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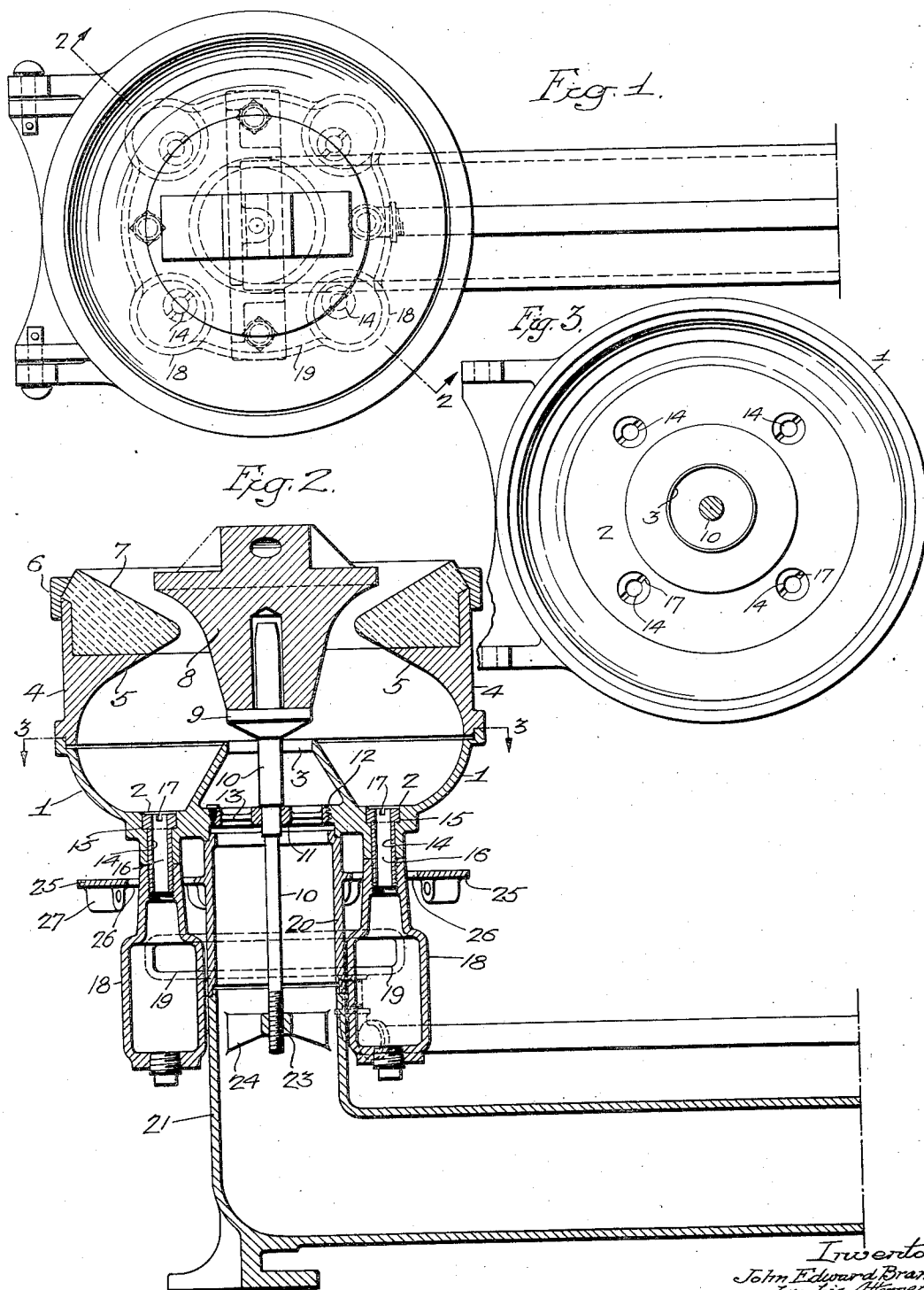
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OIL BURNER

