July 14, 1936. G. N. ALBREE 2,047,303

OIL BURNER

Filed Aug. 4, 1931 3 Sheets-Sheet 1

Fig.1.

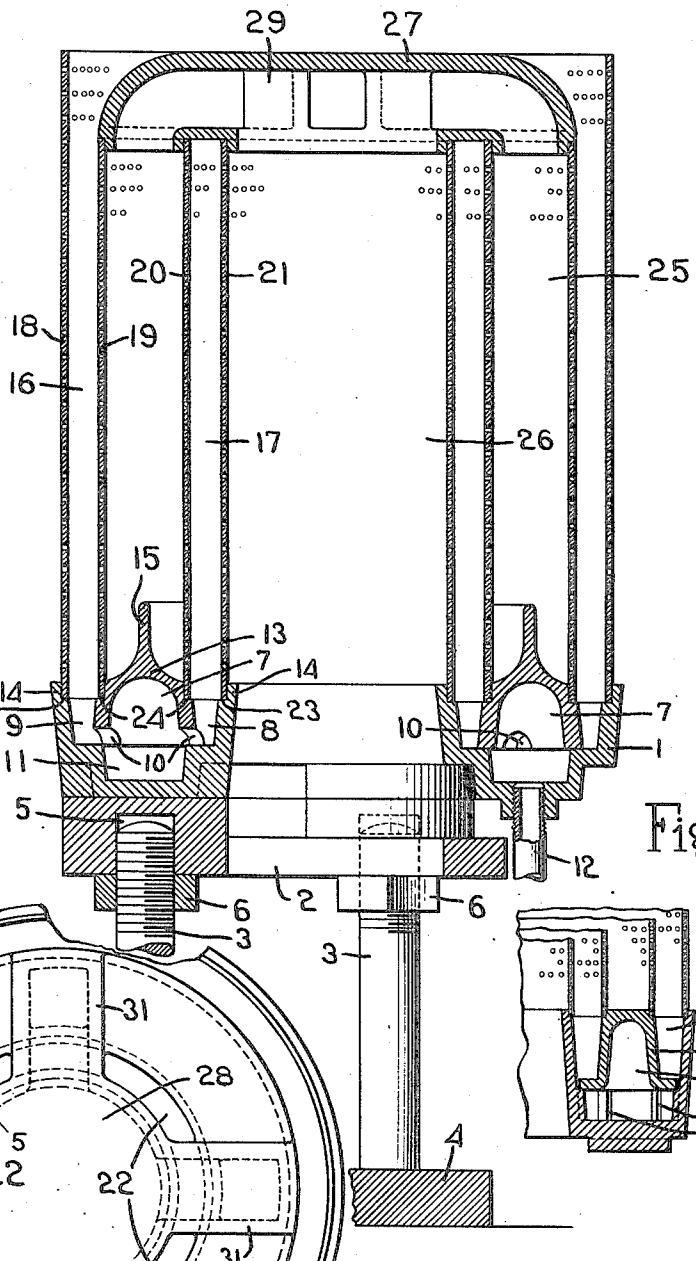


Fig.2.

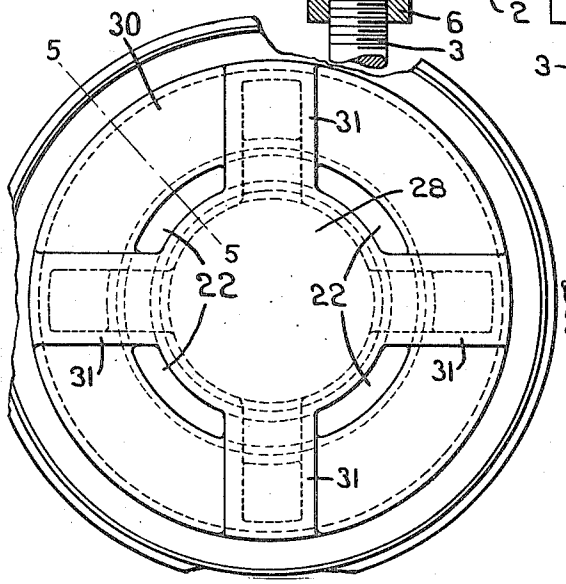


Fig.7.

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July 14, 1936. G. N. ALBREE 2,047,303

OIL BURNER

Filed Aug. 4, 1931 3 Sheets-Sheet 2

Fig.3.

