UNITED STATES PATENT OFFICE

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OIL-BURNING HEATER

Otto C. Griewank, La Porte, Ind.

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7 Claims. (Cl. 126—93)

1 This invention relates to improvements in oil burning heaters.

The primary object of this invention is to provide a simple, economical, trouble-free and inexpensive device of this character.

A further object is to provide a device of this character which operates at a very high degree of efficiency.

A further object is to provide a device of this character wherein the formation of carbon residue from the burning of oil is much lower than in conventional oil burning heaters.

A further object is to provide a device of this character which is constructed to produce turbulence in the combustion zone for the purpose of improving the efficiency of combustion.

A further object is to provide a device of this character with a fuel distributor and vaporizer at its fuel intake which is constructed and arranged relative to the fuel inlet to insure against clogging of the inlet by the carbon residue of combustion.

A further object is to provide a device which distributes fuel both upwardly by convection and laterally outwardly for a substantial distance at a low level by radiation.

Other objects will be apparent from the description.

Fig. 1 is a vertical sectional view of the device. Fig. 2 is an enlarged fragmentary detail sectional view.

Fig. 3 is a transverse sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 1.

Fig. 5 is a transverse sectional view taken on line 5—5 of Fig. 1.

Fig. 6 is a perspective detail view of the distributor ring.

Referring to the drawing, which illustrates one embodiment of the invention, the numeral 10 designates a cylindrical housing member open at its lower end and having an access opening 11 adjacent its lower end adapted to be closed by a door 12 which is hinged or otherwise suitably mounted. A bottom panel 13 spans the bottom open end of cylindrical housing 10 and has an upturned marginal flange 14 which fits around housing 10 and is circumferentially stepped at 15 to support the bottom edge of said housing. Panel 13 has a central opening defined by an upturned collar or sleeve 16. A pair of concentric downwardly off-set dished portions are formed in panel 13, the larger dished portion 17 preferably being of a diameter approximately one-half of the diameter of the housing 10 and being circumferentially stepped at 18 at its margin, and the inner dished portion 19 being of a diameter approximately one-third of the diameter of housing 10.

The housing is supported upon a base comprising a base panel 20, a marginal upturned flange 21 of approximately the same diameter as housing 10 which engages the bottom panel 13 at stepped portion 15, and a plurality of supporting legs 22. Base panel 20 has a central opening therein defined by an upturned sleeve 23 having a snug fit at its upper end within the sleeve 16 of panel 13.

An elongated tube 24 fits snugly at its lower end around the sleeve 16 of base panel 13, whereby it extends vertically in communication with the opening in the bottom of the device. Tube 24 is provided with a plurality of small uniformly spaced apertures 25 throughout substantially its full extent. A head is mounted on the upper end of tube 24 and comprises an apertured cup-shaped concentric part 26 and an imperforate cover plate 27. Part 25 has a plurality of circumferential series of uniformly spaced small apertures 28 therein adjacent its outer periphery.

For best results, the apertures 28 are formed at and adjacent that portion of part 25 at which the substantially cylindrical marginal flange 29 thereof merges with the laterally extending portion, so that said apertures face downwardly and outwardly from said head. The head is of a diameter substantially one-half that of housing 10.

A cylindrical sleeve member 30 encircles the lower end of tube 24, having a diameter to fit snugly at the stepped portion 18 of bottom panel 13. Member 30 is of a length slightly less than one-half of the length of tube 24. An annular plate 31 fits on the upper end of member 30 and cooperates therewith to define an inverted cup-shaped member, the opening 32 in said plate being of a diameter slightly greater than tube 24 to provide a restricted annular opening between said tube and plate.

An annular distributor ring 33 fits in the central off-set 19 of bottom panel 13. As here illustrated, the ring is of curved shape in cross section. It fits around tube 24 with only a slight annular clearance 33' in the order of one-eighth of an inch. An oil feed line 34, provided with a suitable control valve (not shown), extends substantially horizontally into the off-set 19 and terminates therein spaced from tube 24. Ring 33 is cut away at 35 to fit around said oil line. Also, the lower outer margin is preferably provided
with a plurality of spaced slots or notches 36 to permit passage of fuel oil therethrough.

An annular smoke passage defined by an annular base 37 against an inner cylindrical wall 38, the housing 10 and the housing cover 39, is provided at the upper end of housing 10. The base 37 has an opening 40 therein for entry of the products of combustion into said passage. The vertical radial partition 41 is provided along sides of said opening. The housing has an opening defined by flange 42 adjacent to opening 40 but separated therefrom by partition 41. A smoke pipe 43 fits around flange 42 and communicates with the interior of the annular smoke passage.

