Aug. 30, 1949. O. C. GRIEWANK 2,480,728

OIL BURNING HEATER

Filed April 4, 1945

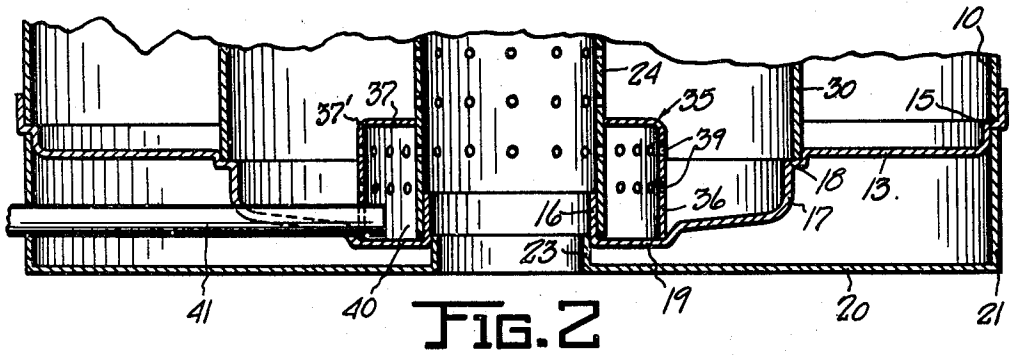


FIG. 2

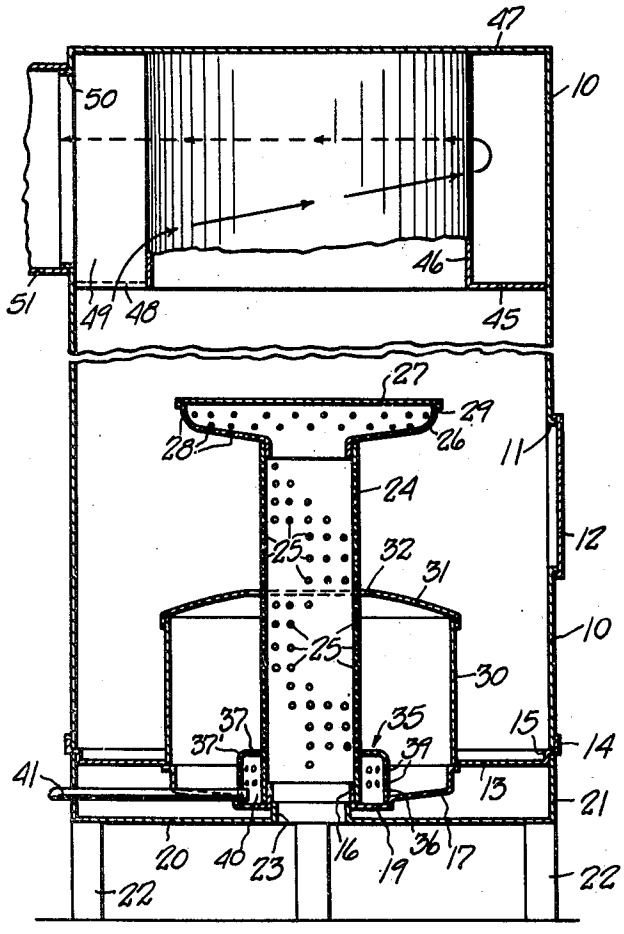


FIG. 1

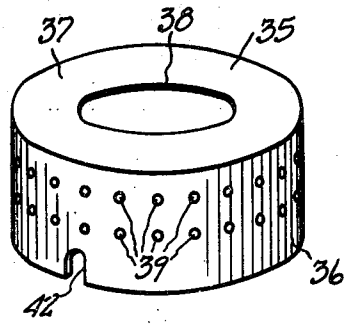


FIG. 3

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OIL-BURNING HEATER

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4 Claims. (Cl. 158—91)

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This invention relates to oil burning heaters, such as space heaters. It may also be used in other heating apparatus.

The invention relates particularly to that type of heater illustrated in my copending patent application, Serial No. 566,516, filed December 4, 1944, which is characterized by an elongated apertured vertical air supply tube terminating in an enlarged head having downwardly and outwardly directed apertures, by a reduced combustion chamber surrounding the lower portion of the tube and having a restricted annular outlet space around the tube, and by a distributor ring surrounding the base of the tube within the reduced combustion chamber and defining an annular space into which fuel oil is fed for combustion. This device operates efficiently and effectively under ordinary conditions and possesses many advantages. However, best operating results for this device depend upon the use of a standard grade of fuel oil. If a sub-standard oil, such as an oil characterized by a low B. t. u. value, is used there is a possibilty that combustion will not be uniform around the tube, particularly at idling or low fire settings. It is the primary object of this invention to overcome this condition and to insure free burning operation, uniform combustion and improved efficiency at all setting or rates of fuel feed.

