C. A. ORR.

HYDROCARBON BURNER.

APPLICATION FILED JAN. 23, 1922.

1,434,021. Patented Oct. 31, 1922.

2 SHEETS—SHEET 1.

FIG. 1.

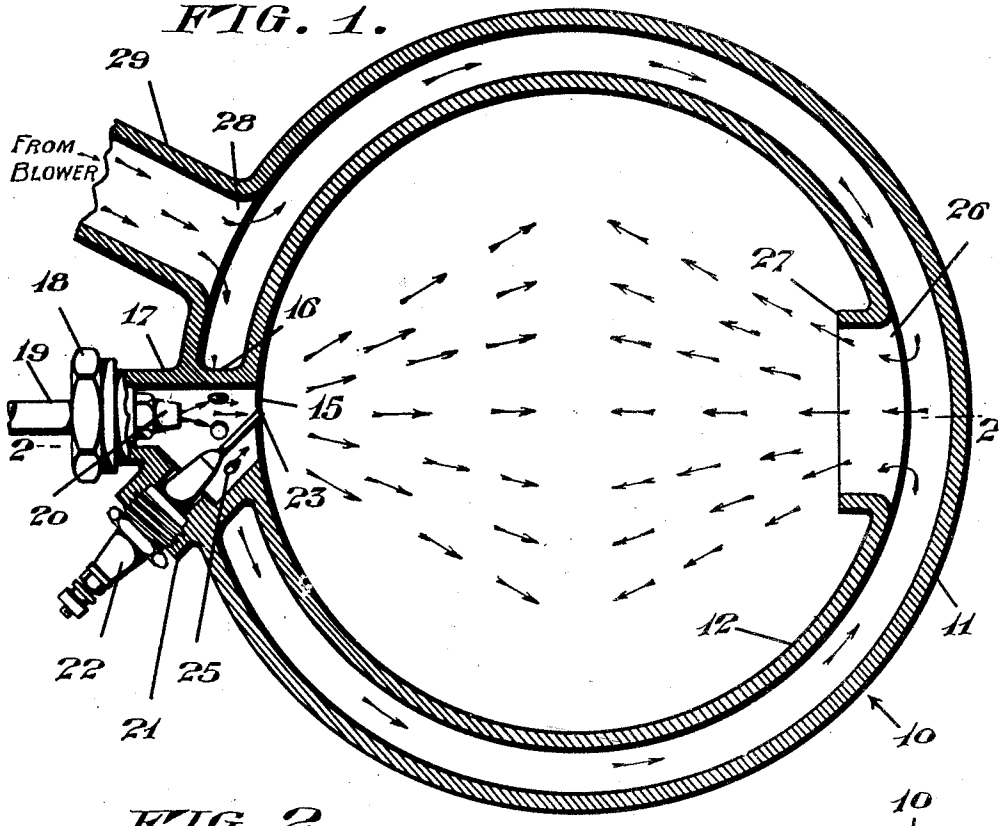
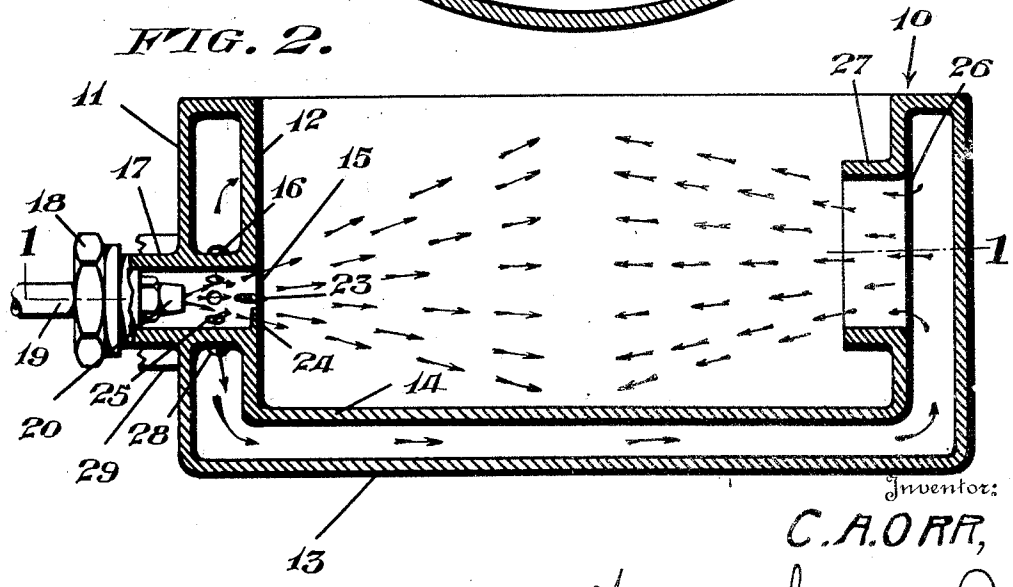


FIG. 2.