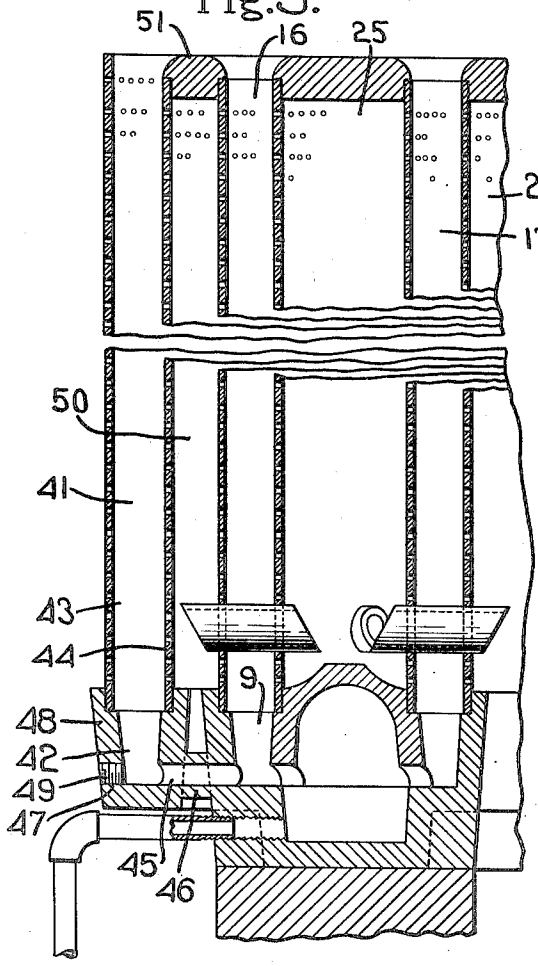


Fig.4.

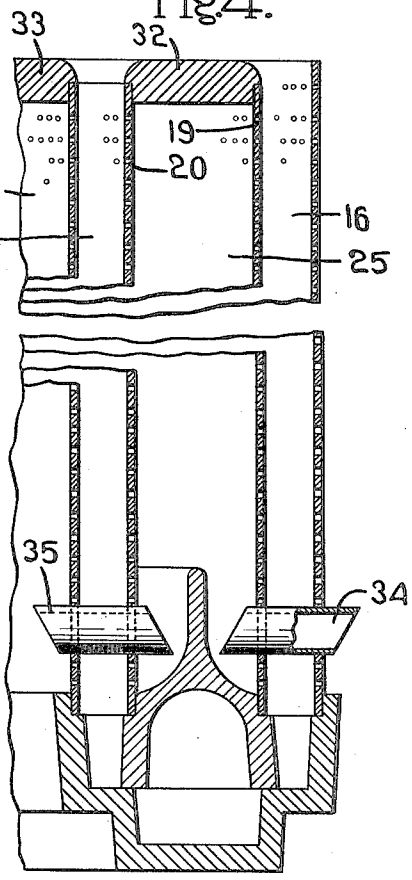


Fig.6.

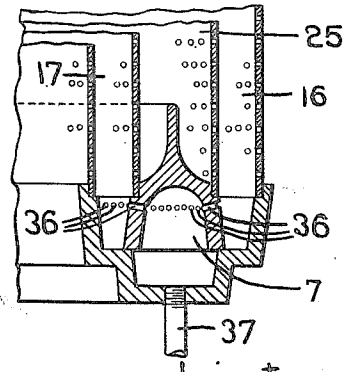
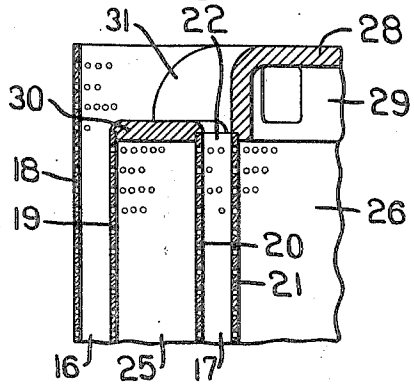


Fig.5.



