

Jan. 1, 1952

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2,581,145

OIL BURNING HOT AIR FURNACE

Filed Sept. 5, 1947

2 SHEETS--SHEET 1

FIG. 1

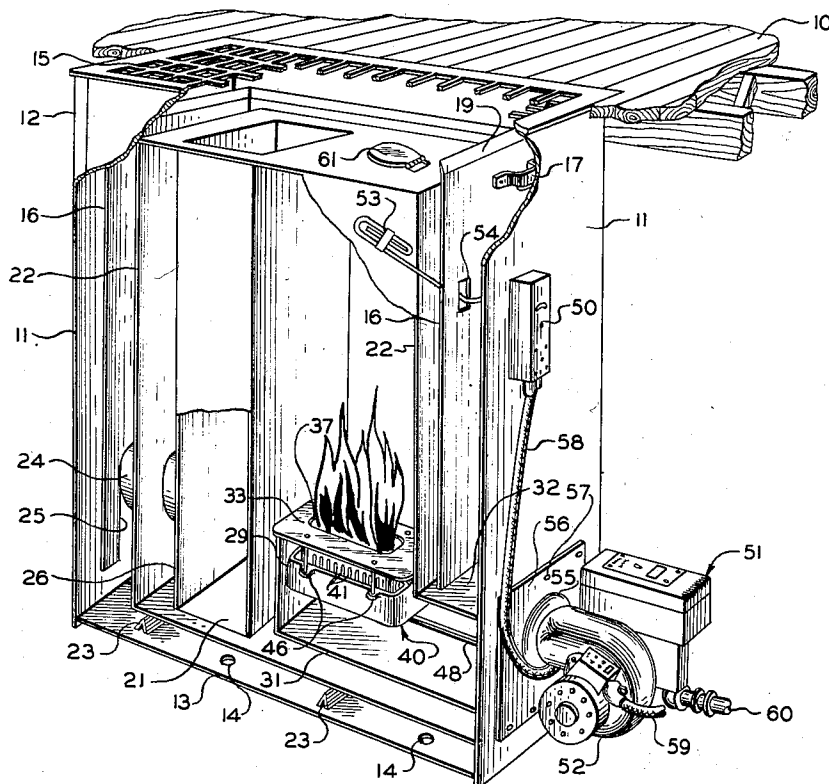
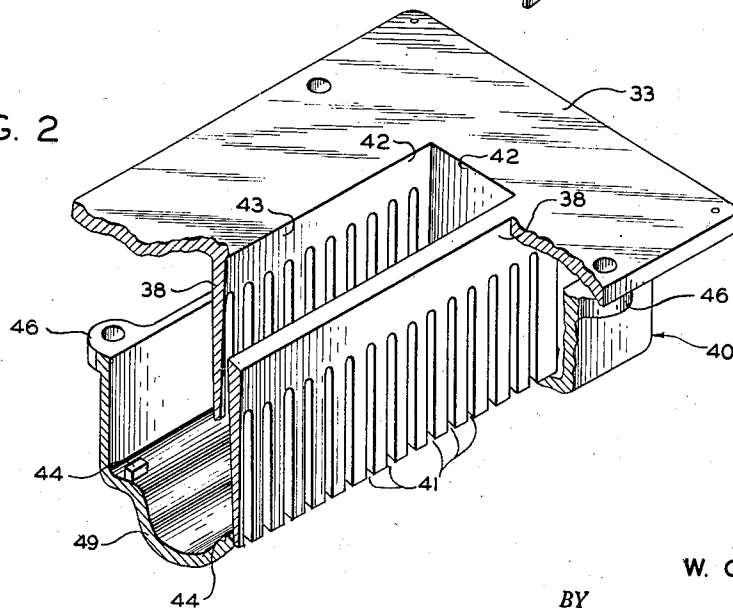


