June 17, 1947. H. M. REEVES ET AL 2,422,209

OIL BURNER

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Fig. 1.

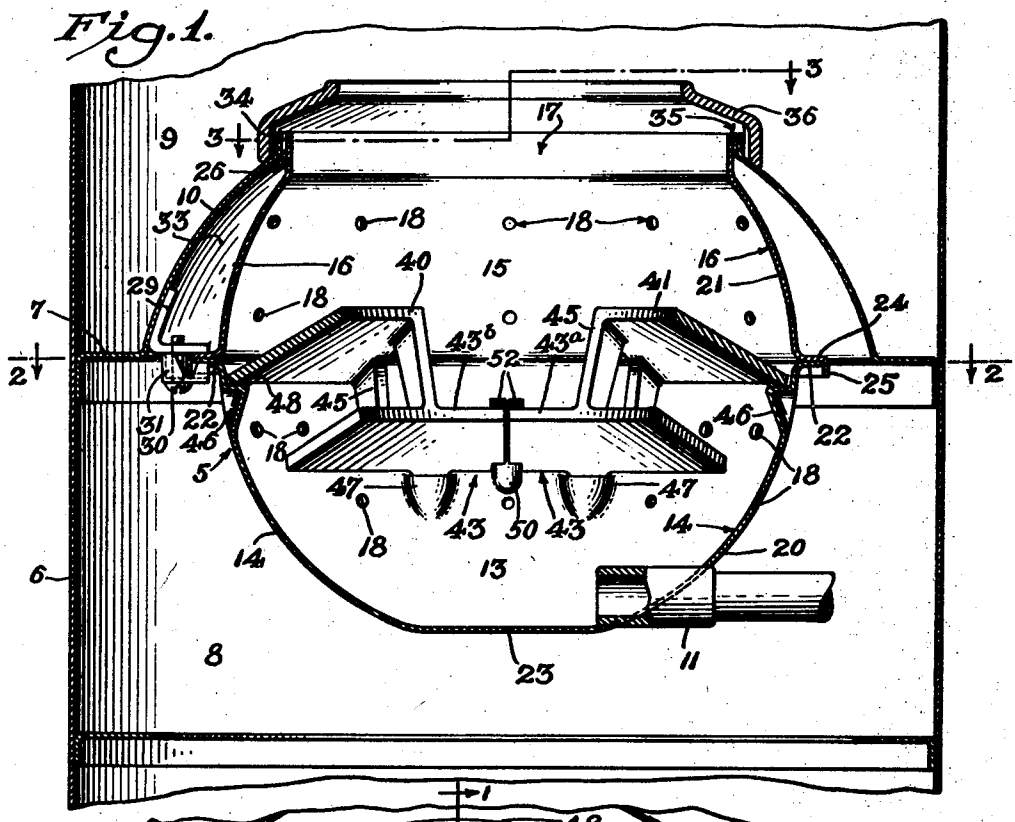
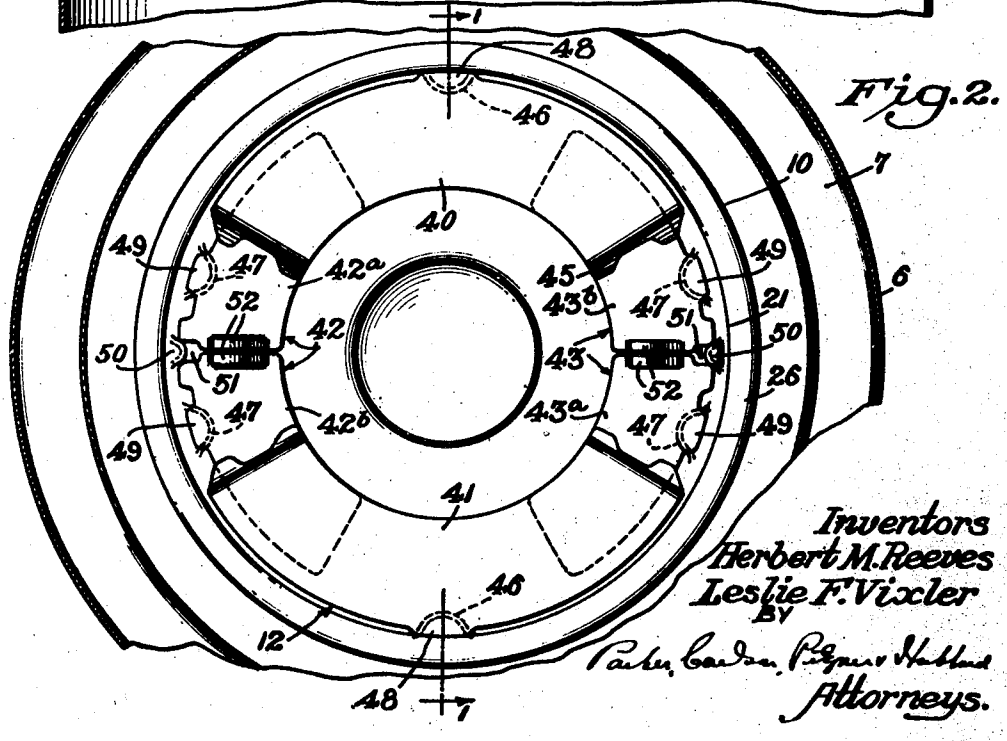


