Jan. 19, 1937. M. RESEK ET AL 2,068,111

FORCED AIR HEATER

Filed Jan. 3, 1935 5 Sheets-Sheet 1

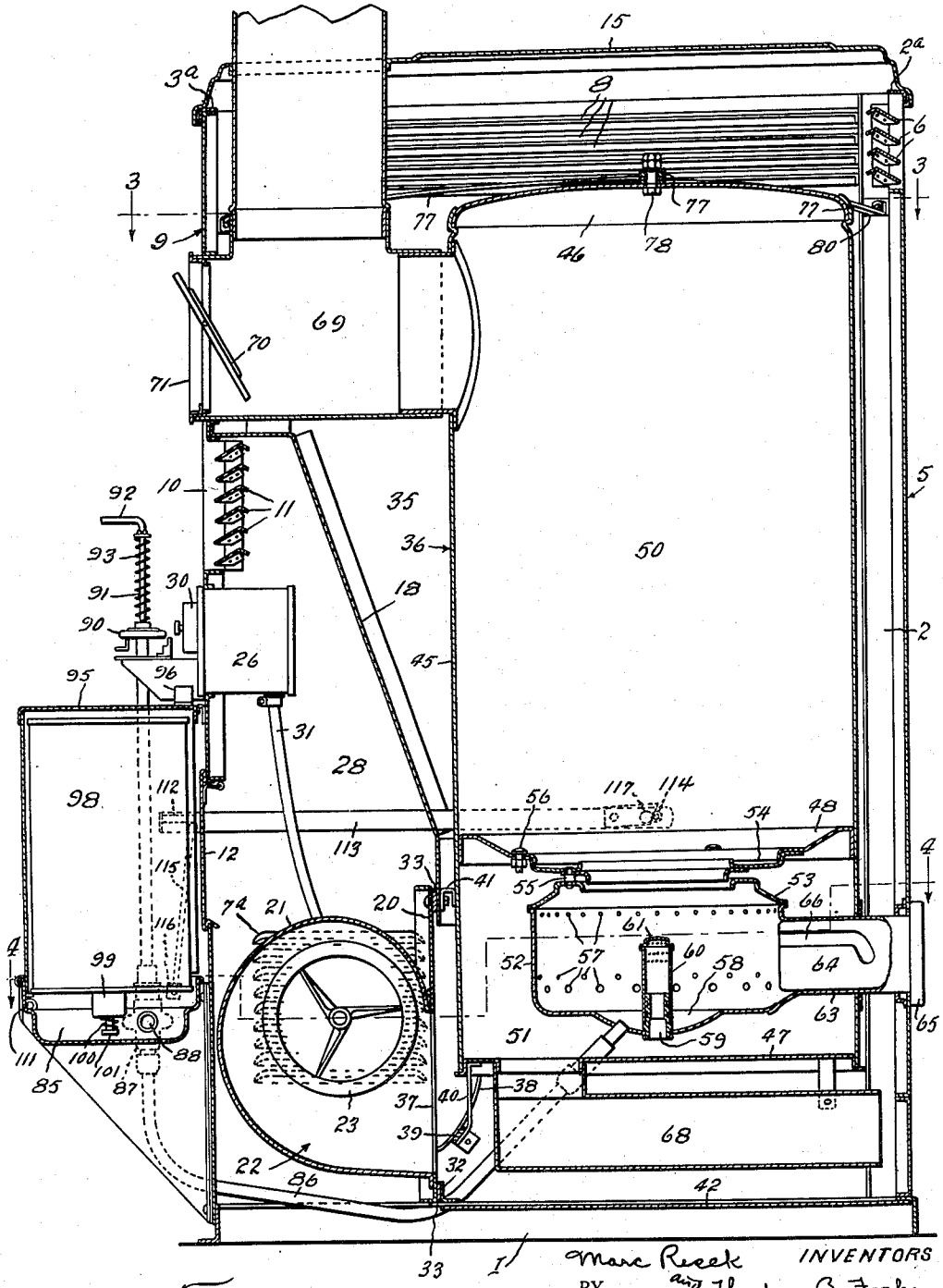


Fig. 1

