Oct. 14, 1941. B. HAYTER 2,258,679

RECIRCULATING GASIFIER OR PILOT

Filed Oct. 21, 1939 4 Sheets-Sheet 1

Fig. 3

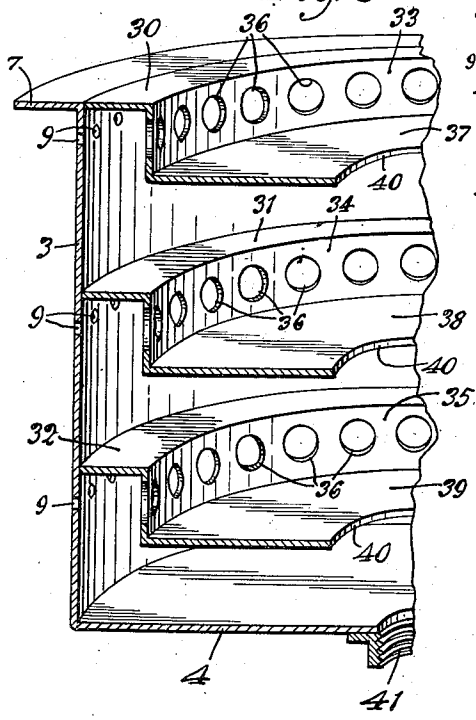
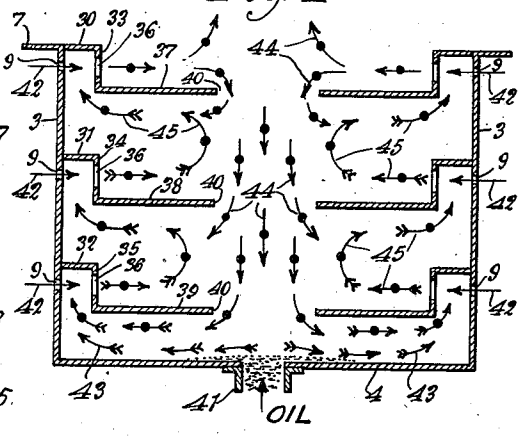


Fig. 4



LEGEND

AIR →

CO_2 →●

OIL VAPOR ⇉

HYDROXYLATED OIL VAPOR ⇉●

Fig. 1

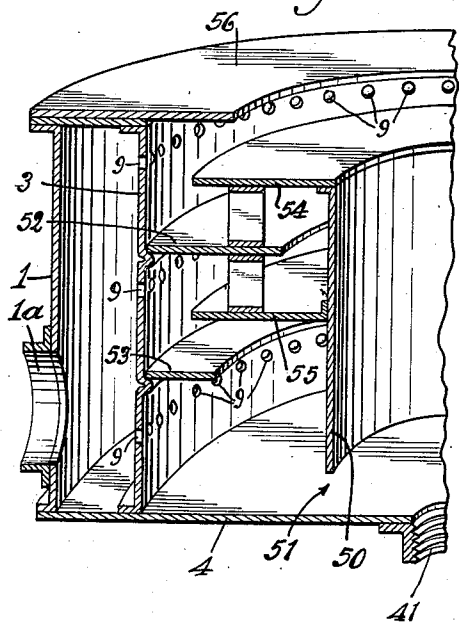
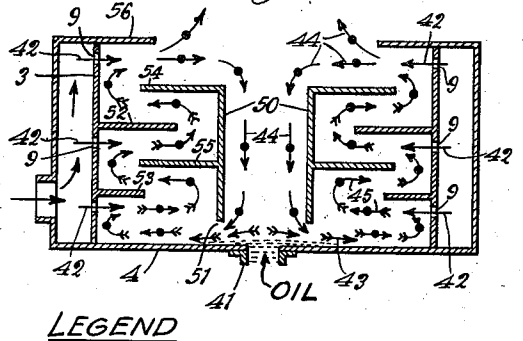


Fig. 2



LEGEND

AIR →

CO_2 →●

OIL VAPOR ⇉

HYDROXYLATED OIL VAPOR ⇉●

INVENTOR.

BY Bruce Hayter

Parker & Carter

ATTORNEYS.