Fig. 2.



Inventors
Herbert M. Reeves
Leslie F. Vixler
By
Parker, Carlson, Pegram & Hubbard
Attorneys.

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Fig. 3.

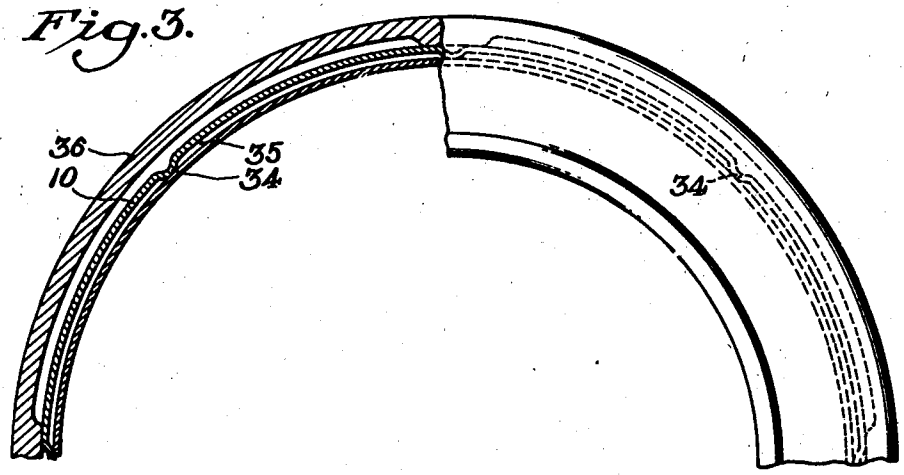
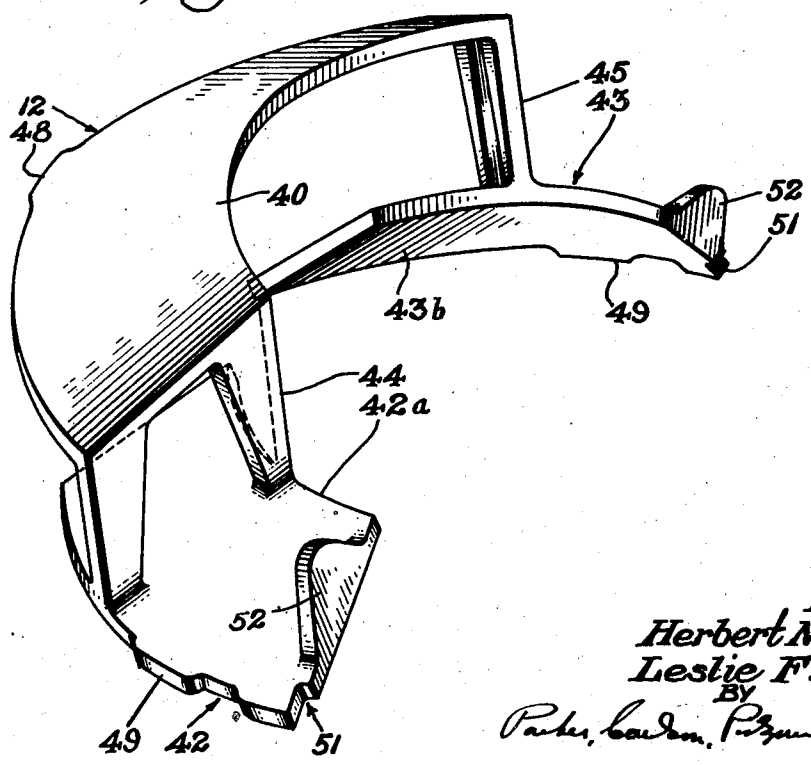


