June 3, 1952 R. W. BECKETT 2,599,153

OIL BURNER OF THE ATOMIZING TYPE

Filed May 1, 1948 5 Sheets-Sheet 1

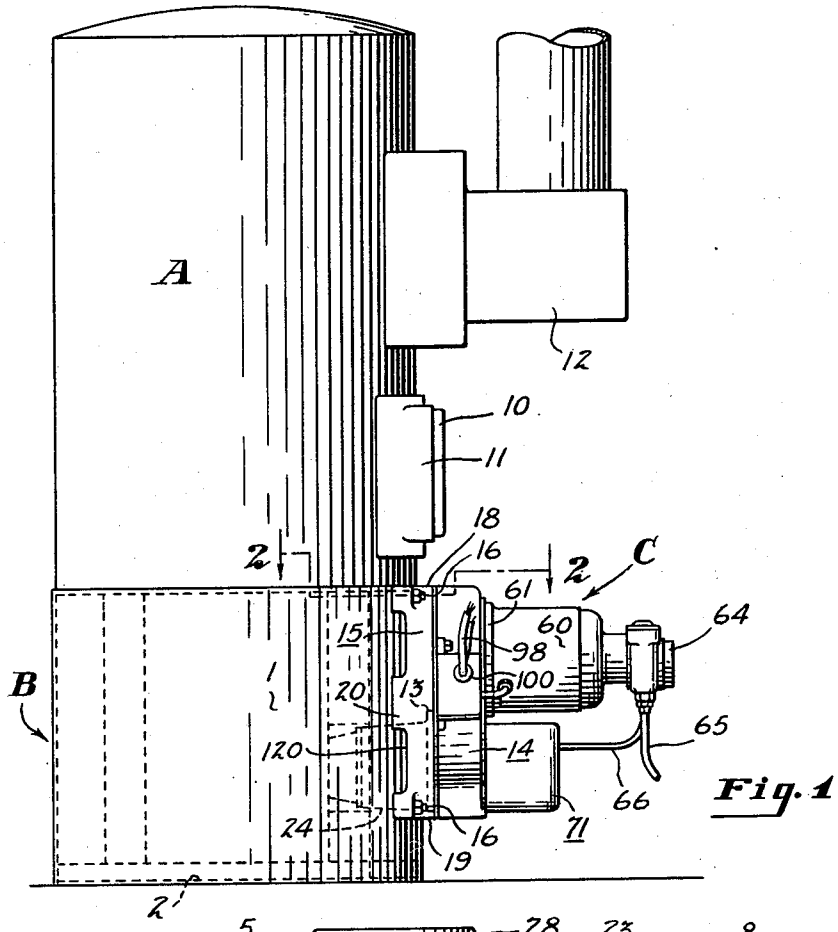


Fig. 1

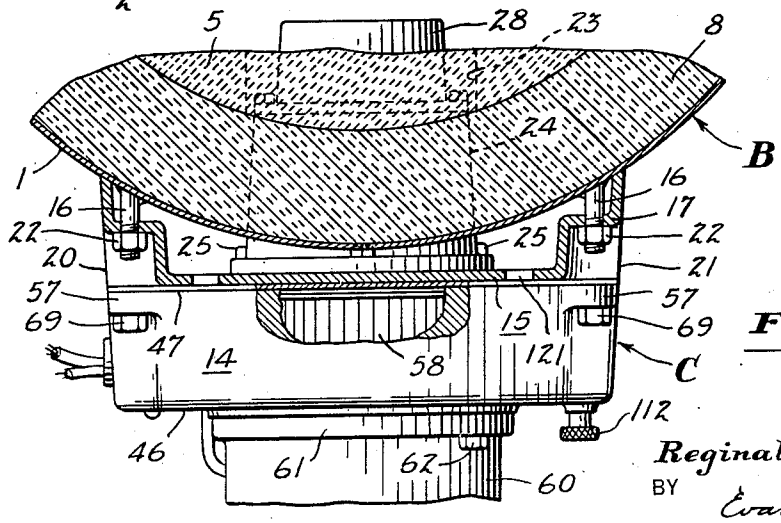


Fig. 2

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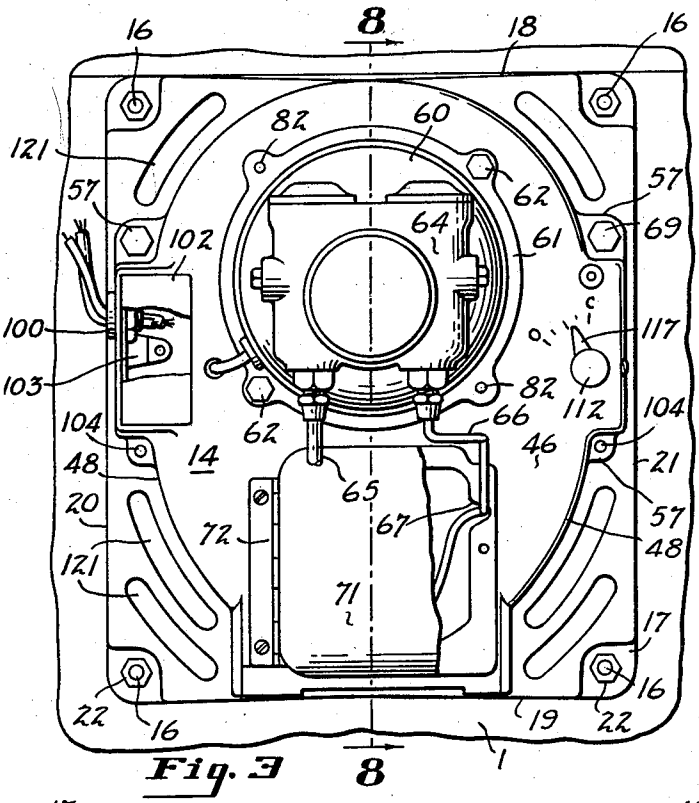


Fig. 3

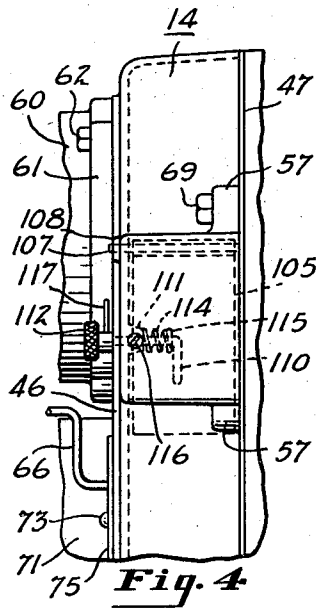


Fig. 4

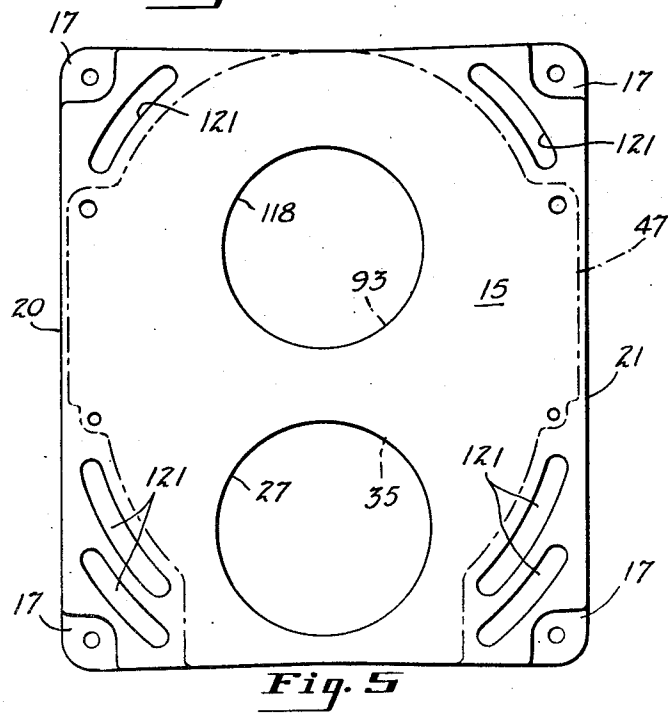


Fig. 5

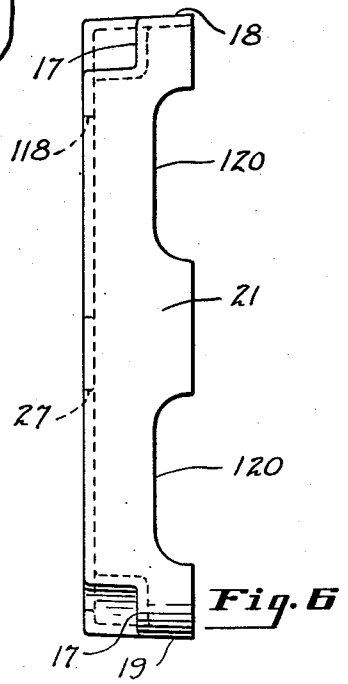


Fig. 6

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OIL BURNER OF THE ATOMIZING TYPE