I have found that this condition can be overcome by providing an annular mixing or vaporizing chamber in place of the distributor ring, to which chamber both fuel and air are admitted, the air being permitted to pass radially through the annular mixing chamber to vaporize the fuel uniformly, and the chamber having provision for uniform radial discharge of the expanded vaporized fuel into the reduced combustion chamber.

Other objects will be apparent from the following specification.

In the drawing:

Fig. 1 is a vertical sectional view of the device.

Fig. 2 is an enlarged fragmentary detail sectional view.

Fig. 3 is a perspective view of the ring which, in part, defines the new mixing chamber.

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 hingedly 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

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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 slightly greater than 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 and 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 26 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 26 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 member 30 encircles the lower nd of tube 24, and has a diameter to fit snugly at the stepped portion 18 of bottom panel 13. Member 30 is of a length less than one-half of the length of tube 24. An annular plate 31 fits on the upper end of member 30, 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 inverted cup-shaped annular distributing member 35 fits in the central off-set 19 of bottom panel 13. As here illustrated, member 35 comprises a cylindrical portion 36 and an annular top portion 37. The diameter of the cen-

tral opening 38 in top portion 37 is such that it has a snug slip fit around tube 24. While it is not necessary to provide a sealed fit between the tube 24 and top 37, it is desirable to avoid any substantial clearance between these parts. Cylindrical portion 36 is of a length or height to extend above at least the lowermost annular row of apertures 25 in tube 24, and the top 37 also extends and is positioned above the lowermost apertures 25. A plurality of small apertures 39 are arranged uniformly throughout cylindrical portion 36. As here illustrated, apertures 39 are arranged in two circumferential rows. The number of openings 39 is sufficient to compensate for expansion incident to mixing and vaporizing of the fuel within the annular chamber 40, defined by member 35, so that there will not be any restriction to radial discharge of the vaporized fuel from chamber 40. An oil feed line 41 provided with a suitable control valve (not shown) extends substantially horizontally through the off-set 19 and terminates spaced from tube 24. Cylindrical portion 36 of member 35 is cut away at 42 to fit around said oil line.

An annular smoke passage defined by an annular base 45, an inner cylindrical wall 46, the housing 10 and the housing cover 47, is provided at the upper end of housing 10. The base 45 has an opening 48 therein for entry of the products of combustion into said passage, and a vertical radial partition 49 is provided alongside of said opening. The housing has an opening defined by flange 50 adjacent to opening 48 but separated therefrom by partition 49. A smoke pipe 51 fits around flange 50 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 member 35 and serves as a mixing 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.

In the operation of the burner, assuming a low setting of the control valve, the oil is vaporized by the uniform radial outward flow of air from the lowermost apertures 25 of tube 24, to and through the apertures 39. As the oil is vaporized it expands, and this expansion is substantially compensated for by the large number of apertures 39 compared to the number of air intake apertures 25 which communicate with chamber 40. The vaporizing action results in an increase in pressure. This pressure increase at any localized point or points at which vaporization occurs in chamber 40 results in a uniform distribution of the vapor within the chamber 40 by reason of the physical law of equalization of pressure of fluids. Consequently, the vapor or gas discharge is uniform around the circumference of member 35, even though vaporization is localized within chamber 40.

The advantage of this uniform distribution of the vaporized fuel is that combustion is likewise uniform around the member 35, rather than being localized at one or more limited points. In this connection, operation of a burner at low fire or idling setting is one of the critical points in determining burner efficiency. The heat generated is low and hence adequate vaporization may not occur so that incomplete combustion and rapid formation of carbon products caused by incomplete combustion may result. In this device, because of the combination of the pressure equalization feature, which distributes the vaporized fuel circumferentially within the chamber 40, and the uniform radial outward passage of air through chamber 40, which causes entrainment of the vaporized fuel so distributed, the fuel and air are mixed effectively and combustion properties are greatly improved. Consequently, uniform flame conditions obtain at idling setting circumferentially around member 35, and the formation of carbonaceous residual products of incomplete combustion at this idling setting is reduced to a minimum.

In starting the burner, fuel discharged onto the depression 19 flows thereover. During this flow some of the oil passes to the outer margin of depression 19 and exteriorly of member 35, as through the cut-away 42. Consequently, combustion can be initiated by dropping a burning match or brand through the opening 32 of plate 31 so that it will cause the oil outside of member 35 to ignite. In this connection, it will be noted that the member 35 is so shaped that cylinder wall 36 and top 37 merge in a portion 37' of curved cross section and fairly large radius. It will be observed that the combustion of the oil in starting occurs exteriorly of the member 35, so that the formation of carbonaceous by-products of incomplete combustion cannot clog either of the two sets of air supply apertures, i. e. apertures 25 in tube 24 or apertures 39 in member 35.