Fig. 4.



Inventors
Herbert M. Reeves
Leslie F. Vixler
By
Parker, Carlson, Pitzner & Hubbard.
Attorneys

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2,422,209

OIL BURNER

Herbert M. Reeves and Leslie F. Vixler, Kankakee, Ill., assignors to Florence Stove Company, Gardner, Mass., a corporation of Massachusetts

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10 Claims. (Cl. 158—91)

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The invention relates to improvements in liquid fuel burners and more particularly to burners of the so-called pot type adapted for burning oil.

One object of the invention is to provide a burner of the above general type having a fuel burning receptacle or pot and a baffle structure which embody novel features of construction and which are arranged to cooperate in a novel and advantageous manner to provide improved performance at low fuel feeding rates as well as efficient performance at medium and high fuel feeding rates, to provide rapid change from low fire to high fire operation when the fuel feed is increased, and to effectually eliminate pulsations of fire when operated at low or intermediate fuel feeding rates.

It is also an object of the invention to provide a pot type oil burner of simple, sturdy construction, which is inexpensive to manufacture yet efficient and reliable in operation.

Other objects and advantages of the invention will become apparent from the detailed description of the preferred embodiment illustrated in the accompanying drawings in which:

Figure 1 is a sectional view of a liquid fuel burner embodying the features of the invention, the section being taken in a vertical plane substantially on the line 1—1 of Fig. 2.

Fig. 2 is a plan view of the burner.

Fig. 3 is a sectional view taken in a horizontal plane substantially on the line 3—3 of Fig. 1.

Fig. 4 is a perspective view of one of the baffle units forming a part of the improved combustion zone defining structure.

While the invention is susceptible of various modifications and alternative constructions, we have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that we do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring to the drawings, the liquid fuel burner selected to illustrate the invention comprises a fuel receptacle or oil pot 5 adapted to be supported within a stove or furnace casing 6 of any preferred type. As herein shown, the pot 5 is supported on a horizontal partitioning member 7 extending transversely across the casing 6 and dividing it into vertically spaced air and combustion chambers 8 and 9. The partitioning member 7 is formed with a central opening for the reception of the pot 5 which opening is encircled by

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an upstanding flange 10 converging inwardly towards the central axis of the opening. Fuel oil is supplied to the pot 5 through a pipe 11 under control of conventional fuel feeding devices (not shown) which determine the feed rate in well known manner.