It will be observed that three concentric spaces or zones, each having a restricted outlet, are provided in the device. One of these is defined by the sleeve 30 and annular plate 31 and serves as a starting and vaporizing zone. The second is defined by the sleeve 30 and annular plate 31 and serves as a low fire zone. The third or high fire zone is defined by housing 10 and head 26, 27.

To start the burner, oil is fed at a low rate through line 34 into the cup-shaped depression 19. The oil is permitted to flow through the distributor ring slots 35 into the portion of depression 19 exteriorly of the distributor ring. Consequently, combustion can be initiated by dropping a burning match or brand through the opening 32 of plate 31. As the oil burns in depression 19 it heats the distributor ring until the latter reaches a temperature adequate to vaporize the oil within the ring. This vapor is uniformly discharged through the central opening in the distributor ring around the tube 24 into the intermediate combustion zone. It is important to note that initial combustion, which is relatively inefficient and characterized by carbon formation, occurs exteriorly of the distributor ring 33. Consequently, the carbon resulting from incomplete and inefficient combustion is deposited exteriorly of ring 33 and cannot clog the oil line 34 which terminates within said ring.

Air entering the device through the opening 16 in panel 13 and 23 in base 20 and the tube 24 is discharged from tube 24 through apertures 25 and supports combustion of the vaporized fuel. At a low rate of fuel supply, combustion will occur at 26 and immediately above the distributor ring. Combustion is characterized by outwardly directed tongues of flame at each of the apertures 25 within the zone of combustion, that is, at all radii of the device within a limited vertical dimension or section of tube 24. As the rate of fuel supply is increased step-by-step, the amount of fuel vapor increases proportionately. Also, the combustion occurs at a higher elevation in the device. When the upper range of the rate of fuel supply is approached, the restriction of the outlet opening 32 of the intermediate combustion zone automatically causes combustion to occur in the upper zone, i.e., above plate 31. Combustion will then occur both at the apertures 25 of tube 24 and at the apertures 28 of heads 26, 27. However, since the discharge of air from apertures 28 is downwardly and outwardly, turbulence results. This produces a high efficiency of combustion, characterized by a very low rate of formation of soot and carbon residue, because the fuel vapors are subjected to two sources of air and this factor, coupled with the turbulence which effectively mixes the vapors and air, produces substantially complete combustion.

Stated differently, all products of combustion must pass around the head 26, 27 for discharge to the smoke passage, and hence are subjected directly to the secondary air discharged through apertures 28 for completion of combustion if the supply of air from apertures 25 has not been adequate for that purpose.

Another advantage of the device is that the head 26, 27 serves to direct the products of combustion radially outwardly to heat the vertical housing 10 adjacent its bottom. Hence, though the device operates on the convection principle, it is also a radiant heater of outstanding properties and efficiency. This radiant heating effect is enhanced at its low rate of combustion by the intermediate combustion zone. In other words, when combustion occurs within sleeve 30 at a low rate of fuel feed as described above, the restriction at 32 to the products of combustion serves to heat the sleeve 30 and its cover 31 and thereby facilitate radiant distribution of heat.

Temperature readings taken at different levels of housing 10 at different rates of fuel supply, disclose that, at low rates of fuel supply, the lower portion of the housing is hotter than the upper portion. As the rate of fuel supply increases, the temperatures at different levels increase and tend to equalize. At the highest rate of fuel supply, the upper portion of the housing 10 becomes slightly hotter than the lowest portion thereof. As a result of this and possibly other factors, heat is distributed by the device in a wide area around the device. Of greater importance, however, is the fact that the heat is distributed at a low level. Thus, when the device is operating at and above its intermediate rate of fuel supply, a person standing as far as twelve or fifteen feet from the device experiences a heating effect at an ankle level and above. To the best of my information, such results of low level heat distribution have never been achieved with space heaters heretofore.

When the parts are properly proportioned, substantially as illustrated and described, the device will operate efficiently on natural draft at a low fuel feed or low-fire setting. Also, the fuel burns with a yellow flame which is characteristic of maximum combustion efficiency.

The ratio of the areas of the discharge passages 32 to 35, 25, and between head 27 and housing 10 to the volume of the combustion chamber and vaporizing zones, i.e., within chamber 33, within chamber 30, 31, and between head 27, respectively, should be approximately equal for best results in achieving good combustion and radiant heat distribution.