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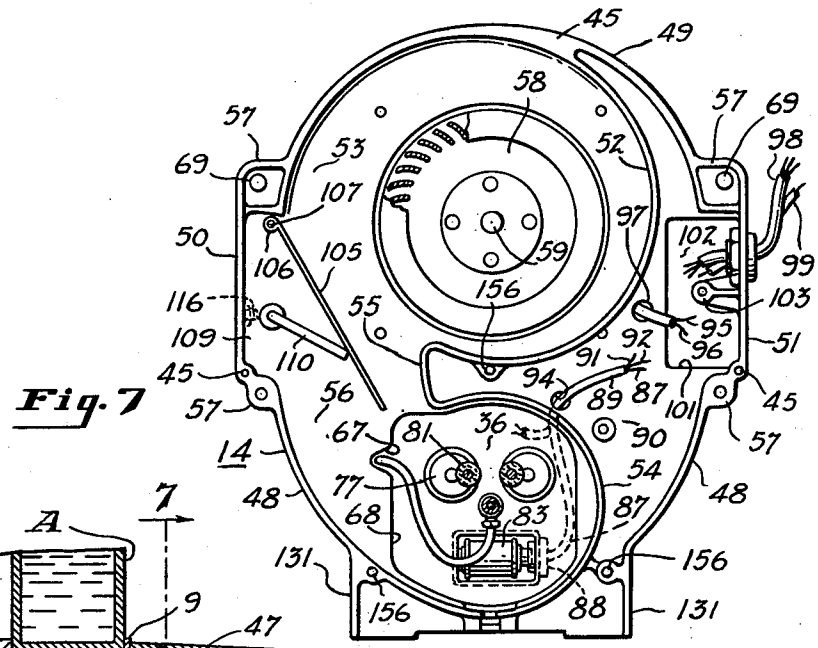


Fig. 7

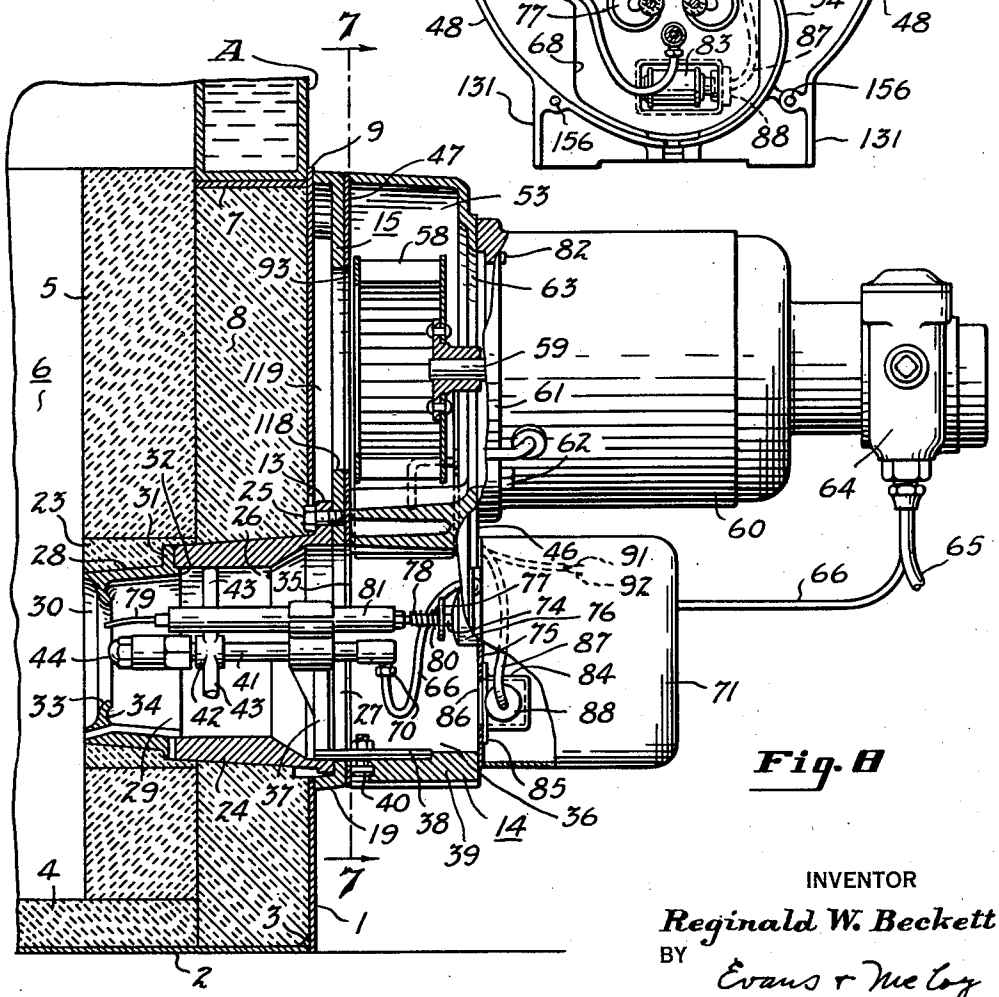


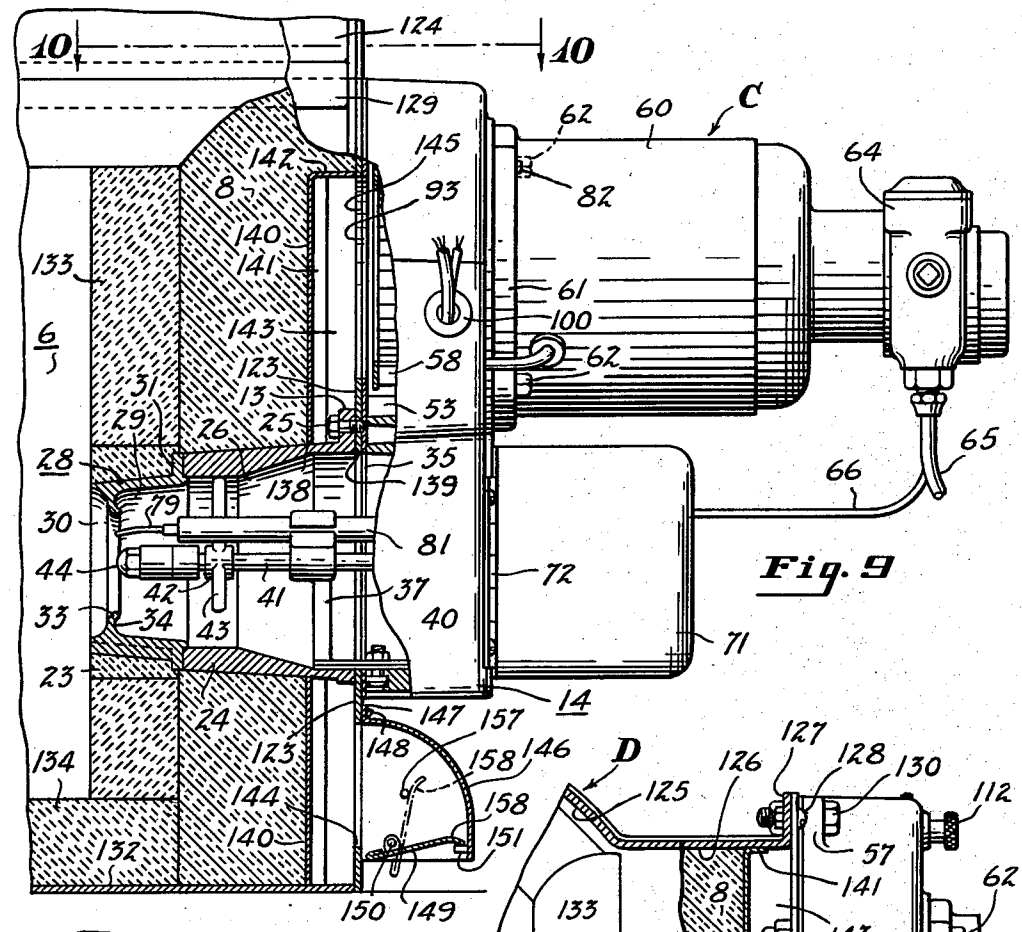
Fig. 8

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OIL BURNER OF THE ATOMIZING TYPE

Filed May 1, 1948 5 Sheets-Sheet 4



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OIL BURNER OF THE ATOMIZING TYPE

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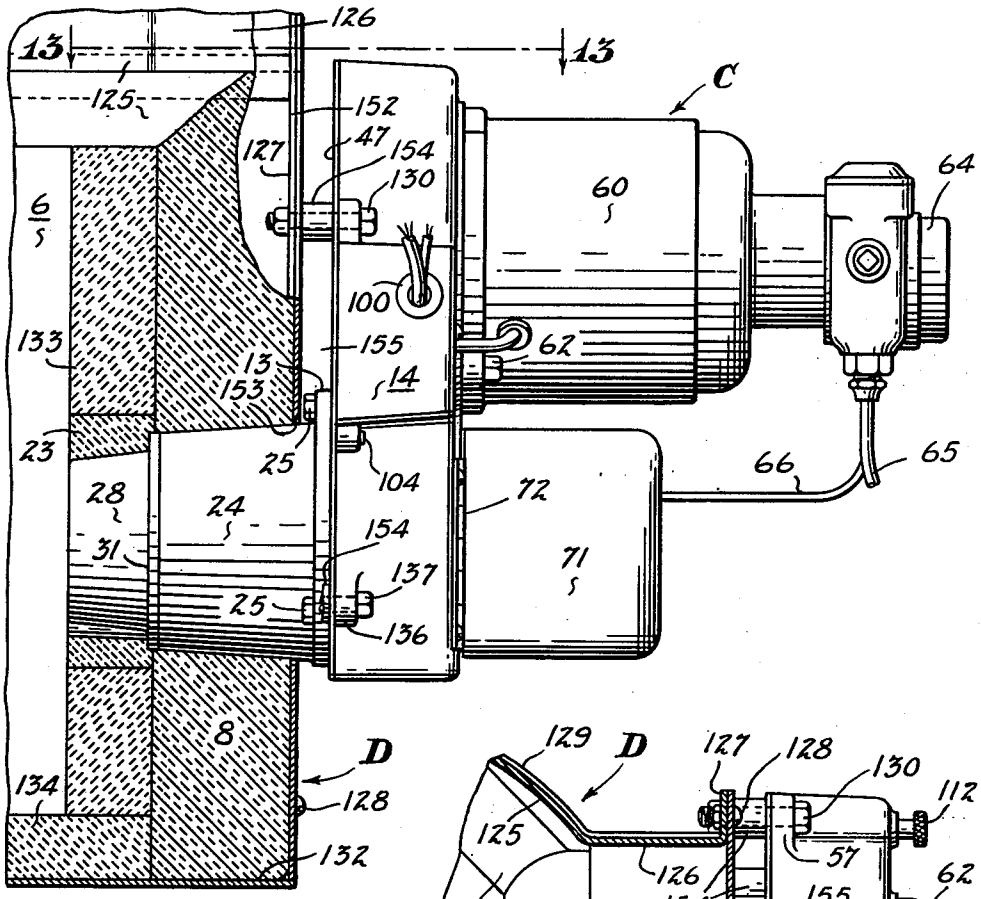