Filed Aug. 23, 1932

2 Sheets-Sheet 1



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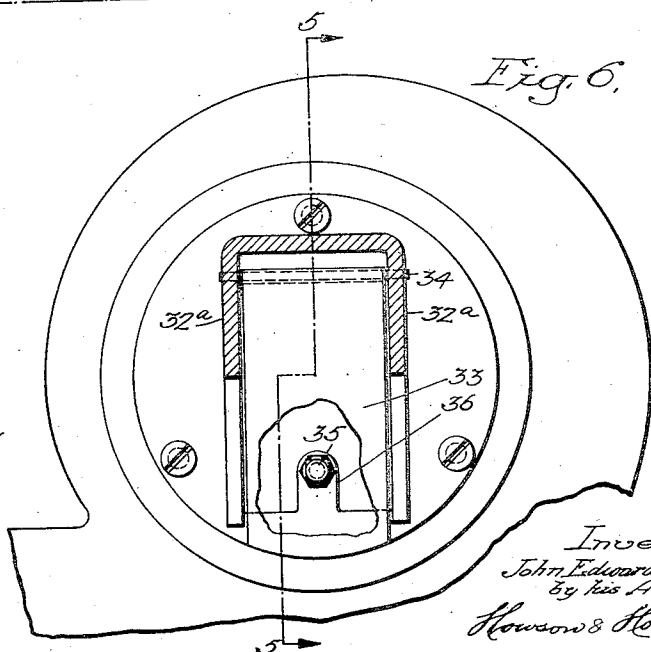
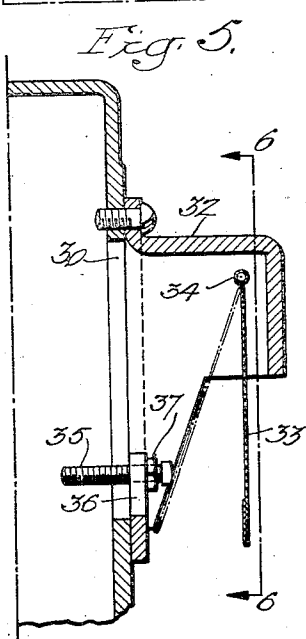
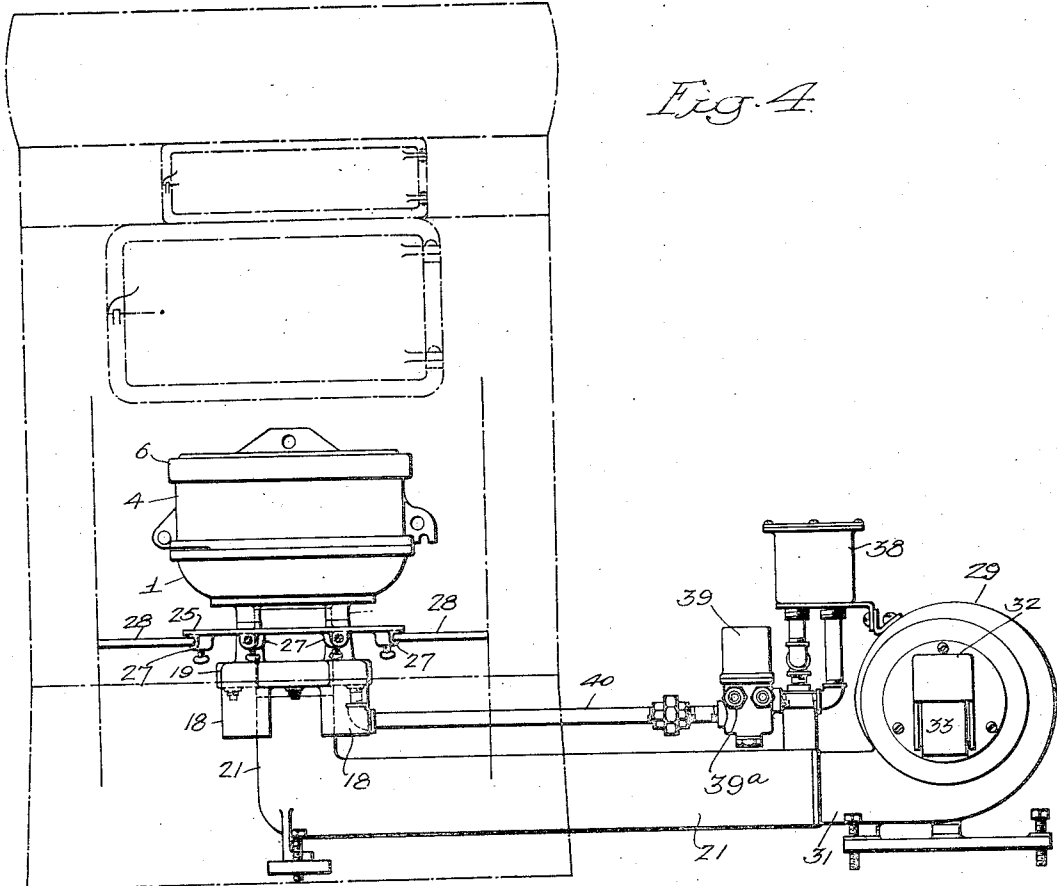
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UNITED STATES PATENT OFFICE

