Jan. 15, 1957 R. W. BECKETT 2,777,509

FLUID FUEL BURNER FOR FREE STANDING AND PLATE MOUNTING INSTALLATIONS

Filed March 28, 1950 2 Sheets-Sheet 1

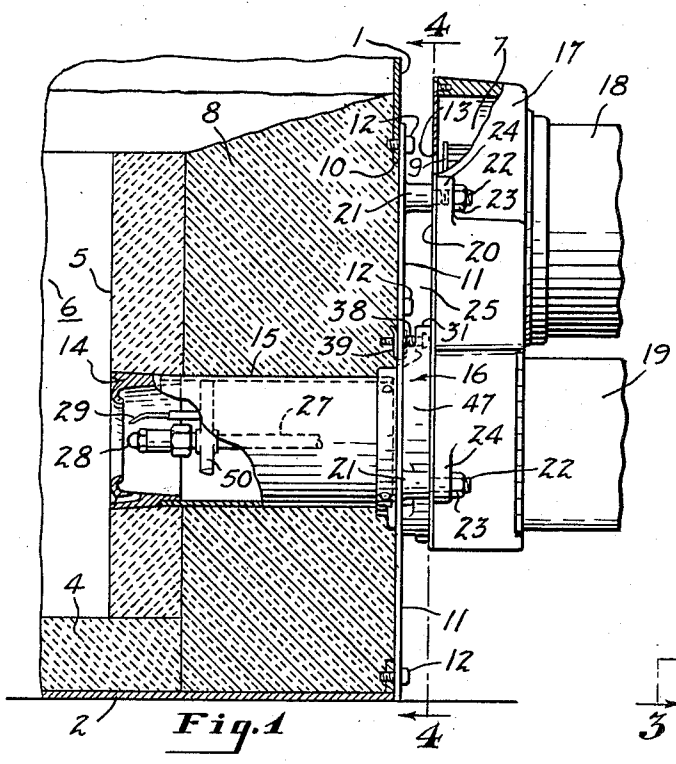


Fig. 1

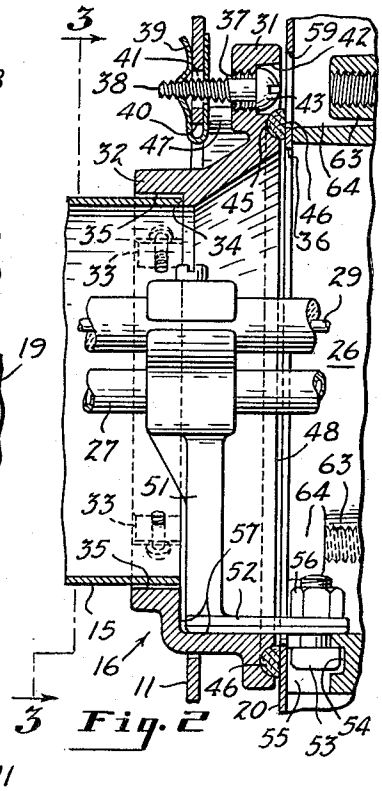


Fig. 2

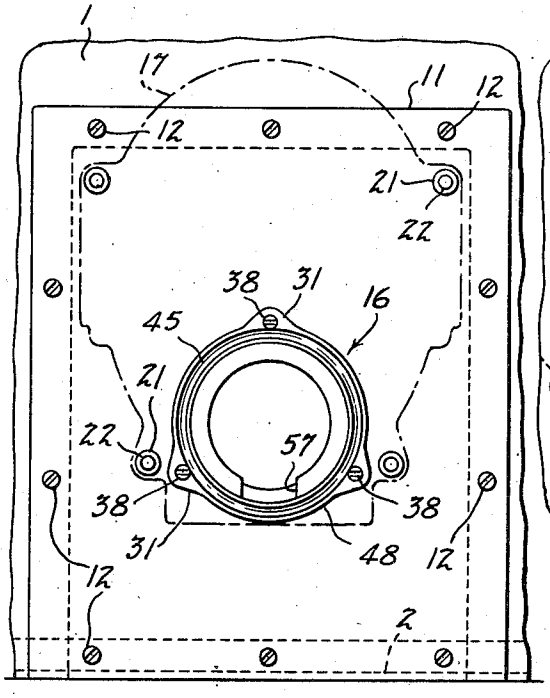


Fig. 4

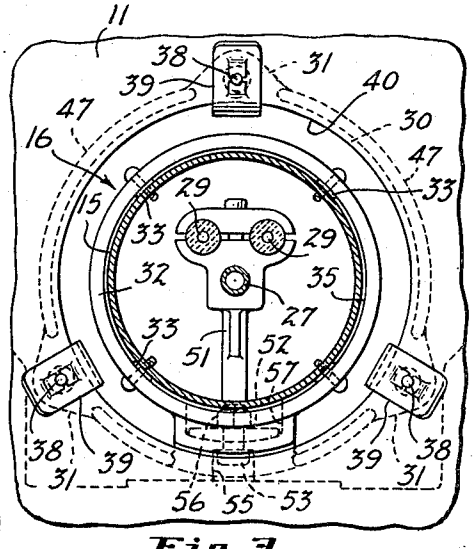


Fig. 3

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FLUID FUEL BURNER FOR FREE STANDING AND PLATE MOUNTING INSTALLATIONS