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2 SHEETS—SHEET 2.

FIG. 3.

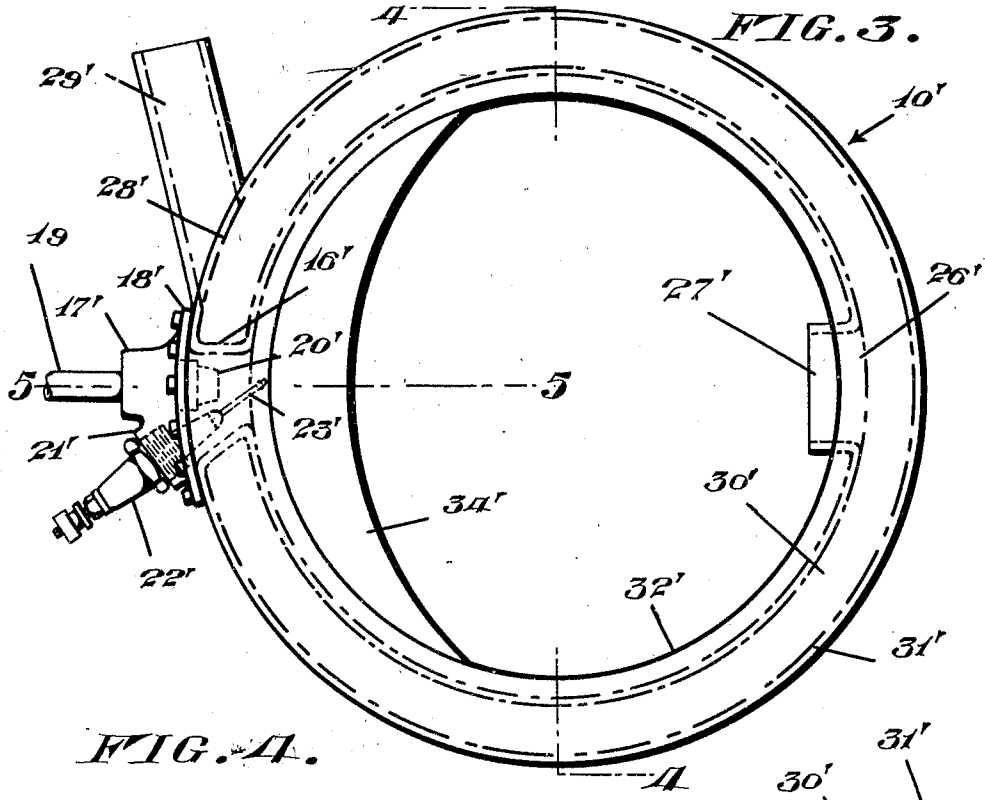
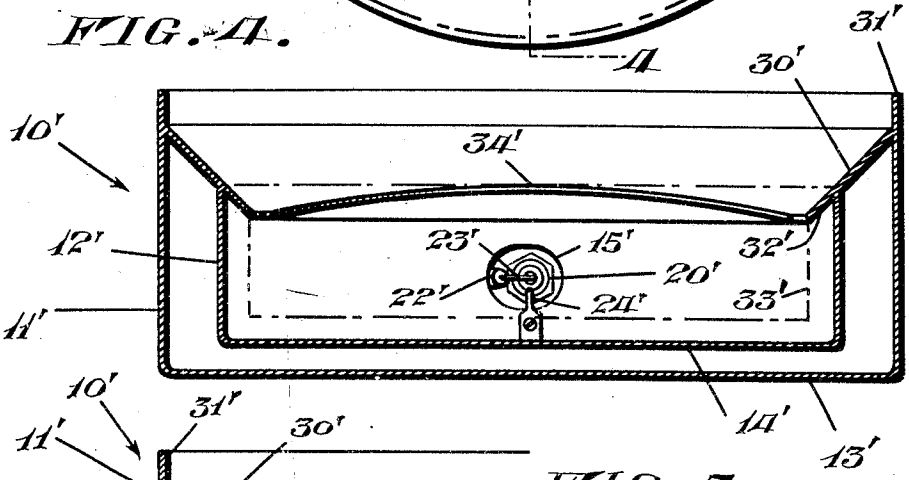


FIG. 4.



