July 17, 1951 J. A. DAHLSTROM 2,561,100

FURNACE CONSTRUCTION INVOLVING REMOVABLE COMBUSTION CHAMBER HOUSING

Filed Oct. 4, 1946 4 Sheets-Sheet 1

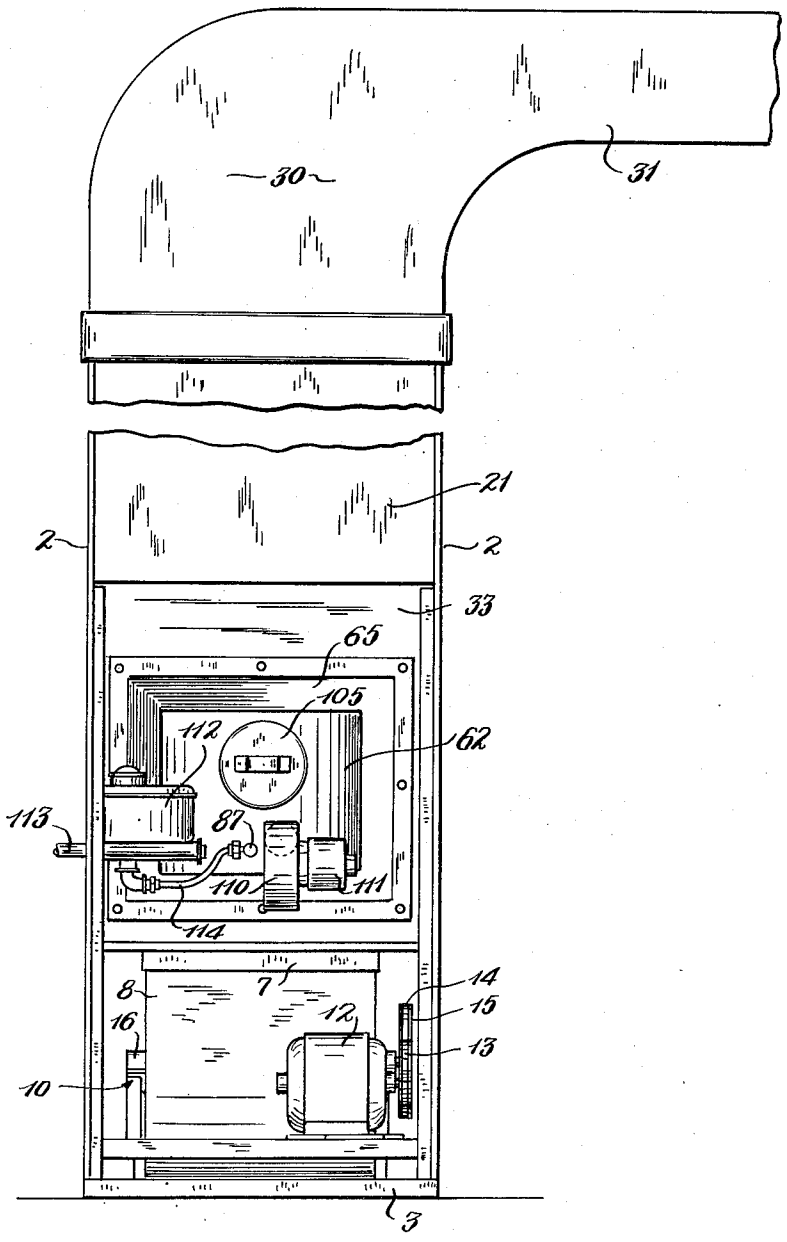


FIG. 1

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