Oct. 14, 1941. B. HAYTER 2,258,679

RECIRCULATING GASIFIER OR PILOT

Filed Oct. 21, 1939 4 Sheets-Sheet 2

Fig. 5

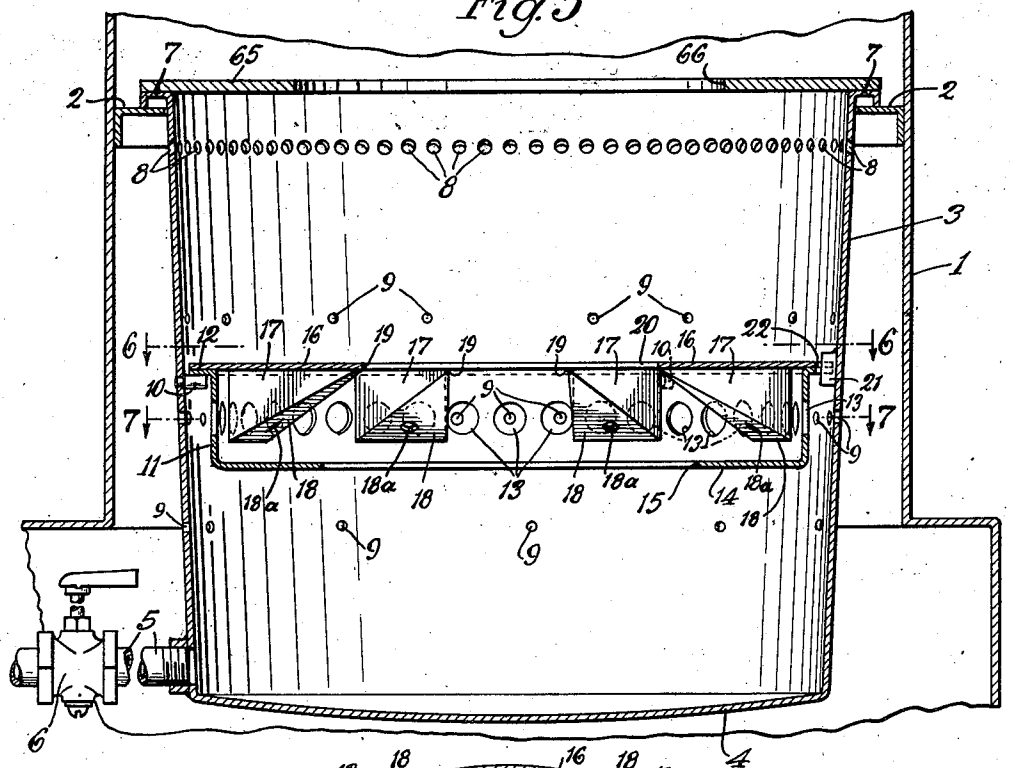
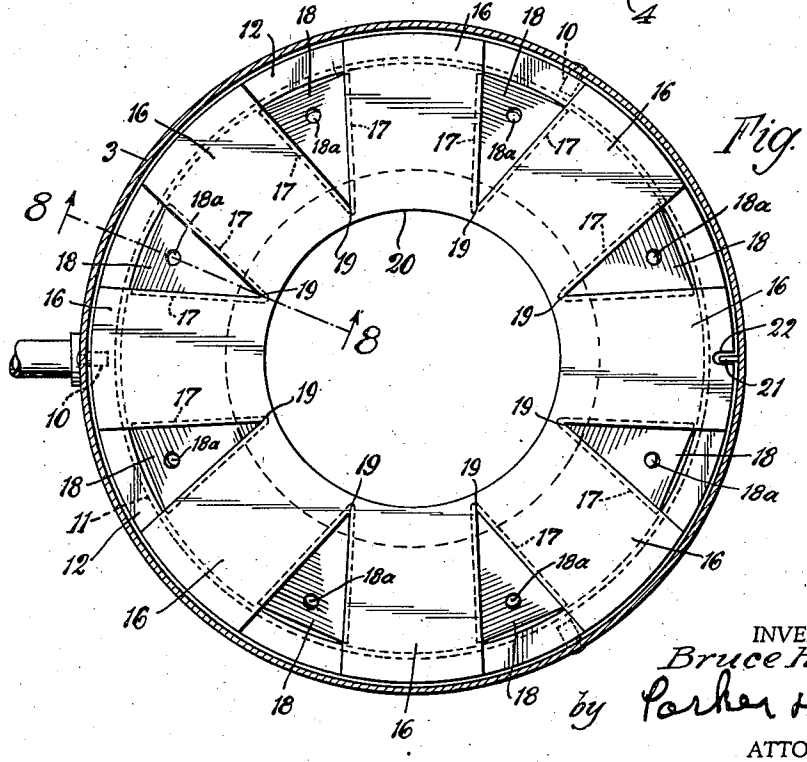


Fig. 6



INVENTOR.
Bruce Hayter
by Parker & Carter
ATTORNEYS.