Filed March 28, 1950 2 Sheets-Sheet 2

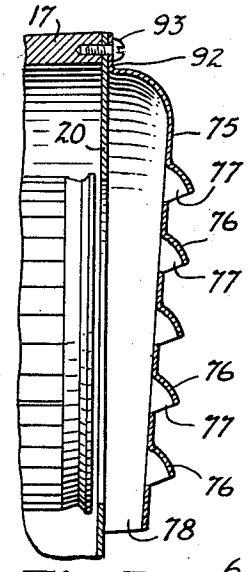


Fig. 9

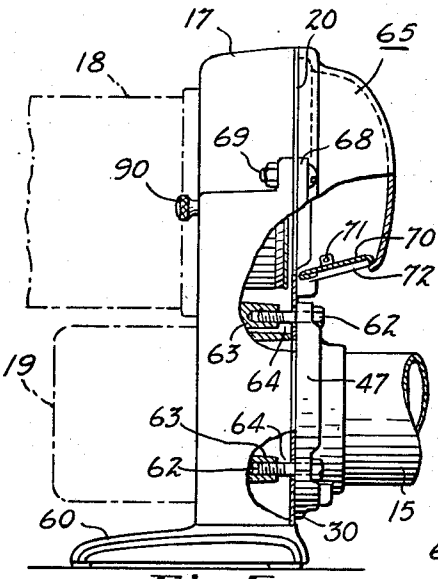


Fig. 5

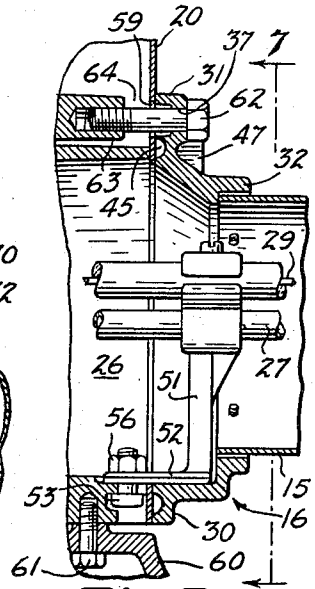


Fig. 6

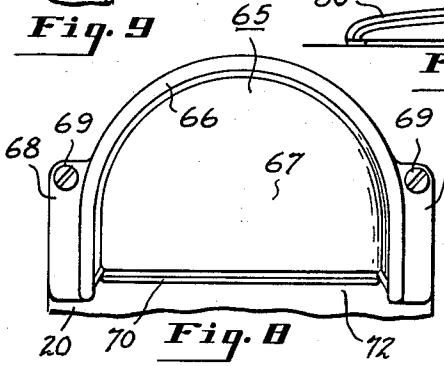


Fig. 8

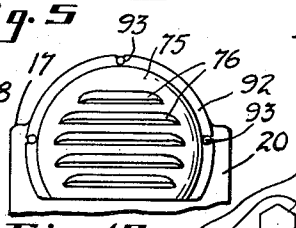


Fig. 10

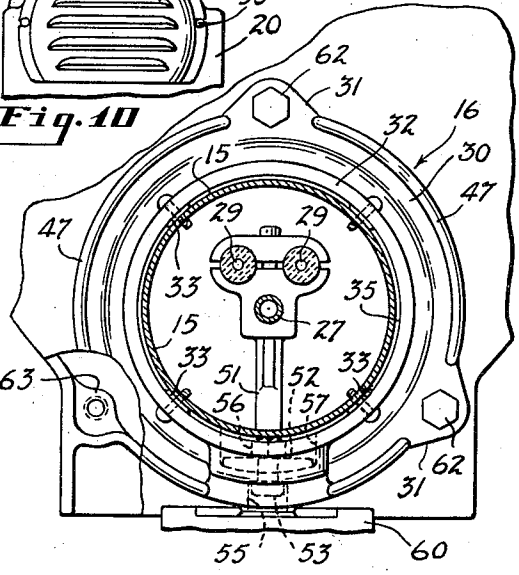


Fig. 7

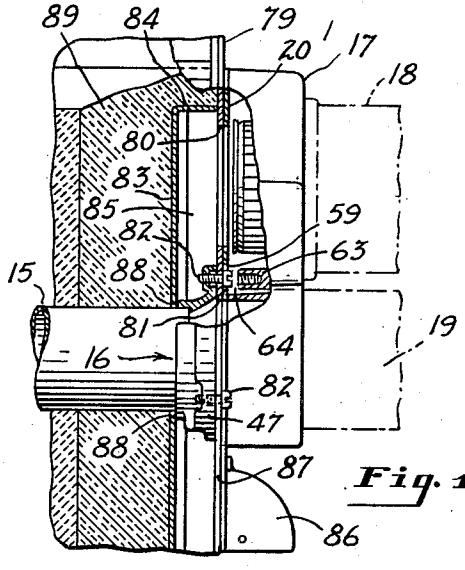


Fig. 11

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FLUID FUEL BURNER FOR FREE STANDING AND PLATE MOUNTING INSTALLATIONS

Reginald W. Beckett, Elyria, Ohio

Application March 28, 1950, Serial No. 152,353

23 Claims. (Cl. 158—4)

This invention relates to fluid fuel burners and burner-heater combinations and more particularly to improvements in multiple use fluid or liquid fuel burners of the pressure atomizing type. One of the problems confronting a burner manufacturer is the necessity of providing a number of styles or types of burners to suit the widely diversified requirements of the conversion trade and also the varying needs of heater manufacturers employing the fuel burners as components of complete systems such as burner-heater combinations. While it is theoretically possible, of course, to design and build burners specifically for each need or requirement, such procedure proves costly and impractical because of manufacturing inventory and storage complications incident thereto. A fuel burner design which lends itself to easy and inexpensive modifications, such as by substitution and re-arrangement of parts or components, is much sought after in the industry and enables a manufacturer to produce burners at low unit cost with proportionate increased availability to the public.

It is therefore one of the principal objects of the present invention to provide a fluid fuel burner having the desired multiple use design and construction characteristics referred to. In its broader aspects, the invention contemplates improvements in the type of burner shown generally in copending application for patent Serial No. 24,559, filed May 1, 1948, now Patent 2,599,153 issued June 3, 1952, for Oil Burner of the Atomizing Type. The burner comprises a main housing having internally connected fan and air chambers and openings into such chambers through the housing wall or walls. An air impeller in the fan chamber is driven by a motor mounted on the housing and an air tube registering with the opening into the air chamber receives air from the latter for discharge into the combustion chamber of the heater with which the burner is used. Fuel supply and ignition elements extend through the air tube and the air chamber of the housing for projecting fuel into the discharged air stream and igniting such fuel.

According to one arrangement the housing preferentially takes the form of an open faced metal casting made as in a match plate mold using a pattern but without any need for a core. Although the internal partitions of the housing which separate the fan and air chambers and which define the connecting passage therebetween are integral parts of the casting, the open face of the housing is covered in use by a separable, usually flat, sheet metal closure plate comprising one wall of the housing. Certain features of the invention can, however, be incorporated satisfactorily in a burner having a housing made of welded together parts or comprising a one piece casting made by conventional coring methods.

Another aspect of the invention is concerned with the provision of a fluid fuel burner structure having an air tube with a base member, preferably in the form of a ring, that can be either attached to the housing of the burner at the time of assembly, or can be mounted in the heater structure with which the burner is to be used.

In the latter method the burner housing is later assembled with the heater structure in such a way that the air tube is properly oriented with the housing. In the former arrangement wherein the air tube is attached to the housing by the burner supplier or manufacturer, the housing may be provided with a base so that the several components of the burner constitute a free standing unit known in the trade as a conversion type burner. If the air tube is assembled in the heater structure by the supplier or manufacturer of the heater, and if the burner housing is to be subsequently assembled with the heater structure, provision is made for dispensing with a pedestal or base for the housing and in lieu thereof a mounting arrangement is provided for supporting the housing on a wall of the heater. As a preferential arrangement the heater wall and the burner housing incorporate fastening means of separable components which facilitate the mounting of the burner housing on the heater wall in predetermined relation and with the air tube in registered relation to the air chamber opening in the housing.