Fig. 12

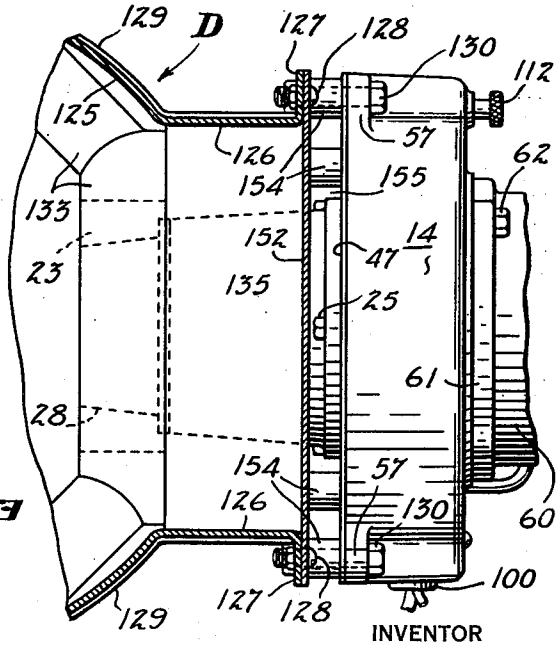


Fig. 13

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UNITED STATES PATENT OFFICE

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OIL BURNER OF THE ATOMIZING TYPE

Reginald W. Beckett, Elyria, Ohio

Application May 1, 1948, Serial No. 24,559

23 Claims. (Cl. 158—4)

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This invention relates to liquid fuel burners of the pressure atomizing type, more particularly to such burners incorporating improvements calculated to simplify the same and reduce the cost thereof.

One of the principal objects of the invention is to provide an oil burner of the flange mounted type which includes an open housing that can be inexpensively made and to which other parts of the burner can be quickly and easily assembled by mass production methods. Thus results a low cost burner which retains in its design desirable characteristics of high performance, efficiency, reliability, and easy maintenance. More specifically, this aspect of the invention is concerned with the provision of an open sided oil burner housing compartmented by internal partition means. During assembly the housing in a flat, stable position is adapted for movement along belt conveyors. Sub-assemblies or components of the burner are easily and accurately mounted on the conveyor supported housing in predetermined relationships and are secured in place with a minimum of effort and skill.

Another object is to provide an oil burner adaptable for combination with a heat exchanger to form an improved heater in which the heater includes a factory assembled base unit incorporating a refractory or heat resistant combustion chamber and also the oil burner air tube. The burner components of such combination, other than the air tube, are separable from the heater base unit for ease in shipment and installation, but are readily assembled to the heater base unit at the site of use. As a preferred arrangement of this type of combination, the invention contemplates a heater having a wall for enclosing the combustion chamber and an oil burner housing adapted to be mounted on the heater wall in predetermined relation thus registering the housing air passages with the air tube in the base unit. The complete burner is supported by the heater, eliminating the need for a base or pedestal on the burner.

Another object of the invention is to provide a heater-oil burner combination in which a wall of the heater serves as a closure for one side of the oil burner housing to cooperate with partition means in the housing in compartmentizing the latter. As a development of this aspect of the invention, the combination includes an arrangement in which air for combustion is drawn into the burner housing through one or more openings in a wall of the heater structure, the latter including an internal passage or passages and

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openings for admitting air into or behind the heater wall and for conducting the admitted air to an opening communicating with the burner housing fan chamber.

Another object of the invention is to provide an oil burner construction comprising a main housing adapted to be mounted flatwise against an upright wall of a heater and so connected to such wall as to be supported thereby, the burner including an air tube which extends through the heater wall into the interior of the heater. As a preferential arrangement it is contemplated to provide such a burner construction in which the body of the burner is spaced from the heater wall and air drawn into the burner for combustion is forced to flow through the space between the upright heater wall and the burner supported thereon.

A further object of the invention is to provide an improved air flow control so that in burners of the pressure atomizing type having tangential air inlet passages into the air tube the entering air is metered or throttled by gate means positioned in the throat between the fan chamber and the air tube inlet. As a refinement of this aspect of the invention the air control gate is arranged for adjustment to vary the direction of the entering air simultaneously with the throttling thereof, reducing the tangential and increasing the radial entering air components as the air flow volume is reduced.

Still further objects and advantages relate to structural details and novel combinations and arrangements of parts which will become apparent as the description proceeds. This description is made in connection with the accompanying drawings forming a part of the specification. Like parts throughout the several views are indicated by the same letters and numerals of reference.

In the drawings:

Figure 1 is a side elevational view, partly diagrammatic, showing a heater-oil burner combination in which the heater is a steel boiler of conventional construction supported on a base that includes an adapter plate on which several components of the oil burner are flange mounted as a unit;

Fig. 2 is a fragmentary horizontal sectional detail, with parts broken away and removed, taken substantially on the line indicated at 2—2 of Fig. 1 and enlarged with respect to that figure;

Fig. 3 is an end elevational view of the heater-burner combination, parts of the heater being broken away and removed;

Fig. 4 is a fragmentary elevational detail of one

side of the burner, parts being broken away and removed, this view showing the location and construction of the air flow control gate and related adjusting means;

Fig. 5 is an elevational view showing the face of the adapter plate which serves as a mounting for the burner housing on the base of the heater, the broken lines indicating the outline position thereon of the burner and of the housing closure member or plate;

Fig. 6 is a side elevational view of the adapter plate shown in Fig. 5;

Fig. 7 is an elevational view with parts removed, of the open face of the burner housing, this view being taken substantially along the line indicated at 7—7 of Fig. 8;

Fig. 8 is a side elevational view, partly in section and with parts broken away and removed, showing the heater-burner combination, this view being taken substantially along a line such as indicated at 8—8 of Fig. 3;

Fig. 9 is a fragmentary side elevational view partly in section and with parts broken away and removed showing a modified heater-oil burner combination in which the oil burner is mounted on an upright substantially flat wall portion of the heater and air passages are provided inside or behind the heater wall for conducting air to the fan chamber of the burner housing;

Fig. 10 is a fragmentary plan view of the heater-burner combination of Fig. 9 partly in section and with parts broken away and removed, this view being taken substantially along the line indicated at 10—10 of Fig. 9;

Fig. 11 is an elevational view on a reduced scale of the heater-oil burner combination of Figs. 9 and 10, the heater being largely broken away and removed;

Fig. 12 is a fragmentary side elevational view partly in section and with parts broken away and removed showing a modification in which the oil burner is hung or mounted as a unit on the upright substantially flat wall of the heater base, the air tube of the burner extending into the heater through an opening in the upright burner supporting heater wall; and

Fig. 13 is a fragmentary plan view of the modification of Fig. 12 with parts broken away and removed, this view being taken substantially along the line indicated at 13—13 of Fig. 12.

The heater-burner combination as embodied in the construction illustrated in Figs. 1 through 8 includes a welded steel boiler A supported on a base B to which oil burner C is secured so as to be supported thereby in cantilever fashion. The base B comprises an upright enclosing wall 1 of sheet steel which is bent to cylindrical form and secured as by welding 3 along its lower edge to a circular steel base plate 2. Within the heater base is disposed a fire box of heat resistant refractory material. The fire box may be of integral cast construction or it may be assembled of refractory bricks or blocks cemented together. Bottom wall 4 of the combustion chamber or fire-box rests upon base bottom 2 and upright or side walls 5 of the combustion chamber, which are spaced inwardly from the outer structural wall 1 of the base, cooperate with the combustion chamber bottom 4 to define an open top combustion chamber 6 which may be of circular cross section horizontally. A flat circular steel ring 7 is disposed horizontally in the top of the base B and is secured along its outer edge as by welding to the inside of the base wall 1 below the upper edge of the latter. The inner edge of the ring 7 abuts the outside of the fire box wall 5 adjacent the top of the latter to locate the fire box in the center of the heater base and to seal off the space between the fire box wall and the upright wall 1 of the base. Rockwool or other heat resistant insulation of the fill type indicated at 8 may be packed into the spaces between the fire box walls and the base walls.

The boiler A or other heating component is conventional and includes double walled sides defining the usual water space or leg. The side walls of the boiler rest upon and are supported by the ring 7 of the base as shown in Fig. 8. Upper edge portions 9 of the base wall 1, extending above the level of the support ring 7, engage against the outside of the boiler leg to locate the boiler on the base and to prevent lateral displacement. Conventional access door 10 and frame 11 therefor are provided on the boiler; also a stack outlet 12 through which the products of combustion are drawn by a conventional flue or chimney.

To serve as a support for the oil burner C and to space housing 14 of the burner from the wall 1 of the heater base (so as to provide air inlet passages to the burner housing) an adapter or plate member 15 is secured against the outside face of the heater base as by threaded studs 16 welded to the upright steel wall 1. The studs 16 are spotted or positioned on the base wall as by a welding jig. The studs extend through openings in depressed shoulders 17 located at the four corners of the adapter plate. Nuts 22 tightened on the studs against the shoulders 17 hold the adapter plate firmly against the base wall 1 in predetermined location. As shown in Figs. 3 and 5 the adapter plate, apertured to mate with the burner housing as will later appear, is of rectangular plan and has integral laterally extending flanges along its side, top, and bottom edges, the flanges abutting the curved upright wall 1 of the base. Some of the plate flanges such as top and bottom flanges 18 and 19 respectively, are curved complementally to the base wall curvature, while others, such as side walls 20 and 21, are substantially straight.

