

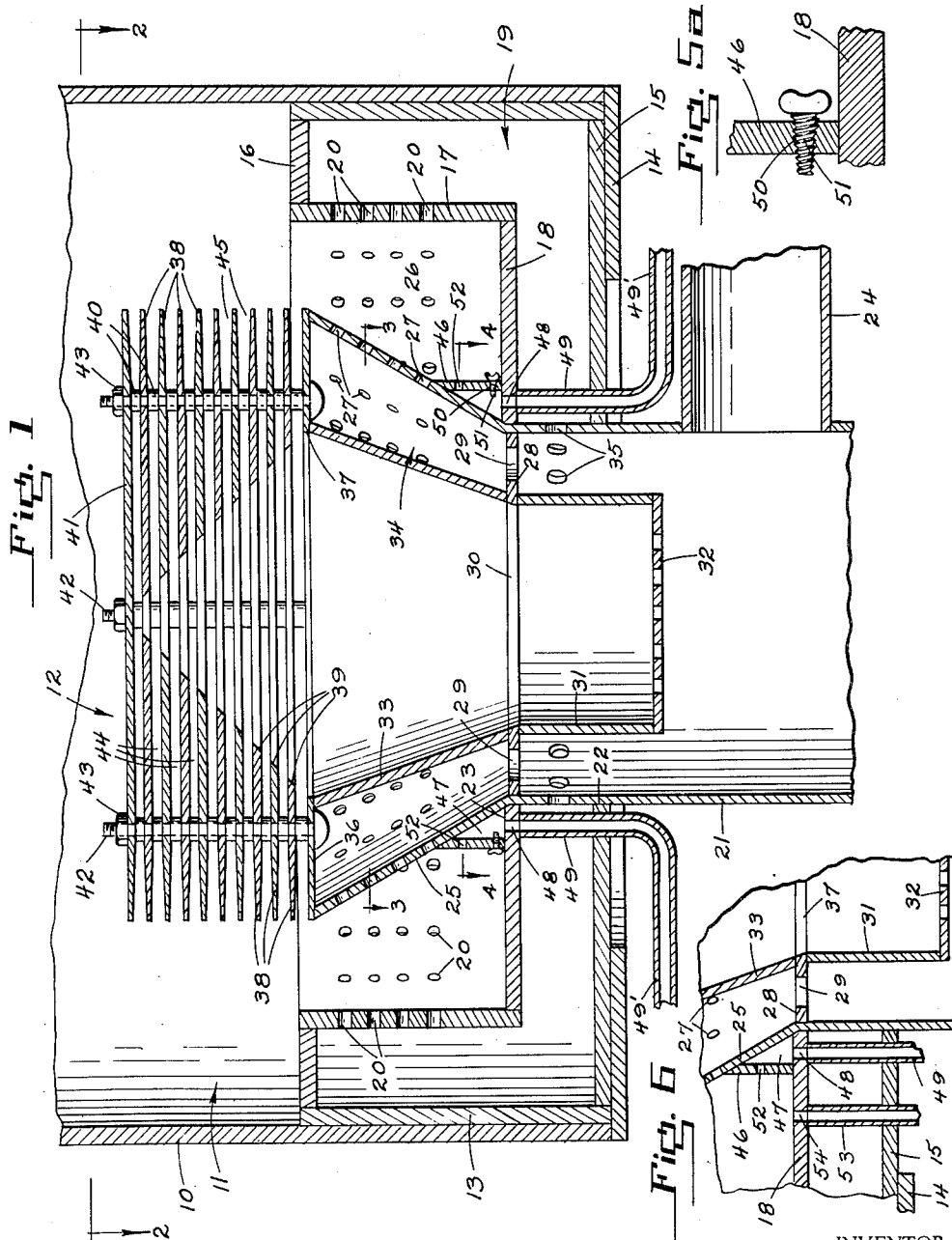
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PAN TYPE OIL BURNER