As a further and more specific object and advantage of the invention, the burner incorporates an air tube having a unique base portion that is adaptable to direct attachment to the burner housing so as to be supported thereby and held in rigid relation thereto, and that is also adapted to mounting or support by or on a heater structure in such manner as to register with the air chamber opening in the burner housing when the latter is mounted on the heater structure. In the latter arrangement the burner housing and the components associated therewith are mounted on the heater structure independently of the air tube insofar as support is concerned although in predetermined relation to the latter.

Other objects and advantages of the invention relate to certain novel features of construction and combinations and arrangements of parts which are set forth in the following detailed description made in connection with the accompanying drawings forming a part of the specification. Like parts throughout the several views are indicated by the same numerals of reference.

In the drawings:

Figure 1 is a fragmentary vertical sectional view through a heater-burner combination showing the burner housing in side elevation and spaced from the heater wall and illustrating certain concepts of the present invention;

Fig. 2 is a fragmentary vertical sectional detail through the air tube base portion of the burner of Fig. 1, this view also showing the relationship between the bracket of the ignition-fuel supply conduit assembly and the air tube base and being enlarged with respect to Fig. 1;

Fig. 3 is a transverse sectional view through the air tube with parts broken away and removed, this section being taken substantially along the line indicated at 3—3 of Fig. 2 and reduced in scale with respect to that figure;

Fig. 4 is a fragmentary front elevational view of the heater of Fig. 1, the burner being removed but indicated in phantom outline, the view showing the end of the air tube base and being taken substantially along the line indicated at 4—4 of Fig. 1;

Fig. 5 is a side elevational view partly diagrammatic, partly in section and with parts broken away and removed, showing a free standing or conversion type burner incorporating featured combinations of the invention;

Fig. 6 is an enlarged fragmentary vertical sectional detail through the base portion of the air tube and the related and adjacent components of the burner of Fig. 5;

Fig. 7 is a transverse sectional detail with parts broken away and removed taken substantially along the line indicated at 7—7 of Fig. 6;

Fig. 8 is a fragmentary front elevational view of the upper portion of the burner of Fig. 5 showing the shape and construction of the air intake hood;

Fig. 9 is a fragmentary vertical sectional detail with parts removed, through the air inlet hood of a modified form of burner of the type shown in Fig. 5, this view being enlarged with respect to Fig. 5;

Fig. 10 is a fragmentary front elevational view of the upper portion of the burner modification of Fig. 9, this view showing the shape of the pressed metal hood on a reduced scale with respect to Fig. 9; and

Fig. 11 is a fragmentary vertical sectional detail, partly diagrammatic and with parts broken away and removed, showing a modified form of heater-burner combination wherein the burner housing is disposed directly against the upright wall of the heater and the air tube is disposed wholly within the heater wall.

As embodied in a heater-burner combination the present invention may take several forms, one of which, shown in Figs. 1 through 4, corresponds in general to the arrangement shown in Figs. 12 and 13 of the copending application referred to. The heater may be either a boiler or hot air furnace, only portions of the base and combustion chamber being shown in the present drawings. The base comprises an upright enclosing wall **1** of sheet steel which is bent or otherwise formed to the desired shape and is secured as by welding along its lower edges to a steel base plate **2**. Within the heater base is located a fire box of heat resistant material such as stainless steel or refractory material, the latter being shown. Refractory bricks or blocks are cemented together to form the fire box that defines combustion chamber **6**. Bottom wall **4** thereof rests upon bottom plate **2** of the heater. Upright side walls **5** of the combustion chamber or fire box are spaced inwardly from the outer structural wall **1** of the heater base, the intervening space being filled with heat insulating material **8** such as rockwool or other type of fireproof loose fill material. The other parts or components of the heater may be conventional or as shown in the copending application referred to and have been omitted from the present drawings.

The lower part of the flat front of the upright heater wall **1** is formed with an access opening **10** closed as by a removable wall plate **11** of sheet steel. The opening **10** permits access to the interior of the heater base for installation and assembly of the fire box. The wall plate **11**, besides serving as a closure for the opening **10**, functions as a support for the burner. The margins of the plate **11** overlap the edges of the heater wall **1** about the opening **10** and are secured to the latter by removable cap screws **12**. Although many of the advantages of the present heater-burner combination are obtained when the heater wall **1** is formed without an access aperture or opening, the burner being mounted directly on such wall, it is preferable to incorporate the removable closure plate **11** as an element of the wall structure because such plate can be made in any desired strength considered necessary adequately to support the burner. The removable closure plate also permits ready access to the interior of the heater base should it ever become necessary to repair or replace any of the internal components of the heater such as the refractory walls **4** and **5** of the combustion chamber.

The wall plate **11** is formed with a single circular opening **40** (Fig. 2) through which extends the burner air tube comprising head **14**, cylindrical tube **15** and base portion **16**. The burner head projects through a circular opening in the upright refractory wall **5** of the combustion chamber, the head end of the air tube being substantially flush with the combustion chamber wall.

The principal components of the oil burner are mounted cantilever fashion on the outside of and spaced from the upright heater wall plate **11**, these components including a housing **17**, an electric drive motor **18** (which carries a pump, not shown) and an ignition transformer **19**. Essentially these components are the same as those described in the copending application referred to. Within the housing **17** are connected fan and air chambers defined as by partitions cast integrally with the outer walls

of the housing. A portion of the housing is broken away at the top (Fig. 1) to expose the fan chamber indicated at **7**. A fan **9** of the squirrel cage type is shown in the chamber and is secured on the shaft of the motor **18**. The open face of the housing is covered by closure plate **20** which thus constitutes a wall panel of the burner housing. This flat plate is apertured to admit air into the fan chamber in the upper portion of the housing (see one aperture indicated at **13** in Fig. 1) and to provide a communicating opening between the air chamber **26** in the lower part of the housing and the passage through the base **16** of the air tube (see another aperture **36** surrounded by annular gasket **46** in Fig. 2).

To locate and support the burner on the heater wall plate **11** for facile removal and replacement as for service or repair, the heater and the burner are provided at spaced points with separable fastening and aligning means comprising cooperating interfitting components. In the arrangement shown, studs **21** are welded to spaced points of the outside face of the plate **11** in predetermined positions as by use of a template. These studs have reduced diameter threaded portions **22** receivable through aligned openings located at spaced points of the burner structure as in ears formed on the closure plate or wall panel **20** and the housing **17**. Nuts **23** are received on the threaded portions of the studs and are tightened against ears **24** of the housing to draw the housing and the closure plate together and to hold the closure plate against the stud shoulders in predetermined spaced relationship with respect to the upright wall of the heater.