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OIL BURNER

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Application August 23, 1932, Serial No. 630,103

4 Claims. (Cl. 158—91)

This invention relates to new and useful improvements in oil burners and particularly to oil burners of the character commonly known as the high-low flame vaporizing type.

5 The principal object of the invention is to produce an oil burner of the character described having a novel combustion chamber which effectively eliminates the formation of carbon and soot therein as a result of the vaporizing of the fuel.

10 Another object of the invention is to provide an oil burner of the character described having novel means associated therewith for controlling the feed of the liquid fuel into the combustion chamber.

15 A further object of the invention is to provide a burner of the character described having novel means in conjunction with a forced draft system, whereby the quantity of air passing into the combustion chamber for mixture with the fuel vapor may be regulated.

20 A more specific object of the invention is to provide a burner of the character described wherein the combustion surface of the fuel chamber is a plane surface annular in form and the fuel projected thereinto at a plurality of spaced points thereabout for distributing over the flat surface of the burner in a relatively thin even film which insures substantially complete combustion of the fuel without carbonization and provides for uniform heat throughout the receptacle.

30 A further object of the invention is to provide a burner of the character described having novel means in the form of a manifold and sumps whereby the quantity of fuel projected into the combustion chamber at the several points is maintained constant and heat changes in the burner are reduced to a minimum.

40 Other features and details of the invention are disclosed in the accompanying drawings, in which:

Fig. 1 is a view in plan of the combustion chamber of the burner;

Fig. 2 is a view in section on line 2—2, Fig. 1;

Fig. 3 is a view in plan on line 3—3, Fig. 2;

45 Fig. 4 is a view in side elevation of the complete burner forming the subject of this invention, showing its relation when associated with a furnace or heater of the type generally used in the heating of homes and the like;

50 Fig. 5 is an enlarged fragmentary view in section on line 5—5, Fig. 6; and

Fig. 6 is a fragmentary view in section on line 6—6, Fig. 5.

Heretofore in oil burners of both the high-low flame and full-off or full-on systems, the burner

chambers in the majority of instances have been of cup-shaped cross section form, and the liquid fuel fed thereto in sufficient quantity to produce the heat required during combustion must be maintained in the burner chamber at a substantially great depth. By virtue of the substantially great depth of the oil in prior burners, the vaporization of the fuel occurs solely on the upper surface thereof, the fuel at lower depths being removed from the hot area remains at a lower temperature and tends to cool and congeal the fuel at the surface resulting in poor vaporization and hence combustion thereof, as well as causing an increase in quantity of unvaporized oil to accumulate in the bottom of the chamber. Also when such a burner has been in operation for a period of time the heat of combustion is conducted downwardly by the metal receptacle tending to heat the fuel at the bottom and thus producing vaporization from the center of the body of oil as well as the surface thereof. This situation throws the entire burner out of range and control, and causes carbon to form on the inner walls of the combustion chamber due to an inadequate supply of air. Furthermore, in burners of the present character the fuel has been fed into the combustion chamber from a single source, thus requiring a certain amount of time to allow the fuel to become evenly distributed within the fuel receptacle.