At idling and low intermediate settings of the fuel supply of the device, combustion occurs within the member 30. This combustion at idling setting is characterized by tongues of flame at each of the apertures 39 of member 35. As the setting is changed for increased oil flow, the elevation at which combustion occurs progressively increases, and occurs uniformly around tube 24 above member 35. Likewise, the size of the flame increases proportionally.

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 head 26, 27. However, since the discharge of air from apertures 28 is downwardly and outwardly, a 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 increases the effectiveness of the mixture of the vapors and air, and 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.

Observation and examination of the instant device, as compared to the device disclosed in my copending application, Ser. No. 566,516, discloses that combustion at the intermediate and higher rates of feed, occurring within member 30, and above the plate 31, respectively, is improved. Freer and better combustion, characterized by a bushy flame or large flame size, by greater uniformity, and by increased efficiency, results from the instant construction.

I claim:

1. An oil burning heater comprising a housing having side wall and a bottom provided with a central opening and an annular dished portion around said opening, a vertical apertured tube communicating with said opening, a hollow apertured head mounted on and communicating with said tube, said head being of greater cross-sectional dimension than said tube to define a restricted annular space in said housing, an imperforate cylindrical member mounted on said bottom coaxially of said tube and between said tube and side walls, a centrally apertured top carried by said cylindrical member spaced below said head and having a clearance with said tube an annular distributing member within said cylindrical member fitting in said dished portion and around the lower apertured portion of said tube to define a vaporizing chamber, said member including a circumferentially apertured substantially cylindrical portion and an annular inwardly extending top portion fitting snugly around said tube, the major portion of said tube projecting above said distributing member, and means for supplying fuel oil to said vaporizing chamber.

2. An oil burning heater comprising a housing having side walls and a base with a central opening and a concentric annular dished portion, a vertical apertured tube communicating with said opening, a transversely enlarged apertured head mounted on and closing the top of said tube to define with said side walls a restricted annular discharge passage from a combustion zone around said tube, an imperforate annular member mounted on said base coaxially with said tube to define a second and smaller combustion zone around the lower end of said tube, said member having a clearance with said tube providing a restricted outlet, an annular apertured member fitting around said tube and supported by said dished portion to define a vaporizing space with which the lowermost tube apertures communicate, and means for supplying oil to said dished portion.

3. An oil burning space heater comprising a housing having side walls and a base with a central opening, a vertical apertured tube communicating with said opening, an apertured head of enlarged diameter mounted on and closing the top of said tube to define with said side walls a restricted annular discharge passage from a combustion zone around said tube, an imperforate annular member mounted on said base coaxially with said tube to define a second and smaller combustion zone around the lower end of said tube, said annular member having a clearance with said tube providing a restricted outlet, a small apertured annular member encircling the base of said tube to define a vaporizing chamber communicating with said tube, and means for supplying oil to said vaporizing chamber.

4. An oil burning space heater comprising a housing having side walls and a bottom provided with a central air intake opening, a vertical tube communicating with said opening and having a plurality of longitudinal series of circumferentially arranged apertures, an enlarged head mounted on said tube and cooperating with said side walls to define a combustion zone around said tube having a restricted annular outlet around said head, means within said zone defining a second smaller combustion zone around the lower end of said tube having a restricted annular discharge passage around said tube, means for feeding oil into said second zone adjacent said tube, and an inverted apertured cup-shaped member fitting snugly around the base of said tube and in communication with at least the lowermost series of tube apertures for vaporizing said oil and distributing said vapor uniformly around said tube.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
473,858	Stacey	Apr. 26, 1892
1,452,563	Lewis	Apr. 24, 1923
1,840,137	Sturgis	Jan. 5, 1932
1,944,593	Chadwick et al.	Jan. 23, 1934
2,039,591	Gilmore et al.	May 5, 1936
2,091,658	Sturgis	Aug. 31, 1937
2,128,155	McPherson	Aug. 23, 1938
2,136,317	Rialdini	Nov. 8, 1938
2,184,653	Sherrick et al.	Dec. 26, 1939
2,184,967	Winter	Dec. 26, 1939
2,257,834	Behee	Oct. 7, 1941
2,262,922	Castle et al.	Nov. 18, 1941
2,263,737	Miller et al.	Nov. 25, 1941
2,357,587	Hammell	Sept. 5, 1944
2,375,347	Castle et al.	May 8, 1945