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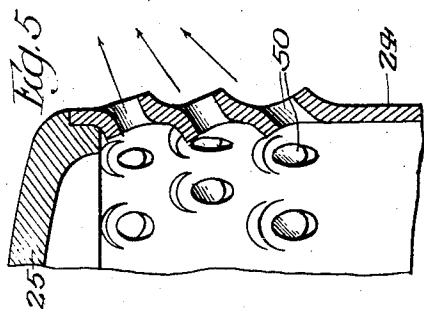
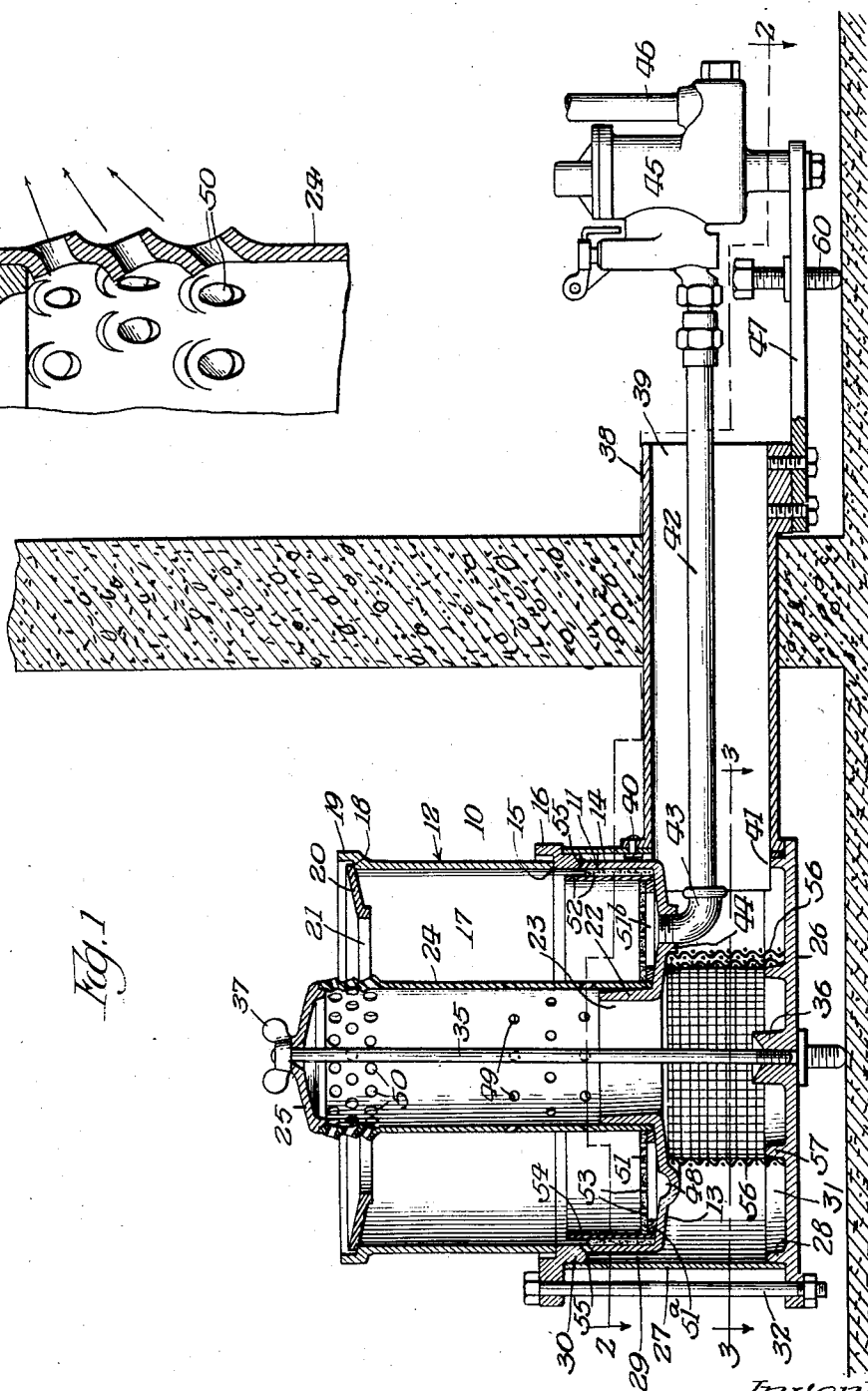
W. B. STURGIS