To obtain uniformly efficient performance of the burner under widely varying fuel feeding rates we construct the pot 5 of generally spherical form and provide therein a baffle structure 12 of novel and advantageous construction. The pot provides in its lower part, that is, below a median plane, a fuel vaporizing zone 13 having radially diverging side walls 14. The upper part of the pot 5 forms a chamber 15 having side walls 16 converging radially to a central outlet 17. The fuel vaporized in the zone 13 is mixed with air admitted through air inlet ports 18 in the walls 14 and 16.

By reason of the spherical contour of the pot, liquid fuel delivered to the vaporizing zone is confined to a relatively small area when the feed rate is low but is permitted to spread over a progressively larger area as the feed rate is increased. Uniform vaporization of the liquid fuel and consequently efficient combustion is thus obtained at all feed rates within the limits for which the pot is designed. The diverging side walls 14 permit the vaporized fuel to expand as it rises through the vaporizing zone and, in combination with the baffle structure 12, thoroughly mixes the fuel with the air entering through the ports 18 thereby insuring complete and clean combustion of the fuel.

To simplify the manufacture and assembly and to facilitate replacement and repair of worn or broken parts, the pot 5 is preferably constructed in two sections, namely, a bottom member 20 and a top member 21 which may conveniently take the form of sheet metal stampings. As herein shown, the bottom member 20 is generally hemispherical in form and is provided at its open end with an outwardly projecting peripheral flange 22. The bottom of the member may be flattened as at 23 to spread the fuel out over the desired area at low feed rates.

The top member 21 is preferably constructed in the form of a segment of the sphere. A peripheral flange 24 formed around the larger end of the member is adapted to register with the flange 22 of the bottom member, the flanges preferably meeting on the medial plane of the pot. The outer edge of the flange 24 may be turned down as at 25 to assist in properly aligning the members in their assembly. At its upper end, the side walls 16 of the top member 21 merge

into a generally cylindrical neck 26 which encircles and defines the central outlet 17 previously referred to.

Means of a simple yet effective character is provided for holding the top and bottom members of the pot in assembled relation and for supporting the assembled structure on the partitioning member 7. This means, as herein shown, comprises a plurality of L-shaped brackets 29, one of which is shown in Fig. 1. One leg of the bracket is spot welded or otherwise suitably attached to the inner surface of the flange 10 with the other leg projecting inwardly substantially flush with the lower surface of the partitioning member 7. The said other leg of each of the brackets 29 is adapted to extend over the flange 24 of the top member 21 and is threaded for the reception of a clamping screw 30 which acts through a V-shaped clamping member 31 to clamp the flange 22 of the bottom member 20 firmly against the lower face of the flange 24 and to support the weight of the pot.

Complete combustion of the fuel and air mixture produced in the pot 5 is insured by supplying a relatively large quantity of air through an annular passage 33 defined jointly by the partition flange 10 and the side walls 16 of the pot member 21. As the side walls of the pot are heated during the operation of the burner, the air flowing through the passage 33 is preheated before its delivery to the combustion zone. Bosses 34 (Fig. 3) struck inwardly from the upper end of the flange 10 engage the neck 26 of the pot to hold the parts in uniform spaced relation thus providing an annular air discharge port 35 for the air passage 33. An inwardly tapering fire ring 36 of cast iron or other suitable material supported on the upper end of the flange 10 directs the preheated air stream toward the center of the pot outlet 17 and thus assists in thoroughly mixing the vaporized fuel and air for complete combustion.

At high fuel feeding rates combustion of the vaporized fuel and air mixture takes place in the upper part of the pot 5 and is completed at or above the outlet 17 upon mixture of the burning gases with the preheated air entering through the annular port 35. As the feeding rate is diminished combustion occurs at progressively lower levels in the pot, the particular zone or level being determined by the baffle structure 12 in conformity with the rate of fuel feed.

The baffle structure 12 comprises a plurality of baffle elements or plates each in the form of an annular segment arranged in vertically and horizontally staggered relation around the inner walls of the pot 5. Thus, in the exemplary burner, the baffle structure includes two upper baffle plates 40 and 41 each of such length as to subtend an arc of approximately 120°. The upper plates are arranged on opposite sides of the pot 5 in vertically spaced overlapping relation with two similarly dimensioned lower baffle plates 42 and 43.