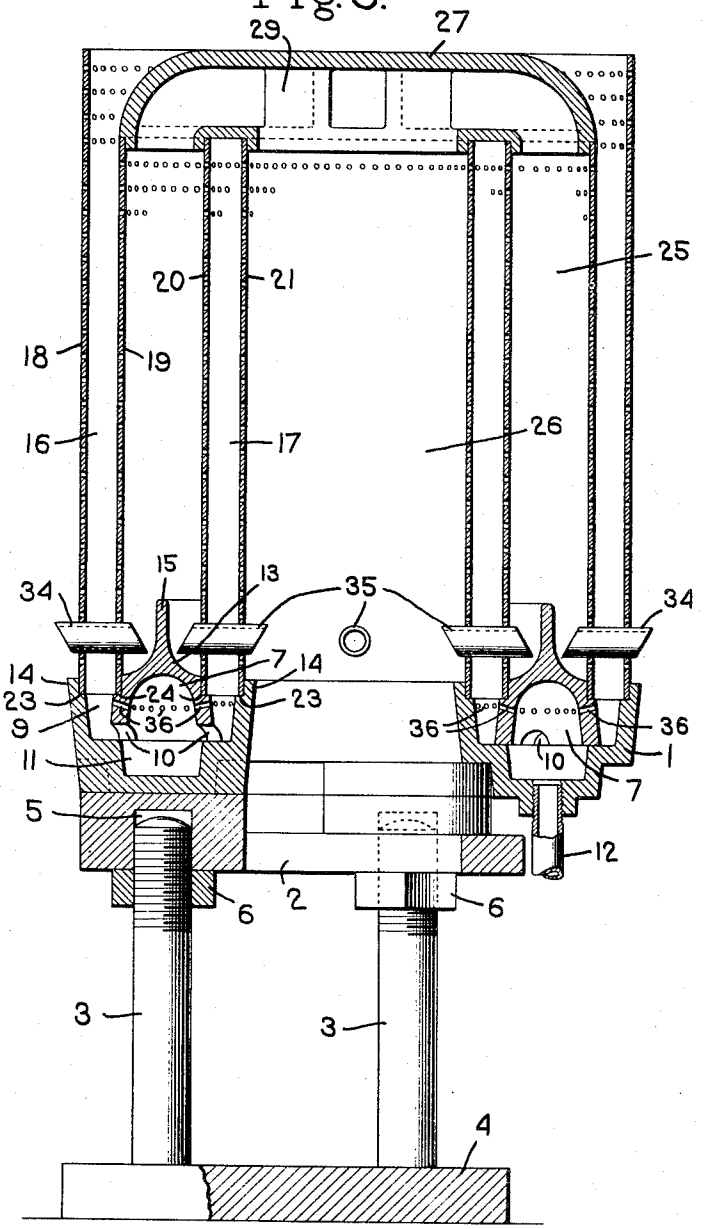
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Filed Aug. 4, 1931 3 Sheets-Sheet 3

Fig. 8.



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2,047,303

OIL BURNER

George Norman Albree, Concord, Mass.

Application August 4, 1931, Serial No. 554,999

11 Claims. (Cl. 158—87)

This invention relates to oil burners and particularly to a type of burner which is self-gasifying, and in which no mechanical motion or forced draft is utilized to produce a combustible mixture of air and gasified oil.

The principal object of the invention is to provide a burner in which the cool oxygen bearing air currents are diverted from the gasifying chamber thereof thereby maintaining a high uniform gasifying temperature within the gasifying chamber.

A further object of the invention is to provide an oil burner of a design which is adaptable readily to the construction of burners having a wide range of heating capacity.

A further object of the invention is to provide a burner having elements which may be readily fabricated.

A further object of the invention is to provide a burner in which a portion of the air enters the combustion chambers from a specially constructed air feeding chamber.

A further object of the invention is to provide a burner in which a portion of the gasifying chamber may be removed readily to facilitate cleaning of the carbon from the burner.

Other objects and features will more fully appear from the following description in connection with the accompanying drawings, and will be particularly pointed out in the claims.

It has heretofore been difficult to obtain satisfactory dependable operation in an oil burner which is self-vaporizing when burning oils of a relatively low volatility. The successful operation of such a burner depends not only upon a satisfactory high gasifying temperature, but depends to a great extent upon maintaining such temperature at a constant degree. The present invention accomplishes this result in a simple but entirely satisfactory manner.

Briefly the burner consists of an annular base member which constitutes a foundation upon which the other elements of the burner are supported, and is itself supported in position within a heater, stove or other apparatus for utilizing heat. The base is generally channel shaped in cross section being entirely closed at its lower end and open at its upper extremity. At a point substantially centrally between the sides of the base member is located a gasifying chamber having relatively heavy walls which act to absorb and retain the heat generated by the burner. The gasifying chamber extends upward into the channel shaped chamber of the base member, and divides this chamber into two smaller concentric annular chambers which receive gas from the gasifying chamber through a series of conduits or ports and serve to distribute the gas evenly throughout the circumference of the burner to the combustion chambers. The combustion chambers are annular in shape being open at their upper extremity, and are formed by vertical perforate walls which rise from the upper edges of the distributing chambers. These chambers will be referred to herein as combustion chambers although it is within these chambers also that mixing of the oil vapor and air takes place to provide a properly combustible fluid.