2,658,568

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2 Sheets-Sheet 1



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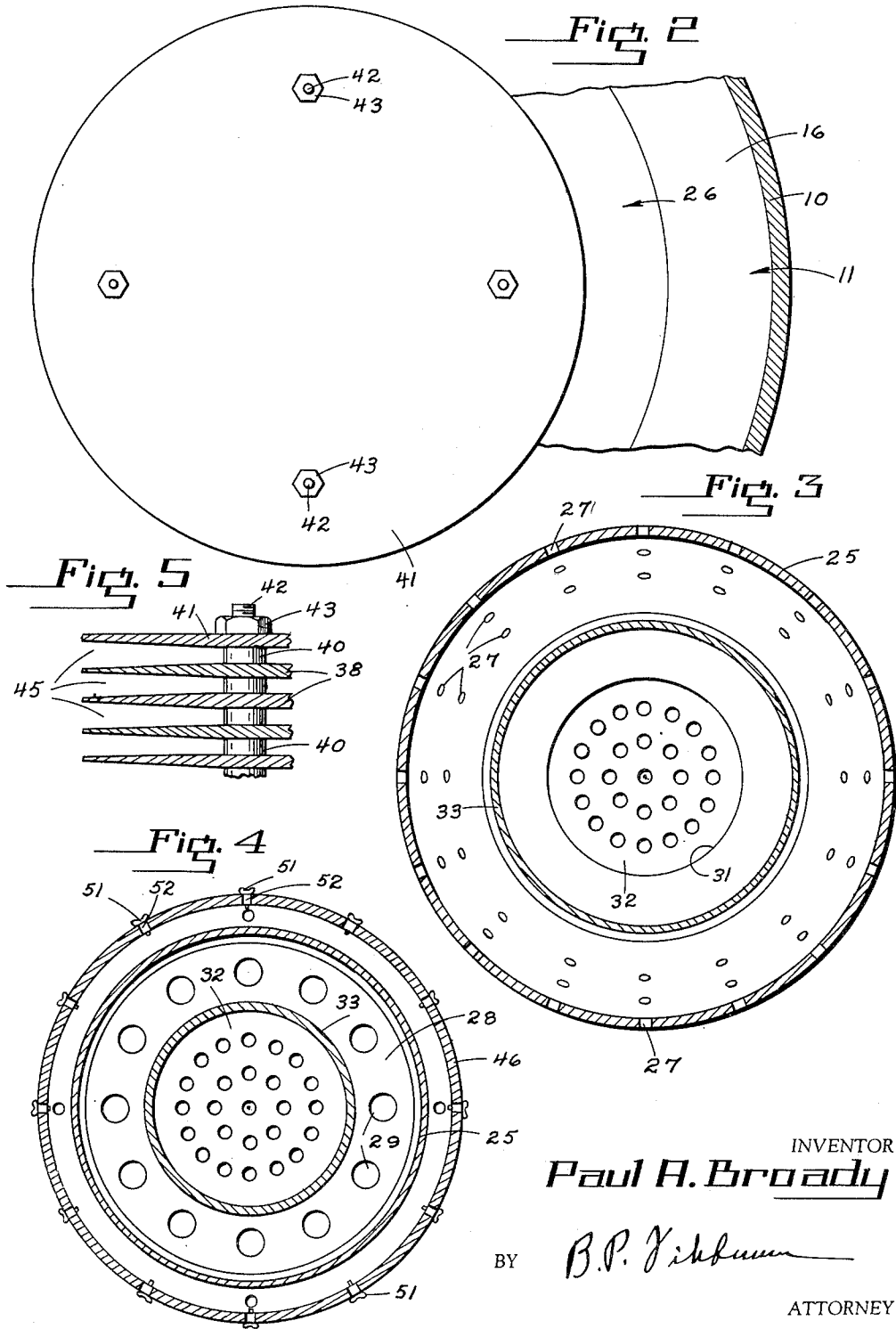
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PAN TYPE OIL BURNER

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2 Claims. (Cl. 158—91)

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My invention relates to improvements in liquid fuel burners.

An important object of the invention is to provide a pan type oil burner having an open oil pan surrounding a substantially closed vaporizing chamber, and novel air diffusing means for directing the air laterally outwardly in layers above the oil pan and vaporizing chamber.

A further object of the invention is to provide a pan type oil burner which is well adapted to serve as a conversion or replacement unit in existing stoves or furnaces, and which may be manufactured cheaply in sizes to fit substantially any heating requirement.

A further object is to provide a pan type oil burner which is highly simplified in construction, compact and extremely sturdy and durable.

A further object is to provide an oil burner having novel oil feed and vaporizing means which coact with novel combustion air distributing means to form a burner which is highly efficient, and reliable in operation.

A still further object is to provide an oil burner of the above-mentioned character which is not likely to accumulate heavy carbon deposits upon the vital parts of the burner, and which is very easy to adjust and clean.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a central vertical longitudinal section through a liquid fuel burner embodying my invention,

Figure 2 is a horizontal transverse section taken on line 2—2 of Figure 1, part broken away,

Figure 3 is a similar section taken on line 3—3 of Figure 1,

Figure 4 is a similar section taken on line 4—4 of Figure 1,

Figure 5 is an enlarged fragmentary radial section through air diffusing plates, and associated elements,

Figure 5a is a similar section showing a tapered metering screw and associated elements, and,

Figure 6 is a fragmentary radial section through a liquid fuel burner showing separate oil supply lines for the oil pan and vaporizing chamber.