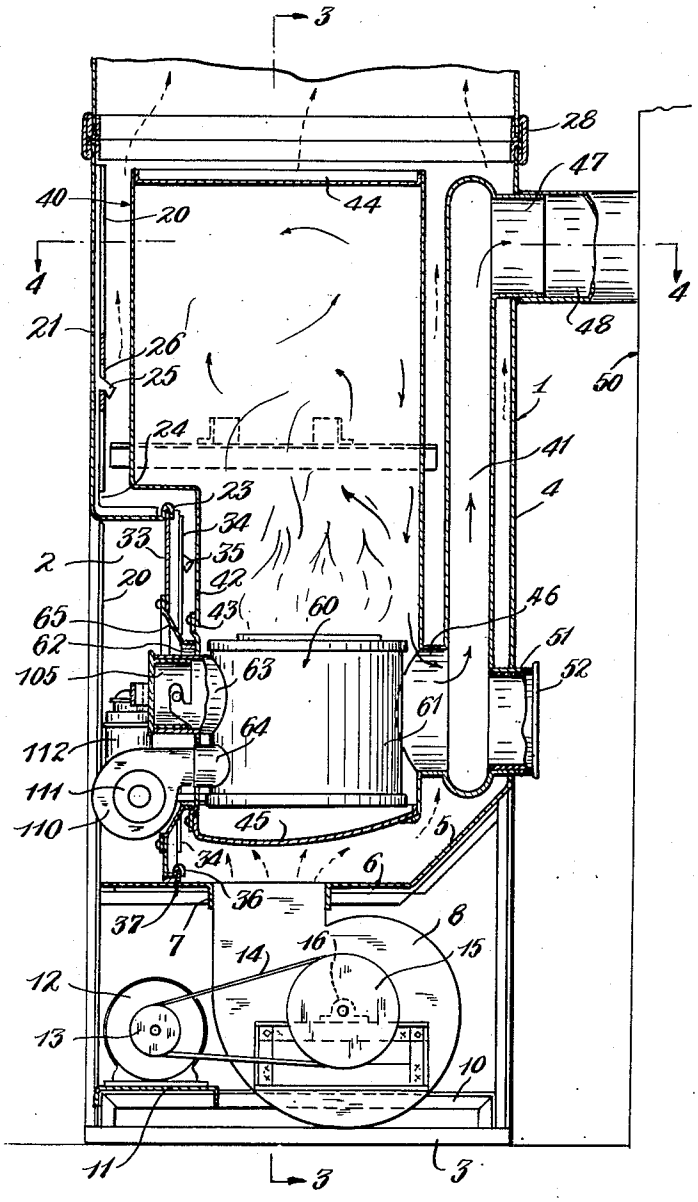


FIG. 2

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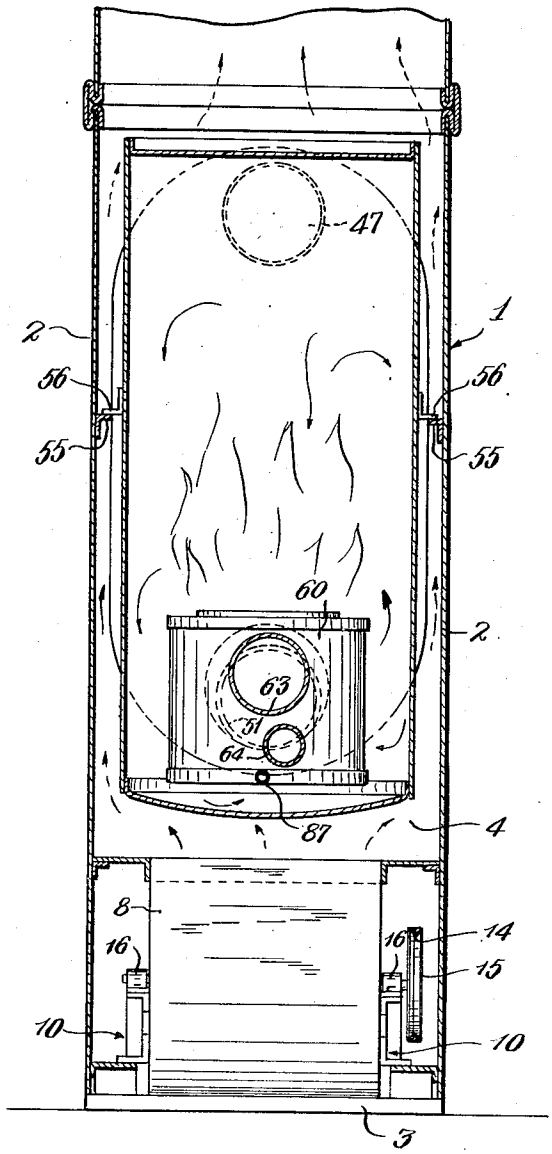


FIG. 3

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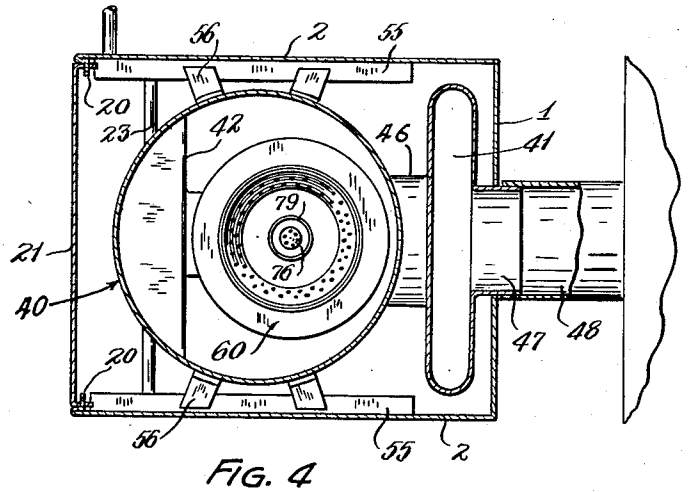