The inner and outer combustion chambers are of such diameter that an appreciable space exists between them. This space is utilized as an air feeding chamber which is closed at its bottom end by the upper wall of the gasifying chamber, and is closed at its upper end by a specially constructed cover plate. This cover plate is composed of two sections, an inner ring shaped section which closes the upper end of the air feeding chamber, and a central section which covers the central chamber of the burner which is formed by the inner face of the innermost vertical wall of the inner combustion chamber. The cover plate forming the closure for these two chambers has therein a plurality of conduits communicating from the central chamber of the burner to the upper end of the air feeding chamber.

The necessary air to support combustion within the combustion chambers is supplied partly by that which penetrates the perforated outer vertical wall of the outer combustion chamber and the inner vertical wall of the inner combustion chamber. The balance of the air which acts to support combustion enters the combustion chambers by way of the air feeding chamber which in turn receives a supply of air through the conduits in the cover plate. Sufficient air is fed thereby to the burner without cooling the gasifying chamber since the cool air currents are diverted from the surfaces of the gasifying chamber. Furthermore, the air supplied to the burner through the feeding chamber accumulates considerable heat before it enters the combustion chambers. The air may be fed also directly into the air feeding chamber through a plurality of conduits leading from the outside through the combustion chambers.

In the drawings:

Fig. 1 is a vertical sectional view through a preferred embodiment of the invention.

Fig. 2 is a top plan view of the apparatus.

Fig. 3 is a partial vertical section of a modified form of the invention.

Fig. 4 is a partial sectional view of a further modification of the invention.

Fig. 5 is a sectional view on line 5—5 Fig. 2.

Figs. 6 and 7 illustrate modifications of the construction of the base section of the burner, it being understood that the upper section of the burner may be constructed similar to that shown in either Figs. 1, 3, or 4.

Fig. 8 is a vertical section through a burner having the base section illustrated in Fig. 6.

The preferred embodiment of the invention herein illustrated is generally cylindrical in shape and disposed with its axis vertically. The burner may be, however, of any desired shape consistent with the broad principles of the invention. The burner may be supported in any suitable manner. An efficient construction is illustrated in which the base 1 of the burner is supported by resting upon the upper face of an adjustable frame 2 which is in turn supported the desired distance from the floor or foundation of the heating apparatus by means of a plurality of posts 3 which may be embedded in the foundation or fixed in a base plate 4. Any number of such posts may be employed, the use of three such posts constituting a desirable construction, two of which are shown in the drawings. The upper ends of the posts are received loosely in apertures 5 in the frame 2. The upper ends of the posts 3 are provided with nuts 6 upon the upper face of which the frame 2 rests. By adjusting the nuts 6 upon the posts the frame 2 may be leveled accurately. The burner may now be removed and replaced for cleaning or other purposes with the assurance that it will reassume its proper level position.

The base member 1 is annular in form and desirably is hollow and generally channel shaped in cross section being closed at its bottom and open at its upper extremity. The base member is divided into a central chamber 7 which is the chamber into which oil is fed and in which it becomes gasified, and an inner and outer chamber 8 and 9 which communicate with the gasifying chamber 7 by means of conduits or ports 10.

The base member may be divided into its various chambers in any suitable manner. One method is illustrated in Fig. 1 wherein the base 1 is provided with a recess 11 into which the oil is fed by means of the feed pipe 12 which is connected to a source of supply not shown. Above the recess 11 is placed a hollow heat retaining ring 13 which opens downwardly and cooperates with the recess 11 to form a gasifying chamber 7. The position of the ring 13 automatically forms the chambers 8 and 9, the side walls 14 of the base 1 and the walls of the hollow ring 13 constituting the side walls thereof. The ring 13 may be provided with a vertical heat collecting fin 15. The manner in which the recess 11 is formed produces stepped inner walls to the flanges of the base member and the member 13 rests on the steps thus formed.