In the drawings, where for the purpose of illustration are shown preferred embodiments of the invention, attention is directed first to Figures 1 to 5a inclusive, wherein the numeral 10 designates a cylindrical furnace casing or side wall. My

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burner proper is designated generally by the numeral 12, and the burner is centrally located within the furnace, as shown. A main annular combustion space 11 is provided between the furnace side wall 10 and the periphery of the burner 12.

The burner 12 comprises an outer cylindrical vertical sleeve 13, mounted within the lower end of the casing 10 and preferably substantially contacting the same. The sleeve 13 rests upon a bottom annular horizontal flange 14, rigidly secured to the lower end of the cylindrical casing 10. A lower flat circular plate 15 rests upon the flange 14, and is preferably welded or otherwise rigidly secured to the lower end of the sleeve 13. A narrow annular horizontal plate 16 is spaced above the lower plate 15, and rigidly secured by welding or the like to the upper end of the sleeve 13. An inner cylindrical vertical sleeve 17 has its upper end rigidly secured to the annular plate 16, and its lower end rigidly secured to a flat horizontal circular plate 18, concentric with the plate 15 and spaced above the same. The sleeves 13 and 17 and the plates 15, 16 and 18 form an annular air jacket or passage 19, which is L-shaped in radial cross section, and arranged adjacent to the lower end of the furnace casing 10. The plate 18 and inner sleeve 17 form an annular oil pan inwardly of the air passage 19. The sleeve 17 is provided with circumferential rows of air openings 20, and the lowermost row of openings is spaced above the plate 18 a substantial distance.

A large central vertical cylindrical air duct 21 extends through concentric openings 22 and 23 formed in the plates 15 and 18, and the air duct is rigidly anchored in these openings. A lateral branch duct 24 leads into the vertical duct 21 below the flange 14, and may be connected with a blower or fan, not shown, for creating a forced draft through the burner. The vertical duct 21 is adapted to supply a natural updraft of air to the burner to support combustion, and when a natural draft is used, the blower is not used. The upper end of the duct 21 terminates at the plate 18, and an upwardly flared conical plate or baffle 25 has its lower end rigidly secured to the upper end of the duct 21 by welding or the like. The upper end of the conical baffle 25 terminates near the elevation of the plate 16 and is spaced radially inwardly of the sleeve 17, as shown. An annular upwardly tapering pilot burning space is formed between the cylindrical sleeve 17 and conical baffle 25, above the plate 18. The upper end of the pilot burning space 26 is somewhat constricted and opens into the main annular combustion space 11. The conical baffle 25 is provided with vertically spaced circumferential rows of air

openings 27, preferably arranged at the elevation of the rows of openings 20. The lowermost circumferential row of openings 27 is spaced a substantial distance above the plate 18.

A horizontal annular plate or baffle 28 is rigidly mounted within the upper end of the air duct 21, at the elevation of the plate 18. This baffle 28 has a circumferential group of openings 29 near its periphery, and a large central opening 30. A relatively short cylindrical depending sleeve 31 has its upper end rigidly secured to the baffle 28, surrounding the central opening 30, and a horizontal perforated plate 32 is rigidly secured to the lower end of the sleeve 31 at an elevation below the plate 18 and slightly above the branch duct 24. The perforated plate 32 serves as an air flow divider, preventing some of the air flowing upwardly in the duct 21 from entering the sleeve 31 which would otherwise normally do so. The perforations in the plate 32 break up the air entering the sleeve 31 into small streams, which is desirable. Part of the air flowing in the duct 21 passes outside of the sleeve 31 and discharges through the openings 29, as will be more fully described. An inner conical upwardly flared imperforate sleeve 33 has its lower end rigidly secured to the baffle 28 and substantially registering with the opening 30 and upper end of the sleeve 31. The upper end of the conical sleeve 33 terminates at the elevation of the upper end of the baffle 25. The conical sleeve 33 is concentric with the conical baffle 25 but substantially smaller in diameter than the same, and an annular upwardly flaring air passage 34 is formed between the imperforate sleeve 33 and baffle 25, above the baffle 28. The air duct 21 is provided near and below the baffle 28 with a circumferential row of air discharge openings 35 leading radially into the annular space 19.