The flanged end 13 of a tapered air tube 24 of circular cross section is disposed against the inside face of the adapter plate 15 and secured thereto as by cap screws 25. Air passage 26 in the air tube registers with a circular opening 27 formed in the lower part of the adapter plate. On the remote or discharge end of the air tube 24 is received a tapered head 28 of cast iron or steel. Circular passage 29 of the head is aligned with the passage 26 of the air tube so as to receive combustion air from the latter and conduct the received air to mouth or discharge end 30 of the head. An outwardly directed radial flange 31 adjacent the large diameter end of the burner head is received against the outlet end of the air tube 24 and secured thereto as by cap screws. Adjacent the flange 21, an axially extending relatively short pilot flange 32 is received within the air tube and serves to locate the parts in correct alignment. Combustion air forced through the air tube advances in spiral fashion, the outermost portions thereof being deflected inwardly by the end of the axial head flange 32 which forms a circular shoulder against the oncoming air. Inwardly of the discharge mouth 30 the head is formed with a circular inwardly directed flange 33 that is curved reversely or back into the oncoming air so as to

present thereto a concave inner face 34. The head flange thus tends to reverse the advancing air just prior to the release of the air from the burner head.

The construction of the oil burner-heater combination of the present invention is so designed that the parts described above can be assembled together by the manufacturer and shipped to the site of use as a unit and separately from the burner housing and related components hereinafter described. Thus the refractory wall 5 and bottom 4 of the combustion chamber or fire box 6 can be accurately fitted and cemented together or, if cast integrally, can be installed as a unit in an economical manner by factory production methods and can be precisely located, secured in place, and tested under direct control of the manufacturer. Additionally, the air tube 24 and the burner head 28 can be correctly positioned, cemented in place, and tested under factory control and inspection to eliminate installation errors and variations that would otherwise be apt to occur in the field. It is important that the discharge end of the burner head 28 be substantially flush with the inside surface of the refractory fire box so that correct combustion is obtained and so that cement 23, used to seal about the burner head in the fire box opening, can effectively protect the burner head from the heat of the flame.

The metal housing 14 which forms the main body of the burner and to which a number of the burner components are attached in assembly may be formed by welded together pieces but preferably by casting as a single integral unit of aluminum or other metal. One face of the housing comprises an apertured, substantially flat main wall 46, the other face being open or substantially so and disposed flatwise against the adapter plate 15. Curved side walls 48 and curved top wall 49 of the housing are joined by straight side wall portions 50 and 51 imparting a generally ovate shape to the housing.

As previously mentioned the heater base B with the adapter plate 15, air tube 24, refractory firebox, insulating fill 8 and related parts assembled therewith may be shipped to the site of use separately from the housing 14 and its associated components. The housing, motor, transformer, fan, and ignition-oil tube assembly, may thus be handled separately as for convenience in manufacturing and shipping. The ignition-oil tube assembly is removed from the housing during transit. A closure member 47 of flat sheet metal or metal plate is disposed across the open side or face of the housing 14 to cover the internal chambers and protect the fan, wiring and air control device in transit. This plate has substantially the same outline shape (indicated by the broken lines of Fig. 5) as the open face of the housing 14 and is located and secured in place by screws, not shown, threaded into holes 45 (Fig. 7) in the edges of the housing side walls 50 and 51, the screw heads being flat and countersunk or round and received in registering recesses in the adapter plate 18. The closure plate 47 is formed with circular apertures, one, indicated at 35, opening into the lower air chamber 36 of the housing and another, indicated at 93, opening into fan or blower chamber 53 described below.

At the time of mounting or assembly of the oil burner housing 14 and related components on the adapter plate 15 of the heater base unit at the site of use, the closure member or plate 47 optionally may be removed from the housing and discarded or, as shown in the drawings, it may be left in place on the housing so as to be disposed in the assembly between the housing and the adapter plate. The closure plate and the adapter plate have registering apertures for admitting air to the fan chamber and for discharging air into the air tube from the housing air chamber 36.

The housing side walls 50 and 51 are laterally offset from the ends of the curved wall portions 48 and 49 connected thereto. In the angles so formed are integral ears 57. The upper ear at each side of the housing is apertured to receive an attaching cap screw 69 threaded into holes provided therefor in the adapter plate 15. The lower ears are drilled to receive dowel pins 104 which are held in the ears by friction fits. Holes are also provided for the pins in the closure plate 47. In assembling the burner housing on the adapter plate the dowel pins 104 are fitted into drilled holes provided therefor in the plate to locate the parts in predetermined positions and to support the burner housing and related components carried thereby while the cap screws 69 are being threaded into position.

The interior of the housing is divided or compartmentized by partitions which may be separately formed and welded or otherwise secured in place, or, as shown, may be cast integrally with the body of the housing. The partitions include an upper arcuately curved portion 52 which partially defines a blower or fan chamber 53 and a lower arcuately curved portion 54 which partially defines a lower air chamber 36. The two partition portions are reversely curved and their inner ends are connected by an integral upright portion 55 at air passage or throat 56 which connects the air chamber 36 and the fan or blower chamber 53. The upper end of the fan chamber partition 52 is joined tangentially into the inner-surface of the top housing wall 49 so as to provide a relatively smooth unbroken wall or fan scroll about the blower chamber. Similarly the lower or air chamber partition 54 is joined tangentially into the lower end of the housing side walls 48 to provide a relatively smooth unbroken surface for the flow of air tangentially into the air chamber 36 from the throat 56.

A fan or blower 58 of the squirrel cage type is rotatably mounted in the chamber 53, being secured on shaft 59 of an electric motor 60. One end bell of the motor is formed with a flange 61 disposed flatwise against the housing face wall 14, being located by dowels 82 and secured by diametrically disposed cap screws 62. A circular opening 63 is provided in the housing wall 46 sufficiently large to admit the cylindrically shaped fan 58 therethrough during assembly or when it is desired to withdraw the fan from the housing in repairing or servicing the burner. When the parts are assembled the motor 60 covers the opening 63.

On the outer or free end of the electric motor 60 and driven thereby is a fuel oil pump 64 of conventional construction. Oil is supplied to the pump from a suitable source not shown through an intake conduit 65 and is discharged from the pump under high pressure through a tubular metal conduit 66 which extends through a notch 67, Fig. 7, in an access opening 68 formed in the lower portion of the housing face 46. Within the air chamber 36 in the lower part of the housing high pressure fuel conduit 66 is connected, as by threaded fitting 70, to an elbow on

the intake end of fuel oil conduit 41 of an ignition electrode and oil conduit assembly.

The electrode-oil conduit assembly extends longitudinally through the aligned circular air passages within the air tube 24, the burner head 28 and the air chamber 36 in the bottom of the burner housing 14 and includes a split clamp bracket 37 having a foot portion 38 disposed in a recess formed in bottom wall 39 of the housing 14 and secured in predetermined position as by means of a nut and bolt 40, the bolt extending upwardly through the housing wall and through a hole or slot in the bracket foot 38. The pipe or fuel conduit 41 supported axially in the connected air passages by bracket 37, is received in and located by a spider 42 having a plurality of radial legs 43; the ends of the spider legs engage the walls of the air tube passage 26 to center the assembly. On the end of the fuel conduit 41 is an atomizing nozzle 44 which includes the usual strainer and internal structure so that fuel oil supplied therethrough under pressure is projected from the nozzle orifice in a conical spray of fine particles.

The access opening 68 in the face wall 46 of the housing communicates with the air chamber 36 and is large enough to permit the ignition electrode and oil conduit assembly to be withdrawn bodily from the air tube for cleaning and repairing and to then be replaced, all without disturbing the main burner housing and without removing the burner structure from its assembled relation on the heater base. Disposed across the access opening 68 and normally closing the same is a transformer box or casing 71 of stamped metal construction, which includes an inner, substantially flat plate 75. This casing is pivotally mounted on the housing face 46 as by a hinge 72 attached to the inner plate 75. The transformer box can be swung bodily away from the access opening in servicing and repairing the burner. To hold the transformer in closed position across the opening a captive screw 73 (Fig. 11) carried by projecting flange portion of the inner plate 75 is screwed into a threaded hole in the housing face 46. Within the transformer box 71 is disposed a conventional high voltage ignition transformer, not shown in detail, having the usual primary and secondary coils. The secondary coil is connected to terminals 74 projecting through the inner plate 75 of the transformer casing, the terminals being supported by insulators 76.

On reduced ends of the terminals 74, secured as by soldering, are circular contact plates 77 of brass or copper. As the transformer box is swung to closed position across the access opening 68 the contact plates 77 move against and make contact with tubular contact elements 78 slidable on the ends of parallel ignition electrodes 79 supported in tubular insulators 81 clamped by the bracket 37. The contact elements are held against the contact plates 77 by helical coil compression springs 80.

In the lower part of the transformer casing 71 is disposed a light sensitive or photoelectric cell 83 supported in an open sided stamped metal box 84 having integral edge flanges 85 spot welded or otherwise secured to the inside of the transformer inner plate 75. The box opening registers with an opening 86 in the transformer plate. Thus, the photocell 83 is directly exposed to radiation from the flame of the burning gases in the combustion chamber 6 through the open passages in the housing and air tube. The photocell is, however, readily accessible for inspection, test or replacement by swinging the transformer casing 71 away from the housing face 46. Reference is made to my copending application Serial No. 149,550, filed March 14, 1950, containing claims to these features of the present disclosure.

One terminal of the photocell is engaged by a metal spring secured in the receptacle and thus grounded to the oil burner housing through the metal of the receptacle or box 84 and the metal of the transformer casing 71. The other terminal of the photocell is connected by means of insulated wires including a wire 87 to conventional controls (not shown, and which are also grounded to the burner housing) governing the burner and the transformer. The wire 87 is soldered to an insulated metal socket terminal supported in one end of the photocell box 84 as by a ceramic sleeve 88.