The chambers 8 and 9 receive the gas generated by the gasifying chamber through the ports 10 and distribute the gas evenly throughout the burner from where it rises into the annular combustion chambers 16 and 17 which are situated directly above the chambers 8 and 9 and are formed by vertical walls rising from the upper sides of the chambers 8 and 9. The vertical walls are perforated cylinders disposed with their axes vertically. The cylinders 18 and 19 form the combustion chamber 16 while the cylinders 20 and 21 form the combustion chamber 17. The combustion chambers 16 and 17 are open at their upper ends, the chamber 17 opening through apertures 22 formed in a specially constructed cover plate to be described hereinafter.

The perforated cylinders 18 and 21 rest upon shoulders 23 formed in the side walls of the base 1 while the cylinders 19 and 20 rest upon shoulders 24 in the ring 13. The perforated cylinders are disposed desirably substantially concentrically, and are so proportioned relatively to each other that a chamber 25 is formed between the adjacent walls 19 and 20 of the combustion chambers. A central chamber 26 is also formed by the inner cylinder 21 which is open at its lower end and closed by a cover plate 27 of special design. The plate 27 rests upon the upper ends of the cylinders 19, 20 and 21, and is composed of two connected sections an inner hollow circular section 28 acting to close the upper end of the chamber 26 and having a chamber 29 therein opening downwardly. The other section 30 of the plate 27 is ring shaped and serves to close the top of the chamber 25. The two sections 28 and 30 are connected by means of conduit members 31 which have passages therein communicating from the chamber 29 to the upper end of the chamber 25. The spaced relation of the sections 30 and 28 provides access to the outside for the burning gas within the combustion chamber 17. By reason of the construction of the cover plate 27 having the conduit members 31 extending from its central section to its outer section, the opening above the combustion chamber 17 is partially cut off leaving the openings 22.

The operation of the burner is as follows. To start the action of the burner heat is supplied in any desired manner as for instance by igniting raw oil at some point adjacent to or within the burner or by means of auxiliary apparatus. As the temperature of the burner reaches its normal value, the walls and the fin 15 of the gasifying chamber become heated and act to vaporize or gasify the oil which is fed to the chamber by means of a feed pipe 12. The gas thus generated passes through the conduits 10 to the distributing chambers 8 and 9 from which point it rises into the combustion chambers 16 and 17. At this point the air which passes through the perforations in the vertical walls of the combustion chambers mixes with the gas therein to provide a more volatile mixture and to support combustion. As the mixture of gas and air becomes ignited it ascends to the top of the combustion chambers, and into the air above to supply heat to the heating apparatus. A portion of the air consumed in the combustion chamber 16 reaches the chamber through the perforations of the wall 18, while a portion of the air consumed in the combustion chamber 17 is supplied by passing through the perforations in the wall 21 thereof. The remaining portion of the air supplied to both combustion chambers is fed thereto from the closed chamber 25.

Air is supplied to the chamber 25 through the conduit members 31 which conduct the air from the upper portion of the central chamber 26. Since the temperature of the surrounding walls of the chamber 26 is relatively high the air therein becomes heated and is further heated as it passes downwardly into the chamber 25. The air reaching the combustion chambers through the air feeding chamber 25, is, therefore, consider-

ably raised in temperature, and for this reason efficiently supports combustion.

Another form of the device is illustrated in Fig. 4 which is similar to the device already described having a base member 1 and vertical walls identical with those of the burner already described. The combustion chambers 16 and 17 are open at their upper ends while the air feeding chamber 25 is closed at its upper end by an annular cover plate 32 which rests upon the upper ends of the cylinders 19 and 20. The chamber 26 is closed at its upper end by means of a circular cover plate 33. In this embodiment of the invention air from the outside enters the air feeding chamber 25 through one or more conduits 34 which pass through the combustion chamber 16 and are supported in closely fitting apertures in the cylinders 18 and 19. Air is fed also to the air feeding chamber 25 by means of one or more conduits 35 which pass through the combustion chamber 17 and are suppoted in apertures in the cylinders 20 and 21 in a manner similar to that of the conduits 34. The conduits 34 and 35 are situated preferably adjacent the lower ends of the cylinders but may be located in a position to conduct air to the chamber 25 at any desired point.

