No. 892,706. PATENTED JULY 7, 1908.

L. A. BLUBAUGH.

HYDROCARBON BURNER.

APPLICATION FILED DEC. 19, 1904.

3 SHEETS—SHEET 1.

Fig. 1

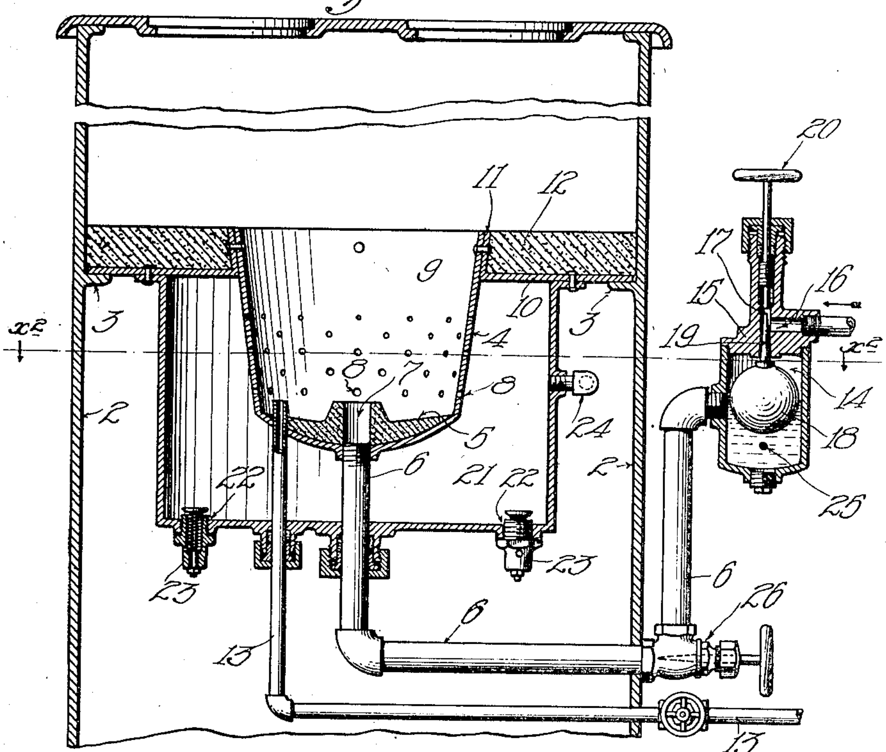
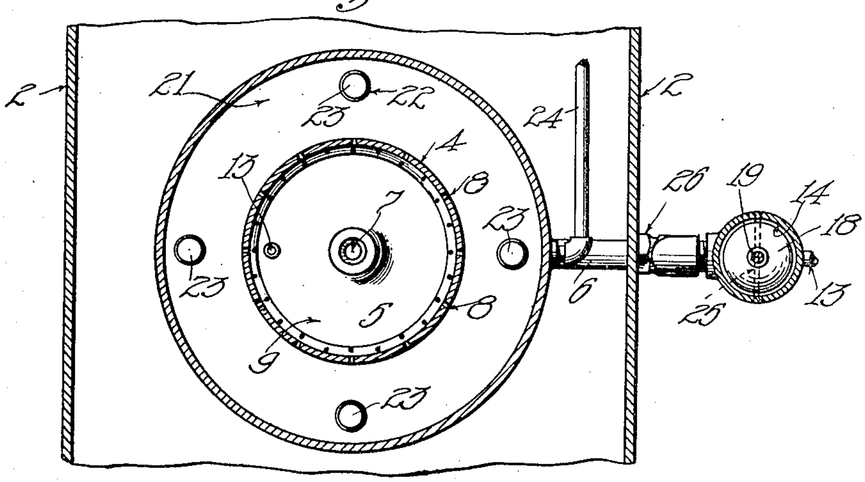


Fig. 2



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3 SHEETS—SHEET 2.