Oct. 14, 1941. B. HAYTER 2,258,679

RECIRCULATING GASIFIER OR PILOT

Filed Oct. 21, 1939 4 Sheets-Sheet 3

Fig. 7

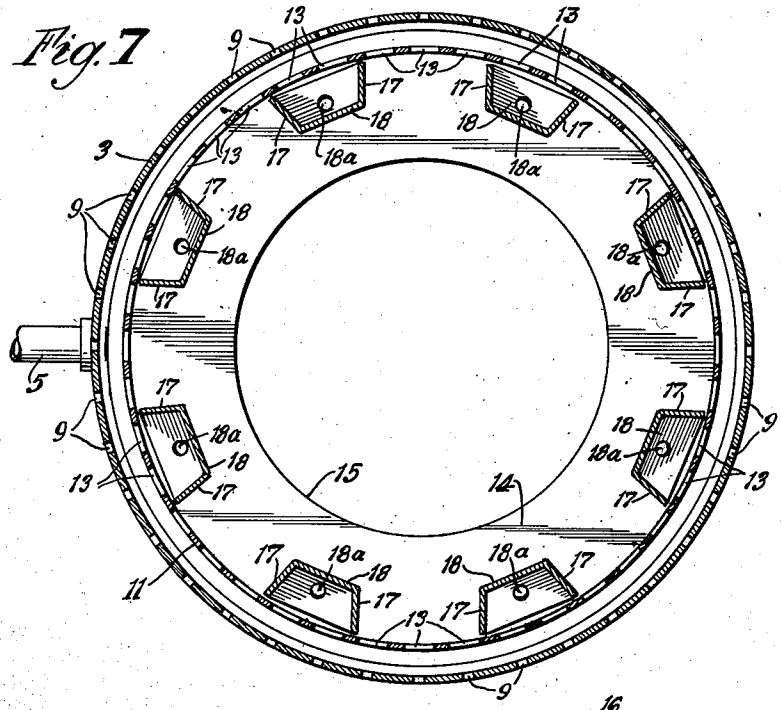


Fig. 9

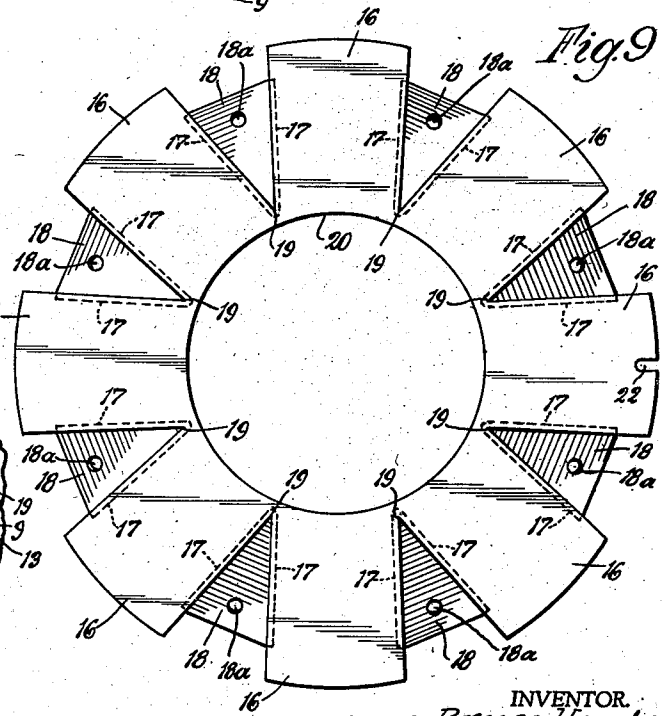
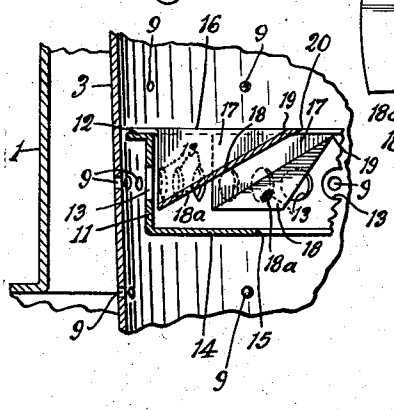


Fig. 8



INVENTOR.
Bruce Hayter

BY Parker & Carter

ATTORNEYS.