Within the transformer box 71 the voids or unused portions of the latter are filled with pitch or tar in the usual manner, and the electrical wires or leads connected to the primary coil of the transformer are assembled with the photocell wire 87 in a common three-wire insulated cable 89, Fig. 7. This cable extends through an aperture in the transformer plate 75, an aperture 94 in housing wall 46, and into a wiring chamber 90 formed internally of the burner housing 14. This wiring chamber is defined by the partitions, one of the side walls 48, and the straight side wall portion 51. The electrical conductors or wires connected to the transformer primary are indicated at 91 and 92. The aperture 94 registers with the cable aperture in the transformer plate 75, both being disposed adjacent the supporting hinge 72. Locating the passages for the three-wire cable 89 adjacent the hinge axis in this manner permits the transformer to be swung back and forth without objectionable or excessive sliding of the cable 89 through the aperture 94.

An insulated cable containing wires or conductors 95 and 96 from the motor 60 enters the wiring chamber 90 through an aperture 97 in the face wall 46, the aperture being disposed adjacent the edge of the motor mounting flange 61.

Other insulated cables 98 and 99 enter the wiring chamber 90 through insulating bushing 100 secured in and extending through the side wall 51. These cables extend to the aforesaid conventional controls to which the electrical wires in the cables 98 and 99 are connected. The wires of the cables 98 and 99 are connected within the wiring chamber 90 to the wires of the motor and transformer cables so that the electrical parts of the burner are controlled and energized conventionally, including intermittent ignition control responsive to the light responsive cell 83. An access opening 101 in the face wall 46 of the housing is provided adjacent the side wall 51 so that the wiring connections can be made after the housing 14 is assembled on the adapter plate 15. A metal closure plate 102 is held across the access opening 101 by a screw threaded into the end of an integral inwardly extending arm 103 carried by the side wall 51.

For the purpose of controlling the direction and quantity of air forced into the blower chamber 36 and air tube of the burner by the fan 58 a hanging gate 105 is suspended in the housing at one side of the throat 56 so as to swing toward and away from the connecting partition 55, the latter constituting the cut-off in the fan scroll.

The air gate 105 is a substantially flat sheet metal plate having its upper edge rolled to form a tube 106 slidingly received on a fixed pin 107 driven into a socket in a boss 108 (Fig. 4) cast integrally on the housing face wall 46. The gate is free to swing on the pivot pin 107, the latter being so positioned that the gate normally swings downwardly by gravity, although it may be spring biased if desired, to a substantially vertical position in which it extends as a continuation of the fan scroll, the bottom edge of the gate being then disposed flush against the inside surface of the housing lower wall portion 48.

In recess 109 between the housing side wall 50 and the swingable air gate 105 is an L-shaped lever 110 one leg of which has a running fit in a hole drilled through a boss 111 cast on the housing wall 46. The other or angularly disposed leg of the lever is swingable to engage the rear side of the gate 105 and move the latter toward the connecting partition 55 to a position such as that illustrated in Fig. 7, thus reducing the air flow into the air tube and effecting a relative increase in the radial component of the air being forced into the chamber 36.

On the outer end of the lever 110 is secured a knurled knob 112 by means of which the lever can be shifted to different positions while the burner is in operation. A helical coil compression spring 114 embracing the rod 110 and interposed between the boss 111 and a washer 115 at the angle of the rod 110 acts to draw the knob 112 against the outside of the housing face thereby providing a frictional restraint against free turning of the adjusting lever or rod. To lock the rod after adjustment of the air gate a set screw 116 threaded laterally through the boss 111 is brought to bear radially against the rod. Desirably a pointer 117 is carried by the knob 112 so as to be swung over a scale inscribed on the outside surface of the housing 46 providing visual indication of the position of the control rod 110 and the air gate 115.

In the upper portion of the adapter plate 15 is formed a circular opening 118 which is aligned with and is approximately of the same diameter as the opening in the squirrel cage fan 58 providing an inlet to the latter and through which air enters the fan chamber 53. The closure member or plate 47 is also formed with a circular opening that registers with the air inlet opening 118 of the adapter plate. Between the adapter plate and the upright wall 1 of the heater base is a space 119 constituting a passage for air to flow to the fan chamber inlet opening 118. Air is admitted into the space 119 through plate openings such as marginal cut-outs 120 formed in the side flanges 20 and 21, or arcuate slots 121 in corner portions of the adapter plate outside the area thereof covered by the housing 14, or through both the side flange openings and the slots. Air drawn into the fan scroll chamber 53 by the rotating fan 58 is forced downwardly through the housing throat 56, as restricted by the control gate 105, and tangentially into the lower air chamber 36. The partition 54, forming the wall of the lower air chamber, is substantially flush with the inlet opening in the end of the air tube 24 so that the air flows smoothly into the air tube from the air chamber and thence out through the burner head 26. The spirally advancing air strikes tangentially against the curved inner face 34 of the reversely curved head flange and is thrown inwardly and against the mass of air advancing through the central portion of the air tube and burner head. This reversing of the outer portions of the spirally advancing air mass has a beneficial mixing and turbulating effect which promotes thorough mixing of the oil particles so as to obtain complete and efficient combustion. Air thus discharged from the burner head in a rotating body entrains the oil spray from the nozzle 44, the latter burning in the combustion chamber when ignited by an electrical spark induced across the ends of electrodes 49.

In Figs. 9 through 11 is illustrated a modification in which the burner C, constructed as described above, is supported on a substantially flat upright plate 123 which constitutes the front wall of a heater base D. The heater may be a warm air furnace of conventional construction, a portion of the sheet steel upper casing being indicated at 124. This casing rests on and is supported by a similarly shaped upright steel wall 125 of the heater base D. A steel plate 132 constitutes the bottom of the heater base, the base walls 125 being secured to the margins of the bottom as by welding. A refractory or heat resistant fire box is supported inside the heater base and may be of the same construction as that described in connection with the preceding figures or if desired it may be made of shaped fire bricks 133 cemented together and supported on and cemented to a bottom 134 also of refractory fire bricks. The loose fill insulating material 8 is packed into the spaces between the combustion chamber bricks and the base walls.

At the front of the heater base the horizontally curved upright wall 125 is formed with integral lateral extensions 126 which are disposed in generally spaced parallel relation and have flanges 127 disposed flatwise against the rear face of the burner mounting wall 123, the parts being secured together as by nuts and bolts 128. A steel strip 129 is welded or otherwise secured to the upper margin of the base wall 125 and spans the joint between the matching furnace casing 124 and the base wall to locate and retain the heater parts in correct relative positions.

The burner is supported and held against the plate 123 by bolts 130 which extend through the housing ears and registering drilled holes in and adjacent the edges of the plate and the flanges 127. The nuts for the bolts may be welded or otherwise held in place on the rear fans of the flanges so that the bolts may be inserted and tightened from the outside when a conventional jacket or casing (not shown) of the heater is also attached to the flanges. The locating and supporting dowel pins 104, mentioned above, may be omitted if desired or may be received in drilled holes in the burner supporting plate 123. At the sides of the burner housing 14, in the angles between the curved side walls 48 and short vertical depending wall portions 131, are integral ears 136 which are apertured to receive cap screws 137 threaded into the upright wall plate 123 of the heater base. The open side of the burner housing is thus held snugly against the plate.

Behind the upright plate 123 of the burner base and spaced therefrom is a dividing panel, wall or partition 140, formed as by a sheet metal stamping and preferably extending across the entire width of the space between the base wall portions 126. The upright edges of the partition or panel 140 may be flanged at 141 to fit snugly against the inside surfaces of the heater base side walls. A flange 142 extends laterally from the

top edge of the partition 140 into abutment with the rear face of the wall plate 123. A space 143 is thus provided internally of the heater base between the upright wall 123 thereof and the partition or panel 140. This space functions as a duct or passageway for air which enters through an opening 144 in the bottom of the furnace front or plate 123, flows upwardly around the air tube 24, and is drawn through a circular opening 145 in the plate wall into the fan chamber 53 by the fan 58.

A circular opening 138 in the partition 140 receives the air tube 24, the latter being assembled in the heater base at the factory. The tube is secured to the inside of the upright heater plate or wall 123 over a matching circular opening 139 in the latter by the cap screws 25, similarly to the manner in which the air tube is secured to the inside of the adapter plate 15 described in connection with the embodiment of Figs. 1 through 8.

Over the air inlet opening 144 in the bottom of the heater base wall plate 123 is disposed a hood 146. This hood, formed of sheet metal, has an integral laterally extending flange 147 disposed flatwise against the outside of the wall plate 123 and secured to the latter as by screws 148. Across the open bottom of the hood a sheet metal gate 149 is pivoted on pins 150 to turn about a horizontal axis from the closed position shown in full lines to an open position indicated by the broken lines of Fig. 14. The pivot pins 150 are supported in the opposite side walls of the hood 146, their inner ends being received loosely in holes formed in ears on or secured to the ends of the gate 149. The pivot receiving ears are so disposed that the turning axis of the gate is offset from the gate center of gravity and the gate normally swings or falls by gravity to the horizontal position shown in which the bottom opening into the hood is substantially closed.

The bottom edge of the hood front may be turned under or fitted with a stop pin 151 to engage the gate and limit the downward movement of the latter. A struck-in tab or pin 157 in one of the side walls of the hood 146 engages the gate 149 to limit the upward or opening movement of the gate. A rolled-over portion along the bottom edge of the gate stiffens the latter and acts as counterweight. The upper edge of the gate is curved as indicated at 158 to provide an aerodynamic action which holds the gate against the upper stop pin 157.

The action of the pivoted shutter or gate 149 is to prevent the gravity flow of air through the burner, the gate remaining in closed horizontal position across the inlet opening in the bottom of the hood when the burner is inactive. Upon starting the burner the reduced pressure created inside the air passage 143 and the hood 146 causes the gate 149 to be instantly swung upright to open position by the inrushing air drawn into the burner by the fan 58. During operation, deflection of the flowing air by the curved edge 158 holds the gate firmly against the stop 157. Closing of the gate upon shutdown of the burner arrests the flow of air through the burner and heater so as to prevent objectionable cooling of the combustion chamber and furnace.