FIG. 2



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2 SHEETS—SHEET 2

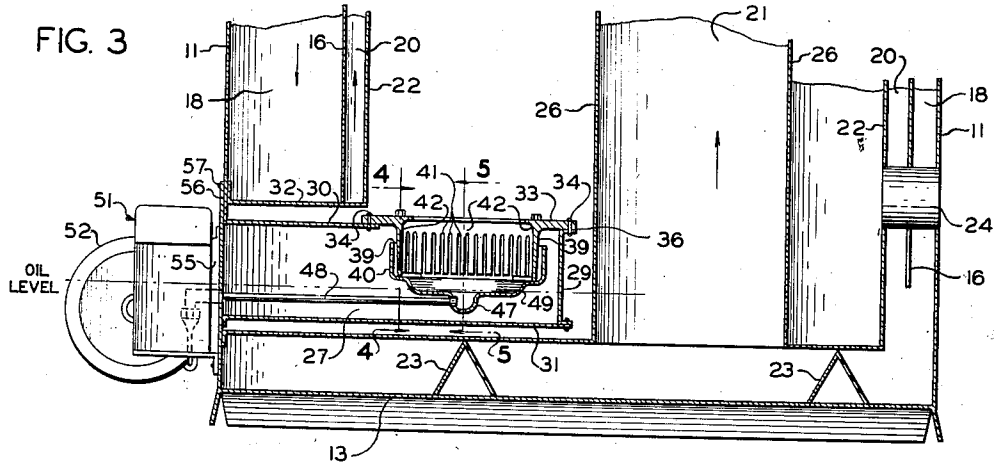
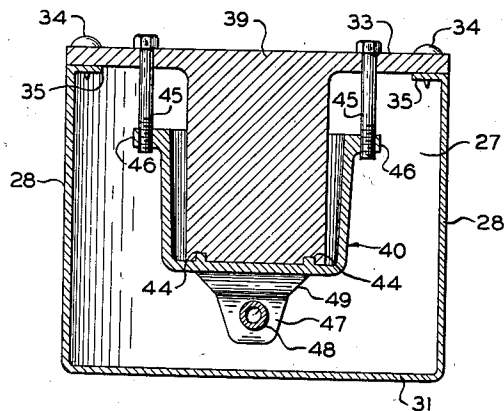


FIG. 4

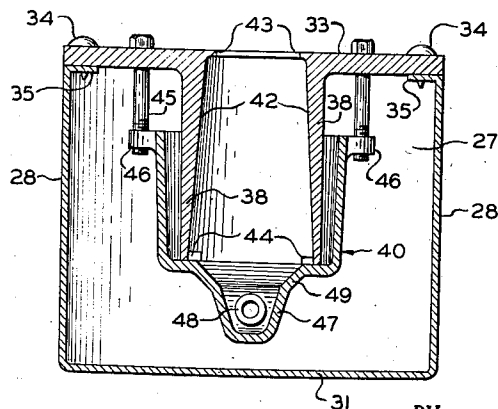


FIG. 5

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OIL BURNING HOT-AIR FURNACE

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1 Claim. (Cl. 126—116)

1 This invention relates to heating and more particularly to a furnace unit including a liquid fuel burner.

Oil burners and furnace structures for use with oil burners have heretofore been made and used incorporating a plurality of flue and air passageways in relatively expensive constructions with utilization of numerous types of air passageways, both for the burner and the heated air in structures of complicated design and configuration without creating a maximum of heat efficiency or reducing the cost of manufacture. In addition one of the primary faults with previous burners of the character as herein described has been their failure to support combustion by properly supplying air thereto.

It is therefore among the objects of this invention to provide an improved furnace structure; an improved and efficient oil burner construction which is capable of utilizing commercial fuel oils of a character as low as grade number 3 at their maximum heating efficiencies; the combination of a furnace and oil burner structure which is simple in design, heats with maximum efficiency and yet is produced at a minimum of cost; and, to provide an oil furnace and burner structure of compact nature to serve as a central heating unit.

Further objects and advantages of the invention will be apparent from the following specification taken in conjunction with the accompanying drawings, wherein;

Fig. 1 is a perspective in partial section of my improved oil burner and furnace structure;

Fig. 2, an isometric view in partial section of the oil burner fire box;

Fig. 3, a cross sectional plan view of the oil burner fire box and its insert assembly;

Fig. 4, a cross sectional view taken on the line 4—4 of Fig. 3;

Fig. 5, a cross sectional view taken on the line 5—5 of Fig. 3.

With reference to the drawings, for purpose of illustration the heating unit is shown as installed under floor 10 and comprises an outer heavy steel casing 11 of sheet material bent to a rectangular shape and having its joined edges welded in an overlapping flange 12. The casing 11 is closed at its base portion by plate 13 provided with illustrative openings or holes 14 and open at its top portion, over which is placed a floor grill or register 15 in alignment with the floor structure 10. Within the rectangular outer casing 11 is a rectangular air flow shield 16 open at its top and bottom portions which are in

2 spaced relationship to grill 15 and base plate 13, and held from contact with the casing 11 by one or more suitable brackets 17 on each side to form or provide inlet air flow passageways 18 for comparatively or relatively cool air to enter the heating unit of the furnace structure during its heating operation. The shield 16 is provided about its upper portion with the inturned angular flange 19 which directs a downward flow of air through the passageways 18 and further tends to keep the heated air rising from passageways 20 and 21 segregated from the incoming relatively cold air in passageways 18.