Fig. 3

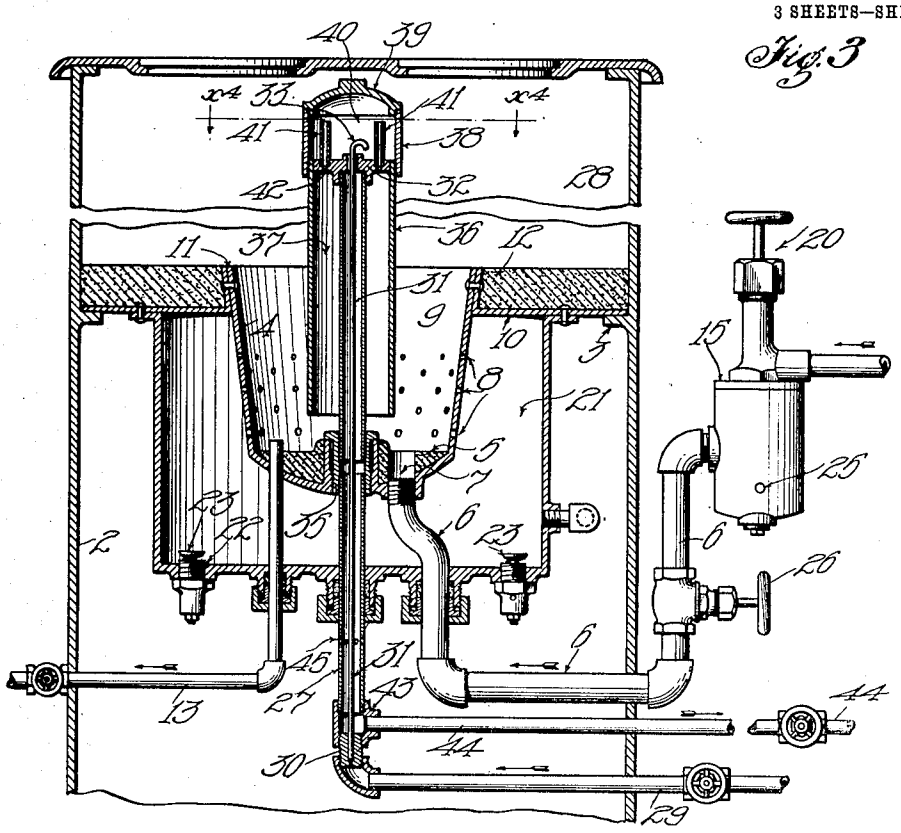
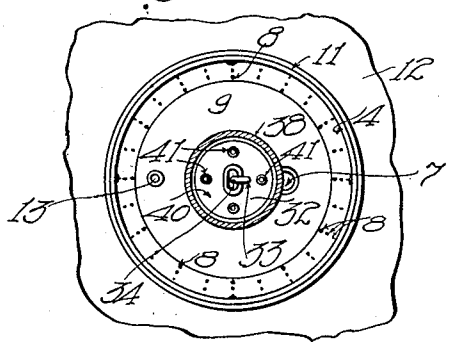


Fig. 4



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3 SHEETS—SHEET 3.