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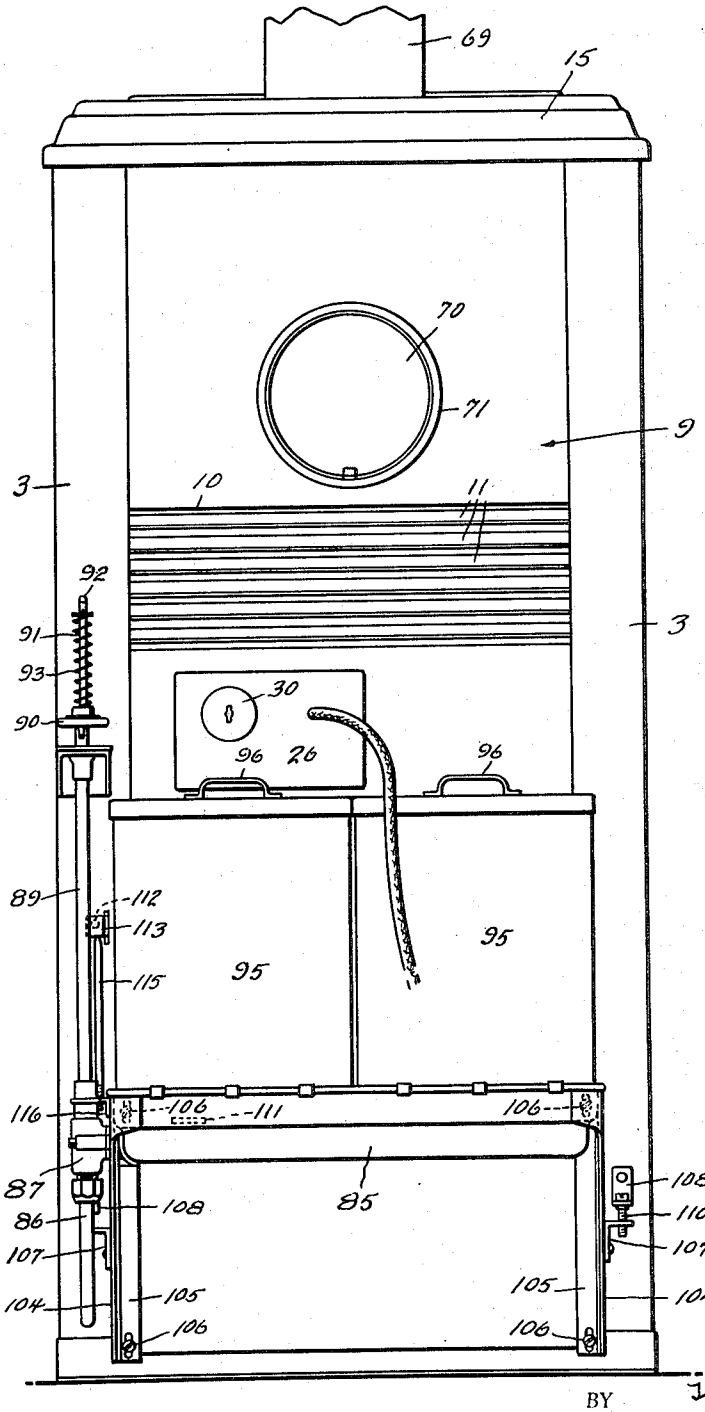


Fig. 2

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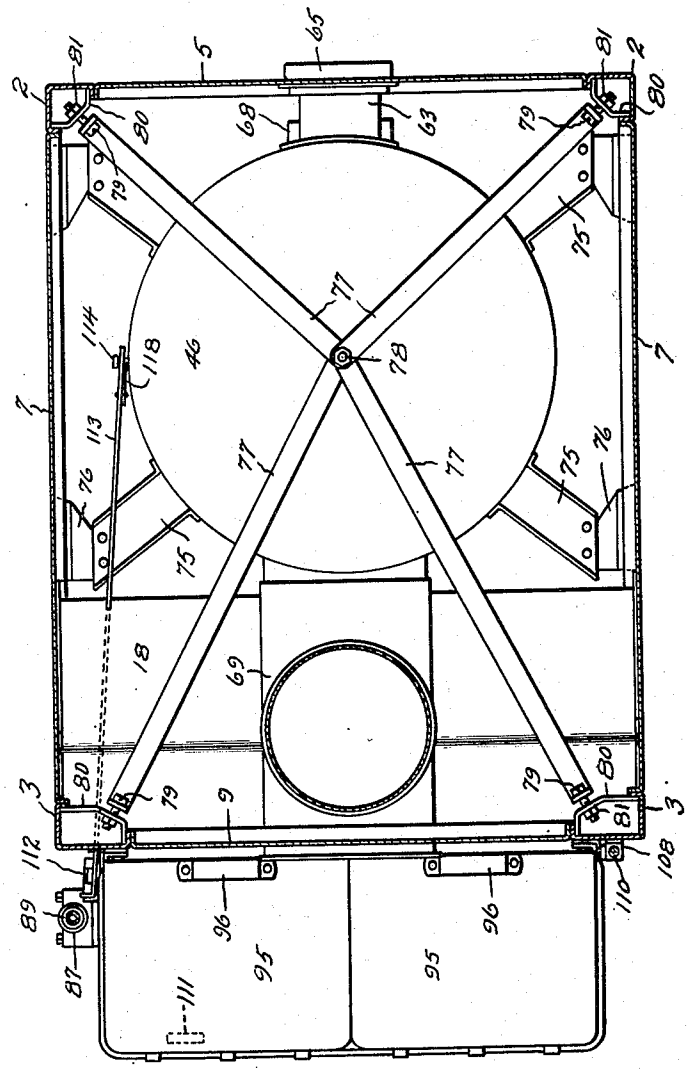