Within the air flow shield 16 is a rectangular fire-chamber 22 likewise spaced from the air shield 16 by suitable spaced brackets, as illustrated at 17, to provide air up-flow passageways 23. The fire-chamber 22 is supported above the outer shell bottom 13 by suitable blocks or angle iron supports 23 in order to permit circulation of incoming and outgoing air throughout the passageways as illustrated and described. An outlet flue 24 leading from the lower portion of fire-chamber 22 and extending through outer casing 11 passes under a cut-out portion 25 of shield 16 and supports one end of the shield 16 thereby.

Within the walls of the fire chamber 22, exposed to the direct heat of the fire, there is positioned a rectangular flue or air flow duct 26 containing air flow passageway 21 exposed at its lower portion to the incoming air from air passageway 18 and open at its top end to expel superheated air substantially centrally through the air register 15. The rectangular air flue 26, in passing through the fire-chamber 22, is spaced from the walls of the fire chamber 22 to provide a suitable space through which the heated products of combustion may circulate directly from a heat source, about the flue 26, to superheat the air as it flows therethrough adjacent to the direct flame of the heat source and substantially throughout its path of travel in counterflow to the heated products of combustion.

Adjacent to the base of air flue 26, a rectangular closed force-draft conduit 27 formed by walls 28, 29, 30 and 31 is inserted adjacent base portion of fire chamber 22 through a conduit 32 and supports a rectangular oil burning firepot or box assembly within the walls of the fire chamber 22. This firebox is supported by the side walls 29 of rectangular enclosed conduit 27, its end wall 28 and its top 30 is partially covered by a rectangular cover or baffle plate 33, 6 inches x 9 inches in outside diameter, fastened by suitable

bolt means 34 in top 30 and flanges 35 and 31 formed by the appropriate turned edges of the walls 28 and 29 respectively. The plate 33 is provided with a narrow, centrally positioned longitudinal slot 37, which is $5\frac{1}{8}$ inches x $1\frac{1}{8}$ inches in size, integral depending flanges 38 and 39 spaced $\frac{1}{8}$ inch inwardly at the lower curved edge of the slotted opening 37 and extending downwardly 3 inches from the top of plate 33. The receptacle 40, baffle plate 33 with its depending flanges 38 form a rectangular firepot or box closed at its ends by solid walls 39 and with the side portions 38 containing 15 equally spaced slots 41, each of which is $\frac{3}{4}$ inch in width and $2\frac{3}{8}$ inches in length with an open space of $\frac{1}{4}$ inch between each kerf.

As is more clearly shown in Figs. 2 and 5, the inner surface portion 42 of depending flanges 38 and 39 are inclined upwardly at a slight angle from their base, adjacent the base portion of receptacle 40, to form at their top edges a narrowed mouth ending in the inwardly extending curved lip 43 which projects $\frac{1}{8}$ inch inwardly and is curved upwardly from the inner peripheral top portion of the depending flanges 38 and 39. The lowermost surface of the lip 43 is angled inwardly and upwardly toward the top of the fire-pot at an approximate angle of 110° with its inner peripheral edge rounded so that the inclined surfaces 42 of walls 38 and 39 act in conjunction with dip 43, causing in effect, with forced draft, flame concentration during a burning operation.

The depending flanges 38 and 39 extend into and against the locating ridges or buttons 44 positioned in the corners at the base of oil receptacle 40, and have a clearance about their outer periphery of $\frac{1}{16}$ inch with respect to the sides of the receptacle 40. The oil receptacle 40 is supported from baffle plate 33 by bolts 45 in ears 46 with the bolts 45 being threaded to provide a clearance of 1 inch between the upturned baffle-like sides of receptacle 40 and the plate 33. A suitable fuel oil composition capable of being volatilized for burning is supplied to the sump 47 from oil line 48 and adapted to be thinly spread over the area 49, forming the base portion of receptacle 40, between the flanges 38 wherefrom it burns in a manner as hereinafter described.

Conventional apparatus providing for the automatic operation and control of the fuel supply and blower may be provided for use with the furnace described. It is contemplated that a fuel supply valve unit or oil control 51 receiving oil by means of a feed line 60 may be employed in association with a thermostatic device 53 positioned within the furnace and a thermostat, not shown, located in the space being heated, such as a room. It is also contemplated that means for varying the speed of a blower 52 may be provided in association with the oil level control 51 and the thermostatic elements previously mentioned. The controls referred to may regulate the flow of fuel including shutting off the supply at a predetermined temperature of either thermostatic element or adjusting the supply in accordance therewith.