1,840,137

OIL BURNER

Filed Sept. 18, 1929

2 Sheets-Sheet 1



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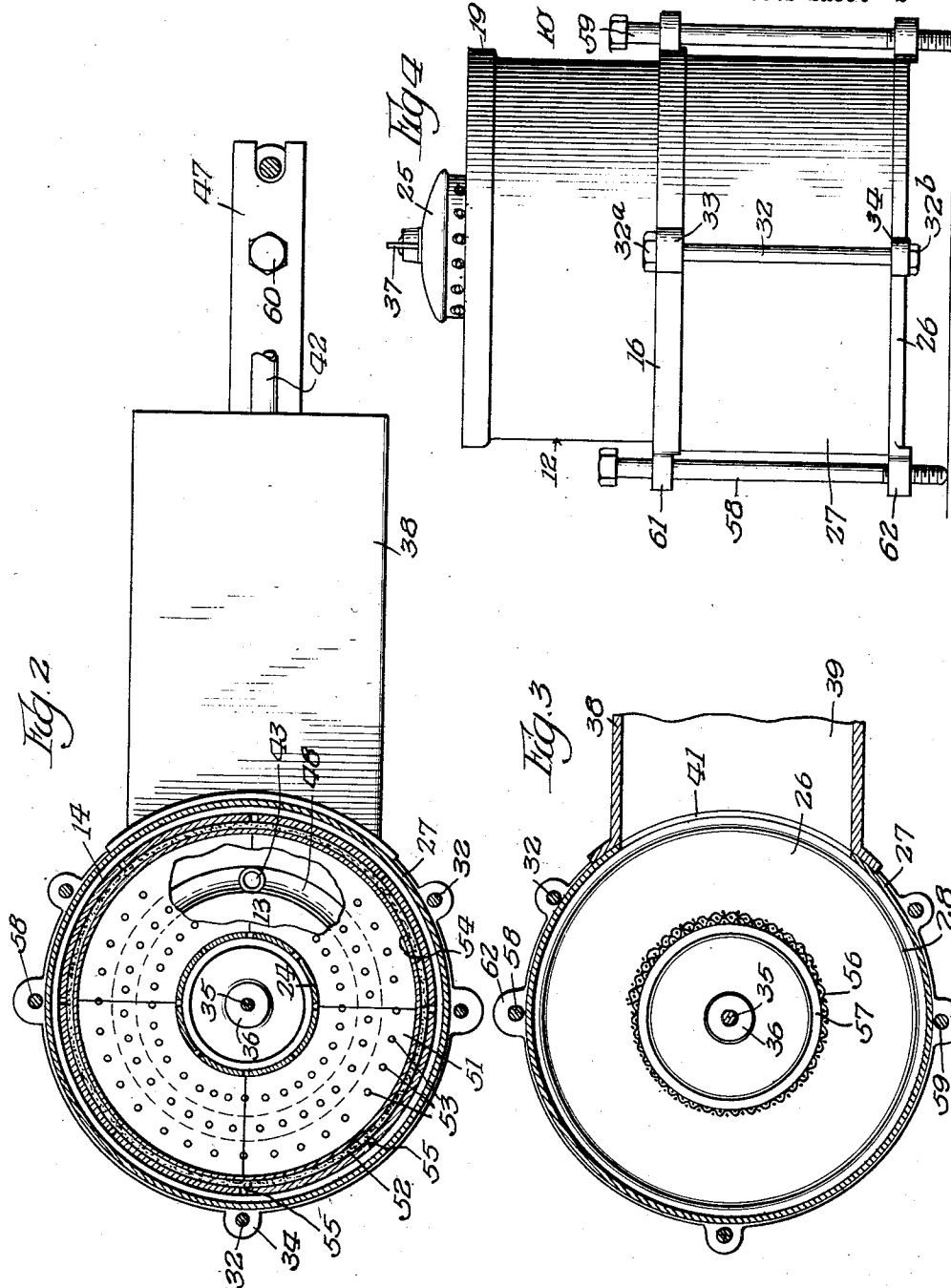
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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OIL BURNER

Application filed September 18, 1929. Serial No. 393,361.

The present invention relates generally to oil burners for use in connection with boilers and similar heating apparatus. More particularly the invention relates to that type of oil burner which is known as a vaporizing burner of the "premixing" type and comprises a cylindrically shaped pot having an open top, a pipe for delivering oil over the bottom of the pot, and a perforated tube which is positioned centrally with respect to the continuous side wall of the pot and is adapted to receive air at its lower end and to deliver a portion of the air into the pot for oil vaporizing purposes and the remainder of the air across the top of the pot to cause combustion of the vaporized oil.

One object of the invention is to provide an oil burner of the aforesaid type, which embodies a ring-shaped wall that extends inwardly from the upper marginal part of the side wall of the pot and has its inner edge spaced from the tube so as to form around the tube a restricted outlet for the vaporized oil, and in which the perforations or openings in the upper end of the tube are so arranged with respect to height or elevation that the jets of air emanating therefrom are directed across the restricted outlet and cause combustion of the vaporized oil above the wall and the resulting flames to spread outwardly from the top of the pot.

Another object of the invention is to provide an oil burner of the "premixing" type embodying means for automatically controlling the vaporization of the oil in accordance with the quantity of air supplied to the burner, which means includes openings arranged to jet some of the air entering the pot in a downward direction.

Another object of the invention is to provide an oil burner of the type under consideration, which embodies means of an improved character for preventing the inner faces of the bottom and side wall of the pot from becoming heated to such an extent that cracking of the oil and the formation of carbon occur.

Another object of the invention is to provide an oil burner of the pot and air tube type, which comprises a cylindrical jacket

that is arranged to form a tubular air space around the lower portion of the pot, and in which provision is made for continuously circulating air through the said tubular space so as to cool the outer faces of the bottom and side wall of the pot and prevent overheating of the pot-bottom.

A further object of the invention is to provide a burner of the character heretofore described, which comprises a member that projects radially from the jacket and forms a laterally extending inlet duct for supplying air to the perforated tube, and embodies a cylindrical wire screen which extends between the lower end of the tube and the bottom of the jacket and operates to break up or diffuse the lateral flow of air into the jacket and to cause the air to flow into the tube in an evenly distributed manner.

A still further object of the invention is the provision of a base structure for the pot, having elongated vertically extending screws at the sides thereof, which screws operate as legs for the burner and are so arranged and of such length that, during the installation of the burner, they may be readily manipulated or adjusted from above to position the pot in a truly horizontal position in order to insure the proper flow of oil over the bottom of the pot.

Additionally it is contemplated as one of the objects of the invention to provide an oil burner which is generally of new and improved construction, may be manufactured at a comparatively low cost, and is more efficient in operation than burners of a similar character now in use and heretofore proposed.

Other objects of the invention and the various advantages and characteristics of the present burner construction will be apparent to those skilled in the art from a consideration of the following detailed description.

The invention consists in the several novel features hereinafter set forth and more particularly defined by the claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference de-

note corresponding parts throughout the several views:

Figure 1 is a vertical longitudinal section of an oil burner embodying the invention;

5 Figure 2 is a transverse section taken on the line 2—2 of Figure 1 and showing in detail the improved means for insulating the inner faces of the bottom and side wall of the pot in order to prevent such faces from becoming heated to such an extent that cracking of the oil and the formation of carbon occur;

10 Figure 3 is a transverse section taken on the line 3—3 of Figure 1 and disclosing in detail the construction and arrangement of the wire screen which operates to break up the lateral flow of air into the jacket and to cause the air to flow into the perforated tube in an evenly distributed manner;

15 Figure 4 is an end elevational view of the burner; and

20 Figure 5 is a detail sectional view of the upper end of the tube illustrating the arrangement and formation of the perforations that serve to cause jets of air to be delivered across the restricted outlet and over the inwardly extending wall at the top of the burner.