FIG. 4

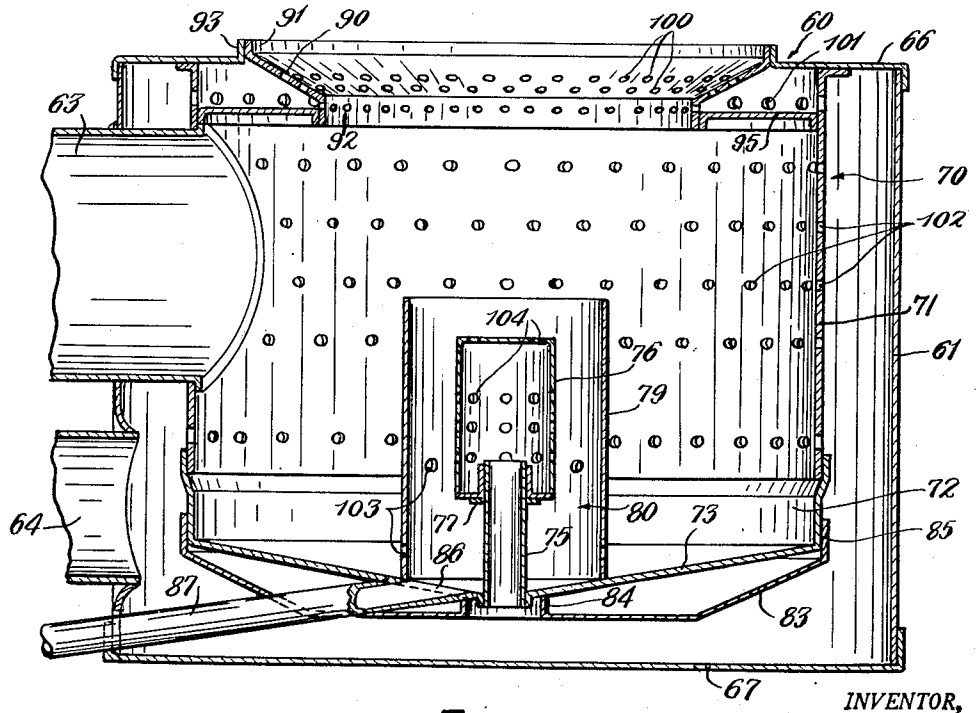


FIG. 5

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Patented July 17, 1951 2,561,100

UNITED STATES PATENT OFFICE

2,561,100

FURNACE CONSTRUCTION INVOLVING REMOVABLE COMBUSTION CHAMBER HOUSING

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Application October 4, 1946, Serial No. 701,302

3 Claims. (Cl. 126—116)

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This invention relates to heating apparatus. Although the present disclosure is that of an oil burning forced-draft hot-air furnace, intended especially for domestic use, it will be apparent to those acquainted with the art to which the invention belongs that certain of my improvements are applicable to heating apparatus of other types and employing other kinds of fuel.

An object of the invention is to provide a construction for furnaces or the like that will afford convenient access to parts enclosed by an outer casing—such parts as the combustion chamber housing, burner unit, etc.—by having a wall, preferably the front wall, of the casing movable or detachable, such an arrangement permitting the apparatus to be permanently installed with its rear side, and desirably either of its lateral sides, close to walls of a room or compartment in which the apparatus is located without interfering with the servicing of the apparatus.

Another object is to facilitate replacement and repair of the aforesaid parts by providing for their ready removal from the casing when said wall is moved or detached.

Another object of the invention, as it pertains to liquid fuel burning apparatus, is to enhance the vaporization of the fuel by enclosing the burner unit in the combustion chamber housing so that it is capable of being wholly or partially enveloped by, and therefore in very intimate heat exchanging relation to, the products of combustion.

Another object is to provide a hot-air furnace or similar apparatus that is of compact construction, preferably tall and slender for accommodation in small utility rooms or closets, according to present trends, and wherein the heat radiating surfaces are unusually extensive relative to the size of the apparatus so that the heat output is accordingly large, and the apparatus highly efficient and economical in operation.