To facilitate manufacture and assembly, the lower baffle plates 42 and 43 are divided into sections 42_a, 42_b, 43_a and 43_b, respectively, and one section of each plate is formed as a unit with one of the upper plates. Accordingly, as shown in Fig. 4, one of the baffle units comprises the upper plate 40 and sections 42_a and 43_b of the lower plates 42 and 43 connected together by rigid vertical members 44 and 45 extending between the ends of the upper plate and the adjacent faces of the respective lower plate sections. The baffle

elements or plates and the members are preferably formed as a unitary casting.

The other baffle unit is similar to that above described comprising the upper plate 41 and sections 42_b and 43_a of the lower plates 42 and 43. Accordingly these units when installed within the pot define an annular series of baffle plates with alternate plates overlapping those adjacent each end thereof and spaced vertically therefrom.

For supporting the baffle units in the pot 5, brackets 46 and 47 are provided on the side walls 14 of the bottom member 20 of the pot. The brackets are preferably in the form of nibs or lugs struck inwardly from the walls 14. As herein shown, two of the brackets 46 are formed on opposite sides of the member 20 closely adjacent the upper edge thereof for coaction with projections 48 on the outer edges of the upper baffle plates 40 and 41 which also act to hold the baffle plates in spaced relation to the side walls of the pot. The brackets 47 are spaced substantially below the brackets 46 and are positioned for coaction with projections 49 on the outer edges of the baffle plate sections 42_a, 42_b, 43_a and 43_b. Lugs 50 struck in the side walls 14 between each pair of brackets 47 engage in recesses 51 formed by notches in adjacent corners of the plate sections to accurately locate the baffle units in the pot. Upstanding lugs 52 on the abutting ends of the baffle sections 42_a, 42_b, 43_a and 43_b assist in the alinement of the baffle units.

Referring to Fig. 1 of the drawings it will be observed that the brackets 46 and 47 are located so as to hold the baffle plates at an inclination effective to deflect the rising gases upwardly toward the center of the pot. Moreover, the baffle plates are located so that at least one row of air inlet ports 18 open below the lower baffle plates 42 and 43 while ports of another row open between the lower plates and the upper plates 41 and 42 and the remaining ports open above the upper plate. The proper amount of air for combustion is therefore introduced into the pot at the various levels at which combustion takes place at different fuel feeding rates. Changes in the fire level thus follow rapidly the changes in the fuel feeding rates.

In operation, liquid fuel is fed to the vaporizing chamber 13 through the pipe 11 at a rate determined by the setting of the control apparatus. The rising fuel vapors are immediately mixed with air entering through the lower row of ports 18 and a portion is deflected inwardly toward the center of the pot by the inclined lower baffle plates 42 and 43.

At intermediate and high fuel feeding rates, combustion takes place in the vicinity of or above the upper set of baffle plates 40 and 41, the rising fuel and air being thoroughly mixed by the action of both the upper and lower sets of baffles and the pot walls. The gases rising between the lower baffle plates 42 and 43 are deflected inwardly by the upper baffle plates 40 and 41 across the currents set up by the lower baffle plates. The thorough mixing of the fuel and air by the joint action of the baffles and the pot walls insures complete and efficient combustion of the fuel.

Burners constructed as above described have been found to have superior operating characteristics as compared with prior pot type burners. The baffle structure coacts with the bowl-shaped fuel receptacle or pot in producing a more thorough and intimate mixture of vaporized fuel and air while at the same time maintaining a smooth

flow of the mixed gases into the combustion zone. Thus the outwardly diverging side walls 14 of the lower section 20 of the pot permit the fuel vapors rising from the bottom of the pot to expand freely and mix with the air entering through the lower ports 18. The rising column of air and gaseous fuel impinges on the lower baffle plates 42 and 43 substantially at right angles to its path of movement, and a portion of the column is thus deflected inwardly and upwardly toward the center of the pot. Due to the inclined position of the baffle plates, pockets for trapping the gases are eliminated. The fuel and air mixture, therefore, burns cleanly and without pulsations or flickering even at the lowest fuel feeding rates.