A blower fan **9** located within the fan chamber in the upper portion of the housing **17**, the fan being mounted on the shaft of the motor **18** and driven by the latter, draws air into the fan chamber from space **25** between the burner housing and the heater through an opening **13** in the closure plate **20**. The air so drawn into the housing is forced by the fan through an inter-connecting passage into the air chamber **26** (Fig. 2) in the lower portion of the housing. From the air chamber of the housing the air is forced into and through the air tube and is discharged from the head **14** into the combustion chamber **6**.

A fluid fuel such as petroleum oil is forced, as by a pump mounted on and driven by the motor **18** in accordance with conventional practice, to flow through a rigid conduit **27** that extends through the air chamber **26** and longitudinally through the air tube. At the end of the air tube the fuel conduit **27** terminates in a nozzle **28** which projects the fuel into the combustion chamber in the form of fine spray.

Ignition is effected as by a high frequency electrical spark adjacent the nozzle **28**, current being supplied through electrodes **29** connected to the secondary terminals of the transformer **19** and extending through the air chamber and air tube in parallel relation to the fuel conduit **27**.

Principal features of the present invention are concerned with the design and construction of the base portion or ring **16** of the air tube. This base enables the burner to be adapted easily to different types of installations of either the conversion type wherein the burner is free standing or the unit application type wherein the burner housing and related components are mounted on and supported by one of the walls of the heater. Although the base portion of the air tube may be cast as an integral portion of a complete air tube, it is more economical and convenient, as when air tubes of various lengths are to be made to suit the unit application requirements of different heater manufacturers, to form or cast the base portion separately, as shown. The base portion thus comprises a cast metal ring or annulus, preferably of generally frusto-conical form, having an internal diameter considerably greater than its axial length. At the large diameter end of the base ring is formed a radially outwardly directed circumferentially

extending flange 30, this flange at circumferentially spaced intervals being radially extended to provide attaching ears 31. At its other or small diameter end the base ring 16 is formed with a cylindrical tubular portion 32 which telescopically receives one end of the cylindrical portion 15 of the air tube. Desirably, the end of the cylindrical tube 15 abuts a circumferential shoulder 34 on the inside of the base ring to locate the parts in assembly. The outer face of the tube 15 is engaged at spaced intervals about its circumference by raised portions or lands 33 formed on internal face 35 of the cylindrical end portion 32. Use of the lands facilitates assembly and reduces cost since localized finishing or grinding of the lands in lieu of the entire internal circumference of the tubular portion 32 of the base simplifies the machining required.

The ears 31 on the base flange 30 are formed with apertures or through openings indicated generally at 37 that receive mounting fasteners or screws 38 secured to the supporting wall plate 11. The wall plate may be drilled and tapped to receive the screws although it is preferable, as shown, to employ U-shaped sheet metal nuts or fasteners 39 that straddle the wall plate 11. The sheet metal nuts are each formed with aligned openings which receive the threaded portion of one of the screws 38. The opening 40 in the wall plate 11 that receives the air tube base 16 is considerably larger than such base to permit lateral adjustment of such base in assembly. Apertures or openings 41 in the wall plate that receive the attaching screws 38 are also larger than required to pass such screws so that the latter may be shifted laterally in the openings in adjusting the air tube base to different positions in the wall opening 40. The passages 37 in the attaching ears 31 of the air tube base portion which receive the mounting screws are counterbored or otherwise formed with enlarged openings indicated at 42 so that heads 43 of the screws 38 are countersunk in the ears and are thus disposed wholly below end face 48 of the air tube attaching flange. This face of the air tube base is formed with an annular channel or groove 45 concentric to the air passage through the base. A deformable gasket ring 46 of asbestos rope or similar material is received in the groove and compressed between the air tube base and the outer face of the closure plate 20 to seal the joint between the parts.

A series of arcuate spacing ribs 47 are integrally formed on the flange 30 of the air tube base, these ribs being concentrically disposed about the longitudinal axis of the air tube, on a common radius. The ribs extend between the attaching ears 31 and each is a greater height axially of the air tube base than are the ears 31 so as to engage the outer face of the wall plate 11 outwardly of the opening 40 in the latter. The ribs thus partially seal the wall opening against the entrance of dirt and other foreign material and also serve to locate the air tube base with respect to the wall plate 11 so that the outer face 48 of such base is located in a plane at a predetermined distance from the wall plate for proper positioning of the air tube with respect to the housing 17 and the closure plate 20 when the latter are mounted on the supporting studs 21. Reference is made to copending application for patent Serial No. 254,025, filed October 31, 1951, for Oil Burner of the Vaporizing Type which covers a related construction.

The fuel conduit 27 and the ignition electrodes 29 comprise an assembly which also includes a locating spider 50 and a supporting bracket 51. The spider is disposed adjacent the nozzle end of the assembly while the bracket is formed with an angularly disposed foot portion 52 secured by bolt 53 to a bottom portion of the housing 17. The head of the bolt is retentively received in a recess 54 formed in the walls of a slot 55 in the housing bottom. The shank of the bolt projects upwardly through an aperture in the bracket foot 52 to receive a nut 56. The slot 55 opens through the face of the housing casting 17 to permit lateral movement of the bolt head into the recess 54 during assembly and the housing wall panel or closure plate 20 retains the bolt captive in the slot while the housing and related components are in transit with the bracket 51 and related fuel conduit-ignition electrode assembly parts removed.

As shown in Fig. 2 the bracket 51 is disposed substantially entirely within or between the planes of the end openings in the base portion 16 of the air tube, only one end of the foot portion 52 extending into the housing 17 to be received on and secured by the bolt 53. Thus the air chamber 26 in the housing base is substantially free of the assembly supporting bracket for free flow of air and ready access to the ends of the ignition electrodes and the fuel conduit. The lower part of the bracket is received in a recess 57 formed in the wall of the frusto-conical portion of the air tube base. The interfitting relation of the bracket foot in the recess of the air tube base serves to locate the parts in assembly as well as to provide for an improved flow of the spirally advancing air from the air chamber of the housing into the air tube passage.