25 The oil burner which forms the subject matter of the present invention is a vaporizing burner of the "premixing" type. It is adapted to be disposed in the firebox of a boiler or similar heating apparatus and comprises a receptacle or pot 10 which consists of a bottom member 11 and a cylindrical top member 12. The bottom member is preferably 30 formed of a one-piece casting and comprises a circular bottom 13 and a cylindrical side wall 14. The latter is joined to and extends upwardly from the outer marginal part of the bottom 13. The upper portion of the side wall 14 is shaped so that it extends outwardly and then upwardly and forms an annular shoulder or seat 15 and a ring-shaped flange 16. The top member 12, like the bottom member 11, is preferably formed of a one-piece 40 casting. It is equal in diameter to the cylindrical side wall 14 and rests directly upon the annular seat 15. By constructing and arranging the members 11 and 12 in this manner, the top member is in the nature of a continuation of the cylindrical side wall 14 and forms in conjunction with said side wall and the bottom 13 a vaporizing chamber 17, the upper end of which is open. The ring-shaped flange 16 encircles the lower end of 45 the top member 12 and operates to hold said member in its operative position and to prevent lateral displacement thereof. By providing the shoulder or seat 15 and the flange 16, the top member 12 is removably held in 50 place and may be readily disconnected from the bottom member 11 when access is desired to the space within and defined by the bottom 13 and the side wall 14. The upper portion of the top member 12 is shaped so that it 55 extends outwardly and then upwardly and

forms an annular shoulder or seat 18 and a ring-shaped flange 19. An imperforate ring-shaped wall 20 is supported by and rests loosely on the annular shoulder or seat 18. This wall is constructed so that it slopes 70 slightly downwardly from the upper portion of the top member and operates to form a restricted outlet 21 for the vaporizing chamber 17. By utilizing a seat and flange as the supporting and retaining instrumentality for 75 the ring-shaped wall 20, said wall is removably held in place and may be readily withdrawn from its operative position in the event that it becomes necessary to clean or replace the same.

80 The circular bottom 13 of the bottom member 11 is provided at the central portion thereof with an integral upwardly extending flange 22. The latter is annular in shape and has a cylindrical opening 23 extending there- 85 through. This opening is of uniform diameter throughout and extends through the bottom 13. A vertically extending sheet-metal tube 24 is positioned centrally in the pot and has the lower end thereof sleeved 90 over the annular flange 22 so that it is fixedly held in place. The upper end of the tube projects through the restricted outlet 21 and terminates slightly above the ring-shaped wall 20. A disk-like cap 25 operates to close 95 the said upper end of the tube.

100 The receptacle or pot 10 is supported upon a base structure which comprises a circular cast iron plate 26 and a cylindrically shaped jacket 27. The lower end of the jacket rests upon the upper face of the plate 26 and fits snugly around an annular rib 28 which is 105 formed integrally with and extends upwardly from said plate. The upper end of the jacket 27 extends around the bottom member 11 and engages the bottom face of the ring-shaped flange 16 for supporting purposes. The jacket 27 is preferably formed of steel and is somewhat larger in diameter than the cylindrical side wall 14 so as to form a tubular air 110 space 29 around the bottom member 11. Said bottom member is held in concentric relation with respect to the jacket 27 by a circular head 30 which is formed integrally with the side wall 14 and is positioned directly be- 115 neath the shoulder or seat 15. The lower end of the jacket 27 operates in conjunction with the plate 26 to form a cylindrical air compartment 31 beneath the bottom 13. The bottom member 11, the jacket 27 and the circular plate 26 are connected together and held in 120 clamped relation by means of vertically extending bolts 32. The upper ends of these bolts are provided with nuts 32^a and extend through lugs 33 which are formed integrally 125 with and project outwardly from the ring-shaped flange 16 of the bottom member 11. The lower ends of the bolts 32 are provided with nuts 32^b and extend through lugs 34 130 which are formed integrally with the mar-

ginal part of the plate 26 and project outwardly therefrom. By tightening the nuts 32^a and 32^b the member 11 and the plate 26 are clamped against the jacket 27. The tube 24 is held in its operative position by means of a tie-rod 35. This tie-rod extends downwardly from the cap 25 and has the lower end thereof anchored in a boss 36 which is formed integrally with and projects upwardly from the central portion of the plate 26. The upper end of the tie-rod is provided with a wing-nut 37 which abuts against the top face of the cap 25 and serves, when tightened, to clamp the tube 24 against the bottom 13.

The base structure, in addition to the plate 26 and the cylindrical jacket 27, comprises a tubular member 38. This member projects laterally from the jacket and is adapted to extend through the side wall of the boiler or heating apparatus with which the burner is associated. Said tubular member 38 operates to form a laterally extending duct 39 through which air is supplied to the vaporizing chamber 17. The inner end of the member 38 is connected to the jacket 27 by bolts 40 and communicates with the air compartment 31 via an opening 41 in the jacket. The distal end of the member 38 is open so that air may enter the duct 39 and flow to the tube 24 through the air chamber 31 and the opening 23 in the flange 22. In the event that a forced draft is desired, the said distal end of the member 38 may be connected to a fan or blower.

The oil that is used in the burner is delivered into the bottom member 11 by a pipe 42. This pipe extends through the tubular member 38 and is connected to the bottom 13 of the member 11 by an L-fitting 43. The latter is positioned so as to supply the oil to the upper surface of the bottom 13 and is secured to a boss 44 which is formed integrally with the member 11. The outer end of the pipe 42 is connected to a float-operated feed device 45 which receives oil from a tank or similar source of supply (not shown) through a pipe 46. The device 45 may be of any suitable construction and is supported upon a plate 47 which is rigidly secured to and projects outwardly from the distal end of the member 38. The upper surface of the bottom 13 is concave and embodies an annular trough 48 so that the oil which is discharged through the fitting 43 will flow around the tube 24 and all parts of the upper face of the bottom 13 for vaporizing purposes.