Rigidly secured to the upper ends of the sleeve 33 and baffle 25 is a circular horizontal plate 36 having a large central opening 37 in registration with the upper end of the sleeve 33. The periphery of the plate 36 registers with the upper end of the conical baffle 25, and except for the central opening 37, the plate 36 is imperforate and completely covers the upper end of the annular air passage 34. Arranged above the plate 36 in vertically spaced superposed concentric relation is a plurality of horizontal circular air diffusing baffles or fins 38, all having the same outside diameters as the plate 36. The fins 38 are provided with central circular openings 39, each of which is successively smaller in diameter than the central opening of the next lowermost fin 38. The central opening 39 of the lowermost fin 38 is only slightly smaller than the opening 37, whereas the openings 39 of the uppermost fins 38 are greatly reduced in diameter with respect to the opening 37. The arrangement is such that the openings 39 form a central upwardly tapering conical air passage leading from the top end of the sleeve 33. The fins 38 are preferably equidistantly spaced apart vertically, and are maintained spaced by circumferentially spaced sets of small spacer sleeves 40, arranged radially inwardly of the peripheries of the fins 38, as shown. An upper imperforate horizontal cap plate 41 is mounted upon the uppermost spacers 40 and spaced above the uppermost fin 38. This cap plate 40 has the same outside diameter as the fins 38. Upwardly directed vertical bolts 42 extend through the sets of spacer sleeves 40, and through corresponding openings in the fins 38, plate 36 and cap plate 41. The upper ends of the bolts 42

receive nuts 43, holding the fins and plates together in assembly. The spaced superposed fins 38 form flat horizontal annular air diffusing passages 44, leading radially outwardly from the upwardly tapering conical air passage formed by the central openings 39.

As best shown in Figure 5, the fins 38 are radially tapered, outwardly of the bolts 42, so that the horizontal annular air diffusing passages 44 are flared or increasing in width near their outer discharge ends, as at 45. The purpose of this construction is to provide an increase in pressure of the air passing radially outwardly in the passages 44, before such air flows into the main combustion space 11, where the temperature and consequently the pressure is increased. Since the pressure of the air discharging from the passages 44 is somewhat increased at 45, this air can force or blast its way into the increased pressure zone of the main combustion space 11 and materially aid combustion therein. Likewise the flared construction of the passages 44 at their outer portions 45 prevents backfiring, or the hot gases from entering between the fins 38. The peripheries of the fins 38 are spaced radially inwardly a substantial distance from the furnace side wall 10, so that the radial width of the main combustion chamber is substantial, and burning occurs in a continuous annular ring, all about the superposed fins 38. The upper discharge end of the upwardly tapering annular space 26 leads into the main combustion space 11 at the peripheries of the fins 38, and due to the upward convergence of the annular passage 26, the velocity of the gases discharging therefrom is considerable.

Rigidly mounted upon the horizontal plate 18, radially outwardly of the vertical duct 21 is a low cylindrical vertical sleeve or wall 46, having its upper end engaging and rigidly secured to the conical baffle 25, below the lowermost openings 27. The wall 46 forms with the conical baffle 25 and plate 18 a liquid tight annular fuel vaporizing chamber 47 which is triangular in radial cross section. Radially inwardly of the wall 46, the plate 18 is provided with circumferentially equidistantly spaced fuel inlet ports 48, preferably four in number, and leading into these ports 48 and having their discharge ends secured to the plate 18 are vertical oil supply lines or tubes 49. The tubes 49 are arranged radially outwardly of the duct 21, and the tubes are directed radially outwardly at points below the flange 14, as shown at 49'. The tubes lead to a suitable constant level fuel oil metering valve, not shown.

Near and slightly above the horizontal plate 18, the wall 46 is provided with a plurality of circumferentially spaced radial screw-threaded openings 50 which are preferably tapered, and the screw-threaded openings receive adjustable tapered metering screws 51, see Figure 5a. The oil entering the vaporizing chamber 47 through the ports 48 is maintained constantly at the level of the metering screws 51, and these screws may be adjusted so that some oil will seep through the screw-threaded connections and into the oil pan formed by the plate 18 and sleeve 17. In the oil pan, the oil may rise to the maximum level of the metering screws 51. Ignition of the burner and pilot burning take place in the oil pan radially outwardly of the wall 46.

The wall 46 is provided near the top of the vaporizing chamber 47 with a plurality of circumferentially equidistantly spaced radial vapor discharge ports 52, preferably about twelve in number. These ports 52 open into the annular

space 26 a substantial distance above the metering screws 51 which limit the maximum oil level in the oil pan.