Fig. 5

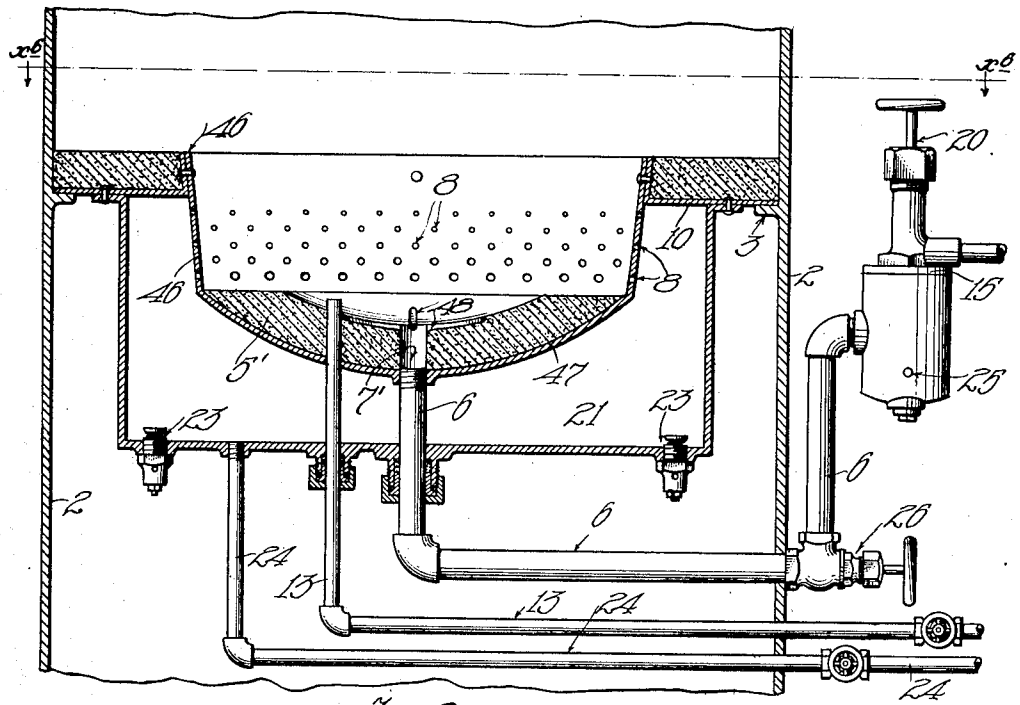
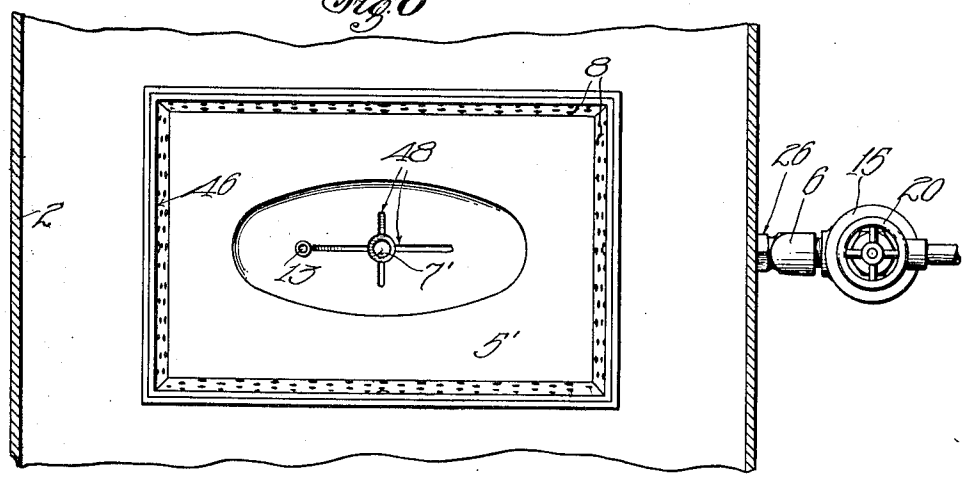


Fig. 6



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UNITED STATES PATENT OFFICE.

LEEGORA A. BLUBAUGH, OF BAKERSFIELD, CALIFORNIA.

HYDROCARBON-BURNER.

No. 892,706. Specification of Letters Patent. Patented July 7, 1908.

Application filed December 19, 1904. Serial No. 237,358.

To all whom it may concern:

Be it known that I, LEEGORA A. BLUBAUGH, a citizen of the United States, residing at Bakersfield, in the county of Kern, State of California, have invented certain new and useful Improvements in Hydrocarbon-Burners, of which the following is a specification.