30 By the present invention a fuel receptacle is provided at the lower end of the combustion chamber with a substantially flat surface and enables a quantity of fuel necessary for proper combustion to be injected thereinto to a depth which is substantially less than would be possible were the fuel receptacle of cup-shaped cross section form. The present invention further contemplates the feeding of liquid fuel into the receptacle through a plurality of ports in equal quantities so that the fuel emerging upwardly into the receptacle may be quickly and equally distributed over the combustion surface of the chamber by spreading radially from each one of the several ports as it emerges into the fuel chamber. This feature of feeding the liquid fuel into the receptacle at several equally spaced points also has the effect of maintaining the temperature and heat of said receptacle substantially uniform which is very desirable for proper vaporization of the fuel and rather in contrast to the situation where fuel is fed from a single port as in the past which resulted often in temperature differences of as much as sixty degrees between various points of the receptacle. By pro-

viding the substantially flat fuel surface, as in the present case, together with the several ports of inlet for the fuel, a quantity of fuel sufficient for high flame combustion of the burner may be distributed evenly over the receptacle surface to a depth not greater than approximately one thirty-second of an inch, and this film of fuel permits complete and substantially instantaneous vaporization of the fuel as rapidly as it is fed to the receptacle.

It should be particularly noted that at no time is the air entering the port 3 deflected into contact with the fuel proper, but rather the burner opening at the top functions in the manner of a stack and the Venturi section at the top, together with the heat of combustion, creates a siphon or stack effect to draw the air away from the liquid fuel on the surface 2 and mix it immediately with the fuel vapor in the combustion chamber above the receptacle. This principle of operation of the burner has been found to be an improvement over burners in the past, wherein the baffle or spreader functioned to deflect the air into contact with the fuel proper in accordance with an erroneous theory that by mild agitation of the fuel surface a better vaporization of the fuel was effected for mixture with the air.

Referring now more particularly to the drawings, the reference numeral 1 designates a fuel receptacle, having an annular flat combustion surface 2. The sides of the fuel receptacle extend obliquely upwardly and outwardly from the combustion surface 2 and an opening 3 is formed in the center of the receptacle 1, surrounded by the inner side of the receptacle, the purpose of which will be set forth later. The bottom of the receptacle 1 is made substantially thicker than the side walls thereof for the purpose of better retaining the heat received during combustion and prolong for as long a period as possible the tendency for the oil and receptacle to become cool after high flame combustion has ceased.

A combustion chamber is superimposed upon the annular fuel receptacle 1 and is provided with concave side walls 5 constituting baffle members arranged to effect proper circulation of the air passing into the chamber through the opening 3 into contact with the fuel vapor to insure perfect mixture thereof with said fuel vapor for combustion purposes. A top or cover member 6 is hinged in superposed relation above the combustion chamber 4 by means of hinge pins positioned adjacent one side thereof, the said cover member 6 being provided with a complementary baffle member 7 composed in the present instance of fire brick or other suitable refractory material which, when the cover 6 is placed upon the combustion chamber 4, cooperates with and acts as an extension of the concave baffles 5 of the latter to insure proper direction of the flame outwardly of the burner.

A baffle member 8, composed of fire brick or other suitable refractory material, is positioned centrally with respect to the cover member 6 and the combustion chamber 4 of the burner, the lower external contour of the baffle 8 being convex at its lower surface and concave adjacent the upper surface thereof. A small air spreader or baffle member 9, having a beveled lower surface toward the air inlet 3, is positioned at the lower extremity of the baffle member 8 in spaced relation above said port 3, the said spreader 9 functioning to deflect the air into contact with the fuel vapor for mixture therewith for combustion,

after which it is deflected out of the burner by baffles 5 and 8, respectively.