Fig. 3

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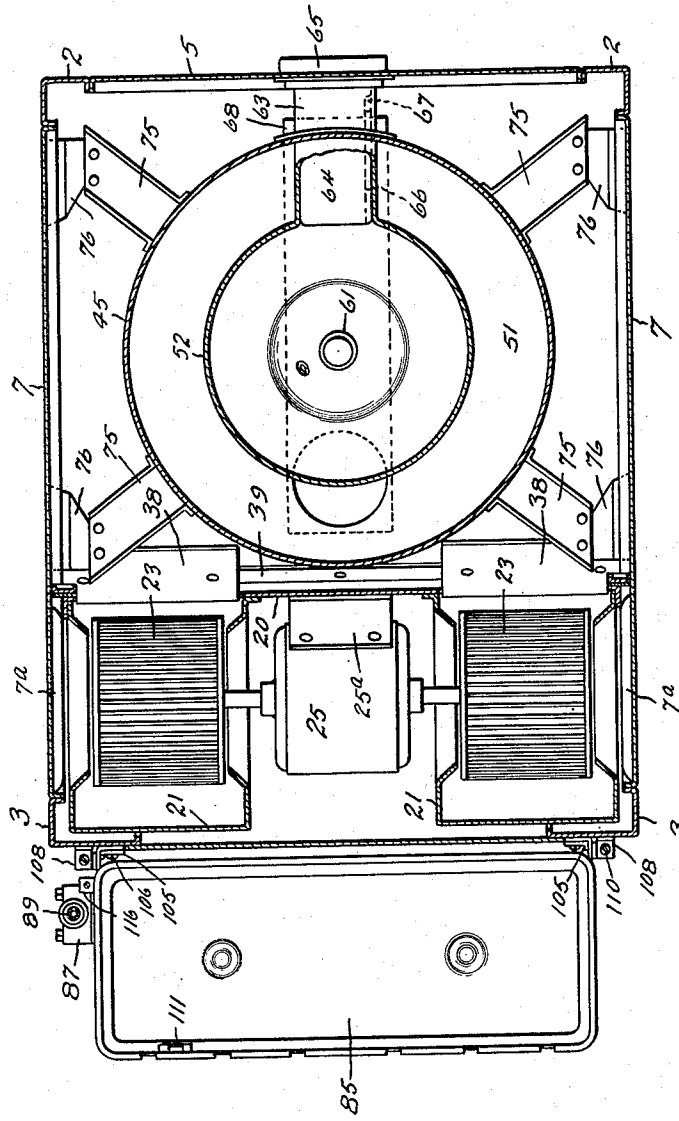