I shall now proceed with a detailed description of the invention with reference to the accompanying drawings wherein like characters designate like parts throughout the several views, and during the course of which description other objects and advantages will become apparent.

In the drawings, Fig. 1 is a front elevational view of a furnace embodying my improvements; Fig. 2 represents a substantially central vertical section through the furnace from front to rear; Fig. 3 is a transverse vertical section on the line 3—3 of Fig. 2, but showing the burner unit and fan casing in elevation; Fig. 4 is a sectional plan on the line 4—4 of Fig. 2, and Fig. 5 is a central vertical section from front to rear through the burner unit on a scale considerably enlarged over that of the preceding views.

An outer casing, designated generally by the reference numeral 1, includes side walls 2 that

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are suitably fastened to and rise from a base 3. A rear wall 4 joins at its lateral edges the rear edges of the side walls 2 and extends from the plane of the top edges of the side walls downwardly a suitable distance where it is shown as merging into a forwardly inclined wall section 5. This wall section joins the rear edge of a bottom wall 6 that extends practically to the front edges of the side walls. The bottom wall 6 is shown as provided with a relatively large opening that is surrounded by a depending flange 7 and into which is fitted the discharge extension of the casing of a centrifugal fan or blower 8 that is carried by a supporting structure 10 which surmounts the base 3 between the side walls 2. On a shelf 11 that is sustained by the structure 10 is mounted an electric motor 12 on the shaft of which is a pulley 13. A belt 14 is engaged about this pulley and one designated 15 that is fastened to the shaft 16 of the fan or blower 8.

While, for the sake of simplicity, I have shown the rear wall 4, inclined wall section 5 and bottom wall 6, along with the flange 7, integral with one another, they may be constructed of parts joined together in accordance with usual furnace practice. Also, the vertical walls of the outer casing may be equipped with liners spaced inwardly from said walls and constructed to provide ventilated spaces between said walls and liners, but this, being a common expedient, is deemed unnecessary of illustration.

As best shown in Fig. 4, the front edge portions of the side walls 2 are turned inwardly upon themselves for a short distance and thence at right angles toward each other to provide flanges 20 against which are seated the inturned lateral edges of a front wall section or panel 21. This panel extends downwardly from substantially the plane of the top edges of the respective side and rear walls 2 and 4, to where it is turned abruptly rearwardly and terminates in an edge formation that provides a downwardly facing cross channel 23, the flanges 20 of the side walls being interrupted at 24 for the passage of said rearwardly turned lower portion of the panel 21. As a means for detachably connecting the panel 21 to the casing, its inturned lateral edges are shown as provided with hooks 25 that are engaged through slots 26 in the flanges 20.

Applied to the top edges of the peripheral walls of the casing 1 is a joint member 28, shown as formed of sheet material to provide upwardly and downwardly opening channels, the latter receiving the top edges of said peripheral walls. Fitted into the upwardly opening channels of said joint member are the peripheral walls of a plenum chamber 30 having an outlet duct 31 that conveys the heated air to the room or rooms to be heated. It will be observed from Fig. 2 that the top edge of the panel 21 enters the channel of the

joint member 28 only a fraction of the depth of said channel so that the panel may be lifted enough to disengage the hooks 25 from the lower edges of the slots 26 in the flanges 20 when it is desired to remove the panel, such action also disengaging the cross channel 23 of said panel from the top edge of a panel 33 that closes the space between the former panel and the bottom wall 6, thus completing the front wall of the casing 1. The panel 33 has its lateral edges turned inwardly for engagement with flanges 34 that are applied to the side walls 2, said edges being provided with hooks 35 that extend through slots in said flanges 34. The lower end of the panel 33 is formed to provide a cross channel 36 that is engaged over a cross rail 37, shown as carried by the bottom wall 6.