The tube 24 is provided with a lower or primary set of perforations 49 and an upper or secondary set of perforations 50. The primary perforations 49 are distributed through the central and lower parts of the tube and operate to admit into the chamber 17 sufficient air to support combustion in the pot during the starting period, and to facilitate

or assist vaporization of the thin film of oil on the top surface of the bottom 13, during the normal operation of the burner. Said perforations 49 are preferably arranged in three rows and are of such total area that during normal operation of the burner they admit into the chamber 17 not more than 45% by volume, of the total air theoretically required for the complete combustion of the oil. To prevent concentration of the air that is admitted into the vaporizing chamber 17, the perforations of the upper row are formed so that they extend slightly upwardly. The perforations of the lower row extend downwardly at such an angle and in such a manner that the jets of air issuing therefrom, when the burner is in full operation, act by their cooling effect, to prevent a further increase in vaporization, thereby controlling the rate of the vaporization by the air supply and making the burner inherently stable. The secondary perforations 50 are formed in the upper part of the tube 24 and are preferably arranged in three rows. These rows of perforations are disposed at such levels or elevations that they operate to direct jets of air into the oil vapor that passes upwardly through the restricted outlet 21 and to support or effect combustion of the vaporized oil above the ring-shaped wall 20. The perforations 50 of the lower row are positioned directly opposite to the inner edge of the wall 20 and extend upwardly and outwardly at an angle of approximately 45° with respect to the horizontal. By having the perforations 50 of the lower row extend at this angle, the lowermost jets of air clear the inner edge of the ring-shaped wall and consequently do not cause combustion in the vaporizing chamber. The desired angularity is given to the perforations of the lower row by distorting the metal around said perforations, as shown in Figure 5 of the drawings. The perforations 50 of the intermediate row are staggered with respect to the perforations of the upper and lower rows and are formed so that they extend upwardly and outwardly at an angle of approximately 25°. The perforations 50 of the upper row are positioned above the wall 20 and are formed so that they extend upwardly and outwardly at an angle of approximately 10°. A characteristic and an advantage of arranging the secondary perforations in the manner set forth and at the various angles specified in that the flames which result from the admixture of air and oil vapor are formed above the wall 20 and consequently deposit no carbon on the pot. A further advantage is that the flames spread outwardly from the upper end of the pot and give an intense heat. The perforations 50 are of such total area that during normal operation of the burner they discharge more

than 55% by volume, of the total air theoretically required for the complete combustion of the fuel.

In practice it has been found that under certain conditions during operation of the burner at maximum fuel consumption, the bottom member 11 of the pot becomes overheated. This causes a cracking of the oil and results in a deposit of coke or carbon on the bottom 13. In addition to this oil cracking, overheating of the bottom member 11 causes carbon to form on and adhere to the cylindrical side wall 14. To keep the temperature of the bottom member 11 below the cracking point of oil and thus to eliminate a deposit of coke on the bottom 13 and the formation of carbon on the side wall 14, a thin ring-shaped sheet 51 of asbestos and a thin cylindrically shaped asbestos strip 52 are provided. The sheet 51 fits over the bottom 13 and is of a foraminous character in that it has formed therein a plurality of apertures 53 for the escape of the oil vapor. A pair of asbestos rings 51^a support the sheet 51 so that it is spaced above the bottom 13 and forms with the latter a distilling chamber 51^b for the oil. When the burner is operating at full capacity the under side of the sheet 51, that is, the side that is contiguous to the bottom 13, remains sufficiently cool to prevent the oil in the trough 48 from cracking, and the upper side becomes sufficiently hot to prevent carbon from forming or remaining thereon. The feed device 45 is so arranged that during operation of the burner the oil is not fed above the sheet. The latter is preferably formed in four sections so that it may be readily inserted into place and withdrawn. The cylindrically shaped asbestos strip 52 fits against the inner periphery of the side wall 14 and operates as a heat insulator. It is held in its operative position against the side wall 14 by a sheet metal band 54. The latter serves not only to retain the strip 52 in its operative position but also to facilitate vaporization of the fuel during the starting period, it being manifest that a band of sheet metal will heat quickly and thereby cause a rapid vaporization of the oil until the cast iron side wall and top member are heated sufficiently to effect the desired and proper vaporization.

To assist in preventing overheating of the bottom member 11, holes 55 are drilled or otherwise formed in the side wall 14. These holes form passageways between the tubular air space 29 and the vaporizing chamber 17 and result in a continuous flow of air around the side wall 14. The volume of air admitted into the combustion chamber through the openings 55 is comparatively small (approximately one-ninth that of the air admitted into the chamber 17 through the tube 24) and is not sufficient to cause combustion to take place in the pot during the normal op-

eration of the burner. The upper end of the sheet metal band 54 extends above the holes 55 and operates as a deflector whereby the air emanating from said holes is directed upwardly along the side wall 14 to the outlet 21. A characteristic and an advantage of having the air space 29 extend only around the bottom member 11 of the pot is that the upper member 12 is permitted to become hot enough to prevent the formation of carbon thereon.

To cause a uniform or even flow of air through the perforated tube 24, a distributor 56 of wire screen is provided. This distributor is cylindrical and extends between the bottom 13 and the plate 26. The lower end of the distributor rests upon the upper face of the plate 26 and fits around an annular flange 57 which is formed integrally with and projects upwardly from the upper face of said plate. The upper end of the distributor engages the under side of the bottom 13 and is surrounded by the metal that forms the trough 48. In forming the distributor, an elongated strip of wire screen is bent into the desired form and so that the ends thereof are positioned in lapped relation. When the distributor is placed in its operative position, it is so positioned that the lapped end parts are directly opposite the opening 41. By arranging the distributor in this manner there is a double thickness of screen in alignment with the inlet duct 39 and consequently the stream of air that passes into the compartment 31 through said duct is diffused so that it does not pass upwardly into the tube 24 unevenly and in such a manner that the perforations at one side of the tube receive more air than the perforations at the opposite side. In other words, by arranging the distributor 56 in the manner set forth, the lateral flow of air into the jacket is broken up or diffused and the air is caused to flow into the tube in an evenly distributed manner.