The flat fuel-receiving surface 2 of the receptacle 1 is provided with a plurality of ports 14, which are equally spaced circumferentially with respect to said receptacle 1. In the present instance the ports 14, at their upper ends in the receptacle 1, are provided with enlarged countersunk recesses 15, as shown in Fig. 2 of the drawings, and a tubular stud 16 is fitted therein. It should be noted that the height of the head of the stud 16 is somewhat less than the depth of the countersinks 15, so that the upper face of the head of said stud 16 is spaced a small distance below the plane of the flat fuel surface 2 of the receptacle 1, the purpose of which construction will be described in detail hereinafter. Threaded onto the lower ends of each of the tubular studs 16 is a fuel sump 18, and these sumps are respectively connected one to another by means of a manifold 19 so that a uniform quantity of fuel is fed upwardly through each of the studs 16 to the fuel receptacle 1.

In the present instance a sleeve 20 extends downwardly from the opening 12 and connects the air port 3 with a substantially L shaped air duct 21. The burner, sleeve, and air duct are secured in the above relation by means of a stay-bolt 10 which projects upwardly into the burner and supports the baffle and air spreader 8 and 9 respectively. A ring 13 having openings therein and a collar 11 at its center is threaded into the receptacle opening 12. The stay-bolt 10 extends through the collar 11 and is provided with a shoulder arranged for engagement by said collar. The lower end of the stay-bolt 10 is connected to the air duct 21 by a nut 23 which is secured in and spaced from the air duct 21 by means of webs 24, as shown in Fig. 2 of the drawings. It should be particularly noted that in the present instance the baffle member 8 may be adjusted vertically with respect to the burner structure, and this is accomplished by screwing the ring 13 in the proper direction. By rotating the ring 13 as described the bolt 10 remains fixed, the ring 13 by said rotation being raised or lowered accordingly and similarly determining the position of the bolt 10 by engagement with the shoulder thereon to regulate the clearance between the baffles 8 and 7 respectively for efficient operation of the burner.

A projecting horizontal flange 25 is cast integral with the sleeve 20 and is provided with openings 26 therein through which extend the upper portions or throats of the sumps 18. A plurality of lugs 27 are formed on the underside of the flange 25 at its periphery in spaced circumferential relation thereto and are arranged to receive rods 28 which extend to the vertical side walls of the fire box of a furnace to firmly support the burner therein, and constitute supports for insulating material to keep the burner heat wholly within the furnace structure.

A centrifugal blower or fan 29 is connected at the opposite end of the air duct 21, the said centrifugal blower 29 being driven at a desired speed by means of a motor (not shown). The blower comprises the customary air intake and discharge ports 30 and 31 respectively. A housing 32 projects outwardly from the side face of the centrifugal blower 29, the said housing 32 constituting a hood-like structure having the lower portion thereof removed to permit entrance of the air through said port 30 to the blower. The quantity of air permitted to pass inwardly of the

port 30 is controlled by means of a shutter 33, rigidly mounted on a small shaft 34, the said shaft 34 being journaled in the side faces 32a of the hood 32, so that the said shaft 34 and the shutter 33 may be free to swing inwardly or outwardly with respect to the air intake port 30. A threaded member 35 is mounted in a projecting tongue 36 formed on the bottom edge of the intake port 30, and is provided with a lock nut 37, whereby the said member 35 may be securely positioned at any desired point normal to the tongue 36 for the purpose of affording a stop or abutment to engage the shutter 33 and limit the extent to which said shutter may act to close the port 30. It will be seen that when the blower 29 is operating, the air sucked inwardly of the port 30 tends to move the shutter 33 to the position shown in dotted lines in Fig. 5, which functions to cut off the flow of air into the blower, and by positioning the abutment 35 outwardly with respect to the tongue 36 and the blower housing, the degree of closure of the port 30 by the shutter 33 may be regulated. When operation of the blower ceases the shutter 33 swings to the vertical position shown in solid lines in Fig. 5 of the drawings and the low flame burns with the natural draft or flow of air through the port 30 and duct 21, any control of the natural draft being effected by the furnace damper (not shown) as it has been found that in this manner stack temperature may be reduced substantially and result in a more efficient operation of the burner at low flame.