A similar deflecting action with further mixing of the vaporized fuel and air is obtained at the upper row of baffle plates 40 and 41. The gases deflected in this instance are mainly those which have passed up between the ends of the lower baffle plates and such gases are directed crosswise of the flow stream produced by the lower baffle plates so as to promote thorough mixing with the air entering through the upper ports 18. A smooth even flow is maintained, however, by reason of the inclination of the said upper baffle plates, thus insuring clean pulsationless burning of the fuel at intermediate fuel feeding rates.

The intimate mixture and the smooth flow of the gaseous fuel and air at all fuel feeding rates permits rapid change from low fire to high fire operation. Moreover, in combination with the inwardly directed flow of preheated air through the annular port 35, it promotes clean and complete combustion of the fuel.

It will be apparent from the foregoing that the invention provides a pot type liquid fuel burner of novel and improved construction which is inexpensive to manufacture yet efficient and reliable in operation. The improved burner provides efficient performance at all feeding rates between the highest and the lowest for which the burner is designed. Moreover, rapid change from low fire to high fire operation takes place very rapidly when the fuel feed is increased and the fuel burns cleanly and without pulsations or flickering at any selected feeding rate.

We claim as our invention:

1. In a liquid fuel burner, in combination, a fuel receptacle of generally spherical contour having a central opening at the top and a plurality of air inlet ports disposed both above and below the median plane of the receptacle, means for supplying liquid fuel to said receptacle, the portion of said receptacle below said plane forming a chamber with radially diverging side walls adapted to confine the liquid fuel to a relatively small area while permitting rapid initial expansion of the same when vaporized, and a plurality of arcuate baffle plates arranged around the side walls of the receptacle, said baffle plates being inclined upwardly toward the center of the receptacle for cooperation with the walls of the receptacle in the mixing of the vaporized fuel and air.

2. In a liquid fuel burner, in combination, a fuel receptacle of generally spherical contour having a central opening at the top and a plurality of air inlet ports disposed above and below the median plane of the receptacle, means for supplying liquid fuel to said receptacle, the portion of said receptacle below said plane forming a chamber with radially diverging side walls adapted to confine the liquid fuel to a relatively small area while permitting rapid initial expansion of the fuel when vaporized, a plurality of arcuate baffle plates arranged in staggered relation around the walls of said chamber in different vertically spaced planes, and means for supporting said baffle plates on the walls of said chamber.

3. In a liquid fuel burner, in combination, a fuel receptacle including a generally hemispherical vaporizing chamber having a bottom wall and side walls diverging sharply outwardly and upwardly therefrom so as to confine the liquid fuel to a relatively small area while permitting rapid initial expansion of the fuel when vaporized, means for supplying liquid fuel to said receptacle, and a plurality of baffle plates arranged in staggered relation around said diverging walls in different vertically spaced planes, said baffle plates being inclined upwardly and inwardly from said walls.

4. In a liquid fuel burner, in combination, a fuel receptacle constructed of sheet metal stampings comprising a substantially hemispherical bottom member forming a fuel vaporizing chamber, means for supplying liquid fuel to said receptacle, a top member in the form of a spherical segment adapted to be mounted over said bottom member, each of said members having a plurality of sets of inlet ports for admitting air for mixture with the vaporized fuel, and a baffle structure including a plurality of baffle plates supported within said bottom member with certain of said plates located above the lowermost set of ports and other of said plates located above the uppermost set of ports of the bottom member.