In installing the burner, it is essential that the pot be level so that the oil flows evenly around the bottom 13. To facilitate the levelling of the pot, three adjusting screws 58, 59 and 60 are provided. These screws operate as legs and form a three-point support for the burner. The screws 58 and 59 are positioned at opposite sides of the jacket 27. The upper ends of said last mentioned screws are provided with polygonal heads and extend loosely through lugs 61 which are formed integrally with and project outwardly from the ring-shaped flange 16 of the bottom member 11. The lower ends of the screws 58 and 59 extend through and are connected by screw thread connections to lugs 62 which are positioned directly beneath the lugs 61 and are formed integrally with the marginal part of the plate 18. By arranging the screws 58 and 59 in the manner set forth, said screws are so located that

they may be readily manipulated from above to effect the desired adjustment. The screw 60 is carried by the plate 47 which projects outwardly from the distal end of the duct-forming member 38. By adjusting the screws relatively to each other the pot may be tilted so that the bottom 13 is truly horizontal and the oil flows properly and evenly around the trough 48.

10 The burner is started by dropping a lighted match through the ring-shaped wall 20 into the bottom of the pot 10. As soon as the match encounters the oil emanating from the apertures 53 of the asbestos sheet 51, 15 combustion immediately takes place in the chamber 17. This is due to the fact that the thin film of oil at first vaporizes slowly because of the absence of heat and the air admitted into the chamber 17 through the perforations 49 is therefore sufficient to cause a combustible mixture. Shortly after combustion occurs in the pot, the sheet metal band 54 and the upper and lower members of the pot become heated and cause such a rapid 20 vaporization of the oil that the air admitted into the chamber 17 through the primary perforations 49 is not sufficient to support combustion. When this condition occurs the rich and incombustible oil vapor rises to the top of the chamber 17 and passes upwardly through the restricted outlet 21. As the oil vapor flows upwardly through said outlet, the secondary perforations 50 at the top of the tube 24 operate to introduce into the 25 vapor an additional quantity of air which renders the vapor combustible and causes combustion to take place above the ring-shaped wall 20. As heretofore mentioned, the perforations 50 are formed and arranged in such a manner that the air jets formed thereby cause the flames to spread outwardly from the top of the pot 10. The ring-shaped wall 20 has an important function, as far as the operation of the burner is concerned, in 30 that it causes the proper and desired vaporization of the oil by preventing a flow of air into the vaporizing chamber from around the upper part of the top member 12. When the burner is fired to a maximum, the apertured asbestos sheet 51 operates to prevent cracking of the oil, and the cylindrically shaped asbestos strip 52 serves to avoid the formation of carbon on the side wall 14. The continuous circulation of air through 35 the tubular air passage 29 operates to assist the sheet 51 and the strip 52 in preventing the bottom member 11 from becoming overheated. By virtue of the fact that the lower end of the tube 24 is surrounded by the wire screen 56, the air that enters the compartment 31 through the duct 39 flows evenly through said tube 24. During the normal operation of the burner, the lower row of primary perforations 49 discharge jets of 40 cool air in a downward direction. These jets

exert a cooling effect which, combined with the cooling effect of the air jacket, offset the radiant heat from above and thereby prevents a further increase in the rate of vaporization with the result that the burner is inherently stable. 70

In the event that it becomes necessary to replace the sheet 51 and the strip 52 or to clean the trough 48, access may be had to the interior of the bottom member 11 simply by raising the top member 12 out of engagement with the seat 15 and the flange 16. To remove the tube 24, it is only necessary to unscrew the wing nut 37 and lift the tube upwardly so as to disengage the same from 80 the annular flange 22.

The burner is installed by placing it in the firebox of the boiler or heater with which the burner is to be associated, in such a manner that it is supported by the screws 58, 59, 60. The pot is positioned so that the bottom thereof is level by adjusting the aforesaid screws. By having the screws 58 and 59 extend upwardly along the side wall of the pot and above the lower member 11, 85 it is possible to adjust said screws by reaching through the fire door of the boiler.

The oil burner herein disclosed may be manufactured at a comparatively low cost and has been found in practice to be exceedingly efficient as far as operation and fuel 90 consumption are concerned.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention. 100

This application is a continuation in part of an application for Letters Patent of the United States filed by me May 24, 1928, Serial No. 280,241. 105

Having thus described the invention, what I claim as now and desire to secure by Letters Patent, is:

1. A burner comprising in combination, 110 a pot consisting of a continuous side wall and a bottom, means for delivering fuel in fluid form into the pot, an upstanding tube positioned centrally in the pot and having the upper end thereof terminating adjacent the upper marginal part of the side wall and its lower end opening through the pot to receive air, said tube forming with the side wall of the pot an aerating chamber for the fuel and having a plurality of spaced openings in the central part thereof for jetting 115 air outwardly into the chamber in such quantity as to effect only aeration of the fuel in the chamber during normal operation of the burner, a wall extending inwardly from the upper marginal part of the side wall and having its inner edge spaced from the tube to form around the tube a continuous restricted outlet for the aerated fuel and operating to prevent air from above entering 120 125 130

the pot to cause combustion therein, and to force the aerated fuel to flow inwardly against the upper end of the tube as it rises from the chamber and passes upwardly through said outlet, and means associated with the upper end of the tube and receiving air through the tube for directing air outwardly across the restricted outlet in greater quantity than that admitted into the chamber by the aforesaid openings, and in sufficient amount to support combustion of the aerated fuel at the top of the pot and to cause the flames resulting from combustion to spread outwardly over the inwardly extending wall.