This invention relates to hydrocarbon burners particularly designed for use in burning crude, heavy hydrocarbon oils, such, for instance, as the heavy asphaltum oils of the California fields, which contain a large percentage of asphaltum.

The object I have in view is to provide a positive, efficient and durable means whereby such heavy oils may be utilized to generate heat either in a cook stove, heating stove, bake oven, furnace or other apparatus or place where it is desired to generate heat and to provide such means in such form and of such construction as to avoid clogging of the burner or interference with its perfect operation or with the perfect combustion of the liquid fuel, and to prevent any carbonization, or caking or coking of the minerals or impurities of the oil so that perfect distribution of the heat generated from the fuel will not be prevented.

A further object of my invention is to provide such a burner for such class of oil whereby the same may be burned without smoke.

A further object of my invention is to provide an automatic feed for such a burner so that the apparatus may be kept in constant service without the requirement of constant attendance thereon.

A further object of my invention is to provide for the safety of the apparatus by the provision of suitable means for carrying away any excess oil fed into the burner by any accidental cause whatsoever.

As shown in the accompanying drawings: Figure 1 is a longitudinal sectional view of a fire-pot of a stove and of a hydrocarbon burning apparatus embodying my invention in place therein. Fig. 2 is a sectional plan view on the line X^2—X^2 of Fig. 1. Fig. 3 is a longitudinal sectional view of a fire-pot of a stove and a somewhat modified form of my invention. Fig. 4 is a sectional plan view on the line X^4—X^4 of Fig. 3. Fig. 5 is a longitudinal sectional view of a modified form of my invention. Fig. 6 is a sectional plan view on the line X^5—X^6 of Fig. 5.

In the drawings, 2 represents the walls of a fire-pot and 3 the flange upon which the fire grates ordinarily rest and on which the fire-pot proper ordinarily is supported.

4 represents the body portion of my generator and this body portion may be, as shown in Figs. 1 and 3, cylindrical in form, or, it may be as shown in Fig. 5, oblong or rectilinear. The bottom of the body 4 is preferably concave and adapted to receive a lining of refractory material 5.

As shown in Fig. 1 an oil pipe 6 is connected with and communicates through the bottom of the body 4 and terminates preferably just within the body, a duct or way 7 being formed in the refractory material which is preferably carried up at its center in the form of a boss, so that the way 7 terminates just below the first series of air inlet perforations 8 and above the main upper surface of the refractory material 5, which surface, as shown, is also preferably inclined downward toward the center. The body 4 is open at its top so that an open generating chamber 9 is formed, and in this chamber a series of holes lead through the wall of the body 4. Preferably, the centers of the first row of these holes or air inlets 8 are one-half inch above the bottom of the tapered chamber, and the concavity formed above the refractory material and the holes must be sufficiently close together to prevent any carbonization on the inside wall of the body 4. By making the holes or air inlets 8 close together only a small heated surface is left between the air inlets and the ingress of air through the inlets 8 is sufficient to effectually prevent carbonization on the inner surface of the body 4. These air inlets 8 must open directly into the chamber 9 and not at an angle, in order to effectuate a thorough mingling of the oil with the air in the chamber 9. By bringing the air inlets straight into the chamber, a greater commotion is effected in the combustion chamber and this insures a more thorough mingling of the vaporizing oil and air.

In order to support the body 4 in position on the fire-pot I prefer to employ angle plates 10 having flanges 11, through which rivets or other means, pass through the wall

of the body 4 and hold the body 4 and the angle plates 10 in fixed position. The horizontal flanges of the angle plates 10 have their outer ends adapted to rest on the flanges 3 of the walls of the stove.

12 represents the refractory material filled in between the walls of the stove and the body 4 so that the inlet of air from below the burner must be entirely through the combustion chamber, although means may be provided for admitting air above the body 4.