In this embodiment of the invention the closure member or plate 47 may also be used across the open side of the burner housing 14 between the latter and the heater wall plate 123. As previously described the closure 47 may be optionally removed from the burner housing prior to mounting of the housing on the heater base. However, one advantage of using the closure 47 is that the openings therein are matched to the burner housing 14 at the time of assembly and testing at the factory.

In the embodiments of Figs. 1 through 8 and 9 through 11 the unitary open sided housing 14 of the burner is disposed with its open side against one side of the substantially flat adapter plate or the substantially flat upright burner wall and cooperates with such plate or wall to form connected fan and air chambers 53 and 36 respectively. Should the closure member 47 be retained between the burner housing and the adapter plate or heater wall it becomes, in effect, part of such plate or wall, the combination being essentially the same in operation with or without the interposed closure.

In Figs. 12 and 13 is illustrated a modification in which the oil burner, constructed as described above, is first assembled as a complete unit and thereafter hung or mounted on the upright wall of the heater. The heater may be of conventional construction such as one of the types described in connection with the preceding figures, as, for example, the warm air heater of Figs. 9–11. The base D of this heater includes the combustion chamber or fire box 6 defined by the refractory bricks 133 and the refractory bottom 134. A substantially flat steel plate 152, similar to the plate 123 previously described, is disposed across the front of the heater base and is attached to the flanges 127 of the spaced upright wall portions 126 by the nuts and bolts 128.

The plate 152 is formed with a single circular opening 153 which receives the air tube 24 of the burner C. The bolts 130 and the cap screws 137, longer than the ones used in the embodiment of Figs. 9–11 and which respectively extend through the ears 57 and 136 of the burner housing, receive tubular spacers 154 which hold the burner away from the upright heater wall 152. The bolts also extend through the heater wall and the flanges 127 and receive nuts which are drawn up behind the flanges to secure the burner in place. The cap screws 137 are received in threaded holes in the plate 152. Thus the oil burner, though hung or suspended in cantilever fashion on the upright wall of the heater by the bolts and cap screws, stands away from the heater wall providing a narrow air passage or space 155 between the heater wall and the closure member or plate 47 of the burner. During operation of the burner the fan 58 draws air into the fan chamber 53 through the upper opening 93 (see Figs. 8 and 9) in the closure member 47, the space 155 serving as a passage for such air. The combustion air is drawn into the space 155 around the marginal edges of the burner housing, keeping the latter at a relatively cool temperature.

In this modification the air tube 24 is secured to and supported by the housing 14, the attaching flange 13 of the air tube being disposed flatwise against the outside of the closure member 47. The air tube passage registers with the lower circular opening 35 (see Figs. 8 and 9) in the closure 47. The cap screws 25, which are longer than the corresponding screws employed in the other modifications and which extend through holes in the air tube attaching flange 13 and in the closure 47, are screwed into threaded sockets 156 (Fig. 7) provided in bosses integral with the partitions of the housing 14.

In this arrangement or modification of the invention, the complete burner hangs as a cantilever unit on the upright heater wall in spaced relation thereto and the closure plate or sheet **47** defines the internal chambers and passages of the housing. Accordingly the closure **47** is a functioning element of this combination as distinguished from the structures of Figs. 1 through 11 wherein, after assembly of the housing to the adapter plate or upright wall of the heater, the closure member becomes, in effect, part of the adapter plate or heater wall. The closure is held in place not only by the screws that are threaded into the sockets **45**, previously mentioned in connection with Fig. 7, but also by the flange **13** of the air tube and by the spacers **154** carried by the housing attaching bolts.

The principles of the present invention may be utilized in various ways, substitution of parts and changes in construction being resorted to as desired, it being understood that the embodiments shown in the drawings and described above and the particular methods set forth are given merely for purposes of explanation and illustration without intending to limit the scope of the claims to the specific details disclosed.

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

1. In a burner and heater combination in which the heater includes means providing a combustion chamber for the burning of combustibles received from the burner and in which the burner includes a hollow housing substantially completely open on one side, means mounting the housing on the heater with the open side directed toward the combustion chamber and so as to be wholly supported by the heater as a cantilever, means compartmenting the interior of the housing to define connected fan and air chambers, an apertured closure supported across the open side of the housing, one aperture thereof being in communication with the fan chamber and another aperture thereof being in communication with the air chamber, an air tube wholly supported by the heater independently of the housing to permit facile removal and replacement of the housing on the heater without disturbing the air tube, said tube extending between the housing and the combustion chamber, said tube having one end registered with said other aperture of the closure to receive air from the air chamber and having a discharge end for releasing received air into the combustion chamber, a fan in the fan chamber, means mounted on another side of the housing and wholly supported by the latter for actuating the fan, and means including a nozzle adjacent the discharge end of the air tube for supplying fuel to air in the combustion chamber.

2. In a burner and heater combination in which the heater has an apertured upright wall and includes means providing a combustion chamber for the burning of combustibles, a burner comprising a hollow housing substantially completely open on one side, means mounting the housing on one side of the upright wall of the heater for facile removal and replacement, and so as to be wholly supported by the heater, the open side of the housing being disposed toward the heater wall, means compartmenting the interior of the housing to define connected fan and air chambers, said chambers registering with apertures in the heater wall, an air tube extending between the heater wall and the combustion chamber, one end of the air tube registering with a wall aperture and communicating with the air chamber in the housing, the other end of the air tube having a discharge opening for projecting air into the combustion chamber, a fan in the fan chamber, means for actuating the fan, a panel between the combustion chamber and the heater wall, said panel being spaced from that portion of the wall having an aperture communicating with the fan chamber to provide a duct between the wall and the panel for air drawn into the fan chamber, means for admitting air into said duct, and means extending through the air tube for supplying fuel to air in the combustion chamber.

3. In a burner and heater combination in which the heater has an apertured upright wall and includes means providing a combustion chamber for the burning of combustibles, a burner comprising a hollow housing substantially completely open on one side, means mounting the housing on one side of the upright wall of the heater for facile removal and replacement and so as to be wholly supported by the heater, the open side of the housing being disposed toward the heater wall, means compartmenting the interior of the housing to define connected fan and air chambers, said chambers registering with apertures in the heater wall, an air tube providing an enclosed passage from the air chamber of the housing to the combustion chamber, a fan in the fan chamber, means for actuating the fan, a panel between the combustion chamber and the heater wall, said panel being spaced from that portion of the wall having an aperture communicating with the fan chamber to provide a duct between the wall and the panel for air drawn into the fan chamber, means for admitting air into said duct, and means extending through the air tube for supplying fuel to air in the combustion chamber.

4. In a burner and heater combination, a heater structure comprising means defining a combustion chamber for the burning of combustibles received from the burner and an upright apertured wall plate spaced from the combustion chamber, a burner structure comprising a hollow housing formed with one side substantially completely open, means compartmenting the housing to define connected fan and air chambers, means mounting the housing on the heater structure in predetermined position to the wall plate and for facile removal and replacement with the one side of the housing confronting the wall plate and with an aperture in the latter aligned with the air chamber of the housing, a fan in the fan chamber, means mounted on another side of the housing and wholly supported by the latter for actuating the fan, an air tube wholly supported by the heater structure independently of the housing to permit separate removal of the latter, said air tube extending between the combustion chamber and the wall plate, said air tube having an inlet opening at one end registered with the wall plate aperture to receive air from the air chamber and said air tube also having a discharge opening at another end to release received air into the combustion chamber, and means including a nozzle adjacent the discharge opening of the air tube for supplying fuel to air in the combustion chamber.

5. In a heater-burner combination, a heater structure defining a combustion chamber and having a casing wall with an aperture therein opening to the combustion chamber, and a fluid fuel burner mounted on said wall, the burner

including a housing member having walls defining open faced fan and air chambers disposed in confronting relation to the casing wall and a connecting passage between said fan and air chambers, flange means extending laterally from the housing member and distributed about the periphery thereof, fastening means distributed about the periphery of the housing member and extending between the flange means and predetermined points of the casing wall to support the housing member on the heater structure for facile removal and replacement, said fastening means being adapted to locate the housing member in predetermined relation on the casing wall of the heater with the air chamber registered with said aperture in the casing wall, an air tube extending substantially to the combustion chamber from said last mentioned aperture in the casing wall and registered with the open faced air chamber, a fan in the fan chamber, means secured to and wholly supported by the housing member for actuating the fan to draw air into the fan chamber and to force such air through the air chamber and the air tube, said fan actuating means and the housing member comprising a unit readily removable from and replaceable on the casing wall, and means for supplying fluid fuel to mix with air forced through the air tube.

6. In a heater-burner combination, a heater structure having a casing wall and means defining a combustion chamber spaced from such wall, and a fluid fuel burner comprising a housing having a main wall and side walls extending forwardly from the main wall, the side walls having edges disposed substantially in a common plane and the housing having in said plane a front face open over substantially its entire extent, attaching flange means on the side walls of the housing and extending laterally therefrom substantially in said plane, mounting elements connecting the flange means to the casing wall of the heater structure and thereby directly securing the housing to the casing wall, said flange means and mounting elements being distributed about the periphery of the housing, means spacing the edges of the housing side walls from the casing wall to provide an air entry passage between the housing and the casing wall, closure means disposed flatwise across the open face of the housing and having apertures opening into the interior of the housing, an air tube, means supporting the air tube in registry with and to extend substantially from one of the apertures in the closure means substantially to the combustion chamber of the heater structure, a fan in the housing, means secured to and wholly supported by the housing for actuating the fan to draw air into the housing through another of the apertures in the closure means from said entry passage and to force such air through the air tube, said fan actuating means and the housing comprising a unit easily removable from and replaceable on the casing wall, means for actuating the fan, and means for supplying fluid fuel to air forced through the air tube.

