll chamber, a plenum chamber and a connecting passage between said chambers; a thin flat plate abutting said inner flange of the rear wall and having an upper air inlet opening into the scroll chamber and a lower opening of substantially the same diameter as the internal diameter of the annular flange and located coaxially of the latter, projections on the front wall, said plate being clamped between the inner flange of the rear wall on one side and said annular flange and projections on the other side, a fan in said scroll chamber, and a nozzle in said air tube for emitting a spray of atomized oil to mix with the air flowing through said tube.

5. In a burner, a housing having two mating sections, one forming the front wall and having a marginal flange and the other forming the rear wall and having a marginal flange, said marginal flanges abutting and forming the top and sides of the housing, means to hold said sections together, the front wall having openings therethrough including an upper air inlet opening and and a lower circular air outlet opening, an air tube connected at one end to said outlet opening and fixed to and projecting from the front wall oppositely from its marginal flange, an annular flange projecting from the front wall toward the rear wall and around said outlet opening; a second flange on the back wall located within its marginal flange and projecting toward the front wall and forming the peripheral walls of a scroll chamber, a plenum chamber and a connecting passage between said chambers; a thin flat plate abutting said second flange and having an upper air inlet opening into the scroll chamber and a lower opening of substantially the same diameter as the internal diameter of the annular flange and located coaxially of the latter, projections on the front plate, said plate being clamped between the second flange on one side and said annular flange and said projections on the other side, a tubular air director separate from said sections and having a circular series of slots through its periphery extending from one end part way toward the other end, said director being located in said plenum chamber coaxially of said air outlet opening and being clamped between the front and rear walls of said housing, a fan in said scroll chamber, and a nozzle in said air tube for emitting a spray of atomized oil to mix with the air flowing through said tube.

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