In Figs. 5 through 8 is illustrated a modification in which parts and components heretofore described are used in a free-standing or conversion type burner. Instead of being mounted cantilever fashion on the heater with which the burner is used, the housing 17 is supported on a hollow base or pedestal 60. This base, formed of cast or stamped metal, is secured against the underside of the housing as by one or more cap screws 61 threaded upwardly into the bottom of the housing. The air tube is secured to the housing as by cap screws 62 that extend through the apertures 37 in the air tube attaching ears 31 and openings 59 in the closure plate 20. The screws are threaded into anchorages or bosses 63 formed on the housing partitions. The ends of the anchorage bosses 63 are spaced inwardly from the plane of the closure plate 20 to provide clearances, one of which is shown at 64, for a purpose hereinafter explained in connection with the modification shown in Fig. 11.

Against the top part of the outer face of the housing wall panel or closure plate 20 and over the opening into the fan chamber is disposed a cast metal hood 65. This hood comprises a continuous curved wall 66 extending across the top and down the two sides and an integral front wall 67. Attaching ears 68 formed along the sides of the hood are disposed flatwise against the closure plate 20 and are apertured to receive attaching bolts 69 that extend through the housing ears previously mentioned. A sheet metal gate 70 pivoted as indicated at 71 to the lower portions of the hood side walls 66 normally closes opening 72 across the bottom of the hood to reduced the flow of air through the burner and the combustion chamber of the heater when the burner is not operating. This gate, which normally gravitates to closed position, is pivoted to open position by the pressure of entering air when the fan is driven during operation of the burner.

In this modification of the burner the asbestos packing or gasket 46 may be omitted, proper fitting and sealing of the parts being assured in factory assembly of the complete burner as an operating unit. Although the base portion 16 of the air tube in the unit application type of burner shown in Figs. 1 through 4 is identical to that employed in the conversion or free-standing type of burner shown in Figs. 5 through 8, the arrangements for supporting the burner components and for aligning the air tube with the air chamber and the burner housing are different in the two burner types. In the unit application type burner the air tube is customarily mounted in the heater structure for transit separately from and independently of the burner housing, whereas in the conversion or free-standing type of burner the air tube is rigidly attached to and supported by the burner housing in original assembly and the entire burner is usually shipped and installed as a single item.

A further modification of the free-standing or conversion type burner is illustrated in Figs. 9 and 10 showing a stamped metal hood 75 formed with a plurality of louvers 76 across its front face. These louvers provide a plurality of openings 77 through which air enters the interior of the hood as well as through an opening 78 across the hood bottom. An integral flange 92 about the periphery of the hood is apertured to receive screws 93 that extend through openings in the housing wall panel or closure plate 20 and are threaded into the housing 17. In this modification the air control gate 70 is omitted for simplicity.

In Fig. 11 is illustrated a modification of the unit application type burner, this modification being patterned after and, in general, corresponding to the burner shown in Figs. 9 through 11 of the copending patent application heretofore identified. The housing 17 is supported on and held against upright front wall or flat metal plate 79 of the heater base as by cap screws or studs (not shown) which extend through the attaching ears of the housing and into or through the upright plate. The heater wall 79 is formed with openings 80 and 81 into the fan and air chambers and the housing wall panel or closure plate 20 is optionally interposed between the housing and the heater wall 79 to define the openings into the fan and air chambers of the housing. The open side or face of the housing 17 may thus be held snugly against the heater with or without the closure plate 20 interposed therebetween.

The base portion 16 of the air tube is disposed with its open end face 48 against the other or opposite side of the heater wall 79. Cap screws 82, which extend through apertures in the heater wall, are screwed into the threaded holes 37 in the attaching ears 31 of the air tube base portion. The heads of these screws are accommodated in the previously mentioned spaces 64 provided between the plane of the closure plate 20 and the threaded anchorages or bosses 63 formed integrally in the housing. In this connection it is to be noted that the screw or bolt apertures 59 in the closure plate 20 are sufficiently large to pass the heads of the screws 82.

Thus, in the modification of Fig. 11, the air tube, including the base portion 16 thereof, is disposed wholly on the inside of the upright wall plate 79 of the heater and may be so assembled at the factory, while the housing 17 and the burner components carried thereby are mounted cantilever fashion on such heater wall and can be so mounted at the site of use. In the mounting of the housing 17 the attaching studs or the cap screws and the threaded sockets or holes in the heater wall 79 for receiving such screws serve as means to locate the burner housing in predetermined position on the heater wall so that the heater wall openings 80 and 81 are correctly aligned with the chambers in the housing.

Disposed within the heater base behind the upright wall or plate 79 is a dividing wall or partition 83. This partition, spaced from the upright wall in generally parallel relation thereto, may take the form of a sheet metal stamping extending across the entire width of the heater base. As described in the copending application referred to, the edges of the partition fit snugly against the side walls of the heater base and a top flange 84 extends laterally from the partition into abutment with the rear face of the upright wall plate 79. A space 85 is thus provided internally of the heater base between the upright burner supporting wall and the partition. This space functions as a passageway for air which enters through a hood 86 supported on the plate wall 79 and disposed over an opening 87 in the latter. The hood and the air admission opening 87 are located below the burner housing 17 so that entering air flows upwardly around the air tube 15 and the air tube base 16, the air being drawn into the fan chamber in the housing through the opening 80 in the wall plate 79 and the corresponding aligned opening in the closure plate 20.

A circular opening 88 in the partition 83 is aligned with the opening 81 in the vertical wall plate 79 to accommodate the air tube 15, it being understood that, as previously explained, the air tube is preferably assembled in the heater base at the place of manufacture of the latter. In the assembly process, after the attachment of the air tube base to the upright heater wall plate by the screws 82, the partition 83 is positioned as shown and loose fill material 89 of a refractory heat resisting nature such as mica or asbestos is packed into the space between the upright wall plate 79 and the combustion chamber and around the air tube 15. This loose fill material serves to retain the partition 83 in position.

The burner design of the present invention is thus adapted to installation and use with different heaters in various combinations. The burner may be utilized for conversion purposes in which event is assembled as a free-standing unit in accordance with the disclosures of Figs. 5 through 10. In arrangements of this character the cylindrical air tube portion 15 is made of any desired length to meet the dimensional requirements of the particular installation being made. The flow of air through the burner may, in all cases, be controlled as by a pivoted gate such as that described in the copending application referred to, the air gate being adjusted as by means of knob 90, Fig. 5.

In utilization of the burner for unit applications, such as disclosed in Figs. 1 through 4 and 11, the same air tube structure may be employed as in the conversion arrangements. The air tube base, however, may additionally function as a spacing device, as in Figs. 1 through 4, or may be mounted wholly within the heater base during factory assembling of the heater, as in Fig. 11.