Oct. 14, 1941. B. HAYTER 2,258,679

RECIRCULATING GASIFIER OR PILOT

Filed Oct. 21, 1939 4 Sheets-Sheet 4

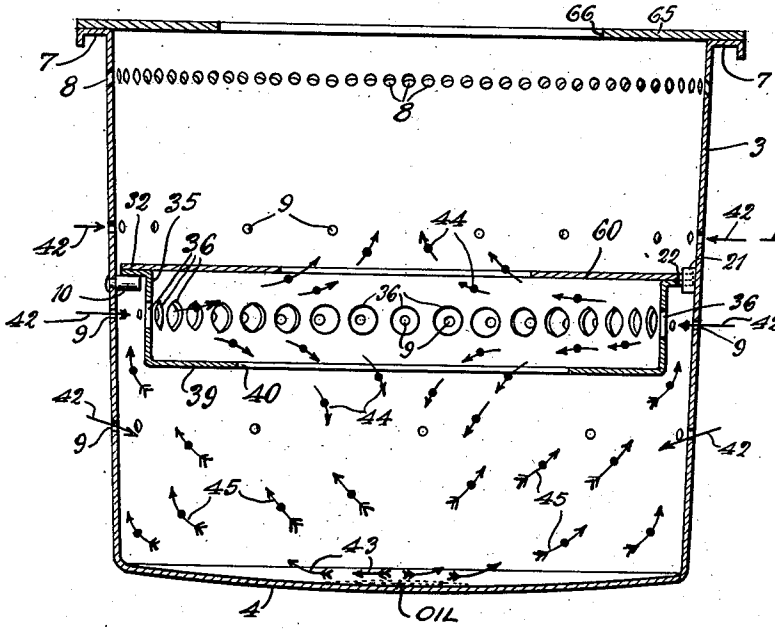


Fig. 11

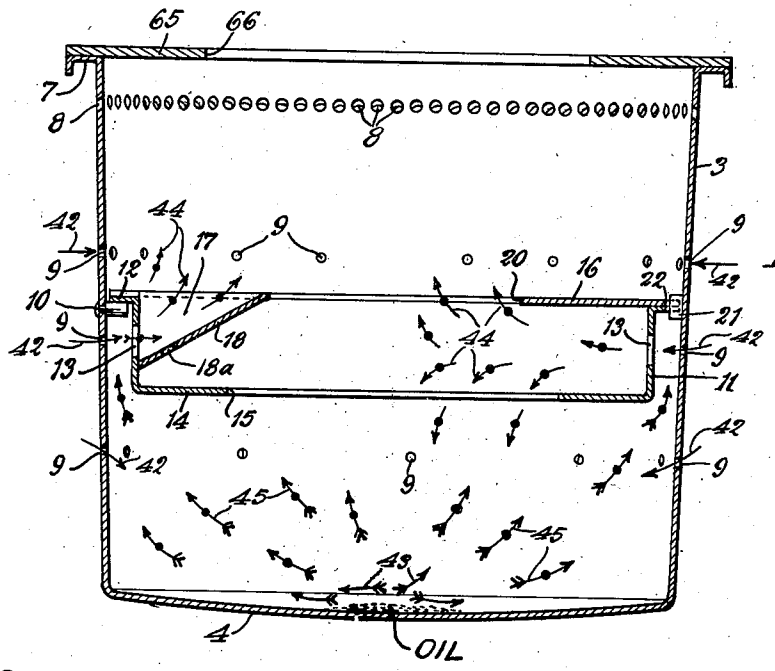


Fig. 10

LEGEND.

AIR

CO_2

OIL VAPOR

HYDROXYLATED OIL VAPOR

Inventor
Bruce Hayter
by Parker & Carter
Attorneys.

Patented Oct. 14, 1941 2,258,679

UNITED STATES PATENT OFFICE

2,258,679

RECIRCULATING GASIFIER OR PILOT

Bruce Hayter, Santa Fe, N. Mex., assignor to Oil Devices, Santa Fe, N. Mex., a limited partnership of Illinois

Application October 21, 1939, Serial No. 300,592

16 Claims. (Cl. 158—91)

My invention relates to an improvement in liquid hydrocarbon burners and has for one purpose the provision of a return gas or recirculating burner.

Another purpose is the provision of a gasifier structure and method which permits the combustion of a liquid fuel with a clean blue flame.

Another purpose is the provision of improved means for recirculating the products of the initial mixture of air and the vaporized hydrocarbon, for mixture with the inflowing air.

Another purpose is to maintain the side walls of the burner pot clean and free from carbon.

Another purpose is the obtaining of a lower oil consumption.

Another purpose is to increase the oil vaporization possibilities of the burner.

Other purposes will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawings wherein:

Fig. 1 is a partial section in perspective of one form of pot employed to carry out my invention;

Fig. 2 is a schematic view of the operation or flow of gases of the structure of Fig. 1;

Fig. 3 is a partial section in perspective of a variant or further development of the form of Fig. 1;

Fig. 4 is a schematic view of the movement of air and gases in the form of Fig. 3;

Fig. 5 is a vertical axial section of another form of the device;

Fig. 6 is a section on the line 6—6 of Fig. 5;

Fig. 7 is a section on the line 7—7 of Fig. 5;

Fig. 8 is a section on the line 8—8 of Fig. 6;

Fig. 9 is a plan view of one of the gasifying members or units shown in Fig. 5;

Fig. 10 is a schematic view of the device of Fig. 5 with some of the structure omitted, indicating the movement of the air and gases; and

Fig. 11 is a schematic view illustrating the movement of gases if only a single gasifier of the type of Fig. 3 is employed.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to the drawings, 3 indicates a side wall of a pot or mixing chamber, and 4 a bottom, which may be generally flat or, preferably, slightly concave. 5 is any suitable liquid fuel inlet, shown for example in Fig. 5. In the form of Figs. 1 and 3 I illustrate the fuel as admitted centrally through a passage 41. It will be understood, however, that the details of the admission of the liquid fuel do not of themselves form part of the present invention. Any suitable valve means, such as that shown at 6 in Fig. 5 may be employed to control or vary the inward flow of the supply of liquid hydrocarbon fuel.

Any suitable top flange 7, as shown in Figs. 3 and 5, may be employed at the top of the pot 3, which is adapted to rest upon a ring 2 of the outer shell or housing 1. Seated upon the flange 7 is a baffle plate 65, which is apertured as at 66. The pot itself is supplied with a plurality of air inlet apertures 9, located at various levels and which may for convenience be arranged in horizontal rows. In the form of Fig. 5 I illustrate a plurality of somewhat larger and more closely spaced secondary air inlet apertures 8. In the form of Figs. 1 and 3 a top row of apertures 9 is shown of substantially the same gauge and spacing as the lower rows 9.

Referring more specifically to the form of Figs. 1 and 2, I provide a central passage or cylinder 50, which terminates short of the bottom of the pot to provide a gap 51. Inwardly extending flanges or rings are indicated as at 52, 53, these rings being exterior to the passage 50 and abutting at their outer ends against the pot wall 3, and terminating at their inner edges substantially short of the outer face of the central passage 50. Intermediate outwardly extending flanges or rings 54, 55 are associated with the passage member 50 and extend horizontally outwardly therefrom. A top ring or baffle 56 extends inwardly from the upper edge of the pot wall 3.