Fig. 4

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FORCED AIR HEATER

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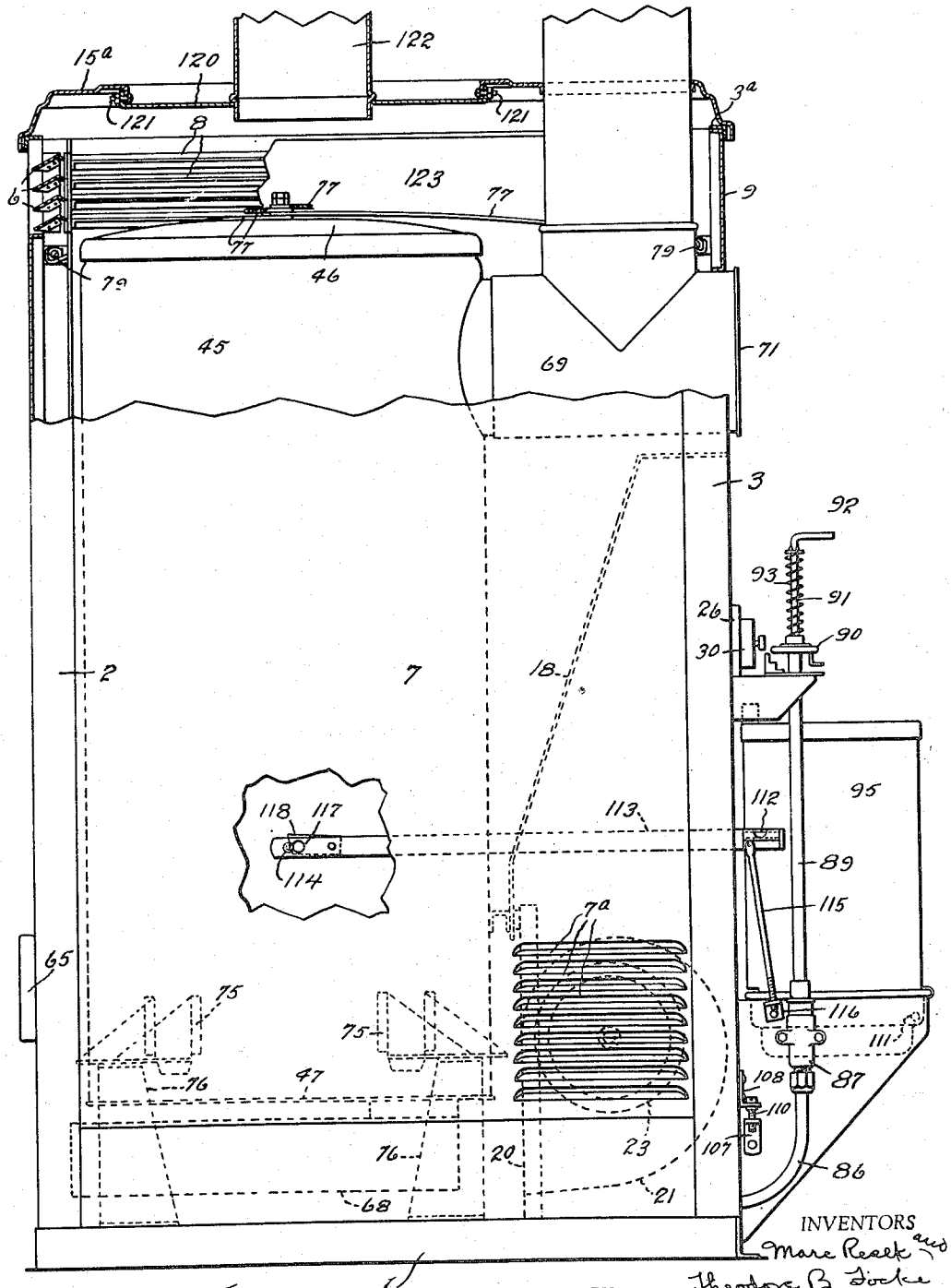


Fig. 5

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UNITED STATES PATENT OFFICE

2,068,111

FORCED AIR HEATER

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Application January 3, 1935, Serial No. 267

5 Claims. (Cl. 126—110)

This invention relates to heating apparatus, particularly of the oil burning kind, characterized by a forced circulation of the heated air; and the invention has to do more especially with a so-called room heater of this variety.

Objects of the invention are to provide an extremely effective room heater—one that is highly efficient and relatively economical of operation and that functions to project the heated air well out into the room so that the full benefit thereof may be realized, as distinguished from natural draft circulating room heaters in which the exhausted air immediately rises to the ceiling; to provide means for shutting off certain of the hot air outlets so as to direct the heat as desired, or as required by the circumstances, as when the heater stands in a corner and the adjacent walls have to be protected; to include in such a heater provisions for the attachment of heat conveying means so that a part of the output may be conducted to remote places, as, for example, to offices or other partitioned-off compartments of stores, shops, or garages heated by the apparatus, and to provide a construction that is not only simple but is capable of adjustments that obviate such precision in manufacture and installation as would otherwise be required.

In the present embodiment of the invention a fuel feed is employed involving a dispensing receptacle in which a substantially constant oil level is maintained and which has to be located in a definite relation to the burner; and it is a further and more specific object to provide means facilitating the leveling of the fuel dispensing receptacle with respect to the burner.

Another object of the invention is the provision of a forced air room heater comprising a casing of attractive appearance and pleasing size within which are compactly arranged an electric motor, air propelling means driven thereby, controls for the motor, and combustion apparatus; and wherein the main portion of the casing in which the combustion apparatus is housed, and which may be termed the hot air compartment, is partitioned off from an inlet duct for the fresh air in which the other of said elements are situated so that their overheating is avoided.