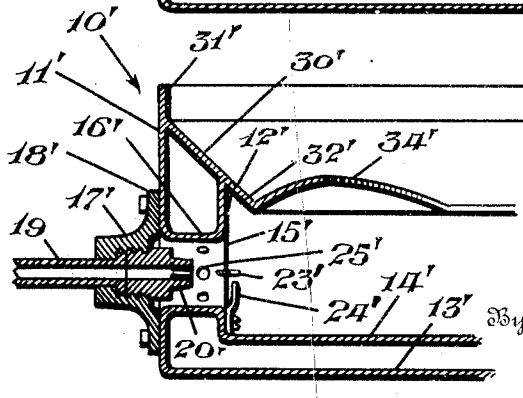


FIG. 5.

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UNITED STATES PATENT OFFICE.

CARLETON A. ORR, OF PUEBLO, COLORADO.

HYDROCARBON BURNER.

Application filed January 23, 1922. Serial No. 531,186.

To all whom it may concern:

Be it known that I, CARLETON A. ORR, a citizen of the United States, residing at Pueblo, in the county of Pueblo and State of Colorado, have invented certain new and useful Improvements in a Hydrocarbon Burner; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to hydrocarbon burners, and is an improvement over the hydrocarbon burner apparatus disclosed in the co-pending application Serial No. 343,887, filed December 10, 1919, and the method of obtaining a combustible mixture of fuel and air disclosed in the co-pending application Serial No. 515,181, filed November 14, 1921.

An object of the invention is the provision of a novel and improved burner for obtaining the combustible mixture by directing opposing streams of fuel and air so that they impinge against one another, in order that the fuel is broken up into a fine mist and the combustion made thorough and efficient for the heating of the boiler of a steam automobile, boilers for many other purposes, furnaces, etc.

Another object is to provide such a burner having a novel arrangement for the flow of air to discharge in opposition to and against the discharging stream of fuel, and the arrangement being such that the inflowing air cools the walls of the burner, to prevent them from burning through or warping, as well as preheating the air to make the vaporization of the fuel more effective.

A further object is the provision of novel means for igniting the fuel.

A still further object is the provision of means in the combination for admitting a small amount of air to the discharging stream of fuel, to mix therewith, prior to the contact of the opposing streams of fuel and air, in order to enable the fuel to be ignited quickly and effectively, as well as to enhance the combustion of the mixture of air and fuel.

A further object is the provision of means for effecting the distribution of the gaseous mixture and flames, so that the object above the burner is more uniformly heated, even though the opposing streams of fuel and air contact with considerable force or pressure thereby tending to blow the flames toward one side.

With the foregoing and other objects in view, which will be apparent as the description proceeds, the invention resides in the construction and arrangement of parts, as hereinafter described and claimed, it being understood that changes can be made within the scope of what is claimed, without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a horizontal section of one form of burner, taken on the line 1—1 of Fig. 2.

Fig. 2 is a diametrical vertical section on the line 2—2 of Fig. 1.

Fig. 3 is a plan view of another form of burner.

Figs. 4 and 5 are vertical sections on the respective lines 4—4 and 5—5 of Fig. 3.

Referring to Figs. 1 and 2, the burner comprises a pan or bowl 10 of suitable size, according to the use to which the burner is to be put, the pan being circular as shown, although it may be of other shape. The pan comprises a hollow double wall and bottom, including the spaced outer and inner walls 11 and 12, respectively, and the spaced bottoms 13 and 14. The bottom proper 13 is united with the outer wall, and the false or raised bottom 14 is united with the inner wall 12, thereby making the pan hollow at the bottom and rim, for the flow of air between the walls 11 and 12 and under the false bottom 14. The pan may be cast, although it can be otherwise formed, and the combustion takes place in the chamber or pot within the pan and in the space above the pan.