In accordance with the patent statutes the principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, 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 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 of the United States is:

1. In combination in a fluid fuel burning heating device, a heater structure comprising means defining a combustion chamber, a wall spaced from such chamber, and an air tube extending between the chamber and wall and having a base portion extending through an aperture in the wall, and a burner structure detachably mounted on the wall of the heater structure and wholly supported thereby, the burner structure comprising a housing having connected internal fan and air chambers and an apertured wall disposed in spaced confronting relation to the heater structure wall, the housing fan chamber being in communication with the space between the heater structure wall and the burner housing wall through an aperture in the burner housing wall, the housing air chamber being in communication with the air tube through another aperture in the housing wall, the base portion of the air tube having an axially directed end face locatingly abutted against the housing wall, the air tube being wholly supported by the heater structure independently of the burner structure, supporting means of separable components securing the housing to the heater structure wall in mounting the burner structure for facile detachment and replacement of the latter separately from and independently of the air tube, a fan in the fan chamber and drive means therefor, a nozzle and means supporting the nozzle within the air tube in position to project fluid fuel into the combustion chamber.

2. In combination in a fluid fuel burning heating device, a heater structure comprising means defining a combustion chamber, a wall spaced from such chamber, and an air tube extending between the chamber and wall and having a base portion extending through an aperture in

the wall, and a burner structure detachably mounted on the wall of the heater structure and wholly supported thereby, the burner structure comprising a housing having connected internal fan and air chambers and an apertured wall disposed in spaced confronting relation to the heater structure wall, the housing fan chamber being in communication with the space between the heater structure wall and the burner housing wall through an aperture in the burner housing wall, the housing air chamber being in communication with the air tube through another aperture in the housing wall, the base portion of the air tube being substantially abutted against the housing wall, the air tube being wholly supported by the heater structure independently of the burner structure, supporting means of separable components securing the housing to the heater structure wall in mounting the burner structure for facile detachment and replacement of the latter separately from and independently of the air tube, a fan in the fan chamber and drive means therefor, a fuel supply conduit assembly extending through the air chamber and air tube, the conduit assembly including a bracket secured to the burner housing and a nozzle in the end of the air tube adjacent the combustion chamber, and the base portion of the air tube being formed to provide guide means to receive and locate the bracket of the conduit assembly in mounting the burner structure on the wall of the heater structure.

3. In a fuel burner having a housing formed with connected fan and air chambers and with an opening through one wall of the housing into the air chamber, an air tube having a base ring receivable against the housing wall in registering the air tube with the wall opening, the base ring having an outwardly directed circumferentially extending radial flange and a substantially cylindrical extension, the air tube including a substantially cylindrical element received within the base ring extension, the base ring flange being formed with a plurality of circumferentially spaced through openings, fasteners in the flange openings, and circumferentially extending means projecting axially from one face of the base ring flange, the last named axially projecting means being discontinuous in the regions of the fastener openings.

4. In a fuel burner having a housing formed with connected fan and air chambers and with an opening through one wall of the housing into the air chamber, an air tube having a base ring receivable against the housing wall in registering the air tube with the wall opening, the base ring having an outwardly directed circumferentially extending radial flange and a substantially cylindrical extension, the air tube including a substantially cylindrical element received within the base ring extension, the base ring flange being formed with a plurality of circumferentially spaced through openings and headed fasteners in the flange openings, the openings each including a relatively large cross sectional area portion opening through the face of the flange which is receivable against the housing for accommodating the head of a fastener and a relatively small cross sectional area portion for accommodating the shank of a fastener.

5. In a fuel burner of the type having a housing formed with connected fan and air chambers and with an opening through one wall of the housing into the air chamber, an air tube registered with the wall opening, and a fuel conduit assembly extending through the air tube and including a bracket with a foot portion secured to the housing within the air chamber of the latter, the improvement which comprises a base ring on the air tube and receivable against the housing wall in registering the air tube with the wall opening, the base ring having an outwardly directed circumferentially extending radial flange and a substantially cylindrical extension, the air tube including a substantially cylindrical element received within the base ring extension, means providing a plurality of circumferentially spaced through openings in the base ring flange, fasteners in the flange openings, and an internal recess in the ring providing circumferentially spaced shoulders for receiving the fuel conduit bracket therebetween.

6. In a fuel burner of the type having a housing formed with connected fan and air chambers and with an opening through one wall of the housing into the air chamber, an air tube registered with the wall opening, and a fuel conduit assembly extending through the air tube and including a bracket with a foot portion secured to the housing within the air chamber of the latter, the improvement which comprises a base ring on the air tube and receivable against the housing wall in registering the air tube with the wall opening, the fuel conduit bracket except the secured foot portion thereof being disposed substantially wholly within the base ring, and means within the ring providing circumferentially spaced shoulders for receiving and locating therebetween a portion of the fuel conduit bracket.

7. A structure of the character described comprising a heater having a combustion chamber and an apertured 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 each opening through said wall panel, an air tube abutted endwise against and extending from the wall panel, through the apertured wall of the heater and to the combustion chamber, said air tube having a through passage registered with the panel opening which communicates with the air chamber, means independent of the burner component securing the air tube to the heater wall, means carried by the heater wall and directly coacting with spaced points on the housing to locate and support the housing in predetermined position relative to the air tube and with an opening into the space between the heater wall and the wall panel of the burner component extending substantially continuously about the entire periphery of the housing, said locating and supporting means being arranged to support the burner component on the heater wall for facile removal and replacement as a unit independently of the air tube, a fan in the fan chamber, means supported by the housing as part of the removable unit 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 registered air tube, 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.

8. A structure of the character described comprising a heater having a combustion chamber and an apertured 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 each opening through said wall panel, an air tube abutted endwise against and extending from the wall panel, through the apertured wall of the heater and to the combustion chamber, said air tube having a through passage registered with the panel opening which communicates with the air chamber, means independent of the burner component securing the air tube to the heater wall, a support element rigidly secured to the heater wall and projecting outwardly therefrom, means on the housing engaging the support element to mount the burner component thereon, the support element and the mounting means being readily separable for facile removal of the burner component from the support element and the heater without disturbing the air tube and for facile replacement of the burner component on the support element in predetermined position, the support element and the mounting means having coacting parts locating the housing in predetermined spaced relation to the heater wall, in predetermined aligned relation to the air tube

passage and with an opening into the space between the heater wall and the wall panel of the burner component extending substantially continuously about the entire periphery of the housing, a fan in the fan chamber, means supported by the housing as part of the removable burner component 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, 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.