The operation of my burner is as follows:

Oil from the constant level metering valve, not shown, enters the annular vaporizing chamber 47 from the oil lines 49 and is maintained at the level of the metering screws 51. As previously stated, oil seeps by these screws and builds up to a maximum level of the screws 51, within the oil pan formed by the plate 18 and sleeve 17. Ignition may be accomplished manually in the oil pan, with a match or the like, or by conventional electrical ignition means, if desired.

Air enters either as a natural updraft from the vertical duct 21 or as a forced draft from the branch duct 24. In either case, the draft is divided at the sleeve 31, and some air passes upwardly between the sleeve 31 and wall of the duct 21, to pass through the openings 29 and enter the annular passage 34. From the passage 34, the air discharges through the openings 27, and enters the pilot combustion space 26, where it aids combustion in the oil pan surrounding the vaporizing chamber 47.

Additional air passes upwardly through the perforated plate 32, sleeves 31 and 33, and through the upwardly tapering passage formed by the openings 39. This air is trapped by the cap plate 41, and strikes the cap plate with a substantial velocity. The trapped air discharges through the horizontal annular passages 44, and travels radially outwardly, and has its pressure increased at 45, prior to entering the main combustion space 11. This air enters the main combustion space and aids in supporting combustion.

The air flow through the burner is constant, and while it is taking place the pilot burning in the oil pan is continuous. The pilot burning heats the fuel oil in the vaporizing chamber 47 until the oil vaporizes and fills the chamber 47 with vapor above the level of the metering screws 51. Considerable pressure is built up within the annular chamber 47, due to vaporization, and radial jets of vapor are projected through the openings 52 and these jets are ignited by the pilot burning in the oil pan. Air from the opening 20 and 27 comes in with the vapor in the pilot combustion space 26, and the mixed gaseous products ascend rapidly through the constricted upper end of the combustion space 26, where they are further mixed with the radial air blast from the passages 44. The air from the passages 44 forms an annular radially outwardly directed layer moving toward the side wall 10 of the furnace. The main burning takes place within the combustion space 11, and this burning is very hot, and combustion of the gaseous products is substantially complete. The main burning in the space 11 forms a continuous ring of fire about the fins 44. Substantially no carbon is deposited upon the fins 38, since combustion takes place beyond the peripheries of the fins, and the air blast is directed radially outwardly.

In Figure 6, I have shown a slight modification of the invention, wherein a separate oil supply conduit 53 leads to an inlet port 54, formed in the plate 18 radially outwardly of the sleeve 46. In this form of the invention, the metering screws 51 are omitted, and the fuel oil is supplied to the separate conduits 49 and 53 from a dual metering valve of the constant level type, not shown. All other parts are identical with

those shown and described in the first form of the invention.

It is to be understood that the forms of the invention, herewith shown and described are to be taken as preferred examples of the same, and that various changes in shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In a liquid fuel burner, an upwardly directed air duct having perforations in its side, a plurality of substantially flat spaced superposed plates arranged near and above the top of the air duct, the uppermost plate being imperforate, the other plates beneath the uppermost plate having central openings to receive the air flowing from the top of the air duct, the air being trapped below the uppermost imperforate plate and discharged radially outwardly in horizontal layers from the spaces between the plates, an oil pan of greater diameter than the air duct and plates surrounding the upper end portion of the air duct and having its top open and disposed adjacent to the top of the air duct, the oil pan having an outer side wall spaced radially outwardly of the peripheries of the plates and air duct, the oil pan and air duct defining an upwardly opening pilot combustion space, a fuel vaporizing ring surrounding the air duct at the bottom of the oil pan and spaced inwardly of the outer side wall of the pan and having radial vapor discharge openings disposed below the perforations of said air duct, and means to supply liquid fuel to the vaporizing ring.

2. In a liquid fuel burner, an upwardly directed air duct having a main opening in its top end, the side wall of the air duct being perforated near and below its top end, air flow divider means mounted within the air duct to direct part of the air to the main opening and part to the perforations of the air duct, a plurality of spaced superposed plates arranged above the top of the air duct and having openings receiving the air flowing from said main opening of the air duct, an imperforate top plate disposed above the uppermost superposed plate for trapping air and causing it to spread radially outwardly in layers from the spaces between the superposed plates, a fuel vaporizing ring surrounding the air duct near and below its top end and below the perforations of the air duct and having vapor discharge openings, means to supply liquid fuel to the vaporizing ring, and an oil pan surrounding the air duct and vaporizing ring and having its top open and arranged near the elevation of the top of the air duct and including an outer side wall arranged radially outwardly of the superposed plates, the perforations of the air duct opening into a pilot combustion space defined by the oil pan and air duct.

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