The inner wall 12 is provided with an opening 15 between the upper and lower edges of said wall, through which the fuel is delivered into the combustion chamber of the pan, and the walls 11 and 12 are united by a neck or portion 16 surrounding the opening 15. A boss 17 extends outwardly from the outer wall 11, as an extension of the neck 16, and has a cap 18 secured thereon through which the fuel supply tube or pipe 19 extends, and a spray nozzle 20 is secured on the end of the tube within the boss 17 for directing the fuel through the neck 16 and opening 15 into

the combustion chamber of the pan. The fuel, such as kerosene, gasoline, crude oil, or the like, is delivered through the tube 19 under pressure to spray the fuel from the nozzle in a stream which discharges under pressure into the pan.

In order to ignite the fuel when the combustion is started, a spark plug or similar igniter is used. Thus, the wall 11 is formed with a boss 21 at one side of the boss 17, and the spark plug or igniter 22 is threaded or otherwise secured within said boss 21, with its electrode 23 projecting into the opening 15 in the path of the discharging stream of fuel. The other electrode 24 is carried by the wall 12 and rises from the bottom of the opening 15 to a point below and spaced from the electrode 23 to constitute a spark gap, the electrode 24 being grounded to the pan, and when the pan and spark plug are connected to the opposite terminals of an electric circuit, sparks will jump between the electrodes when current of sufficient potential is impressed in the circuit, as well known. The boss 21 and spark plug 22 are disposed at an angle to bring the electrode 23 into or adjacent to the discharging stream of fuel, whereas the boss 17 and nozzle 20 are disposed radially of the pan to direct the fuel radially toward the center of the pan.

A limited or restricted amount of air is admitted into the neck 16 and opening 15 to mix with the discharging stream of fuel, and, for this purpose, apertures 25 are provided in the neck 16 so that air can flow through said apertures from the air space of the pan into the neck 16 around the discharging stream of fuel. Only a restricted small amount of air can flow through such apertures around the discharging stream of fuel to mix with the fuel where it discharges from the opening 15, whereby to facilitate the ignition of the fuel by the sparks, and to also enhance the combustion of the fuel by the mixture therewith of a limited amount of air. The air thus admitted to the discharging stream of fuel, however, is only a small part of that necessary for the combustion of the fuel, and is necessary to enable the fuel to be readily ignited by the spark plug.

The main supply of air to mix with the fuel is discharged into the combustion chamber from that side of the pan opposite to the liquid fuel nozzle. Thus, the wall 12 has an air discharge opening 26 diametrically opposite to the fuel discharge opening 15 and nozzle 20, with a collar or nozzle 27 surrounding the opening 26 and projecting slightly into the chamber of the pan for directing the air toward the opposing stream of fuel. The air is supplied into the air space of the pan under pressure from a blower or fan, and, as shown, the outer wall 11 has an air inlet opening 28, preferably opposite to the opening 26 or near the liquid fuel nozzle, whereby the air is compelled to flow around the inner wall 12 before reaching the opening 26. The air supply pipe or conduit 29 is connected to the wall 11 around the opening 28.

The liquid fuel is discharged from the nozzle 20 under suitable pressure, and the air is delivered through the pipe 29 into the air space of the pan under the required pressure also. The liquid fuel in discharging from the nozzle 20 through the opening 15 will be sprayed into the combustion chamber radially toward the center, the liquid spray spreading as it passes into the chamber to meet the opposing air stream. The air after passing around the inner wall of the pan is discharged through the opening 26 and collar 27, and the opposing streams of fuel and air which are directed from opposite directions toward one another, impinge against one another within the combustion chamber, thereby creating considerable agitation, due to the contact of the particles of liquid and air. Consequently, the liquid is broken up into a fine mist and mixes thoroughly with the air to provide for efficient and thorough atomization and combustion of the fuel within and above the pan. The mixture of fuel and air is similar to the production of the mist caused when the wind strikes a stream of water discharging from a hose, or the like, as experienced by most persons when sprinkling lawns or gardens. In other words, the streams of liquid and air being opposed and striking one another from opposite directions, will bring the particles of liquid into intimate conflict with the air, to break up the liquid into a fine mist and to also mix the air and liquid thoroughly. This mixture of fuel and air will result in the more thorough combustion of the fuel, and the greater dissipation of heat units than when the mixed fuel and air are discharged together in a single stream, inasmuch as the pressure or force of the streams is spent when the combustion takes place, thereby adding to the heat derived as well as making the combustion more thorough. The air passing around and under the inner wall 12 and bottom 14 will also keep same cool, to avoid said wall and bottom burning through or becoming excessively heated, even without a refractory or heat insulating lining within the pan. The air is also preheated by its contact with the wall 12 and bottom 14, so that the discharging stream of air is heated to more thoroughly atomize and partially vaporize the fuel and enhance the combustion. A slight amount of air passes through the apertures 25 into the neck 16 and opening 15 around the discharging stream of fuel near the nozzle 20, to mix

with the fuel around the discharging stream, whereby the fuel is more readily ignited when the spark plug is energized. This small amount of air admitted around the discharging stream of fuel will also assist in spraying the fuel, and in supplying a small amount of the air or oxygen necessary, before the fuel contacts with the main opposing stream of air, to improve the mixture of air and fuel and the combustion thereof.