Additional objects and advantages will appear as we proceed to describe the invention by reference to the accompanying drawings in which Fig. 1 is a sectional left hand side elevation of a forced air room heater constructed in accordance with our improvements; Fig. 2 is a rear elevation of the same; Figs. 3 and 4 are horizontal sections through the heater, the approximate planes of said sections being indicated by the respective lines 3—3 and 4—4 of Fig. 1, and Fig. 5 is a right hand side elevation of the heater with the upper portion of the casing in section to better reveal a modified form of top to which a heat distributing conduit is attached.

The casing of the heater is constructed upon a rectangular base frame 1 of angle members. Front posts 2 and rear posts 3 rise from the corners of the base frame and the respective front and rear posts are tied together at their upper ends by transverse angle bars 2^a and 3^a. A sectional front wall 5 occupies the space between the posts 2 and adjacent its upper end has an outlet opening equipped with air deflectors or louvers 6. Side walls 7 extend from the front to the rear posts on both sides of the structure and have outlet openings at their upper ends that are fitted with louvers or air deflectors 8, and a sectional rear wall 9 is disposed between the posts 3, the same having an air inlet 10, provided with louvers 11, and a hand hole that is fitted with a closure 12. As shown in Figs. 1 and 2, a top 15 surmounts the casing and bears at its front and rear ends on the angle bars 2^a and 3^a. The parts are held together by bolts or other means, in an obvious manner.

A partition 18 extends inwardly a suitable distance from the rear wall 9 immediately above the air inlet 10, thence downwardly and forwardly, and finally downwardly in a vertical plane, terminating a substantial distance above the base frame 1. The partition 18 is flanged at its ends and suitably joined to the side walls 7. The space between the lower end of the partition and the base frame 1 is bridged by a plate 20 that carries snail shell casings 21 of blowers designated generally by the reference numeral 22, the fans 23 of said blowers being supported in proper position within said casings by the opposite ends of the armature shaft of an electric motor 25 that is mounted, through supports 25^a, on the plate 20. The snail shell casings 21 are open at their opposite sides, as best shown in Fig. 4, for the admission of air that is drawn in through the inlet 10 of the rear wall, and through louvered openings 7^a of the side walls. Thus it will be seen that the motor and blowers, as well as the motor controls designated generally by the reference numeral 26 and supported within an opening in the rear wall immediately below the inlet 10, occupy the air inlet duct 28 that is separated from the remainder of the interior of the casing by the partition 18 and what is, in effect, a continuation thereof, the plate 20, so that the motor and its controls will be kept cool by the incoming fresh air. It may be explained that the controls 26 are designed to effect variable speeds of the motor and the same involve a switch 30 through which the different speeds may be selected. These electrical units per se constitute no part of the invention and a variable speed control of any approved type may be employed. The controls are electrically connected with the motor through

a cable 31. Where the upper and lower edges of the plate 20 are connected, respectively, to the lower end of the partition 18 and to a cross member 32 on the base frame, cushions 33 of felt or other suitable material are interposed between the plate and said other parts. This is for the obvious purpose of minimizing vibration and obviating noise.

The portion of the interior of the casing that is separated from the fresh air duct 28 by the partition 18 and plate 20 constitutes the hot air compartment 35 within which is situated a combustion apparatus that is designated generally by the reference numeral 36. Communication between the air inlet duct 28 and the compartment 35 is restricted to openings 37 in the plate 20 that register with the open ends of the snail shell casings 21 of the blowers 22. Baffles 38 are associated with these openings and are carried by a cross bar 39, supported at its ends by the side wall 7 and at its center by a hanger 40 that depends from an adjacent part of the combustion apparatus 36. These baffles deflect the major portion of the air from the blowers 22 upwardly, the remainder escaping past the lower edges of the baffles, which edges are spaced a suitable distance above the lower edges of the openings 37. To impart rigidity to the lower end of the partition 18, so that it may constitute a more satisfactory support for the plate 20, the same is tied to the combustion apparatus by a member 41. The bottom of the hot air compartment 35 is closed by a plate 42.