The complete burner is equipped with the customary liquid fuel flow chamber 38, which operates in conjunction with a solenoid or magnetic valve 39 to insure proper flow of the oil through the feed pipe 40 to the manifold 19. The valve 39 in the present instance is controlled by the operation of the centrifugal blower 29, that is, when the electric current is turned on to drive the blower motor, the same current actuates the magnetic valve 39 to open same and permit a maximum quantity of oil to flow therethrough from the flow chamber 38 to the burner manifold 19, and immediately the current is cut off from the blower motor, the magnetic valve 39 closes to stop the maximum oil flow into the manifold 19 and permits only a quantity of fuel to pass into the manifold 19 sufficient to maintain the relatively low or pilot flame through a by-pass valve 39a.

A particular feature of the invention resides in the provision of the several fuel inlet ports in the receptacle 1, whereby several low or pilot flames are afforded. It should be noted that the quantity of fuel permitted to flow into the manifold 19 and oil sumps 18 by the by-pass valve 39a when the blower is not operating, is such as to just maintain the previously described small countersinks or recesses, filled with fuel, and when the blower 29 is operating and a maximum flow of fuel is permitted by the opening of the solenoid or magnetic valve 39, the flow of fuel into the receptacle 1 through the tubular studs 16 is regulated so that the oil emerging from said ports onto the surface 2 will spread radially from the several ports to cover the substantially horizontal receptacle surface 2 with a thin film of fuel to a depth of approximately one thirty-second of one inch, it having been determined that a fuel depth greater than the latter amount is a decided detriment and not necessary in order to obtain effi-

cient maximum combustion for heating purposes and tends to congeal the fuel at the lower depths. The disposition of the liquid fuel in a thin film over a substantially large flat area permits substantially perfect vaporization thereof for mixture with the air, resulting in immediate total combustion which is free from the formation of carbon and soot.

While the particular embodiment of the invention has been set forth for the purpose of description, it is not intended that the invention be not subject to change or modification within the scope of the appended claims.

What is claimed is:

1. In a fuel burner, a fuel receptacle having a flat surface to receive a thin film of fuel for a high flame, the said surface having a plurality of fuel inlet ports opening thereto and provided with larger countersinks at the surface, and tubular studs threaded in said ports, the said studs having heads of less height than the depth of the countersinks and providing shallow recesses in the receptacle surface of greater diameter than the bore of the studs to provide low flame fuel wells.

2. In a fuel burner, a fuel receptacle having at its bottom a horizontal surface of substantial area, the said surface having ports therein constituting fuel inlet passages, each of said ports having countersinks at the surface; means in said ports and countersinks constructed and arranged to cooperate therewith and provide shallow, low flame fuel wells terminating in the horizontal surface, the said ports, low flame fuel wells and horizontal surface being so arranged that fuel overflowing from the low flame fuel wells for high flame purposes will spread radially from the low flame fuel wells onto the horizontal surface and form a continuous film of fuel thereon.

3. In a fuel burner of the high-low flame type, a fuel receptacle having a continuous horizontal annular surface of substantial area and a plurality of fuel ports therein disposed at equally spaced intervals centrally thereof and having at their upper ends concentric countersunk portions, a fuel manifold, means disposed in each of said ports cooperating therewith to form shallow low flame fuel wells and communicating with said manifold, and means for discharging predetermined quantities of fuel uniformly through each of the first mentioned means and low flame fuel wells onto the horizontal annular surface; the ports, low flame fuel wells and horizontal annular surface being so arranged that the fuel for high flame purposes will spread radially on said horizontal surface to form a continuous film thereon of uniform depth and surface area.

4. In a fuel burner, a fuel receptacle having at its bottom a horizontal surface of substantial area, said surface having fuel ports formed centrally therein at equally spaced intervals, means in each of said ports constructed and arranged to form shallow concentric recesses terminating in the horizontal surface to provide low flame fuel wells, and means for discharging predetermined equal quantities of fuel uniformly through each of said inserts and ports onto the horizontal surface from which the fuel spreads radially and laterally on said surface to form a continuous film of fuel of uniform thickness and surface area thereon.

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