7. In a heater-burner combination, a heater structure having a casing wall and means defining a combustion chamber spaced from such wall, and a fluid fuel burner comprising a housing having a main wall and side walls extending forwardly from the main wall, the side walls having edges disposed substantially in a common plane and the housing having in said plane a front face open over substantially its entire extent, attaching flange means on the side walls of the housing, said flange means being distributed about the periphery of the housing and extending laterally therefrom substantially in said plane, mounting elements also distributed about the periphery of the housing and connecting the flange means to the casing wall of the heater structure and thereby directly securing the housing to the casing wall, closure means having apertures opening into the interior of the housing, the closure means being disposed across the open face of the housing, means providing a passage located between the housing of the burner and the combustion chamber of the heater for the entry of combustion air flowing into the housing through one of the apertures in the closure means, an air tube extending substantially from another of the apertures in the closure means to the combustion chamber, a fan in the housing, means secured to and wholly supported by the housing for actuating the fan to draw air into the housing from the entry passage through said one aperture in the closure means and to force such air into the air tube through the other aperture in the closure means, and means for supplying fluid fuel to the air, said fan actuating means and the housing comprising a unit easily removable from and replaceable on the casing wall.

8. In a heater-burner combination, a heater structure having means defining a combustion chamber and a substantially upright wall spaced from the combustion chamber, said wall being formed with an aperture, and a fluid fuel burner mounted on the wall, the burner including a one piece open sided housing member disposed with its open side toward the upright wall of the heater structure, a closure member formed with an air admission aperture and an air outlet aperture, said closure member being disposed against the open side of the housing member between the latter and the upright wall of the heater structure, said housing member having a main wall defining a substantially closed side thereof and marginal walls disposed along the edges of the main wall and extending forwardly therefrom to the open side of the housing member, partition means in the housing member and cooperating with the closure member and the marginal walls of the housing member to define fan and air chambers and a passage connecting the fan and air chambers, the fan chamber being in registry with the air admission aperture in the closure member for the admission of air into the fan chamber, means located between the combustion chamber and the closure member providing an air entry passage for air flowing to the admission aperture in the closure member, an air tube secured to and supported by the housing member and having a through passage communicating with the air chamber through and registering with said outlet aperture in the closure member, said air tube extending through said aperture in the upright wall and into the heater structure substantially to the combustion chamber, a fan in the fan chamber, means for actuating the fan to draw air into the fan chamber through the admission aperture and to force such air through the air chamber and the air tube, said fan actuating means being secured to and wholly supported by the housing member, the fan actuating means and the housing member comprising a burner unit readily removable from and replaceable on the upright wall of the heater, means for supplying fluid fuel to mix with

air forced through the air tube, and mounting elements distributed about the periphery of and connected to the housing member of the burner, said mounting elements being secured to the heater structure to support the burner unit in predetermined position on the heater structure for facile removal and replacement.

9. A structure of the character described comprising in combination a heater having a combustion chamber and a wall spaced from the combustion chamber, a burner component including a housing having a wall panel disposed in spaced confronting relation to the heater wall, said housing having fan and air chambers and the wall panel having an opening into each of the chambers, an air tube extending from the wall panel, through the wall of the heater and to the combustion chamber, said air tube having a through passage communicating with the air chamber through one of the openings in the wall panel, means carried by the heater wall and directly coacting with points of the housing distributed about the periphery of the latter to locate and support the burner component in predetermined position on the heater wall for facile removal and replacement and to provide an opening extending along the side of the housing into the space between the heater wall and the wall panel of the burner component, a fan in the fan chamber, means for actuating the fan to draw air into the fan chamber directly from the space between the housing and the heater wall and to force such indrawn air into the air chamber and thence into and through the air tube, said fan actuating means being substantially wholly supported by the housing and comprising part of the removable burner component, and means for supplying fluid fuel to air so forced through the air tube to form a combustible mixture to be burned in the combustion chamber of the heater.

10. A fluid fuel burner comprising in combination a housing member having a front face open over substantially its entire extent, the housing member including a main wall opposite the open face and side walls and partitions angularly disposed with respect to the main wall, the side walls and the partitions dividing the housing member interior into fan and air chambers and a connecting passage between such chambers, a substantially flat relatively thin closure plate disposed across the open face of the housing member against the side walls and partitions, said closure plate being formed with an inlet opening in registry with the fan chamber and an outlet opening in registry with the air chamber, an air tube disposed in registry with the closure plate outlet opening, said tube having flange means disposed flatwise against the closure plate about the outlet opening in the latter, said flange means on the air tube being small in extent relative to the closure plate, fastening elements extending through the tube flange means, through the closure plate, and having connection with portions of the housing member spaced inwardly from the side walls to secure the air tube to the housing member for support thereby, said fastening elements being adapted to draw together the air tube flange means and the housing to clampingly grip the closure plate therebetween, fastening means other than said elements connecting marginal portions of the closure plate to the housing member to retain said margins against the housing member, a fan in the fan chamber, means mounted on the main wall of the housing member for actuating the fan, and means for supplying fluid fuel to mix with air forced through the air tube.

11. A structure of the character described comprising in combination a heater having means defining a combustion chamber and a supporting wall spaced from the combustion chamber, and a burner for supplying a combustible mixture to the combustion chamber of the heater, the burner comprising a component mounted on the wall of the heater for facile removal and replacement as a unit, said removable component including a housing having a wall disposed in spaced relation to the heater wall, said housing having fan and air chambers each opening through said housing wall, the burner also including an air tube extending between the supporting wall and the combustion chamber of the heater for guiding air to the latter, the tube having an open receiving end registered with one of the housing wall openings, means securing the air tube to the heater wall to support the tube in the heater independently of the removable component of the burner, means carried by the heater wall and directly coacting with the housing to locate the removable component of the burner in predetermined position relative to the air tube, said locating means also being arranged to support the housing on the heater wall independently of the air tube, a fan in the fan chamber, means for actuating the fan to draw air through one of the housing wall openings into the fan chamber directly from the space between the housing wall and the heater wall and to force such indrawn air into the air chamber and thence into and through the air tube, said fan actuating means being wholly supported by the housing for removal and replacement therewith as part of the removable unit burner component, and means for supplying fluid fuel to air so forced through the air tube to form a combustible mixture to be burned in the combustion chamber of the heater.

12. In a heater-burner combination, a heater structure including means defining a combustion chamber and a wall spaced from the combustion chamber and having apertures therein, a burner housing open faced on one side and having a main wall opposite the open face and marginal walls substantially along the edges of the main wall, partition means providing connected fan and air chambers in the housing, said chambers each having an opening through the open face of the housing, said housing being disposed with its open face confronting the wall of the heater structure with the fan and air chamber openings in registry with apertures in the wall, an air tube supported in the heater structure substantially independently of the burner component, said air tube having a through passage registering with the opening into the air chamber in the housing and extending substantially to the combustion chamber, a fan in the fan chamber, means secured to and wholly supported by the housing for actuating the fan to draw air into the fan chamber and to force such air through the air chamber and the air tube, said fan actuating means and the housing comprising a unit readily removable from and replaceable on the wall of the heater structure, mounting elements distributed about the periphery of the housing and extending between the housing and the heater structure to support said unit in predetermined position on the structure for facile removal and replacement, and means for

supplying fluid fuel to mix with air forced through the air tube.

13. A heater-burner combination comprising a heater structure defining a combustion chamber and having a casing which includes a burner supporting wall, a fluid fuel burner component mounted on the wall, said burner component including a housing disposed against the wall and internally formed to provide connected fan and air chambers, the casing all and the housing having registered openings located for the flow of air from the interior of the casing directly into the fan chamber of the housing and from the air chamber of the housing directly through the casing wall, an air tube within the heater casing and aligned with the air chamber to receive air from the latter, said air tube extending substantially from the casing wall to the combustion chamber, the casing of the heater structure being formed with an opening for admitting combustion air into the interior thereof, means providing a passage within the casing for the flow of air from said last named casing opening to the wall opening registered with the fan chamber, a fan in the fan chamber, means secured to and wholly supported by the housing for actuating the fan to draw air into the fan chamber through the casing and to force such air through the air chamber and into the air tube, said fan actuating means and the housing comprising a unit readily removable from and replaceable on the burner supporting wall of the casing, and means for supplying fluid fuel to air forced through the air tube.

14. A burner and heater combination, the heater comprising casing means including a wall and means defining a combustion chamber spaced from such wall for the burning of combustibles, the burner comprising a demountable component including a hollow housing substantially completely open on one side, means connected to and distributed about the periphery of the housing and secured to the heater wall for mounting and wholly supporting the burner component on the casing wall in predetermined relation for facile removal and replacement as a unit, partition means in the burner housing defining fan and air chambers and a connecting passage between the chambers, said housing chambers each being open through the open side of the housing, the casing wall being formed with an opening registering with the fan chamber for flow of air into the fan chamber from the space between the combustion chamber and the casing wall, an air tube disposed to provide an enclosed passage substantially from the air chamber of the housing to the combustion chamber of the heater, a fan in the fan chamber, means for actuating the fan to draw air into the housing from the said space and to force such air into the combustion chamber, said fan actuating means comprising part of the removable and replaceable unit burner component, the casing means of the heater being formed with an inlet opening communicating with said space for the admission of air to replace that drawn by the fan, and means extending through the air tube for supplying fuel to air in the combustion chamber.