The combustion apparatus 36 comprises a cylindrical drum to which the reference numeral 45 is applied, and the same is closed at its upper end by a top 46, and has a bottom wall 47 fitted within its lower end. A suitable distance above the wall 47 is an annulus 48 that divides the interior of the drum into a combustion chamber 50 and an air chamber 51. 52 is a burner bowl whose annular top 53 is connected to and spaced from a ring-like member 54 by a plurality of fastening means 55, and said ring-like member 54 is, in turn, attached to the annulus 48 by bolts 56. Primary air is admitted to the burner bowl 52 through perforations 57 in its peripheral wall, while secondary air enters the bowl through the annular slot that is formed between the top wall 53 and the ring-like member 54. The bottom wall of the burner bowl is formed with an oil sump or basin 58, and permanently fitted within a hole at the center of said sump or basin is a hollow hub 59 downwardly over which is adapted to be engaged a replaceable sheet metal sleeve 60 having a perforated top 61. The sleeve and its perforated top constitute an air distributor for supplying primary air to the central region of the burner bowl, and the same being simple and inexpensive may be readily and cheaply replaced in case it becomes burned out. The burner bowl is provided with a lighting and clean-out opening in the front side of its peripheral wall and the same is surrounded by a neck 63 that projects forwardly through the adjacent wall of the drum 45 and through the front wall 5 of the casing. The opening is adapted to be closed by a plug 64 having an enlarged outer end 65. The plug is held within the neck 63, preferably by a bayonet joint connection, the groove of which is shown at 66 for cooperation with an inward projection 67 (Fig. 4) on the neck.

Air is supplied to the chamber 51 of the combustion apparatus through a duct 68 that opens into the lower front portion of the compartment 35; and the products of combustion are carried off from the combustion chamber through a flue connection 69 that opens into the upper rear portion of said chamber and extends out through an opening in the top 15. Said flue connection is equipped with an automatic draft regulator in the form of a gravity damper 70 that is pivotally supported within an extension 71 that opens through the rear wall of the casing for the admission of atmospheric air. The damper 70 gravitates toward closed position and operates in a manner well known to those skilled in the art.

As best shown in Figs. 3, 4 and 5, the drum 45 is provided adjacent its lower end with hangers 75 whose outer ends are supported upon and are connected to brackets 76 carried by the frame structure, and the upper end of the drum is properly positioned within the casing by metal straps 77 that are connected, at their inner ends, to the top 46 of the drum by a bolt 78 from which the straps radiate to the four corners of the casing. The outer ends of the straps are turned up and perforated for screws 79 that are engaged through holes in anchorage members 80 that are carried by the corner posts. The screws 79 are threaded through nuts 81 on the rear sides of the anchorage members. So mounted, the screws 79 may function as turnbuckles for altering the length of the ties between the upper end of the combustion apparatus and the corner posts of the structure, thereby to properly position the flue connection with respect to the openings in the rear wall and top of the casing through which parts of the flue connection extend. By virtue of this arrangement any slight irregularities in the dimensions of the parts of the structure involved may be compensated for, thereby obviating such precision in the production of the parts as would otherwise be required. The importance of this becomes more evident when it is explained that the parts of the casing that are exposed to view are preferably coated with vitreous enamel and for this reason it is essential that the parts so coated be relieved of such strains as might occur if the parts did not easily fit together.

We preferably employ a fuel feed of the kind serving to prevent an accumulation of fuel in the burner bowl exceeding a predetermined maximum level. To this end the fuel supply connections involve a constant liquid level device which is supported at a given elevation with respect to the burner bowl so that the liquid level established by the former will fill the sump or basin of the burner bowl only to a given depth. In the present instance we employ a dispensing receptacle 85 that is supported at the rear of the heater in a manner presently to be described and the same is communicatively connected with the burner bowl by a conduit 86. This conduit includes a metering valve 87 that is secured to the side of the receptacle 85 and opens into the same at the point designated 88 in Fig. 1. The valve has a long tubular stem 89 to the upper end of which is fastened an operating handle 90 by which it may be turned to adjust the valve, and downwardly through the stem and through the valve and conduit 86 extends a clean-out element 91 whose upper end incorporates a handle 92 by which the element may be reciprocated. It is normally held in retracted position by a spring 93.

Hingedly connected to the rear side of the receptacle 85 are carriers 95 equipped with han-

dles 96 by which they may be swung from an inclined position to the rear of the receptacle upwardly to the position shown in the drawings. When in the former position, reservoirs 98 are adapted to be placed in them and when the carriers are swung to position over the receptacle 85 the reservoirs are inverted over said receptacle so that the necks 99 thereof depend into the receptacle. These necks constitute the discharge openings of the reservoirs, the reservoirs being otherwise closed, and when liquid fuel accumulates within the receptacle to a height sufficient to seal the necks, further discharge is prevented until said liquid recedes enough to admit air to the reservoirs. The necks 99 are fitted with valves that are closed by springs 100 and are opened when the valve stems 101 engage abutments in the bottom of the receptacle 85.

Inasmuch as it is the constant liquid level feature, above described, that establishes the maximum oil level in the sump or basin 58 of the burner bowl 52, it is evident that the receptacle 85 must bear a very definite relation to the burner bowl, and to facilitate the attainment of this definite relation without the necessity of absolute precision in the production of the parts and the entire structure being perfectly level, we provide a mounting for the receptacle which permits of its vertical adjustment; and we connect the receptacle to the combustion apparatus by means incorporating an indicator so that the proper setting of the receptacle is rendered especially convenient.