2. In a burner of the character described, the combination of a pot consisting of a substantially cylindrical and imperforate side wall and a bottom having an aperture in the central portion thereof, means for delivering liquid fuel into the lower part of the pot, an upstanding tube surrounded by and positioned centrally with respect to the side wall of the pot and having its upper end terminating adjacent the upper marginal part of the side wall and its lower end positioned to receive air through the aperture, said tube forming with the side wall a vaporizing and aerating chamber for the fuel and having a plurality of spaced openings in the central part thereof for delivering air into the chamber in such quantity as to effect only vaporization and aeration of the fuel in the chamber during normal operation of the burner, and a ring-shaped wall formed separately from and connected to the upper marginal part of the side wall and extending inwardly therefrom to form an annular restricted outlet for the chamber at the top of the pot and around the tube to prevent air from above entering the pot to cause combustion therein, and to force the vaporized and aerated fuel to flow inwardly against the upper end of the tube as it rises from said chamber and passes upwardly through the outlet, the upper end of the tube having a plurality of spaced openings therein of greater total area than the first mentioned openings for jetting air outwardly across the outlet to support combustion of the vaporized and aerated fuel at the top of the pot and to cause the flames resulting from combustion to spread outwardly over the inwardly extending wall.

3. In a burner of the character described, the combination of a pot consisting of a substantially cylindrical side wall and a bottom, a cylindrically shaped jacket provided with an air inlet and arranged to form an air compartment under the pot, the upper end of the jacket being positioned around and spaced from the side wall to form a tubular air space around the pot, an imperforate cross wall between the side wall and the upper marginal part of the jacket for clos-

ing the top of the tubular air space, means for delivering fuel in liquid form over the bottom of the pot, a vertical tube surrounded by and positioned centrally with respect to the side wall of the pot and provided with a closure at the top thereof, said tube having its upper end terminating adjacent the upper marginal part of the side wall and its lower end opening through the pot bottom to receive air from the jacket-formed air compartment and forming with the side wall of the pot an annular fuel vaporizing and aerating chamber the top part of which is entirely open and unobstructed around said upper end of the tube, and means forming a plurality of spaced openings for jetting air into the chamber in such quantity as to effect only vaporization and aeration of the fuel during normal operation of the burner, the upper end of the tube having a plurality of spaced openings therein of greater total area than the first mentioned openings and of sufficient size and number to jet enough air outwardly above and across the top part of the chamber to effect complete combustion of all the vaporized and aerated fuel that rises from the chamber and to force the flames resulting from combustion to spread outwardly over and above the side wall of the pot.

4. An inherently stable vaporizing burner of the premixing type comprising in combination, a pot consisting of a continuous substantially imperforate side wall and a bottom, means to prevent the pot from becoming overheated, means for maintaining a layer of liquid fuel over the bottom of the pot, an upstanding tube positioned centrally in the pot and having its lower end opening through said pot to receive air, said tube forming with the side wall of the pot a vaporizing and aerating chamber for the fuel and having a plurality of spaced openings therein of such total area as to jet into the chamber not over forty-five per cent by volume of the total air theoretically required for the complete combustion of the fuel, some of which openings, but not all, facing downwardly in such a manner that the jets of air issuing therefrom, when the burner is in full operation, act by their cooling effect to prevent a further increase in vaporization thereby making the burner inherently stable, and means for discharging more than fifty-five per cent by volume of the total air theoretically required for the complete combustion of the fuel across and above the upper end of the chamber to support combustion of the vaporized and aerated fuel above the top of the pot.

5. An inherently stable vaporizing burner of the premixing type comprising in combination, a pot consisting of a continuous side wall and bottom, means to prevent the pot from becoming overheated, means for

maintaining a layer of liquid fuel over the bottom of the pot, an upwardly extending tube positioned centrally in the pot and having its lower end opening through the pot to receive air, said tube forming with the side wall of the pot a vaporizing and aerating chamber for the fuel, means comprising a plurality of spaced openings of such total area as to jet into the chamber not over forty-five per cent by volume of the total air theoretically required for the complete combustion of the fuel, some of which openings, but not all, facing downwardly in such a manner that the jets of air issuing therefrom, when the burner is in full operation, act by their cooling effect to prevent a further increase in vaporization thereby making the burner inherently stable, and means for discharging more than fifty-five per cent by volume of the total air theoretically required for the complete combustion of the fuel across and above the upper end of the chamber to support combustion of the vaporized and aerated fuel above the top of the pot, the air from the upper end of the tube discharging in a lateral direction to cause the flames resulting from combustion to spread outwardly over and above said side wall.

6. An inherently stable vaporizing burner of the premixing type comprising in combination, a pot consisting of a continuous side wall and a bottom, means to prevent the pot from becoming overheated, means for maintaining a layer of liquid fuel over the bottom of the pot, an upstanding tube positioned centrally in the pot and having its lower end opening through the pot to receive air, said tube forming with the side wall of the pot a vaporizing and aerating chamber for the fuel, means at the top of the chamber forming around the tube a continuous restricted outlet for the aerated fuel and operating to prevent air from above entering the chamber, means forming a plurality of spaced openings of such total area as to jet into the chamber not over forty-five per cent of the total air theoretically required for the complete combustion of the fuel, some of which openings, but not all, facing downwardly in such a manner that the jets of air issuing therefrom, when the burner is in full operation, act by their cooling effect to prevent a further increase in vaporization thereby making the burner inherently stable, and means for discharging more than fifty-five per cent by volume of the total air theoretically required for the complete combustion of the fuel across and above the upper end of the chamber to support combustion of the vaporized and aerated fuel above the top of the pot, the air from the upper end of the tube discharging in a lateral direction to cause the flames result-

ing from combustion to spread outwardly over and above said side wall.