9. A structure of the character described comprising a heater having means defining a combustion chamber and an upright apertured wall spaced from the chamber, a housing having a wall panel disposed in spaced confronting relation to the heater wall, said housing having fan and air chambers each opening through said wall panel, an air tube extending from the wall panel, through the apertured wall of the heater and to the combustion chamber, said air tube having a through passage registered with the panel opening which communicates with the air chamber, means securing the air tube to the heater wall independently of the housing, stud means projecting substantially horizontally from and rigidly secured to the heater wall, means on the housing received on the stud means to mount the housing, the stud means and the mounting means being readily separable while the stud means remains secured to the heater wall for facile removal of the housing from the stud means without disturbing the air tube and for facile replacement of the housing on the stud means, the stud means and the mounting means on the housing coacting on replacement of the housing automatically to align the air chamber opening in the wall panel with the air tube passage, means disposed between the heater wall and the housing to locate the housing in predetermined spaced relation to the heater wall with the air chamber in aligned relation to the air tube passage, a fan in the fan chamber, means supported by the housing 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, 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 structure of the character described comprising a heater having means defining a combustion chamber and an upright apertured wall spaced from the chamber, a housing having a wall panel disposed in spaced confronting relation to the heater wall, said housing having fan and air chambers each opening through said wall panel, an air tube extending from the wall panel, through the apertured wall of the heater and to the combustion chamber, said air tube having a through passage registered with the panel opening which communicates with the air chamber, means securing the air tube to the heater wall independently of the housing, stud means rigidly secured to and projecting substantially horizontally from the heater wall, ear means on the housing adjacent the wall panel of the latter and received on the stud means, the ear means being readily separable from the stud means by horizontal sliding thereover while the stud remains secured to the heater wall for facile removal of the housing from the heater without the air tube, means carried by the heater wall and coacting with the housing to locate the housing with said wall panel in predetermined spaced relation to the heater wall and with the air chamber in predetermined aligned relation to the air tube passage, a fan in the fan chamber, means supported by the housing 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, 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.

11. In combination in a fluid fuel burner having an open faced housing and a closure plate across the open face of the housing, an air tube including a base ring receivable flatwise against the outer surface of the closure plate, the base ring and the closure plate being formed with aligned openings to receive fastening elements and the housing having anchorages aligned with the openings for the securement of such fastening elements in supporting the air tube on the housing, and said anchorages being spaced from the inner surface of the closure plate to provide clearances for the heads of fasteners extending through the base ring openings in the optional support of the air tube independently of the housing.

12. In combination in a fluid fuel burner having an open faced housing and a closure plate across the open face of the housing, an air tube including a base ring receivable flatwise against the outer surface of the closure plate, the base ring and the closure plate being formed with aligned openings to receive fastening elements and the housing having anchorages aligned with the openings for the securement of such fastening elements in supporting the air tube on the housing, and the base ring being relieved about the openings therethrough on that side of the ring received against the closure plate to provide clearances for the heads of fasteners extending through the base ring openings in the optional support of the air tube independently of the housing.

13. In combination in a fluid fuel burner having an open faced housing and a closure plate across the open face of the housing, an air tube including a base ring receivable flatwise against the outer surface of the closure plate, the base ring and the closure plate being formed with aligned openings to receive fastening elements and the housing having anchorages aligned with the openings for the securement of such fastening elements in supporting the air tube on the housing, supporting fasteners extending through the openings in the base ring, the base ring being relieved about the openings therethrough on that side of the ring received against the closure plate to provide clearances for the heads of fasteners extending through the base ring openings in supporting the air tube independently of the housing, and the anchorages being spaced from the inner surface of the closure plate to provide other clearances for the heads of fasteners extending through both the base ring openings and the closure plate openings in supporting the air tube independently of the housing.

14. In a heater burner combination of the character described, a heater structure comprising means defining a combustion chamber and a wall spaced from the chamber, a burner component mounted on the structure for facile removal and replacement, and an air tube wholly supported by the heater structure and extending between the combustion chamber and the burner component, the burner component including a housing having connected internal fan and air chambers and a wall disposed in spaced relation to the heater wall, the housing wall being formed with openings one of which places the fan chamber in communication with the space between the walls to receive air from such space, the air tube including a base portion interposed as a spacer between the heater wall and the housing wall and having a through passage in registry with another of the housing wall openings placing the air tube in communication with the air chamber, said base portion of the air tube being formed with oppositely directed locating faces receivable one against the heater wall and the other against the housing wall to determine the space between such walls, means extending between the heater structure and the housing for locating and supporting the burner com-

ponent on the heater structure as a cantilever unit in said determined spaced relation and for facile removal and replacement as a unit independently of the air tube and with the air tube retained in fixed supported relation by the heater structure, 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 and the heater wall and to force such indrawn air into the air chamber and thence into and through the air tube, 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.

15. 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 disposed in spaced relation to the heater wall, said housing having fan and air chambers each opening through said housing wall, an elongated air tube extending between the wall of the housing and the combustion chamber and having a through passage registered with the housing wall opening which communicates with the air chamber, means securing the air tube to the heater wall, means extending between the heater structure and the housing for locating and supporting the burner component on the heater structure in predetermined spaced relation and for facile removal and replacement of the burner component as a unit, a fan in the fan chamber, means supported by the housing and removably 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 and the heater wall and to force such indrawn air into the air chamber and thence into and through the air tube, 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 air tube and a support bracket for the conduit, said bracket being secured to the housing for removal and replacement of the fuel conduit as another part of the unit burner component, and electrode means for igniting the combustible mixture, said electrode means being supported by the bracket for removal and replacement with the fuel conduit.

16. A heater-burner combination comprising a heater having a supporting wall formed with an aperture, an oil burner housing having connected internal fan and air chambers and a wall formed with an opening into the air chamber, and an air tube registering with said opening in the housing to receive air from the air chamber, the air tube being formed to extend into the heater through said aperture in the wall of the latter and including a base portion, flange means carried by the base portion of the air tube and interposed as a spacer between the heater and burner housing walls, said spacer flange means having oppositely directed faces disposed one against the outside of the heater wall and the other against the burner housing wall, the flange means of the air tube base also being formed to receive fasteners for securing the air tube to the heater wall, fasteners connecting the flange means to the heater wall, and deformable packing material interposed between the air tube base portion and the wall of the burner housing and extending around the opening in the latter.