Secured to the ends of the receptacle 85 are triangular brackets 104 having flanges 105 that bear against the adjacent portion of the heater casing wherewith they have screw-and-slot connections, as indicated at 106. Angle members 107 and 108 are fastened, respectively, to the brackets 104 and the rear corner posts 3 of the casing in such position as to dispose their horizontal flanges one above the other. Screws 110 are swiveled in the horizontal branches of the members 108 and are threaded into the corresponding branches of the members 107, so that by turning the screws, the ends of the receptacle 85 may be adjusted vertically and independently of each other. A spirit level 111 is secured to the receptacle 85 just inside the rear wall thereof where it is protected and yet easily observed when the carrier 95 is swung from above the same. This spirit level enables the person adjusting the receptacle to determine when it is perfectly horizontal from end to end. A similar spirit level 112 is carried by the rear end of an arm 113 that is pivoted at its forward end on a headed pin 114 that projects from the side of the drum 45 of the combustion apparatus. The rear end of this arm is connected by a link 115 to the adjacent end of the receptacle 85, as shown in full lines in Figs. 2 and 5 and in dotted lines in Fig. 1. The connection of the lower end of the link 115 with the receptacle is effected through an angle member 116. The right hand rear corner post 3 is slotted for the passage of the arm 113, and the forward end of said arm has a keyhole slot 117 that is adapted to be buttoned over the head of the pin 114 when the arm is projected forwardly through the slot in the corner post and far enough to bring the enlarged end of the keyhole slot into register with the head of the pin. After the connection is effected the arm is drawn rearwardly to dispose the shank of pin 114 within the restricted end of the keyhole slot, and said shank is confined therein by a keeper 118 that is pivoted to the arm so as to swing down and engage its inclined forward end with the pin. By virtue of these connections between the combustion apparatus and the fuel supply receptacle 85 and the incorporation therein of the spirit level 112, the person adjusting the receptacle may readily determine when the same bears the required definite relation to the burner bowl. After the receptacle is properly positioned through the manipulation of the screws 110, it may be secured in such position by tightening the screws that form a part of the previously mentioned connections 106.

To set the apparatus in operation the metering valve 87 is opened to allow oil to flow from the receptacle 85 through the conduit 86 and accumulate within the sump or basin 58 of the burner bowl 52 to the level established within the receptacle 85 in the manner above described. The plug 64 is then removed and the oil within the burner bowl ignited as by inserting a piece of burning paper or the like through the neck 63. The plug 64 is then replaced and combustion proceeds, the products passing up through the combustion chamber 50 and out through the flue connection 69. Combustion air passes in through the duct 68, and that promoting primary combustion enters through the perforations 57 and through the perforations in the top of the sleeve 60, while secondary air enters through the angular slot between the top wall of the burner bowl and the ring like member 54. It is understood that, as the parts become heated, oil vapors are generated within the burner bowl and while combustion originates therein it continues in major proportions in the combustion chamber 50. Variations in the draft of the flue are automatically compensated for by the regulator 70 so as to maintain a more uniform draft through the combustion chamber.

After lighting the burner the switch 30 is closed to set in operation the electric motor 25 thereby to spin the fans 23 of the blowers 22. The blowers draw fresh air in through the openings 10 and 7a and impel it into the compartment 35 creating some static pressure therein, the value of which depends upon the volume of air that is moved by the blowers and this, in turn, may be altered by changing the speed of the motor through the control 26 that is caused to transmit more or less current by the adjustment of the switch 30. The air rising through the compartment 35 about the combustion device becomes highly heated and is exhausted through the openings at the top of the casing and is deflected downwardly by the louvers 6 and 8. A certain amount of heat will also be radiated from the walls of the casing. Not only is the volume of air issuing from the louvered openings of the heater enlarged and projected further into the room when the speed of the blowers is increased, but a higher static pressure is created within the compartment 35 which results in more air being forced through the combustion apparatus, accelerating combustion and naturally increasing the heat given off by the apparatus.

The effectiveness of the heater is enhanced by the fact that the air inlets are below the plane of the hot air exhaust openings. By drawing in the fresh air from adjacent the floor, the outgoing warm air, tending to replace the ingoing air is held down where it will do the greatest amount of good.