The circulation of air, carbon dioxide and oil vapors is indicated schematically in Fig. 2, with the carbon dioxide downwardly recirculated through the passage 50. In the use of the device air is admitted in any suitable fashion, for example through the passage 1a, into the space between the outer jacket 1 and the drum or pot 3. It then flows inwardly through the apertures 9 in the wall 3 at a plurality of levels. The oil which flows upwardly through the passage 41 is vaporized, and the oil vapor initially flows laterally along the bottom 4, and the resultant carbon dioxide flows upwardly through a tortuous path defined by the baffles 52, 53, 54, 55. At each stage of this tortuous path it receives additional air through the apertures 9, as indicated by the arrows at 42. Some of the mixture flows upwardly through and above the baffle 56 and is burned in any suitable chamber or space thereabove. Part of it recirculates downwardly through the passage 50 and out-

wardly across the bottom 4 of the pot, mingling with the vaporized hydrocarbon, as indicated by the arrows 44.

Referring to Figs. 3 and 4, I illustrate, in connection with the pot 3, a plurality of circumferential rings or baffles 30, 31 and 32, located at various levels within the pot wall 3. Aligned with each row of holes 9, and depending from the inner edges of said baffles, are annular flanges 33, 34 and 35, having larger apertures 36 aligned with the apertures 9. Inwardly extending from the lower edges of said annular flanges are horizontal inwardly extending flanges or rings 37, 38 and 39, respectively. These various flanges have aligned central apertures 40, which in effect define a vertical generally cylindrical passage, as shown in Fig. 4.

Assuming that a liquid hydrocarbon fuel is delivered, for example, through the passage 41 and is vaporized by the heat of combustion going on above, the entry of air is indicated by the simple arrows in Fig. 4 at 42. The movement of the oil vapor or vaporized hydrocarbon, which is radially outwardly along the bottom of the pot, is indicated by the feathered arrows as at 43. As the consequent mixture flows upwardly along the inside of the wall member 3, it is mixed with air inflowing through the small apertures 9. The consequent mixture is directed inwardly through the corresponding large apertures 36. The mixture takes a more or less tortuous path about the outer edges ofthe rings 37, 38, receiving at each one a further increment of air and being directed in something of a Venturi effect inwardly through the apertures 36 of each row of outside apertures 9. At the top of the burner a major portion of the carbon dioxide flows upwardly for combustion, but a certain amount of it flows downwardly through the passage area defined by the apertures 40 and mixes with the outwardly flowing vaporized hydrocarbon at the bottom of the burner. The recirculated carbon dioxide is indicated by arrows and balls as at 44; and the hydroxylated oil vapor is indicated by feathered arrows and balls as at 45. The effect is thus substantially that of the form of Figs. 1 and 2. The form of Fig. 4 constitutes a development and a structural simplification thereof. This structure is considerably cheaper to make and is a more efficient mechanical job than the form of Fig. 1.

Figs. 5 and following illustrate a further development or simplification in which only a single gasifier unit is employed, instead of the three shown in Fig. 3, and in which the gasifier is modified and made even more efficient. I found that employing a single unit like the one shown in Fig. 3 gives an excellent blue combustion up to a certain point, but the modified unit shown in Fig. 5 is even more efficient.

Referring to Figs. 5 and following, the air apertures of the pot are divided into primary and secondary air apertures. The primary air is admitted through the apertures 9, and secondary air through the larger and more closely spaced apertures 8. The employment of the single unit also permits the obtaining of a pilot effect and at low fuel supplies, the topmost row of apertures 9 performs the function of secondary air admission, while the lower rows supply the primary air.

The pilot or gasifier unit of Figs. 5 and following includes a generally cylindrical ring or skirt 11 having an upper outwardly extending flange 12, seated upon any suitable supports or pins 10. It is provided with apertures 13 of larger size than the apertures 9 aligned therewith. Preferably the apertures 13 correspond in number to the apertures 9 of the particular row of apertures with which they are aligned, but are of substantially greater diameter, and are so aligned therewith that a jet of air flowing in through an aperture 9 finds its way through the corresponding aperture 13 of the annulus 11 and draws inwardly therethrough a volume of vaporized hydrocarbon or carbon dioxide flowing upwardly along the inner face of the pot 3 from the space below the gasifier unit. The annulus or skirt 11 also preferably includes a bottom inwardly extending flange 14, shown as flat and as terminating at an inner aperture 15 of substantial diameter. I find it preferable in practise to direct some of the inflowing air above the pilot or gasifier structure, and some below. I therefore employ an upper member which employs a plurality of flat generally radial elements 16, which are separated by deflectors. Each such deflector includes radially vertical side walls 17 downwardly extending from the edges of adjacent members 16. The walls 17 are connected by a bottom or deflecting member 18, as will be clear for example from Figs. 5 and 8. The walls 17 are generally triangular in shape and converge as at 19. The adjacent members 16 also join at the same point, and their inner walls define a central circular aperture 20, aligned with the aperture 15 but preferably of somewhat smaller diameter. The ends of the members 16 extend outwardly over and rest upon the flange 12.

Since the parts above described are aligned with the air inlet apertures, and an accurate alignment is necessary, I provide a centering inward projection 21, which seats in a single slot or notch 22 in the composite gasifying or pilot member above described.