13 represents the overflow pipe, which as shown, extends up above the top of the refractory material 5, but terminates below the lower series of air inlets 8. This overflow pipe is connected with any suitable outlet, such as a sewer or tank for receiving any overflow of oil.

The oil pipe 6 is connected with a suitable source of supply, the oil being supplied to the chamber 9 under just sufficient head to cause it to flow up into the chamber 9, although the oil supply, in order to insure such pressure, may be located at sufficient height above the burner to insure sufficient gravity pressure for this purpose, and the oil supply tank may be located at any distance subservient to safety and convenience.

In order to insure the automatic regulation of the supply of oil to the chamber 9 and to prevent the supply of any excess thereto, and at the same time to obviate the necessity of constant attendance upon the burner, I interpose in the oil pipe 6 between the source of supply and the chamber 9, an automatic cut-off mechanism. This mechanism consists of a chamber 14 formed in a suitable reservoir and to which the portion of the pipe 6 leading to the chamber 9 is connected at about its center. At the top of the chamber 14 and forming a closure therefor, is a body 15 provided with an oil inlet way 16 and a valve way 17. 18 represents a ball or float adapted to operate in the chamber 14, and provided on its periphery with a tapering valve 19 adapted to operate in the way 17. The body 15 is projected upward above the way 16 and the way 17 extended up through this projection. A regulating hand wheel 20 operates in this extension through a packing gland and by operating this regulating device 20, the limit of upward movement of the valve 19 may be controlled so that the valve 19, if desired, may be prohibited from, at any time, entirely shutting off the flow of oil to the chamber 9. With the provision of this automatic regulation of the supply of oil, it will be seen that whenever the supply of oil in the chamber 14 is sufficient to cause the ball 18 to rise and project the valve 19 into the duct 17, that the supply of oil entering the chamber 14 will be thereby cut down or entirely cut off, and that as the supply of oil in the chamber 14 is reduced, the ball 18 drops and permits the inflow of a further supply of oil. Another result which is accomplished by this automatic operating valve 19 is that the duct 17 is mechanically cleaned by the operation of the valve 19 so that the duct 17 will at no time become clogged.

About the body 4 below the angle plate 10, I have provided an air chamber 21. This air chamber is formed by a metallic wall either cylindrical or square in form, and supported from the angle plates 10 as shown. This chamber is closed except through a series of ducts 22 in which I mount puppet valves 23.

If the burner is to be operated in connection with a forced draft,—as for instance, from a blower connected with the pipe 24, the pressure of air in the chamber 21 will hold the valve 23 closed, preventing the egress of air. If, however, a low pressure were desired, and the blower were stopped, the puppet valves 23 would open from the atmospheric pressure without and would permit sufficient air to enter the chamber 21 for the proper combustion within the chamber 9.

In order to prevent the ball 18 from dropping down into the chamber 14 a sufficient distance to allow the valve 19 to entirely escape from the way 17 so that the valve 19 could turn away from such way and not be in position to operate therein upon the rise of the ball, a stop 25 is provided which limits the downward movement of the ball. This stop 25 is preferably in the form of a rod passing horizontally through the chamber 14.

26 represents a valve which may be closed when the burner is not in operation to positively shut off the flow of oil to the burner.

In Fig. 3 I have shown a slightly modified form of my burner. This modification consists in the provision of means for introducing steam to the atomizing oil in the chamber 9. When such apparatus is used, the oil supply pipe 6 is preferably introduced into the chamber 9 at one side of the center of the bottom thereof and the central opening utilized for the water pipe 27, which, as shown, extends up into the fire-pot or chamber 28 above the chamber 9. To the lower end of this pipe 27 is connected a water supply pipe 29 through a reducing plug 30 into which a small water supply pipe 31 is positioned. This water supply pipe 31 is loosely mounted in a duct of the reducing plug 30 and extends up through the interior of the pipe 27 and through the plate 32 and preferably has a hooked end 33, the central opening of the plate 32 being provided with an elongated opening 34 through which the pipe 31 extends and so that when the hook 33 of the pipe 31 is turned in proper position, the plate 32 and parts attached thereto, may be removed, as hereinafter set forth. Preferably, the pipe 27 is made in two pieces connected together in a screw-plug 35, secured in place in the central opening of the bottom of the