When it is desired to utilize some of the output of the heater for heating parts quite remote from

the apparatus, the top 15ª that is shown in Fig. 5 is substituted for the style of top designated 15. The top 15ª has a large opening that is surrounded by a depending flange that gives stiffness to the top so as to reduce liability of the top being sprung and the enamel coating thereof cracked. Supported across the opening of the top is a plate 120, the same being shown as flanged at its edges and secured to the depending flange of the top by bolts 121. The plate 120 is preferably not enamel coated and one or more openings may be made therein depending upon the number of conduits that are to be utilized. In Fig. 5 the plate is shown as having an opening through which the end of a conduit 122 is engaged, said conduit extending to the remote place that is to be heated. To insure a proper amount of heated air passing through the conduit, the area of the louvered exhaust openings of the casing is reduced as by applying one or more plates 123 to the inner sides of the louvers. In Fig. 5, one such plate is shown, the same being broken away at its left hand end to reveal the louvers 8 beyond. A plate may be applied to any one or more of the openings, according to the requirements of the particular case, and it may be held in place in any suitable manner, as by friction resulting from forcing it slightly under tension between the opposed sides of the structure. Even when the top 15 is used, it is sometimes desirable to block off some of the area of the exhaust openings of the casing by one or more plates 123, as when the heater is located in a corner of a room and it is necessary to protect the adjacent wall from the more intense heat that is projected through the openings of the casing. In such a case, a plate 123 will be applied to the opening next to said wall.

Having thus described our invention, what we claim is:

1. A room heater comprising a rectangular casing having outlet openings adjacent its top that open directly into the surrounding atmosphere, a partition dividing the interior of the casing into an air inlet duct and a hot air compartment, the partition having an opening adjacent the bottom of the casing through which the duct and compartment communicate, the casing having air inlets that open into the duct from the surrounding atmosphere, a combustion apparatus situated entirely within the hot air compartment having its sole inlet for combustion air opening into said compartment at a point remote, and shielded, from the opening in the partition, and means for creating a forced draft of air inwardly through the duct.

2. A room heater comprising a rectangular casing having outlet openings adjacent its top along its front and sides that open directly into the surrounding atmosphere, a partition dividing the interior of the casing into an air inlet duct and a hot air compartment, the partition having an opening through which the duct and compartment communicate adjacent the bottom of the casing, the casing having air inlets that open into the duct from the surrounding atmosphere, a combustion apparatus situated entirely within the hot air compartment having an inlet for combustion air that opens into said compartment adjacent the bottom thereof and remote from said opening in the partition, means for creating a forced draft of air inwardly through the duct, and air deflecting means serving to direct the major portion of the incoming air toward the top of the compartment.

3. A heater of the class described comprising a rectangular casing, a partition dividing the interior of the casing into an air inlet duct and a hot air compartment, the partition having laterally spaced openings through which the lower ends of the duct and compartment communicate; a blower associated with each opening comprising a housing having axial intakes at its opposite ends and an outlet registering with said opening, an electric motor supported between the blowers and on the ends of whose armature shaft the fans of said blowers are mounted, the casing having air outlet openings adjacent its top through which hot air is exhausted from the compartment and inlet openings that lead into the aforesaid duct, certain of the inlet openings being in the sides of the casing adjacent intakes of the blowers while another of the air inlet openings is situated in the back of the casing, the air entering through the latter opening being entrained about the motor for maintaining the latter cool, and a heating unit within the hot air compartment.

4. A heater of the class described comprising a casing that is made up of a rectangular base frame, posts rising from the corners thereof, front, rear and side panels extending upwardly from the base between the posts, there being lowered openings adjacent the upper ends of the front and side panels, a top surmounting the structure composed of the aforesaid posts and panels, the side panels having louvered openings adjacent their lower rear corners, and the back panel having a louvered opening intermediate its top and bottom, a partition extending inwardly from above the opening in the rear panel and downwardly and forwardly in front of the openings in the lower rear corners of the side panels, said partition extending from one side panel to the other and separating the interior of the casing into an inlet air duct and a hot air compartment, a heating apparatus within said compartment, the partition having an opening adjacent its lower end through which the inlet duct and the hot air compartment communicate, and air impelling mechanism housed within the inlet duct.

5. A heater of the class described comprising a casing that is made up of a rectangular base, posts rising from the corners thereof, front, rear and side panels extending upwardly from the base between the posts, certain of said panels stopping short of the upper ends of the posts, louvers disposed across the space between the posts above said certain of the panels, a top surmounting the structure composed of the aforesaid posts and panels, a partition rising from the base and dividing the interior of the casing into an inlet air duct and a hot air compartment, certain of the panels having openings that lead into the inlet duct, the partition having an opening through which the duct and compartment communicate, a heating apparatus in said compartment, and air impelling mechanism housed within the inlet duct.

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