I claim:

1. An oil burning heater comprising a vertical housing having top, side and bottom walls, with a central air-intake opening through its bottom wall and a smoke outlet, a vertical apertured tube in said housing communicating with said intake opening and closed at its top, a centrally apertured inverted cup-shaped distributor ring resting on the bottom of the housing encircling the bottom portion of said tube to define an annular vaporizing space having a restricted annular outlet between said ring and said tube, the lower marginal portion of said distributor ring being notched, and means for discharging oil into said vaporizing space.

2. An oil burning heater comprising a vertical housing, including a base having a central air intake opening and a concentric dished portion around said opening, a vertical apertured tube in said housing communicating with said intake opening and closed at its top, an annular in-
2,499,308

5 verted disdished distributing member fitting in said disched portion to define an annular vaporizing space having a restricted annular outlet between said ring and tube, and means for discharging oil into said vaporizing space from said distributing member being of radially curved shape with its inner periphery of slightly larger diameter than said tube and its outer periphery notched to accommodate flow of oil outwardly thereof into said disched portion.

3. An oil burning heater comprising a vertical housing having a bottom provided with a central opening and a concentric annular dished portion around said opening, a vertical tube in said housing communicating with said opening and having a multiplicity of apertures therein throughout substantially its full extent, an enlarged hollow head mounted on and communicating with the upper end of said tube and positioned within and cooperating with said housing to define a restricted annular discharge passage for a combustion space within said housings and around said tube, a dome-like distributor ring fitting in said dished portion to define a vaporizing space having a restricted discharge passage around and partly defined by said tube and a discharge opening in its lower marginal portion, said head having downwardly and outwardly facing apertures uniformly spaced around its lower outer portion.

4. An oil burning heater comprising a vertical housing having a base with a central opening and a concentric annular dished portion around said opening, a vertical apertured tube in said housing communicating with said opening, an enlarged head within said housing mounted on and closing the top of said tube and cooperating with said housing to define a restricted annular discharge passage for a combustion zone in said housing around said tube and below the level of said head, a sleeve member mounted on said base coaxial with said tube to define a second smaller combustion zone around the lower end portion of said tube, said sleeve member having a clearance with said tube providing a restricted outlet, means for supplying oil to said disched portion, and a ring cooperating with said dished portion and said tube to form a vaporizing chamber within and at the bottom of said second combustion zone having a restricted annular discharge passage between said tube and said ring.

5. An oil burning space heater comprising a vertical housing having a base with a central opening and a concentric annular dished portion around said opening, a vertical apertured tube in said housing communicating with said opening, an enlarged head within said housing mounted on and closing the top of said tube and cooperating with said housing to define a restricted annular discharge passage for the space in said housing below the level of said head and around said tube which constitutes a combustion zone, a sleeve member mounted on said base coaxial with said tube to define a second smaller combustion zone around the lower end of said tube, said sleeve member having a clearance with said tube providing a restricted outlet, means for supplying oil to said disched portion, a distributor ring fitting in said disched portion and within said sleeve member, said head having openings for uniformly discharging air around said head in a downward outward direction.

6. An oil burning space heater comprising a vertical housing having a central air intake opening at its bottom, a vertical apertured tube in said housing communicating with said opening and having an enlarged head positioned within and cooperating with said housing to define a combustion zone around said tube and a restricted annular outlet from said zone, means within said zone defining a second smaller combustion zone around the lower end portion of said tube having a restricted annular discharge passage around said tube, means for feeding oil onto the bottom of said housing adjacent said tube, and an inverted dished distributor ring mounted on the bottom of the housing in said second zone in which said oil is vaporized, said ring distributing the vapor uniformly around said tube and discharging the vapor through an annular passage between the tube and the ring.

7. An oil burning space heater comprising a vertical housing having a central air intake opening at its bottom, a vertical apertured tube in said housing communicating with said opening and having an enlarged head positioned within and cooperating with said housing to define a combustion zone around said tube and a restricted annular outlet from said zone, said head having an annular series of openings in its lower outer portion, means within said zone and below said head defining a second smaller combustion zone around the lower end portion of said tube having a restricted annular discharge passage around and partly defined by said tube, a dome-like distributing ring bearing on the bottom of the housing within said second zone and encircling said tube with a small clearance to define a vaporizing chamber around the base of said tube and a restricted annular discharge passage between said ring and said tube, and means for feeding oil into said distributor ring adjacent said tube.

OTTO C. GRIEWANK.

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