casing 4. Extending downwardly from the periphery of the plate 32 is a large cylinder or pipe 36 forming a steam supply duct 37 and opening into the chamber 9 just above the first series of air inlet holes 8. 38 represents a short cylinder screwed on the outside of the cylinder 36 and extending above the plate 32 and having a screw cap 39 forming a steam generating chamber 40 above the plate 32. 41 represents short tubes or pipes extending up from the steam discharge or outlet ducts 42 into the chamber 40 above the water level therein. These pipes 41 communicate through the steam discharge ducts 42 in the chamber 37 of the pipe 36. The large opening 34 through the plate 32 forms an overflow outlet into the overflow pipe 27 which is connected at its lower end through the T 43 with the water overflow pipe 44, leading to the sewer or other outlet. In the pipe 27 I supply perforations 45 which are inclined downwardly and inwardly. These perforations 45 permit air to enter the pipe 27.

In Figs. 5 and 6, the burner of Fig. 1 is modified to show, instead of a cylindrical chamber 9 a rectilinear chamber 46, which is preferably used in large sized burners.

The bottom of the casing 47 is provided with refractory material 5', the upper surface of which is concave and provided with a series of channels 48 leading into a duct or opening 7' above the end of the oil supply pipe 6. The casing 47 is provided with a series of air inlet holes 8 similarly arranged and corresponding to the inlet holes 8 of Figs. 1 and 3.

The operation is as follows: Where the burner is constructed without the water and steam apparatus of Fig. 3, the valve 26 is opened to allow oil from the chamber 14 to flow through the pipe 6 and up onto the refractory material 5 in the chamber 9, the regulation of the valve 19 and ball 18 being such that the supply of oil will be automatically sufficient to maintain just a small quantity of oil on the surface of the refractory material. The initial ignition of the heavy crude oil may be accomplished in the chamber 9 in the usual manner, as for instance, by waste supplied on top of the oil and the burning of such waste heats the surface of the oil so that vapor arises therefrom and this vapor being ignited by the burning waste the oil entering the chamber 9 vaporizes and the vapor ignites and as the wall 4 and the refractory material 5 becomes heated, the vaporization is increased. Air flows into the chamber 9 from the chamber 21, and if the chamber 21 is connected with an air compressor, the forced draft of the air through the air inlets 8 creates a tremendous commotion of the rising vapor and thoroughly insures the complete combustion thereof. This air rushing into the inlets 8 and the heat vapors arising to meet the same, tend to create a vacuum between the oil and the air, which sucks the oil up, atomizing it and forcibly commingling the atomizing oil or vapor with the air. Unless the burner is burned with a very low draft, there will be no fire on the oil. The blue flame burns at the opening of the inlet ports 8 in the combustion chamber. The drawing up of the vaporizing oil in the air currents, passing in the chamber 9 and through the inlets 8, prevents carbonization in the bottom of the chamber 9, either on the sides of the chamber or on the refractory material 5, and an intense heat is thus generated without the production of smoke, the combustion being complete and perfect. With some oils, however, of exceedingly heavy gravity and containing a large percentage of asphaltum and mineral, in order to effect perfect combustion, it is desirable to introduce steam to the burning and atomizing vapor. For such purpose I utilize a burner of the construction shown in Fig. 3, the water being converted into steam in the chamber 40 and being delivered through the chamber 37 down into the rising atomizing vapor as it leaves the body of oil and passes out across the plane of the inlet ports 8.