It will be noted that in both forms of the device as above described that the cool air which is fed to the burner does not come into contact with the walls of the gasifying chamber. By diverting these air currents from the chamber in the manner described, the cooling thereof due to the draft of the burner is eliminated. By properly proportioning the elements of the burner and arranging them in the relation above set forth, it is possible to construct a burner employing the principles of the invention of high efficiency and which will produce a temperature of the proper degree within the gasifying chamber to completely gasify the oil as it is fed to the chamber. It is also contemplated to feed air to the chamber 25 by means of the conduits 34 and 35 in combination with a cover plate 27 conducting air to the chamber 25 through its conduits 31. Such a construction is shown in Fig. 8 wherein the base 1 of the burner is formed with the inner and outer gas-distributing chambers 8 and 9 and the intermediate gasifying chamber 7, and wherein the gas-distributing chambers 8 and 9 communicate with the inner and outer combustion chambers 17, 16 formed by the perforated cylinders 18, 19, 20 and 21 in the same manner as illustrated in Figs. 1, 3 and 4. These perforated cylinders also form the air-feeding chamber 25 between the combustion chambers. In this embodiment the air is fed to the air-feeding chamber 25 both through the conduits 31 formed in a cover plate 27, which is similar to the cover plate shown in Fig. 1 and through other conduits 34, 35 extending through the perforated cylinders as illustrated in Fig. 4.

It is a distinct advantage also to construct a burner as described having a portion of the gasifying chamber removable. By such design the cleaning of the burner is greatly facilitated. Not only is the cleaning of the ring 13 greatly simplified by its removal, but the base 1 being of relatively simple construction may be cleaned also with a minimum of effort. The cylinders 18, 19, 20 and 21 must, of course, be removed to carry on the cleansing operation. Their removal and replacement is, however, a very simple operation since they rest by gravity upon the shoulders provided therefor.

Due to the particular shape of the base member 1 and the ring 13, they may be formed readily of malleable sheet material. This feature is exceedingly valuable in simplifying and reducing the cost of manufacture, and furthermore permits the use of various alloys of iron and steel such as the chromium alloys which resist oxidization and maintaining a normal rigidity at high temperatures, thereby preventing all tendency of the burner elements to warp out of shape.

Figs. 6 and 8 illustrate a method of modifying the construction of the base portion of the burner to permit the use of gases such as illuminating gas or a natural gas. The structure of the burner is substantially the same as has been previously set forth with the exception that a plurality of small ports 36 are drilled through the walls of the gas chamber 7 at short intervals close to the bottom edge of the cylinders 19 and 20. These ports 36 act to conduct the gas to the combustion chambers 16 and 17. This form of burner functions in substantially the same manner as those previously described. The chamber 7 acts as a preheating agent for the gas fed thereto by the feed pipe 37 connnected to the source of supply.

The perforations 36 in the ring 7 do not interfere with the operation of the apparatus as an oil burner but permit its use interchangeably as an oil or gas burner. A further advantage of this feature is that it permits gas to be burned for a short period to raise the temperature of the burner preparatory to burning oil. Furthermore if either gas or oil is used as the main fuel supply, and such supply will fail, the burner may be maintained in operation by using an auxiliary supply of either gas or oil.

Fig. 7 illustrates a very desirable construction of the base portion of the burner in which the base is channel shaped in cross section having no recess as in the burners previously described. The side walls of the base member are provided at intervals with short vertical ribs 38 upon the upper ends of which rest a specially shaped gasifying ring member 39. The ring member 39 has a chamber therein opening downwardly, the side walls of which are bent laterally outward and rest upon the ribs 38. The peripheral edges of the laterally bent portions of the ring 39 fit loosely within the base member, and thereby provide space through which the gas generated within the gasifying chamber 40 may flow into the gas distributing chambers 7 and 8. The design of this particular form of the burner lends itself to large scale production, and is very easily disassembled and may be cleaned with a minimum of effort.

Another valuable feature of the invention is the adaptability of the burner to increased capacity by adding more combustion chambers. The efficient character of the gasifying chamber permits a sufficient quantity of gas to be generated to supply the additional combustion chambers. One or more additional combustion chambers may be added to the central or main unit either outside or inside, or both inside and outside of the main unit. A desirable construction to carry out this feature of the invention is illustrated in Fig. 3 showing one additional combustion chamber 41 outside of, concentric with and spaced from the chamber 16. The chamber 41 is similar to the other combustion chambers, and has a gas distributing chamber 42 at its lower end which is provided with vertical perforated walls rising from the upper edges of the chamber 42

in the form of cylinders 43 and 44 which extend upward to the level of the other cylinders. The outermost cylinder 43 is extended a short distance beyond the other cylinders. By thus extending the outer cylinder it has been found by experimentation that the outer ring of flame issuing from the burner is maintained symmetrical in form, and burns with a steady even heat which otherwise is not the case. The natural draft caused by the rising currents of air adjacent the outer surface of the outer cylinder 43 from the burner has a tendency to cause the outer ring of flame to burn unevenly. In each of the other forms previously described, the outer cylinder is extended slightly above the inner cylinders to improve the function of the outer combustion chambers.