It will be observed that in the device as shown in Figs. 5 and 6, one of the members 16 overlies three adjacent inlet apertures 13. The members 16, in connection with the side walls 17, tend to direct inwardly flowing air radially towards the central axis of the pot. The jets of air from the apertures 9 entrain vaporized hydrocarbon from the space below the flange 14, the vaporized hydrocarbon mixed with the air from the jets 9 being recirculated through the apertures 13. It will be understood that as long as suction is maintained below the gasifier structure a certain amount of the gases has to flow downwardly through the central aperture. The members 16, in connection with the side walls 17, tend to direct the inwardly flowing hydroxylated or gasified oil vapor and air mixture radially toward the central axis of the pot, above the aperture 15 but below the aperture 20. This flame burning just above the aperture 20 blankets the aperture 20 with the products of combustion or CO_2, and prevents air from being drawn downward. To secure a perfect blanketing of the central aperture 20, not all of the jets are needed. Hence, some of the jets are directed upwardly by the above described scoop members or deflectors 17 and 18. Clean blue flames are maintained just at these scoop members 17 and 18. These clean gases are directed upwardly along the side wall members of the pot 3, preventing thereby any carbon deposit thereon.

A small hole in the scoop member, as indicated at 18a, seems further to help the combustion, which is thereby made considerably more quiet. It will be observed in the drawings that the row of holes 9 directly above the gasifier in Fig. 5

are not equally spaced. This variation in spacing has definite advantages. It has also been found in practise that the picking off of two jets at a time by the scoop structures has definite advantages. In fact, where one hole is picked off by the scoop and the next hole is allowed to eject toward the central aperture, the combustion results are not as good as in the structure herein shown. The use of the double jet in one scoop induces turbulence not obtainable with a single jet, and, therefore, produces additional and much better mixing of the air and oil vapor. Therefore, the flame holds at the scoop and does not float away.

The movement of the air and gases shown in the form of Fig. 5 is indicated in the diagram of Fig. 10. Fig. 11 diagrammatically indicates the movement of the gases if only a single gasifier of the type of those of Fig. 3 is employed, for example, the ring or skirt 39, with the addition, however, of an upper baffle 60. The movement of air and gases is illustrated by arrows and indicated by numerals identical with those used for Figs. 2 and 4.

In hydroxylation, mixing carbon dioxide with the oil vapors accomplishes the gradual addition of the oxygen molecule to the hydrocarbon molecule. This avoids the tendency for rapid combustion to take place, and the resultant thermal decomposition of the oil vapor, which would set microscopic carbon free. As long as this microscopic carbon, which is indicated by a luminous flame, is present, there is the possibility that soot will be deposited at some one or more points or areas in a burner. Considering for example Figs. 5 and 10, it will be realized that each jet of air from one of the apertures 9 creates a suction, and at the same time adds the oxygen necessary for the hydroxylation of the oil. The result is a recirculation of carbon dioxide. The definite suction created as the jet of air flows from the aperture 9 through the corresponding aperture 13, causes a definite suction below the pilot or gasifier structure, which affects the recirculation. A certain amount of flame must be present at the central aperture of the pilot or gasifier structure to prevent air from being drawn from above down through the apertures 20 and 15. In order to obtain this condition it is found desirable to blank some of the jets, some being directed directly inwardly and others upwardly by the scoop members 17, 18. That is to say, some of the jets, in line with the space beneath the members 16 are directed to the aperture 15 and are recirculated downwardly through the space below the baffle structure. The other jets, aligned with the scoops 18, are upwardly directed and maintain flame at the central aperture and prevent air from being drawn down from the area above the pilot structure, thus preventing down drafts, which would unfavorably affect the process of hydroxylation.

With the structure shown in Fig. 5, not only is an all blue flame obtained, but the temperatures on the bottom of the pot at 4 are substantially raised and on dropping from high fire to pilot, the flame comes from a maximum to minimum in as little as, for example, 18 seconds. The flame coming from pairs of holes impinges on the inclined scoop 18, and the flame coming from intermediate groups of three holes is directed toward the central aperture. For example, if forty holes are employed in alignment with the pilot or gasifier structure, sixteen jets may be directed upwardly above the aperture 20, and twenty-four are directed toward the center aperture 15.

In employing the above described structure, the pilot fire maintains excellent characteristics with a complete absence of any dirty or soot depositing stage. At the intermediate stage the fire is practically all blue, and the high fire capacity is increased. In practise, the scoops 18 act as combustion catalyzers. Just as soon as the top piece, including the members 16 and the scoops 18, becomes hot, the upwardly directed jets burn just at the scoops and stay lit all the way up to high fire.

It will be understood, of course, that similar recirculating effects are obtained in the additional forms of Figs. 1 and 3.

It will therefore be realized that recirculation may be obtained by a variety of structures, although I find the structure shown in Fig. 5 in the main more practical than those shown in the remaining figures.

It will be realized that whereas I have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my precise showing.

It will be understood, for example, that when in the claims or description I employ the term "skirt," I do not wish this term to be employed as a limitation as to specific form. The skirt member 11, while it may conveniently be secured to or directly associated with the ring 16 above it, as shown for example in Fig. 10, may, if desired, be provided with independent supporting means.