Any excess of water in the chamber 40 is drained off through the overflow pipe 27 into the pipe 44, thus preventing water from being brought in contact with any portion of the highly heated wall 4 of the combustion chamber, and avoiding any puffing therein.

Great difficulty has been found in burning the California crude oils, owing to the presence therein of a substance, known among oil men as "BS". This substance has so far been found to be impossible to chemically classify or distinguish, but it seems to be a liquid saltpeter or a liquid silica and is explosive and highly inflammable. It is exceedingly heavy, being much heavier than any oil and when precipitated into water will sink a considerable distance therein. It is of a consistency and of a nature like exceedingly thick and heavy syrup or molasses, and in the burning of such oils, this substance has been found to accumulate in the valve ways and prevent the regulation of the flow of oil there-through. When properly furnished to the burner with water and in connection with the other oil, it forms a very valuable heating agent. In order to secure an automatic valve which will automatically regulate the supply of oil to the burner and at the same time automatically clean the valve seat or inlet, I have provided the valve 19 in the form of a conical spindle or stem and slidably operated by the ball 18. The constant rise and fall of the ball 18 in the chamber 14 causes the valve or stem 19 to work in the way 17, stirring this "BS" substance, so it cannot accumulate on the walls of the duct 17 and is carried through the valve into the supply pipe and thence

to the burner. By this means the difficulty in the regulation of the feed of oil to the burner, in practice, has been found to be successfully overcome.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A hydrocarbon burner having a combustion chamber, the wall of said chamber being provided with a series of air inlets, means for supplying oil to the bottom of said chamber below said air inlets, an automatic valve in connection with said oil supplying means for controlling the supply of oil to said chamber, means forming a closed chamber about the sides and bottom of said combustion chamber, inlets in the said last named chamber and valves operated by atmospheric pressure for controlling the admission of air through said inlets.

2. A hydrocarbon burner having an open topped combustion chamber provided with air inlets at its sides, means for supplying oil to the bottom of said combustion chamber below said air inlets, a water supply pipe extending up through said combustion chamber above the top thereof, means forming a steam generating chamber into which said water pipe communicates, a cylindrical body having its upper end in communication with said steam chamber and extending down about said water pipe and opening into said combustion chamber near the bottom thereof.

3. A hydrocarbon burner having an open topped combustion chamber provided with air inlets, means for supplying oil to the bottom of said combustion chamber below said inlets, means providing a closed chamber about said combustion chamber, means for supplying air under pressure to said last named chamber, means providing a steam chamber above said combustion chamber, means for supplying water to said steam chamber and means for communicating the steam from said steam chamber down to and discharging the same into said combustion chamber near the bottom thereof.

4. A hydrocarbon burner having an open topped combustion chamber provided with peripheral air inlets, means for supplying oil to the bottom of said combustion chamber below said inlets, a water pipe extending up through said combustion chamber, means forming a steam generating chamber into which said water pipe communicates, an overflow pipe from said steam chamber and means for communicating the steam generating in said steam chamber down into said combustion chamber to discharge the same near the bottom thereof.

5. A hydrocarbon burner having an open topped combustion chamber, having a series of air inlets in its wall, means for supplying oil to said combustion chamber below said air inlets, a pipe extending up through said combustion chamber and supporting a plate forming the bottom of the steam chamber, means forming the sides and top of said steam chamber, a water pipe extending up through said first named pipe through said plate and into said steam chamber, an overflow outlet being left through said plate around said water pipe, a concentric steam supply pipe about said first named pipes and extending from said plate down to near the bottom of said combustion chamber, an opening thereinto, the upper end of said concentric pipe being connected with said plate and means for supplying steam from the top of said steam chamber into the chamber of said concentric pipe.

In testimony whereof, I have hereunto set my hand at Los Angeles California this 17th day of November 1904.

LEEGORA A. BLUBAUGH.

In presence of—

FREDERICK S. LYON,

F. M. TOWNSEND.