Within the outer casing 1 is a combustion chamber housing, designated generally by the reference numeral 40, and a radiator, designated 41. The combustion chamber housing 40 is cylindrical except for the fact that throughout its lower front portion it is cut back to accommodate the inset lower portion of the front wall of the outer casing, comprised of the panel 33. Throughout such cut back portion, the combustion chamber housing is provided with a straight transverse front wall 42, having a relatively large opening 43. The top and bottom walls of the combustion chamber housing are designated 44 and 45, respectively. The radiator 41 is slightly wider than the combustion chamber housing but is relatively shallow from front to rear. In the present construction, it occupies the space between the combustion chamber housing and the rear wall 4 of the outer casing and adjacent its lower end it communicates with the combustion chamber housing through a relatively large tubular connection 46. The outlet of the radiator is defined by a collar 47 that extends rearwardly from the top portion of the radiator through an aperture in the rear wall 4, and fitted over said collar is a flue 48 that leads to a chimney represented at 50. A collar 51, similar to the one designated 47, extends from the lower rear side of the radiator through an aperture in the wall 4, and, being opposite the connection 46, provides a cleanout through which the interior of the combustion chamber housing as well as the radiator may be reached, when a closure 52, shown as a plug, is removed from the collar 51.

The combustion chamber housing 40 is supported within the outer casing by ledges 55. Bearing upon these ledges are lugs 56 that are fastened to the opposite sides of said housing. This means of support permits the combustion chamber housing to be readily withdrawn from the outer casing 1 when the front wall of the latter, made up of the panels 21 and 33, is removed, as will more fully appear hereinafter.

Reference has been made to the opening 43 in the straight front wall 42 of the combustion chamber housing. This opening is of a size and shape that will permit insertion and withdrawal therethrough of the burner unit designated generally by the reference numeral 60. This unit includes a cylindrical air chamber casing 61 in which is enclosed the burner bowl, as I shall presently set out in detail with particular reference to Fig. 5, said air chamber casing being part of an assembly embracing a plate 62 that serves as a closure for the opening 23 and has its edge portion overlying and detachably connected by suitable means to the wall 42 about said opening. Projecting forwardly from the casing 61 through holes in the plate 62 are tubular extensions 63 and 64 that are welded or otherwise rigidly secured to said plate. The panel 33 has an opening similar to but larger than opening 43 of the combustion chamber housing, and projecting inwardly through the opening of said panel, for contact with the plate 62, is a frame 65 having a peripheral flange that is detachably connected by suitable means to the underlying portion of the panel 33.

As shown in detail in Fig. 5, the air chamber casing 61 consists of a cylindrical wall to the upper and lower ends of which are applied, respectively, an annular top wall 66 and a circular bottom wall 67. Occupying the air chamber casing 61 is a burner bowl designated generally by the reference numeral 70. Secured, as by welding, to the top wall 66, in spaced relation to the peripheral wall of the casing 61, is the flanged upper end of a cylindrical wall 71. Telescoping over and fastened, as by welding, to the lower end of the wall 71 is the flared upper end of a pan-like member 72 having a downwardly and inwardly tapering bottom wall 73. Sealed within a central opening of the wall 73 is an air tube 75 that is surmounted by an air distributor 76, the latter preferably being removably fitted over the top of the air tube and resting upon a collar 77 that surrounds and is secured to the tube 75. Rising from the bottom wall 73 about, and in approximately concentric relation to, the air tube 75 and the air distributor 76, to an elevation above the top of the distributor, is a perforated sleeve-like partition 79 that sets off, from the surrounding portion of the burner bowl, a pilot burner space 80. Applied to the underside of the member 72 is a shield 83, having a central opening surrounded by an upturned flange 84 that engages the bottom wall 73, and a peripheral flange 85 that is telescoped over the lower end of said member. Welded or otherwise secured to the bottom wall 73, about an opening 86 therein, which is within the area of the pilot fire space 80, is the inner end of a liquid fuel supply pipe 87 that extends through openings in the shield 83, air chamber casing 61, and plate 62.

Fitted into the opening in the annular top wall 66 of the burner unit is a downwardly converging neck 90 that terminates at its opposite ends in cylindrical flanges 91 and 92, the former being embraced by an upturned flange 93 of said top wall 66 to which the flange 91 is welded or otherwise secured. Bridging the space between the lower end of the neck 90 and the surrounding portion of the wall 71 is an imperforate ring 95. The neck 90 is provided with perforations 100, and above the ring 95 the wall 71 has a horizontal row of perforations 101. The top of the burner bowl proper is defined by the ring 95, and therebelow the wall 71 has several rows of perforations 102. The sleeve-like partition 79 is provided with perforations 103, and the air distributor 76 with perforations 104. The previously mentioned tubular extension 63 extends rearwardly through an aperture in the peripheral wall of the air chamber 61 and has its inner end extended through a hole in the wall 71, said extension being formed at its inner end with a flange that is welded to said wall. The tubular extension 63 thus provides a clean-out for the burner bowl, and is adapted to be closed at its outer end in a common and well known manner by a plug 105.