5. In a liquid fuel burner, in combination, a cylindrical casing, a partitioning member extending across said casing and having a central opening encircled by an upwardly extending annular wall, a fuel receptacle of generally spherical contour constructed of upper and lower sections meeting in a medial plane, means for supplying liquid fuel to said lower section, each of said sections having a plurality of air inlet ports and said upper section having a central opening, flanges on the meeting edges of said sections, and brackets on said partitioning member engageable with said flanges to secure the top and bottom members together and to support the assembled members in predetermined spaced relation to the opening in the partitioning member, the wall encircling said opening coacting with the top section to define an annular air passage opening adjacent the top of the receptacle.

6. In a liquid fuel burner, in combination, a stove casing, a partitioning member extending across said casing and having a circular opening, a fuel receptacle of generally spherical contour supported on said member and disposed substantially coaxially in said opening, means for supplying liquid fuel to said receptacle, an annular inwardly converging flange upstanding from said partitioning member and encircling the upper portion of said receptacle to define therewith an air passage terminating in an annular port opening adjacent the top of the receptacle, and a fire ring supported on said flange and extending over said port, said ring being shaped to deflect inwardly and upwardly the air discharged through said port.

7. In a liquid fuel burner, in combination, a fuel receptacle of generally spherical contour having a central opening at the top, means for supplying liquid fuel to said receptacle, an annular member enclosing the upper portion of said receptacle

and defining therewith a cylindrical air passage terminating in an upwardly opening annular port encircling the opening in said receptacle, and an annular casting supported on said member and extending inwardly and upwardly over said port at an angle to said passage for deflecting the air entering through the port.

8. In a liquid fuel burner, in combination, a fuel receptacle including an upper section defining a combustion chamber, a generally hemispherical lower section defining a vaporizing chamber for liquid fuel, means for supplying liquid fuel to said vaporizing chamber, a plurality of arcuate baffle plates supported in the upper part of said vaporizing chamber at two vertically spaced levels, said bottom section having a set of air inlet holes located below the baffle plates at the lower level and another set of air inlet holes located between the baffle plates, said baffle plates coacting with the hemi-spherical walls of said bottom section to thoroughly mix the vaporized fuel with air entering through said holes and to direct the same into said combustion chamber.

9. In a liquid fuel burner, in combination, a fuel receptacle including an upper section defining a combustion chamber, a lower section having a substantially flat bottom with hemi-spherical side walls rising directly from said bottom, means for supplying liquid fuel to said lower section, said lower section having a plurality of sets of air inlet ports adjacent its upper end, the hemispherical walls of said lower section serving to confine liquid fuel to a relatively small area at the bottom of the section while permitting substantial expansion of vaporized fuel prior to its mixture with air entering through said ports, and a plurality of baffle plates supported on the walls of said lower section, said baffle plates being arranged in vertical and horizontal staggered relation with certain of said baffle plates located above the lower set of inlet ports and others located above the upper set of inlet ports whereby to produce a crosswise flow of vaporized fuel and air to effect a thorough mixing of the same.

10. In a liquid fuel burner, in combination, a fuel receptacle including an upper section defining a combustion chamber, a lower section

having a substantially flat bottom of relatively small area with side walls diverging sharply outwardly and somewhat upwardly therefrom, said lower section defining a vaporizing chamber for liquid fuel, means for supplying liquid fuel to said vaporizing chamber, and a plurality of generally arcuate baffle plates supported in the upper part of said vaporizing chamber at two vertically spaced levels, said lower section having sets of air inlet ports located respectively below and between the baffle plates at said two levels, said baffle plates being inclined upwardly and inwardly from the side walls of said lower section for cooperation therewith in thoroughly mixing vaporized fuel and air and directing the mixture upwardly into said combustion chamber in a smooth even flow adapted to insure clean pulsationless combustion of the same.

HERBERT M. REEVES.
LESLIE F. VIXLER.

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