15. A burner and heater combination, the heater including means providing a combustion chamber for the burning of combustibles received from the burner, the burner comprising a demountable component including a hollow housing substantially completely open on one side, means connected to and distributed about the periphery of the housing and secured to the heater for mounting and wholly supporting the burner component on the heater in predetermined relation for facile removal and replacement as a unit, the open side of the housing of the mounted burner component being directed toward the combustion chamber, means compartmenting the interior of the housing to define connected fan and air chambers, a removable closure member supported across the open side of the housing, the closure member being formed with one aperture in communication with the fan chamber and another aperture in communication with the air chamber, an air tube extending between the closure member and the combustion chamber, said tube having one end registered with said other aperture of the closure member to receive air from the air chamber and having a discharge end extending into the interior of the heater and to the combustion chamber for releasing received air into the combustion chamber, a fan in the fan chamber, means mounted on another side of the housing and wholly supported by the latter for actuating the fan, said fan actuating means comprising part of the removable and replaceable unit burner component, and means including a nozzle adjacent the discharge end of the air tube for supplying fuel to air in the combustion chamber.

16. A heater-burner combination of the character described comprising a heater structure having means defining a combustion chamber and a wall spaced from the chamber, and a burner for supplying a combustible mixture to the combustion chamber, the burner comprising a component mounted on the heater structure for facile removal and replacement as a unit, said removable burner component including a housing having substantially flat wall panel means disposed in spaced confronting relation to the heater wall, said housing being formed with fan and air chambers and an opening from each such fan and air chamber through said wall panel means, an air tube extending substantially from the wall panel means of the housing, through the wall of the heater structure and to the combustion chamber, the air tube having a through passage registered with that opening in the wall panel means which communicates with the air chamber, means carried by the heater wall and directly connected to the housing at points spaced about the periphery of the housing to locate and support the removable component of the burner in predetermined position relative to the heater structure, a fan in the fan chamber, means supported by the housing for actuating the fan to draw air through one of the housing wall openings into the fan chamber directly from the space between the wall panel means of the housing and the heater wall and to force such indrawn air into the air chamber and thence into and through the air tube, said fan actuating means comprising a part of and being removable and replaceable as a part of the removable burner component, and means for supplying fluid fuel to air forced through the air tube to form a combustible mixture to be burned in the combustion chamber of the heater.

17. In a heater-burner combination, a heater structure having means defining a combustion chamber and including a substantially upright wall having an aperture therein opening to the combustion chamber, and a fluid fuel burner

component mounted on the upright wall of the heater structure, the burner component including an open sided housing member disposed with its open side toward the upright wall, mounting elements distributed about the periphery of and having direct connection with the housing member of the burner component and secured to the heater structure to support the burner component in predetermined position on the heater structure for facile removal and replacement as a unit, a readily separable substantially flat apertured closure member interposed between the housing member and the upright wall of the heater structure, said closure member being disposed flatwise against the open side of the housing member, partition means in the housing member and cooperating with the flat closure member to define fan and air chambers and a passage connecting the fan and air chambers, the fan chamber being in registry with an aperture in the closure member for the admission of air into the fan chamber, means providing an air passage located intermediate the combustion chamber and the flat closure member for air flowing to the admission aperture in the closure member, an air tube communicating at one end with the air chamber in the housing member and extending substantially from such air chamber through an aperture in the upright wall into the heater structure and substantially to the combustion chamber, a fan in the fan chamber, means for actuating the fan to draw air into the fan chamber through the admission aperture and to force such air through the air chamber and the air tube, said fan actuating means being secured to and wholly supported by the housing member for facile removal and replacement therewith as part of the removable unit burner component, and means for supplying fluid fuel to mix with air forced through the air tube.

18. A burner and heater combination, the heater having a wall with an aperture therein and including means providing a combustion chamber spaced from the apertured wall for receiving combustibles from the burner, the burner comprising a component that includes a hollow housing disposed with one side faced toward and spaced from the heater wall, means secured directly to and extending between the heater and the housing of the burner component for demountably attaching the burner component to the heater with the one side of the housing in predetermined spaced relation to the heater, said attaching means being distributed about the periphery of the housing and being adapted to support the burner component wholly on the heater for facile removal and replacement as a unit, means internally compartmenting the housing to define fan and air chambers and a connecting passage between the fan and air chambers, the housing having spaced apertures in said one side, one such housing aperture being aligned with said aperture in the heater wall and another such housing aperture opening into the fan chamber, a fan in the fan chamber, means wholly supported by the housing for actuating the fan to draw air from the space between the heater wall and the apertured side of the housing into the fan chamber of the housing through said other housing aperture and to force such air through the connecting passage and into and through the air chamber, said fan actuating means comprising part of the removable and replaceable unit burner component, an air tube extending between the combustion chamber of the heater and the housing of the burner component, said tube being in communication at one end with the air chamber through said one aperture in the housing side to receive air from the air chamber and being in communication at its other end with the combustion chamber to discharge such air into the combustion chamber, and fuel supply means for projecting fuel into the air to form a mixture for burning in the combustion chamber.

19. In a heater-burner combination which includes heater means defining a combustion chamber and having a casing spaced from the chamber and which also includes burner means having a housing with spaced front and rear face walls, and fan and air chambers between the walls, the front face wall having an air inlet opening area for admitting air into the fan chamber and an air outlet opening area for discharging air from the air chamber, a fan in the fan chamber, and a motor mounted on the rear face wall and connected to the fan to drive the latter, an adapter plate for mounting the burner means on the casing, said plate having a substantially flat body portion for receiving the burner housing thereagainst, the body portion being formed with opening areas adapted to be positioned in registry with the housing opening areas, marginal portions of the plate including flanges extending forward from the body portion and being receivable against the casing for spacing the body portion of the plate away from such casing, said plate being formed to receive fastening elements, one group of fastening elements for attaching the plate to the heater, another group of fastening elements for attaching the burner to the plate, whereby to support the burner on the heater with the adapter plate interposed therebetween, and said plate also being formed to admit air marginally to the space between the plate body portion and the casing of the heater.

20. In a heater-burner combination, a heater structure defining a combustion chamber and including a substantially upright wall spaced from the chamber, a fluid fuel burner, and an apertured adapter plate for mounting the burner on the structure, the burner including a housing having internal partition means providing fan and air chambers and a connecting passage between the fan and air chambers, means attaching the adapter plate to the heater structure with one side of the plate in confronting relation to the upright wall, means attaching the burner housing to the other side of the adapter plate for support thereon, said burner housing being formed to provide an inlet for the fan chamber in registry with an aperture in the adapter plate, an air tube extending between the adapter and the combustion chamber, said tube being abutted against and secured to said one side of the adapter plate, the air tube being in registry with an aperture in the adapter plate and through such aperture being in communication with the air chamber in the housing, a fan in the fan chamber, means for actuating the fan to draw air into the fan chamber and to force such air through the connecting passage, the air chamber and into the air tube, and means for supplying fluid fuel to mix with air forced through the air tube.

21. In a heater-burner combination, a heater structure defining a combustion chamber and including a substantially upright wall spaced from the chamber, a fluid fuel burner, and an

apertured adapter plate for mounting the burner on the heater structure, the burner including a housing and an air tube secured against opposite sides of the adapter plate, the housing being wholly supported by the adapter plate and having connected fan and air chambers registered with apertures in the adapter plate, the air tube being disposed over one of the adapter plate apertures in alignment with the air chamber of the burner to receive air therefrom and extending substantially to the combustion chamber of the heater, a fan in the fan chamber, means for actuating the fan to draw air into the fan chamber and to force such air through the air chamber and into the air tube, means attaching the adapter plate to the heater structure in spaced confronting relation to the upright wall whereby to provide an entry space between the upright heater structure wall and the adapter plate for air to flow in being drawn into the air chamber through one of the adapter plate apertures, and means for supplying fluid fuel to mix with air forced through the air tube.

22. In a fluid fuel burner, an open faced housing comprising a main wall having angularly disposed side walls and partitions extending laterally from the main wall, said side walls and partitions being formed to define fan and air chambers, a connecting passage between the chambers, and a wiring box separated by the partitions from the chambers and passage, the side walls and partitions having edges disposed substantially in a common plane spaced from the main wall, closure means comprising a single substantially flat plate in a single plane disposed against said edges of the lateral walls and partitions and across the wiring bix substantially to close such box and the open face of the housing, a fan in the fan chamber, an electric motor mounted on the main wall of the housing and connected to the fan to rotate the latter, an ignition electrode means and fuel conduit assembly extending through the air chamber, and an electric transformer mounted on said main wall and having terminals connected to the ignition electrode means, the motor and the transformer each having electrical wires extending directly into the wiring box through that portion of the main wall of the housing that is definitive of the wiring box for connection therein to a source of electrical power.

23. A structure of the character described comprising a heater structure having means defining a combustion chamber and a wall spaced from the chamber, a burner component including a housing having a wall, means mounting the burner component on the heater structure with the burner wall disposed in spaced relation to the heater wall and for facile removal and replacement of the burner component as a unit, said housing having fan and air chambers each opening through said housing wall, air tube means providing an elongated air passage extending substantially between the wall of the housing and the combustion chamber, the passage in the air tube means being registered with the housing wall opening which communicates with the air chamber, means securing the air tube means to the heater wall and in predetermined position relative to the heater structure to permit removal and replacement of the unit burner component from and on the heater structure independently of the air tube means and without disturbing the position of the air tube in the heater structure, said mounting means extending between the heater structure and the housing for locating and supporting the burner component on the heater structure in predetermined relation, a fan in the fan chamber, means supported by the housing and removable therewith as part of the unit burner component for actuating the fan to draw air into the fan chamber directly from the space between the housing wall and the heater wall and to force such indrawn air into the air chamber and thence into and through the passage in the air tube means, means for supplying fluid fuel to air so forced through the air tube to form a combustible mixture to be burned in the combustion chamber of the heater, said fuel supply means including a conduit extending longitudinally through the passage in the air tube means and a support bracket for the conduit, said bracket being secured to the housing for removal and replacement of the bracket and the fuel conduit assembled together as another part of the unit burner component, and electrode means for igniting the combustible mixture, said electrode means also being supported by the bracket for removal and replacement with the housing as part of the bracket and fuel conduit assembly.

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