The burner can be placed under the coils of a boiler, in the fire pot or box of a furnace, and the like, for a variety of uses, which will be apparent to those versed in the art.

With the present arrangement, the method of obtaining a combustible mixture of fuel and air as disclosed in application Serial No. 515,181, consisting in discharging fuel and air under pressure independently into a combustion chamber from opposite directions toward one another so that the independent streams of fuel and air impinge against one another within said chamber, is improved to the extent that a restricted small proportion of the air is admitted to the discharging stream of fuel around same near the point of discharge, whereby to facilitate ignition by the spark plug or igniter, to assist in spraying the fuel, and to establish a preliminary ignition of the fuel before impinging against the opposite oncoming stream of air.

The modified construction shown in Figs. 3, 4 and 5 is much the same as that hereinbefore described, although there are some variations shown. The walls 11′ and 12′ and bottoms 13′ and 14′ of the pan 10′ can be of sheet metal, and also the neck 16′ connecting said walls and surrounding the fuel discharge opening 15′ in the wall 12′. The bosses 17′ and 21′ are carried by a plate 18′ secured to the wall 11′, so that the fuel nozzle 20′ and spark plug 22′ which are secured in said bosses 17′ and 21′, respectively, are carried by the plate 18′ which can be removed from the pan when desired, thereby giving access through the opening 15′. The electrode 24′ is shown as removably secured to the wall 12′, so that it can be removed and replaced below the electrode 23′ of the spark plug. The neck 16′ has the air inlet apertures 25′ surrounding the point where the fuel is discharged from the nozzle 20′, and the wall 12′ has the air discharge opening 26′ and surrounding collar 27′ opposite to the opening 15′. The air supply pipe or conduit 29′, which extends from the air inlet opening 28′, is shown as being in a tangential position, instead of radially as seen in Fig. 1.

The second form of pan includes a flared or inclined annular top 30′ between the walls 11′ and 12′, and the upper edge of the outer extends above said top to provide an upstanding flange 31′. This is particularly desirable for use with boilers, so that the boiler jacket can be fitted at its lower end on the top 30′ within the flange 31′. The inner edge of the top also projects beyond the wall 12′ to overlie a refractory or heat insulating lining 33′ that may be provided within the wall 12′ and above the bottom 14′, especially when said wall and bottom are of sheet metal.

In order to prevent the stream of air from blowing the flames toward the side of the burner where the fuel nozzle is located, and to also distribute the mixture and flames, a crescent-shaped baffle or shield 34′ is provided above the opening 15′, having its outer convexed edge united with the inner edge of the top 30′ for a distance less than one-half of the circle, and the inner concaved edge of the baffle is raised or arched slightly, as seen in Figs. 4 and 5. Thus, said baffle or shield will tend to catch the air discharged from the opening 26′ toward the opposite side of the pan, thereby arresting the stream of air, and preventing the too forceful blowing of the mixture with the stream of air. Furthermore, the air and mixture of air and fuel blown under the baffle or shield 34′ will be spread and discharged from below the ends of said baffle, back toward the side of the pan opposite to the fuel nozzle and adjacent to the air opening 26′, to thereby distribute and spread the mixture and flames, so that the flames are quite uniform throughout the area above the burner. The baffle or shield is especially desirable when the pressure of the stream of air overcomes the pressure of the stream of fuel, so as to offset such difference in pressures which would tend to carry the flames toward one side of the burner, especially in a shallow pan with a preponderance of air pressure.

Having thus described the invention, what is claimed as new is:—

1. A hydrocarbon burner comprising a combustion chamber, a fuel discharge nozzle directed into said chamber from one side, means for delivering air under pressure into the chamber from the opposite side so that the independent steams of fuel and air impinge against one another within said chamber, a portion surrounding the fuel nozzle through which the fuel is discharged having apertures for the flow of air into said portion around the discharging stream of fuel, and ignition means beyond said apertures in the path of the discharging stream of fuel.