7. An inherently stable vaporizing burner of the premixing type comprising in combination, a pot consisting of a side wall and a bottom, an air jacket surrounding the pot, means for maintaining a layer of liquid fuel on the bottom of the pot, means for aerating the fuel vapor forming a plurality of spaced openings of such total area as to jet into the central and lower portions of the pot not over forty-five per cent by volume of the total air required theoretically for the complete combustion of the fuel, some of which openings face downwardly at such an angle and in such a manner that the jets of air issuing therefrom, when the burner is in full operation, act by their cooling effect to prevent a further increase in vaporization, thereby controlling the rate of said vaporization by the air supply and making the burner inherently stable, means at the top of the pot forming a restricted outlet for the vaporized and aerated fuel and operating to prevent air from above entering the pot, and means adjacent the top of the pot for discharging more than fifty-five per cent by volume of the total air required theoretically for the complete combustion of the fuel across the restricted outlet to support combustion of the vaporized and aerated fuel above the top of the pot.

8. In a burner of the character described, the combination of a pot comprising a continuous side wall and a bottom, said side wall forming with the bottom a vaporizing chamber with an open top, means forming an opening for delivering liquid fuel over the top surface of the bottom, means for delivering air into the chamber in limited quantity for fuel vaporizing and aerating purposes, means adjacent the top of the vaporizing chamber for supplying air to the fuel vapor in greater quantity than the air for vaporizing and aerating the fuel in order to support combustion at the top of the pot, and a sheet of heat insulating non-metallic refractory material positioned in the pot to extend over the opening where the fuel is delivered into the pot to prevent overheating and cracking of the fuel in and about said opening during the starting and stopping of the burner.

9. In a burner of the character described, the combination of a pot comprising a continuous side wall and a bottom, said side wall forming with the bottom a vaporizing chamber, means for delivering liquid fuel over the top surface of the bottom, means for delivering air into the chamber in limited quantity for fuel vaporizing and aerating purposes, means adjacent the upper end of the vaporizing chamber for supplying air to the fuel vapor in greater quantity than the first mentioned air in order to support combustion

tion at the top of the pot, a sheet of heat insulating non-metallic refractory material positioned over the bottom, and means for supporting the sheet so that it is spaced from the bottom and over the fuel and forms with
 5 said bottom a distilling chamber for the fuel, said sheet having apertures formed therein to permit the fuel vapor to pass upwardly therethrough into the chamber and
 10 to prevent overheating and cracking of the fuel.

10. In a burner of the character described, the combination of a pot comprising a substantially imperforate, cylindrical side wall and a circular bottom having
 15 an aperture in the central portion thereof, means for delivering liquid fuel over the top surface of the bottom, an upstanding tube surrounded by and positioned centrally with respect to the side wall of the pot and hav-
 20 ing its upper end terminating adjacent the upper marginal part of the side wall and its lower end adapted to receive air through the aperture, said tube forming with the
 25 side wall a vaporizing chamber for the fuel and having a plurality of spaced openings in the central part thereof for delivering air outwardly into the chamber in limited quantity for fuel vaporizing and aerating pur-
 30 poses, means at the upper end of and communicating with the tube for supplying air to the fuel vapor rising from the top of the pot in order to support combustion at the
 35 top of the pot and cause the resulting flames to spread outwardly, and a ring-shaped sheet of asbestos extending around the tube and positioned directly over the bottom and
 40 above the oil, said sheet having apertures formed therein to permit the fuel vapor to pass upwardly therethrough into the chamber and to prevent overheating and crack-
 ing of the fuel.

11. In a burner of the character described, the combination of a pot comprising a continuous side wall and a bottom, said side
 45 wall forming with the bottom a vaporizing chamber, means for delivering liquid fuel over the top surface of the bottom, means for delivering air into the chamber in limited
 50 quantity for fuel vaporizing and aerating purposes, means adjacent the upper end of the vaporizing chamber for supplying air to the fuel vapor rising from the chamber in greater quantity than the aforemen-
 55 tioned air in order to support combustion of the vapor at the top of the pot, and a strip of heat insulating material fitting against and engaging the inner face of the side wall to prevent overheating of the fuel on the
 60 bottom of the pot by way of reducing the effect of the radiant heat from above on the contiguous portion of the side walls of the pot.

12. In a burner, the combination of a pot
 65 comprising a substantially cylindrical side

wall and a circular bottom, means for delivering liquid fuel over the top surface of the bottom, means for supplying air to support combustion at the top of the pot, a cylindrical-
 70 ly shaped strip of asbestos positioned against the inner face of the side wall to prevent overheating of the bottom portion of the pot, and a sheet metal band fitting against the strip and operating to hold the latter in place and to facilitate vaporization of the fuel during
 75 starting of the burner.

13. In a burner, the combination of a pot comprising a substantially cylindrical side wall and a circular bottom, means for delivering liquid fuel over the top surface of
 80 the bottom, means for supplying air to support combustion at the top of the pot, a disk-like sheet of asbestos positioned directly over the bottom and above the fuel, said sheet having apertures formed therein to permit
 85 the fuel vapor to pass therethrough to prevent overheating of the fuel on the bottom of the pot, and a cylindrically shaped piece of asbestos fitting directly against the inner face of the side wall to assist the afore-
 90 said disk-like sheet in preventing overheating of the liquid fuel by way of preventing conduction of heat from the top of the pot to the fuel therein.

14. In a burner of the character de-
 95 scribed, the combination of a pot consisting of a lower member and a tubular upper member, the lower member comprising a bottom and a continuous side wall that projects upwardly from the marginal part of
 100 the bottom and embodies at the upper end thereof a continuous seat and a flange around the seat, the upper member resting on the seat and forming with the side wall a vaporizing chamber, means for delivering
 105 liquid fuel over the top surface of the bottom, means for delivering air into the chamber in limited quantity for fuel vaporizing and aerating purposes, means adjacent the upper end of the vaporizing chamber for supplying air in greater quantity
 110 than the aforementioned air to support combustion of the vapor at the top of the pot, a jacket surrounding said pot provided with an air inlet and operating to form an air compartment under the pot, the upper end of the jacket being positioned around and spaced
 115 from said side wall to form a tubular air space around the bottom member and having the edge thereof engaging the flange for supporting purposes, and means forming outlet passageways at the top of the air space operative to permit a continuous flow
 120 of air from the compartment upwardly through said air space in order to prevent
 125 overheating of the fuel on the bottom of the pot.