The gas distributing chamber 42 is supplied with gas from the chamber 9 by means of a series of conduits 45, one of which is herein shown communicating from the lower portion of the chamber 9 to the lower portion of the chamber 42. To facilitate the construction of the base member in this particular form of the device, the conduits 45 are drilled through cylindrical sections 46 cast integral with the chambers 9 and 42. The sections 46, one of which is shown in the drawings, serve to support the outer combustion chamber from the main portion of the burner. The conduit 45 may, of course, be formed by coring in the usual manner or may be drilled after the casting process. To accomplish the drilling process, an aperture 47 is drilled through the outer wall 48 of the chamber 42 in line with the sections 46. The drill used for this purpose is then forced to penetrate the section 46 and enter the chamber 9. Upon completion of the drilling operation the aperture 47 is plugged in any desired manner such as by means of the screw threaded plug 49.

The chamber 50 formed by the cylinders 43 and 44 is open at its bottom end by reason of the space existing between the chambers 9 and 42, and is closed at its top by an annular cover plate 51. Air reaches the combustion chamber 41 from the outside directly through the perforated cylinder 43, and also by entering the chamber 50 from below and penetrates the cylinder 44 through the perforations therein. The other elements of the burner function in the same manner as that already set forth.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. An oil burner comprising an annular base member presenting inner and outer annular gas distributing chambers closed at their sides and bottom and open at their top, perforate walls extending upward from the sides of said chambers to form annular combustion chambers above and communicating with said gas distributing chambers, a gasifying chamber into which oil is fed situated between the gas distributing chambers, the side walls of the gasifying chamber forming the inner and outer side walls of the outer and inner annular gas-distributing chambers, conduits communicating from the gasifying chamber to the distributing chambers, an air feeding chamber between the combustion chambers closed at its bottom and top and conduits acting to conduct air from outside the combustion chambers to said air feeding chamber at points removed from the walls of the gasifying chamber whereby air will be conducted to the air feeding chamber without cooling the gasifying chamber and will become preheated before entering the combustion chambers.

2. An oil burner comprising an annular base member presenting inner and outer annular gas distributing chambers closed at their sides and bottom and open at the top, perforate walls extending upwardly from the sides of said chambers to form annular combustion chambers open at their upper ends situated above and communicating with said gas distributing chambers, the innermost perforate wall forming a central cylindrical chamber opening to the air, a gasifying chamber between the gas distributing chambers and into which oil is fed, conduits communicating from the gasifying chamber to the gas distributing chambers, an air feeding chamber between adjacent walls of the combustion chambers closed at its bottom and top and means to conduct air from the central chamber into the upper end of said air feeding chamber.

3. An oil burner comprising an annular base member having a central opening to the air and presenting annular concentric gas distributing chambers closed at their sides and bottom and open at the top, perforate walls extending upwardly from the sides of said chambers to form annular combustion chambers open at their upper ends, an air feeding chamber between the combustion chambers closed at its bottom and a central air chamber communicating with said central opening, a gasifying chamber situated between the gas distributing chambers into which the oil is fed, conduits communicating from the gasifying chamber to the gas distributing chambers, a cover plate having two concentric sections with space between, one section closing the top of said air feeding chamber and the other section closing the central opening of the burner, said cover plate having conduits therein acting to conduct air from said central opening to the top of said air feeding chamber in which chamber the air is preheated and then passes through the perforations in the walls thereof to mix with the gas in the combustion chambers.

4. An oil burner comprising an annular base member presenting inner and outer concentric gas distributing chambers closed at their sides and bottom and open at the top, perforate walls extending upwardly from the sides of said chambers to form annular combustion chambers open at their upper ends, a gasifying chamber situated between the gas feeding chambers and into which the oil is fed, conduits communicating from the gasifying chamber to the said gas distributing chambers, an air feeding chamber between adjacent walls of the combustion chambers closed at its top and bottom, conduits for supplying air to said air feeding chamber from outside the combustion chambers, an additional combustion chamber disposed concentrically of the base member and spaced therefrom and conduits connecting the gas distributing chambers with the additional combustion chambers.