2. A hydrocarbon burner comprising a double wall surrounding a combustion chamber having an air space therein to be supplied with air under pressure, the inner wall having an opening for the flow of air into

the combustion chamber, and means for directing fuel under pressure into said chamber to impinge against the stream of air discharging into the chamber from said opening.

3. A hydrocarbon burner comprising a double wall surrounding a combustion chamber and having an air space therein to receive air under pressure, the inner wall having an opening for the discharge of air into said chamber from one side of the chamber, and means for discharging fuel under pressure into said chamber from the opposite side to impinge against the discharging stream of air.

4. A hydrocarbon burner comprising a double walled pan having an air space between the walls thereof to receive air under pressure, the inner wall having an opening for the discharge of air into the combustion chamber within the pan, and means for discharging fuel into said chamber to impinge against and mix with the air.

5. A hydrocarbon burner comprising a double walled pan having an air space between the walls thereof for receiving air under pressure, the inner wall having an air discharge opening at one side of the combustion chamber of the pan, and means at the opposite side for the discharge of fuel under pressure into said chamber to impinge against the discharging stream of air.

6. A hydrocarbon burner comprising a pan having a combustion chamber therein and double walls and bottoms with air spaces between said walls and bottoms, the inner wall having an opening for the discharge of air under pressure from said air spaces into the combustion chamber, and means for directing fuel under pressure into said chamber to impinge against and mix with the air.

7. A hydrocarbon burner comprising a double wall surrounding a combustion chamber with a space between the walls for receiving air under pressure, a neck connecting the walls, and means for discharging fuel under pressure through said neck into said chamber, said neck having an aperture for the flow of air from said space into the neck to mix with the fuel.

8. A hydrocarbon burner comprising a double wall surrounding a combustion chamber with a space between the walls for receiving air under pressure, a neck connecting the walls, and means for discharging fuel under pressure through said neck into said chamber, said neck having an aperture for the flow of air from said space into the neck to mix with the fuel, and the inner wall having an opening for the discharge of air into said chamber to impinge against and mix with the fuel.

9. A hydrocarbon burner comprising a double wall surrounding a combustion chamber having an air space between the walls for receiving air under pressure, the inner wall having an opening for the discharge of air from said space into the combustion chamber, means for discharging fuel under pressure into said chamber through the inner wall to impinge against and mix with the discharging stream of air, and means for the admission of a limited amount of air from said space to the discharging stream of fuel.

10. A hydrocarbon burner comprising a double wall surrounding a combustion chamber and having an air space between the walls for receiving air under pressure, a neck connecting said walls having an aperture for the restricted flow of air from said space into the neck, means for discharging fuel under pressure through said neck into said chamber, and igniting means in the path of the discharging stream of fuel beyond said aperture in the neck.

11. A hydrocarbon burner comprising a double wall surrounding a combustion chamber and having an air space between the walls for receiving air under pressure, a neck connecting said walls having an aperture for the restricted flow of air from said space into the neck, means for discharging fuel under pressure through said neck into said chamber and igniting means in the path of the discharging stream of fuel beyond said aperture in the neck, the inner wall having an opening opposite to said neck for the discharge of air from said space into the combustion chamber in opposition to the discharging stream of fuel so that the streams of fuel and air impinge against one another within said chamber.

12. A hydrocarbon burner comprising a double wall surrounding a combustion chamber, a neck connecting said walls having an aperture for the restricted flow of air from said space into the neck, a nozzle for delivering fuel under pressure to pass through said neck into said chamber, and a spark plug having an electrode projecting into said neck to ignite the fuel.

13. A hydrocarbon burner having a combustion chamber, means for delivering fuel under pressure into said chamber from one direction, means for the delivery of air under pressure from an opposite direction into said chamber so that the discharging streams of fuel and air impinge against one another within said chamber, and a baffle for catching the discharging air to resist the blowing of the mixture and flames to one side with the air.

14. A hydrocarbon burner comprising a pan with a combustion chamber therein, means for the discharge of fuel under pressure into said chamber from one side of the pan, means for the discharge of air under pressure into said chamber from the opposite

side of the pan so that the streams of fuel and air impinge against one another within said chamber, and a baffle over the first named means along the wall of the pan for catching the discharging stream of air and resisting the blowing of the mixture and flames to one side with the air.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CARLETON A. ORR.

Witnesses:
H. O. BAKER,
LILLIAN ISRAEL.