15. In a burner of the character described, the combination of a pot consisting of an upper member and a lower mem-
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ber, the lower member comprising a circular bottom and a cylindrical side wall that projects upwardly from the marginal part of the bottom and embodies at the upper end thereof an annular seat and a surrounding ring-shaped flange, the upper member being cylindrical and resting on the annular seat so as to form with the side wall a vaporizing chamber, means for delivering liquid fuel over the top surface of the bottom, means for delivering air into the chamber in limited quantity for fuel vaporizing and aerating purposes, means adjacent the upper end of the vaporizing chamber for supplying air in greater quantity than the aforementioned air to support combustion of the fuel vapor at the top of the pot, and a cylindrically shaped jacket surrounding said pot provided with an air inlet and operating to form an air compartment under the pot, the upper end of the jacket being positioned around and spaced from the side wall to form a tubular air space around the bottom member and having the top edge thereof engaging the flange for supporting purposes, said side wall having holes formed therein adjacent to the flange, operative to form passageways between the top portion of the tubular air space and the vaporizing chamber whereby air is caused to flow upwardly from the air compartment through said space and into the chamber.

16. In a burner, the combination of a pot consisting of an upper member and a lower member, the lower member comprising a circular bottom and a cylindrical side wall that projects upwardly from the marginal part of the bottom and embodies at the upper end thereof an annular seat and a surrounding ring-shaped flange, the upper member being cylindrical and resting on the annular seat so as to form with the side wall a vaporizing chamber, means for delivering liquid fuel over the top surface of the bottom, means for supplying air to support combustion at the top of the pot, a cylindrically shaped jacket surrounding said pot, provided with an air inlet and operating to form an air compartment under the pot, the upper end of the jacket being positioned around and spaced from the side wall to form a tubular air space around the bottom member and having the top edge thereof engaging the flange for supporting purposes, said side wall having holes formed therein adjacent to the flange, operative to form passageways between the top portion of the tubular air space and the vaporizing chamber to permit air to flow upwardly from the air compartment through said space and into the chamber, and a vertically extending cylindrical band in the bottom of the pot positioned around the side wall and arranged so that it extends above the level of the aforesaid holes and operates as

a deflector whereby the air emanating from said holes is caused to be directed upwardly to the top of the pot.

17. In a burner of the character described, the combination of a pot comprising a bottom and a continuous side wall that extends upwardly from the marginal part of the bottom and forms with said bottom a vaporizing chamber, means for delivering liquid fuel into the pot, a tube projecting upwardly from the central portion of the bottom and having the lower end opening through the pot to receive air, means for delivering air into the chamber in limited quantity for fuel vaporizing and aerating purposes, means at the upper end of the tube for supplying air to support combustion and spread the flame above the top of the pot, a supporting structure for the pot having an air compartment therein beneath the bottom, means for delivering air laterally into the structure for passage through the compartment to the tube, and a tubular screen disposed in the compartment extending around the opening for the tube and between the bottom of the pot and the bottom part of the supporting structure and operative to cause an efficient circulation of air under the bottom of the pot for cooling purposes and to diffuse the lateral flow of air and cause the air to pass upwardly into the tube in an evenly distributed manner.

18. In a burner, the combination of a pot comprising a bottom and a continuous side wall that extends upwardly from the marginal part of the bottom and forms with said bottom a vaporizing chamber, means for delivering liquid fuel into the pot, a tube projecting upwardly from the central portion of the bottom and having the lower end opening through the pot to receive air, said tube having means for distributing air to support combustion at the top of the pot, a supporting structure for the pot having an air compartment therein beneath the bottom of the pot, means for delivering air laterally into the structure for passage through the compartment to the tube, and a cylindrically shaped wire screen extending around the opening for the tube and between the bottom of the pot and the bottom part of the supporting structure and operative to cause an efficient circulation of air under the bottom of the pot for cooling purposes and to diffuse the air in transit from the delivery means to the tube so as to cause it to pass upwardly into the tube in an evenly distributed manner.

19. In a burner, the combination of a pot comprising a bottom and a continuous side wall that extends upwardly from the marginal part of the bottom and forms with said bottom a vaporizing chamber, means for delivering liquid fuel into the pot, a tube projecting upwardly from the central portion

of the bottom and having the lower end opening through the pot to receive air, said tube having perforations formed therein for distributing air to support combustion at the top of the pot, a supporting structure for the pot having an air compartment therein beneath the bottom of the pot, means for delivering air laterally into the structure for passage through the compartment to the tube, and a cylindrically shaped air distributor extending around the opening for the tube and between the bottom of the pot and the bottom part of the supporting structure, said distributor being formed of an elongated strip of wire screen which is bent into cylindrical form the ends overlapping each other, the overlapped ends of the screen being positioned directly opposite the air-delivery means.

20. In a burner of the character described, the combination of a pot comprising a side wall and a bottom, means for delivering liquid fuel over the top surface of the bottom, means for delivering air in limited quantities into the chamber for fuel vaporizing aerating purposes, means for supplying air to support combustion at the top of the pot, a jacket extending around the lower portion of the pot, and terminating below the top of the pot, and a plurality of vertically extending screws adjustably supporting the burner, the lower ends of said screws engaging threaded lugs attached to the baseplate of the structure and the upper ends passing through lugs attached to the bottom section of the pot, said screws extending upwardly outside of and to a point above the jacket and provided with means at their upper ends whereby they may be turned to adjust the position of the burner.

Signed at Chicago, Illinois, this 12th day of September, 1929.

WILLIAM B. STURGIS.

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