17. In a burner of the type having a fan housing member formed with an air chamber, the housing member having a face formed with an opening into the air chamber, an air tube member having an end face formed with an opening for receiving air from the chamber in the housing member, and a fuel supply assembly including a conduit extending through the air tube and a supporting bracket for the conduit, the improvement which comprises a bolt for securing the bracket to one of the members, the member to which the bracket is secured being formed with a slot continuous with the opening in the slotted member, the slot including an undercut recess portion and having an opening through the face of the slotted member, the bolt being insertable laterally into the slot through said last mentioned opening in the face of the slotted member and having a head disposed in the undercut recess portion of the slot, said recess portion having wall means for engaging the head of the bolt to limit axial shifting and turning of the inserted bolt, and means disposed across the opening into the slot through the face of the slotted member to prevent withdrawal of the bolt laterally from the slot whereby to retain the bolt captive in the slot.

18. A heater-burner combination comprising a heater having a supporting wall formed with an aperture, an oil burner housing having connected internal fan and air chambers and a wall formed with an opening into the air chamber, and an air tube registering with said opening in the housing to receive air from the air chamber, the air tube being formed to extend into the heater through said aperture in the wall of the latter and including a base portion, flange means carried by the base portion of the air tube and interposed as a spacer between the heater and burner housing walls, said spacer flange means having oppositely directed faces disposed one against the outside of the heater wall and the other against the burner housing wall, the flange means of the air tube base also being formed to receive fasteners for securing the air tube to the heater wall, and fasteners connecting the flange means to the heater wall.

19. In combination in a fluid fuel burning heating device, a heater structure comprising means defining a combustion chamber, a wall spaced from such chamber, and an air tube extending between the chamber and the wall and having a base portion at the wall, and a burner structure comprising a housing having a wall disposed in spaced confronting relation to the heater wall, means securing the air tube to the wall of the heater structure for transit therewith independently of the burner housing, means located radially beyond the air tube base portion securing the housing to the heater structure for removal and replacement without disturbing the secured air tube, the burner housing having internally connected fan and air chambers, the housing having an opening into said fan chamber and an opening through said housing wall into the air chamber, the base portion of the air tube extending across the space between the heater wall and the housing wall, abutting the housing wall and constituting spacing means interposed between the heater wall and the housing wall, the base portion of the air tube registering directly with the opening through the housing wall into the air chamber in sealing relation, whereby the base portion of the air tube defines a passage across the space between the burner housing wall and the heater wall for air discharged from the air chamber through the housing wall opening, and fuel supply and ignition means extending through the air chamber of the housing and the air tube.

20. In combination in a fluid fuel burning heating device, a heater structure comprising means defining a combustion chamber, a wall spaced from such chamber, an an air tube extending between the chamber and the wall and having a base portion at the wall, and a burner structure comprising a housing having a wall disposed in spaced confronting relation to the heater wall, means securing the air tube to the wall of the heater structure for transit therewith independently of the burner housing, means located radially beyond the air tube base portion securing the housing to the heater structure for removal and replacement without disturbing the secured air tube, the burner housing having internally connected fan and air chambers, the housing having an opening into said fan chamber and an opening through said housing wall into the air chamber, the base portion of the air tube extending across the space between the heater wall and the housing wall, abutting the housing wall and constitut-

ing spacing means interposed between the heater wall and the housing wall, the base portion of the air tube registering directly with the opening through the housing wall into the air chamber in sealing relation, whereby the base portion of the air tube defines a passage across the space between the burner housing wall and the heater wall for air discharged from the air chamber through the housing wall opening, a bracket secured to the housing and extending into the base portion of the air tube, and fuel supply and ignition elements supported by the bracket and extending longitudinally through the air tube, said housing, bracket and fuel supply and ignition elements being removable as a unit from the wall of the heater structure and the secured air tube.

21. In combination in a fluid fuel burning heating device, a heater structure comprising means defining a combustion chamber, a wall spaced from such chamber, and an air tube extending between the chamber and wall and having a base portion at the wall, and a burner structure detachably mounted on the wall of the heater structure and wholly supported thereby, the burner structure comprising a housing having connected internal fan and air chambers and an apertured wall disposed in spaced confronting relation to the heater structure wall, the housing fan chamber being in communication with the space between the heater structure wall and the burner housing wall through an aperture in the burner housing wall, the housing air chamber being in communication with the air tube through another aperture in the housing wall, means carried by the base portion of the air tube and interposed as a spacer between the heater and burner structures, said spacer means having oppositely directed faces disposed one against the outside of the heater structure wall and the other against the burner housing wall, the air tube being secured to and wholly supported by the heater structure for transit therewith independently of the burner housing, supporting means of separable components securing the housing to the heater structure wall in mounting the burner structure for facile detachment and replacement of the latter separately from and without disturbing the secured air tube, a fan in the fan chamber and a nozzle and means supporting the nozzle within the air tube in position to project fluid fuel into the combustion chamber.

22. In combination with a heater having a supporting wall formed with an aperture, a fuel burner comprising a housing having fan and air chambers and openings communicating with such chambers, an air tube adapted for support wholly by the heater for transit therewith in commerce independently of the housing, fan means in the fan chamber and means for actuating the fan, and means for supplying fuel to the air tube, the air tube extending into the heater from the heater wall aperture and having a base portion disposed in the aperture of the heater wall, radial flange means on said base portion, the flange means having oppositely directed faces one of which is disposed abuttingly against the outside of the heater wall, the flange means being formed with through apertures each including a portion of relatively small cross sectional area and a portion of relatively large cross sectional area, headed fasteners extended through the apertures and secured to the heater wall, the heads of the fasteners being disposed in the large portions of the apertures, and means other than said headed fasteners and independent of the air tube supporting the housing with one wall thereof in confronting relation to the heater wall and with the opening which communicates with the air chamber in registry with the air tube, the one wall of the housing being substantially abutted against the other face of the flange means on the air tube base portion, and the large portions of the apertures opening through such other face with the fastener heads disposed wholly within the large aperture portions and recessed within the air tube base portion.

23. For use with a heater having a supporting wall, an oil burner comprising a housing having connected internal fan and air chambers and an air tube for registry with an opening in the housing to receive air from the air chamber, the air tube being formed to extend into the heater through the wall of the latter and including a base portion and a hollow air conducting portion extending as a continuation of the base portion, the base portion of the tube comprising circumferentially extending radial flange means having oppositely directed faces one of which is disposed abuttingly against the outside of the heater wall in locating the air tube relative to the heater, and the other of which is abutted by the housing, the flange means being formed with through apertures to receive fasteners for securing the air tube to the heater wall, said apertures each including a portion of relatively small cross sectional area and a portion of relatively large cross sectional area aligned with the small cross sectional area portion, the large area portions of the apertures opening through the other face of the flange means, and headed fasteners extending through the apertures and securing the air tube to the heater wall, the heads of the fasteners being received in the large portions of the apertures and being wholly recessed within the tube base to permit air sealing abutment of the housing against said other face of the flange means on the base of the air tube.

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