5. An oil burner comprising an annular base member presenting inner and outer annular gas distributing chambers closed at their sides and bottom, perforate walls extending upward from the sides of said chambers to form annular combustion chambers, a gasifying chamber into which oil is fed situated between the gas distributing chambers, a plurality of small conduits formed in the upper portion of the side walls of the gasifying chamber communicating from said gasifying chamber to the lower end of said combustion chambers, an air feeding chamber between ad-

jacent walls of the gasifying chamber closed at its bottom and top ends and conduits acting to conduct air from outside the combustion chambers to the air feeding chamber at a point removed from the walls of the gasifying chamber.

6. An oil burner comprising an annular base member presenting inner and outer annular gas distributing chambers closed at their sides and bottom and open at their top, perforate walls extending upwardly from the sides of said chambers to form annular combustion chambers above and communicating with said gas distributing chambers, a gasifying chamber into which oil is fed situated between the gas distributing chambers, a plurality of small conduits distributed throughout the periphery of the gasifying chamber at the upper portion thereof communicating therefrom to the base of the combustion chambers, a plurality of conduits at the lower portion of the gasifying chamber communicating therefrom to the gas distributing chambers, an air feeding chamber between the combustion chambers closed at its bottom and top and conduits acting to conduct air from outside the combustion chambers to said air feeding chamber at points removed from the walls of the gasifying chamber whereby air will be conducted to the air feeding chamber without cooling the gasifying chamber and will become preheated before entering the combustion chambers.

7. An oil burner comprising an annular base member channel shaped in cross section opening upward and having an annular recess formed in the bottom wall thereof into which oil is fed, a hollow annulus channel shaped in cross section opening downward and positioned above said recess to form therewith a gasifying chamber and dividing the remaining space within said base member into inner and outer gas distributing chambers, combustion chambers situated above and communicating with said gas distributing chambers, conduits communicating from the gasifying chamber to the gas distributing chambers and means to feed air to said combustion chambers at points removed from the gasifying chamber.

8. A liquid fuel burner comprising, in combination: an annular base ring; spaced shells, certain of which are perforated, extending above said base ring and coacting therewith to define inner and outer combustion chambers, an air passage therebetween and an inner downwardly open air chamber; means for admitting air to said air passage; an annular inverted channel shaped member supported above said ring, below and of the same radial extent as said air passage and forming with said base ring a vaporized fuel passage constituting the principal means for distributing the vaporized fuel to said combustion chamber; means for supporting said member; means comprising a portion of said ring below said member for supplying fuel vapor to said fuel passage; said vaporized fuel passage opening into said combustion chambers.

9. A liquid fuel burner comprising, in combination: an annular base ring; shells, certain of which are perforated rising from said ring adjacent its inner and outer peripheries respectively; intermediate spaced shells; means supporting said last named shells above intermediate portions of said base ring, and with said first named shells and with each other defining inner and outer combustion chambers and an intermediate air passage; an annular ring supported above said base ring and the lower edges of said intermediate shells, extending continuously between said intermediate shells, forming a bottom wall for said air passage and an upper wall of an annular vaporized fuel passage; said vaporized fuel passage forming the principal means for distributing the vaporized fuel to said combustion chambers; means to admit air to said air passage; means to supply fuel vapor to said vaporized fuel passage comprising a portion of said base ring, and means for supporting said annular ring above said annular base ring; said vaporized fuel passage opening into said combustion chambers.

10. An oil burner comprising an annular base member having upstanding outer and inner concentric flanges provided with stepped walls, a hollow annulus channel-shaped in cross section opening downwardly and having its edges resting on the stepped portions of said outer and inner walls, said annulus forming with the base member an annular gasifying chamber and with the outer and inner walls of said base member, an outer and an inner gas-distributing chamber, a separate combustion chamber communicating with each gas-distributing chamber, conduits forming communication between the gasifying chamber and each gas-distributing chamber, means to feed air to the combustion chambers at points removed from the gasifying chamber and means to supply liquid fuel to the gasifying chamber.

11. An oil burner comprising an annular base member having upstanding outer and inner concentric flanges and an annular recess in the bottom wall thereof, an annular inverted channel-shaped member situated between said flanges and forming with said recess an annular gasifying chamber, said channel-shaped member also forming with said flanges outer and inner concentric gas-distributing chambers, the walls of said inverted channel-shaped member having openings through which gas is delivered from the gasifying chamber to said gas-distributing chambers, a plurality of concentric perforated walls, one supported on the outer flange, one on the inner flange, and others on said inverted channel-shaped member, said perforated walls forming inner and outer combustion chambers communicating with the inner and outer gas-distributing chambers and also forming an air feeding chamber above said annular channel-shaped member and conduits to conduct air from outside the combustion chambers to said air feeding chamber.

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