I claim:

1. In a pot type burner, a pot having a circumferential wall provided with a plurality of air inlets located at various levels, means for delivering a fuel to said pot, a transversely extending generally horizontal gasifier structure in said pot intermediate the upper and lower apertures, said gasifier including a ring having a central aperture, a skirt depending from said ring and including a portion generally parallel with the circumferential wall of the pot, said skirt being formed with apertures aligned with corresponding apertures in said pot, and means for directing air inflowing through some of said skirt apertures to the space in the pot above said gasifier structure without passing through said central aperture.

2. In a pot type burner, a pot having a circumferential wall provided with a plurality of air inlets located at various levels, means for delivering a fuel to said pot, a transversely extending generally horizontal gasifier structure in said pot intermediate the upper and lower apertures, said gasifier including a ring having a central aperture, a skirt depending from said ring and including a portion generally parallel with the circumferential wall of the pot, said skirt being formed with apertures aligned with corresponding apertures in said pot, and means for directing air inflowing from some of said skirt apertures to the space in the pot above said gasifier structure without passing through said central aperture, including upwardly and inwardly extending deflectors, the ring being upwardly apertured in line with said deflectors.

3. In a pot type burner, a pot having a circum-

ferential wall provided with a plurality of air inlets located at various levels, means for delivering a fuel to said pot, a transversely extending generally horizontal gasifier structure in said pot intermediate the upper and lower apertures, said gasifier including a ring having a central aperture, a skirt depending from said ring and including a portion generally parallel with the circumferential wall of the pot, said skirt being formed with apertures aligned with corresponding apertures in said pot, and means for directing air inflowing from some of said skirt apertures to the space in the pot above said gasifier structure without passing through said central aperture, including upwardly and inwardly extending segmental deflectors, the ring being upwardly apertured in line with said deflectors.

4. In a pot type burner, a pot having a circumferential wall provided with a plurality of air inlets located at various levels, means for delivering a fuel to said pot, a transversely extending generally horizontal gasifier structure in said pot intermediate the upper and lower apertures, said gasifier including a ring having a central aperture, a skirt depending from said ring and including a portion generally parallel with the circumferential wall of the pot, said skirt being formed with apertures aligned with corresponding apertures in said pot, and means for directing air inflowing from some of said skirt apertures to the space in the pot above said gasifier structure without passing through said central aperture, said skirt including an inwardly extending annular portion having a central aperture axially aligned with the central aperture of the first mentioned ring.

5. In a pot type burner, a pot having a circumferential wall provided with a plurality of air inlets located at various levels, means for delivering a fuel to said pot, a transversely extending generally horizontal gasifier structure in said pot intermediate the upper and lower apertures, said gasifier including a ring having a central aperture, a skirt depending from said ring and including a portion generally parallel with the circumferential wall of the pot, said skirt being formed with apertures aligned with corresponding apertures in said pot, and means for directing air inflowing from some of said skirt apertures to the space in the pot above said gasifier structure without passing through said central aperture, including upwardly and inwardly extending deflectors, the ring being upwardly apertured in line with said deflectors, said skirt including an inwardly extending annular portion having a central aperture axially aligned with the central aperture of the first mentioned ring.

6. In a pot type burner, a pot having a circumferential wall provided with a plurality of air inlets located at various levels, means for delivering a fuel to said pot, a transversely extending generally horizontal gasifier structure in said pot intermediate the upper and lower apertures, said gasifier including a ring having a central aperture, a skirt depending from said ring and including a portion generally parallel with the circumferential wall of the pot, said skirt being formed with apertures aligned with corresponding apertures in said pot, and means for directing air inflowing from some of said skirt apertures to the space in the pot above said gasifier structure without passing through said central aperture, including upwardly and inwardly extending segmental deflectors, the ring being upwardly apertured in line with said deflectors, said skirt including an inwardly extending annular portion having a central aperture axially aligned with the central aperture of the first mentioned ring.

7. In a pot type burner, a pot having a circumferential wall provided with a plurality of air inlets located at various levels, means for delivering a fuel to said pot, a gasifier structure in said pot intermediate the upper and lower apertures, said gasifier including a ring having a central aperture, and gasifier wall associated with the ring and including a portion generally parallel with the circumferential wall of the pot, said wall being formed with apertures aligned with corresponding apertures in said pot.

8. In a pot type burner, a pot having a circumferential wall provided with a plurality of air inlets located at various levels, means for delivering a fuel to said pot, a transversely extending generally horizontal gasifier structure in said pot intermediate the upper and lower apertures, said gasifier including a ring having a central aperture, and a skirt depending from said ring and including a portion generally parallel with the circumferential wall of the pot, said skirt being formed with apertures aligned with corresponding apertures in said pot, said skirt including an inwardly extending annular portion having an axial central aperture.

9. In a pot type burner, a pot having a circumferential wall provided with a plurality of air inlets located at various levels, means for delivering a fuel to said pot, a transversely extending generally horizontal gasifier structure in said pot intermediate the upper and lower apertures, said gasifier including a ring having a central aperture, a skirt depending from said ring and including a portion generally parallel with the circumferential wall of the pot, said skirt being formed with apertures aligned with corresponding apertures in said pot, each such aperture being of greater diameter than the corresponding aperture in the wall of the pot, and means for directing air inflowing from some of said skirt apertures to the space in the pot above said gasifier structure without passing through said central aperture.