The blower unit 52 is mounted by ring 55 on plate 56 which constitutes an end closure member for conduit 27 and is attached to the outer casing 11 by suitable bolt and screw means 51. The valve unit 51, blower unit 52, control box 50, and thermostatic element 53 are conventional structures which operate in a conventional man-

ner, through control cables 58 and 59 in that they are supplied with electrical energy from a conventional junction box (not shown) operated from a conventional hand switch (not shown) located in any position desired and suitable to an operator. The operating circuit is an inter-related control arrangement having suitable conventional time delay and current relay devices for controlling the operation of the automatic blower 52 in conjunction with the flow of oil from feed line 60 to the oil line 48. That is, upon the starting operation the speed of the blower is reduced until the oil is aflame and thereafter the speed of the blower is regulated in accordance with the degree of heat required or in other words in proportion to the quantity of oil fuel supplied to the base 47 of receptacle 40.

With the burner in operation and the blower 52 forcing air through the duct 27 a regulated preheated forceful draft is created through the burner by reason of the air passing over the upright sides of the receptacle 40 which form in effect with the depending flanges 38 and 39 a series of compression nozzles 41 from which the air is emitted through each of the diametrically opposed slots 41 in equal and opposite directions and force. The upper open area portion of the slots 41 forming evenly spaced direct admission ports causing relatively horizontal opposed air stream to flow into the burner space and the lower portion of the same slots, enclosed in spaced relationship to the upright sides of receptacle 40, forming indirect air ports and causing somewhat downwardly directed opposed heated air streams to flow against the surface of the fuel oil.

It has been found that by this arrangement, a more complete mixing of incoming air and gases from the evaporating oil is obtained producing a bright hot flame structure capable of vaporizing low grade fuel oils which burn. This flame burns within the fire-box formed by the slightly angled surfaces 42 and projects from the mouth of the burner formed by the curved lip 43 substantially without leaving any deposit of soot or carbon either within the fire chamber 22 or about the space within the which the furnace structure is placed. This complete combustion of a fuel oil is believed to be provided by a complete mixing of opposed vertical and somewhat angular forced streams of air with the gases vaporized from the oil by turbulence of conflicting streams of air through slots 41 and the heat of combustion within the firepot. That is, the position and size of the kerfs or slots permit a turbulation by a combination of turbulence and heat and fuel atomization.

While the above description is concerned with an improved furnace heating device started by turning on the hand switch, opening the hinged door 61 and thrusting a flame into the incoming oil it will be apparent that a conventional spark gap ignition device or other conventional starting device, as a pilot or the like, may be used for igniting the oil and the unit made completely automatic by substitution of a thermostatic control for the hand operated switch. Further that by proper adjustment of the valve unit automatic ignition means for starting the burner may be utilized with appropriate automatic controls.

As will be apparent from the above description, another of the features of the improved furnace structure is that instead of forming the walls of the numerous flat surface portions from a continuous metal sheet welded at the juncture of their meeting ends, the entire portion of the fur-

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nace structure may be built from a plurality of cut and fitted flat metal sheets which are welded at their joining edges. Further that a furnace structure of the character as herein described will permit of installation with the maximum of efficiency as related to standard floor construction and that its installation does not interfere or weaken supporting members of the building.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof and therefore the invention is not limited by that which is shown in the drawing and described in the specification but only as indicated in the appended claim.

What is claimed is:

The combination of a rectangular casing open at the top and closed at the bottom, a register mounted at the top of said casing, a substantially rectangular combustion chamber structure having top, bottom, side, and end walls within said casing substantially parallel to and in spaced relation to the register, the bottom, and the walls, respectively of said casing, a conduit extending from said chamber through an end wall of said casing and providing communication between the exterior of said casing and said chamber for the admission and removal of an oil burning fire pot, an elongated oil burning fire pot in said chamber adjacent the bottom and said end wall and having a flame outlet slot in substantially parallel relation to the side walls of said chamber, means to supply combustion air through said conduit to said fire pot, means to supply oil to said fire pot, a substantially rectangular air flow duct open at the top and bottom having the walls thereof substantially parallel to opposed walls of said chamber, said duct extending through said combus-

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tion chamber from the bottom through the top of said chamber providing communication between the bottom space and the top space lying between the tops and bottoms of said casing and chamber, an outlet flue extending from the other end wall of said chamber adjacent the bottom thereof and extending through the corresponding end wall of said casing, a substantially rectangular shield open at the top and bottom surrounding the walls of said chamber with the walls of said shield substantially parallel to and spaced from the corresponding walls of said chamber and said casing, the open top and bottom of said shield being spaced from the top and bottom of said casing whereby air may circulate between the shield and the casing downwardly and between said chamber and said shield upwardly through said register.

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