Occupying the niche that is formed by the insetting of the panel 33, are the casing 110 of a

centrifugal fan or blower, the outlet of which is connected to the extension 64 of the air chamber casing 61; an electric motor 111 by which the fan or blower is driven, and a liquid fuel feeding and control device designated 112 to which fuel is conducted through a pipe 113, and which has its outlet connected, through a tube 114, with the previously mentioned pipe 87 that leads to the burner bowl.

It may be explained that the operation of the apparatus is desirably automatically governed by an electrical control system (not shown) which may be of the usual type including, among other things, thermostats, circuits and relays that control the fuel feed and the operation of the motors 12 and 111. It will be understood that, so long as the apparatus is in use, fuel is constantly supplied to the burner, at all times in sufficient amount to sustain a pilot fire in the space 80. When the thermostatic device of the control system, commonly known as the room thermostat, calls for heat, the fuel feeding and control unit 112 is caused to increase the fuel supply to the burner thereby to enlarge the fire. The blower 110 supplies air in sufficient amount to support combustion at the higher rate of fuel feed, as will be readily understood by those acquainted with this type of combustion apparatus. Practically all of the air entering the burner bowl through the perforations 102 mixes with the rich vapors generated within the lower portion of the bowl and serves as primary air to render said vapors incipiently combustible. As the mixture rises through the neck 90, secondary air, entering the space above the ring 95 through the perforations 101 and passing on through the perforations 100 in the neck 90, join the rich mixture rising from the bowl and produces a highly combustible mixture that burns vigorously in the combustion space enclosed by the housing 40. The products rise more or less centrally within said space and then sweep down the walls of the housing 40, heating them to a very high degree before escaping through the connection 46 to the radiator 41 from the upper end of which they escape to the chimney through the flue 48. Not only does this tortuous course of the products insure their giving off a very large percentage of their heat before escaping to the chimney but, being caused to descend to the region of the burner unit 60, they wipe about the air chamber casing 61 and elevate the temperature of the combustion air therein which enhances the vaporization of the fuel in the burner bowl.

As pointed out above, an important object of my invention is to facilitate servicing of the apparatus, especially when placed near the walls of a room or compartment in which the apparatus is located. In modern practice, especially with respect to small homes and apartments, the furnaces are frequently installed in small utility rooms or in closets, and in the latter case, in close proximity to the side walls and the back wall of the closets. Accordingly, I have made the present embodiment of my invention so that it may be serviced entirely from the front.

I have already explained how, by first removing the frame 65, the plate 62 may be detached from the front wall 42 of the combustion chamber housing and said plate, with the burner unit 60 carried thereby, withdrawn through the opening in the panel 33. This, of course, presupposes disconnection of the fuel feeding and control device, etc.

In case it becomes necessary to remove the combustion chamber housing 40, and the radiator 41, the panels 21 and 33 that constitute the front wall of the outer casing may be detached in an obvious manner, after which the combustion chamber housing and radiator may be withdrawn from the outer casing. The required rather frequent lubrication of the fan or blower 8 and the motor 12 is facilitated by the ready accessibility of these elements.

Having thus described my invention, what I claim is:

1. Heating apparatus comprising a casing having a removable front wall, a combustion chamber housing removably supported within the casing, a liquid fuel burning unit removably supported within the lower portion of the combustion chamber housing, the front wall of the combustion chamber housing having an opening through which the burner unit may be withdrawn, a closure for said opening, the front wall of the casing having an opening registering with that of the combustion chamber housing, and a frame detachably applied to said front wall of the casing about the opening therein and having a part extending rearwardly through said opening and engaging said closure.

2. Heating apparatus comprising a casing characterized by a movable wall so arranged that the casing may be opened substantially throughout an entire side thereof by the movement of said wall, a combustion chamber housing removably supported within the casing and having an opening in the side thereof adjacent the side of the casing that is adapted to be opened, a closure for said opening of the chamber housing, a liquid fuel burning unit fastened to and supported by said closure and movable through said opening into and out of the combustion chamber housing, and means for delivering fuel to the fuel burning unit.

3. Heating apparatus comprising a vertically disposed elongated casing of relatively small rectangular cross section, the casing being characterized by a movable wall so arranged that the casing may be opened throughout substantially the entire area of one side thereof, an intercommunicating combustion chamber housing and radiator supported in the casing and removable through the side thereof having said movable wall, the combustion chamber housing having an opening on the side thereof adjacent the last mentioned side of the casing, and a combustion device removably supported in the combustion chamber housing and capable of being passed through said opening thereof.

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