10. In a pot type burner, a pot open at the top and closed at the bottom and having a circumferential wall provided with a plurality of air inlets located at various levels, and a skirt member spaced inwardly from and generally parallel with the wall of said pot, said skirt member having a plurality of apertures therein aligned with air inlet apertures in the pot wall but of larger size, said skirt member having a flange outwardly extending toward the opposed inner face of the pot wall, adjacent an upper portion of the skirt, and an inwardly extending centrally apertured flange adjacent a lower portion of the skirt, and a centrally apertured baffle partially closing the open top of the pot, the upper portion of the pot being provided immediately below said last mentioned baffle with a plurality of secondary air inlet apertures more closely spaced than the air inlets located at the lower levels in the pot.

11. In a pot type burner for liquid fuel and the like, a pot, means for introducing air, to support combustion, to the interior of the pot, means for supplying liquid fuel to the pot for vaporization on the bottom thereof, means for inducing some of the products of combustion to flow downwardly in the pot toward the bottom thereof, means for redirecting the products of combustion upwardly in the pot, and for commingling the said redirected products with the vaporized fuel and air,

and for directing the resultant mixture toward a combustion zone above the bottom of the pot, including a generally cylindrical generally vertical walled sleeve located within the pot and spaced inwardly from the wall thereof, said sleeve and pot being generally concentric, the sleeve terminating below the top of the pot.

12. In a pot type burner for liquid fuel and the like, a pot having a plurality of air inlet apertures located at various levels in the wall thereof, means for delivering air, through said apertures, to the interior of the pot, means for supplying liquid fuel to the pot adjacent the bottom thereof, and means for inducing some of the products of combustion to flow downwardly in the pot toward the bottom thereof, and for redirecting the products of combustion upward in the pot and commingling said redirected products with vaporized fuel and air, and for directing the resultant mixture toward a combustion zone above the bottom of the pot, including a generally cylindrical generally vertical walled sleeve located within said pot and spaced inwardly from the apertured wall thereof, said sleeve terminating at its upper edge below the top of the pot and at its lower edge above the bottom of the pot.

13. In a pot type burner for liquid fuel and the like, a pot having a plurality of air inlet apertures located at various levels in the wall thereof, means for delivering air, through said apertures, to the interior of the pot, means for supplying liquid fuel to the pot adjacent the bottom thereof, and means for inducing some of the products of combustion to flow downwardly in the pot toward the bottom thereof, and for redirecting the products of combustion upward in the pot and commingling said redirected products with vaporized fuel and air, and for directing the resultant mixture toward a combustion zone above the bottom of the pot, including a generally cylindrical generally vertical walled sleeve located within said pot and spaced inwardly from the apertured wall thereof, said sleeve terminating at its upper edge below the top of the pot and at its lower edge above the bottom of the pot, and a generally horizontal flange inwardly extending from said sleeve, and defining a generally circular opening generally coaxial with the pot wall.

14. In a pot type burner for liquid fuel and the like, a pot having a plurality of air inlet apertures located at various levels in the wall thereof, means for delivering air, through said apertures, to the interior of the pot, means for supplying liquid fuel to the pot adjacent the bottom thereof, and means for inducing some of the products of combustion to flow downwardly in the pot toward the bottom thereof, and for redirecting the products of combustion upward in the pot and commingling said redirected products with vaporized fuel and air, and for directing the resultant mixture toward a combustion zone above the bottom of the pot, including a generally cylindrical generally vertical walled sleeve located within said pot and spaced inwardly from the apertured wall thereof.

15. In a pot type burner for liquid fuel and the like, a pot having a plurality of air inlet apertures located at various levels in the wall thereof, means for delivering air, through said apertures, to the interior of the pot, means for supplying liquid fuel to the pot adjacent the bottom thereof, and means for inducing some of the products of combustion to flow downwardly in the pot toward the bottom thereof, and for redirecting the products of combustion upward in the pot and commingling said redirected products with vaporized fuel and air, and for directing the resultant mixture toward a combustion zone above the bottom of the pot, including a generally cylindrical generally vertical walled sleeve located within said pot and spaced inwardly from the apertured wall thereof, said sleeve terminating at its upper edge below the top of the pot and at its lower edge above the bottom of the pot, and having at its upper edge a flange outwardly extending toward the inner wall of the pot.

16. In a pot type burner for liquid fuel and the like, a pot having a plurality of air inlet apertures located at various levels in the wall thereof, means for delivering air, through said apertures, to the interior of the pot, means for supplying liquid fuel to the pot adjacent the bottom thereof, and means for inducing some of the products of combustion to flow downwardly in the pot toward the bottom thereof, and for redirecting the products of combustion upward in the pot and commingling said redirected products with vaporized fuel and air, and for directing the resultant mixture toward a combustion zone above the bottom of the pot, including a generally cylindrical generally vertical walled sleeve located within said pot and spaced inwardly from the apertured wall thereof, said sleeve terminating at its upper edge below the top of the pot and at its lower edge above the bottom of the pot, and having at its upper edge a flange outwardly extending toward the inner wall of the pot, and a generally horizontal flange extending inwardly from said sleeve and defining a generally circular opening generally coaxial with the pot wall.

BRUCE HAYTER.