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O. D. ARMSTRONG.

HYDROCARBON BURNER.

APPLICATION FILED FEB. 9, 1903.

NO MODEL.

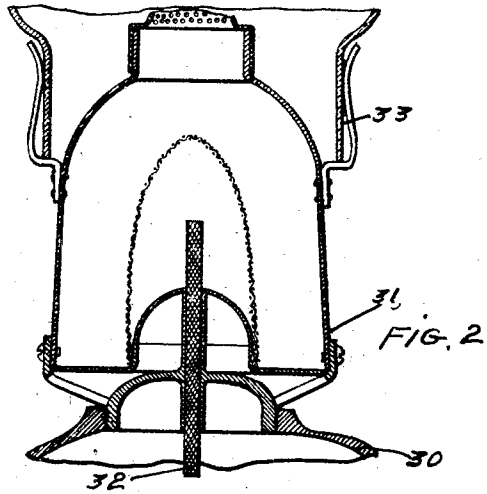



FIG. 2

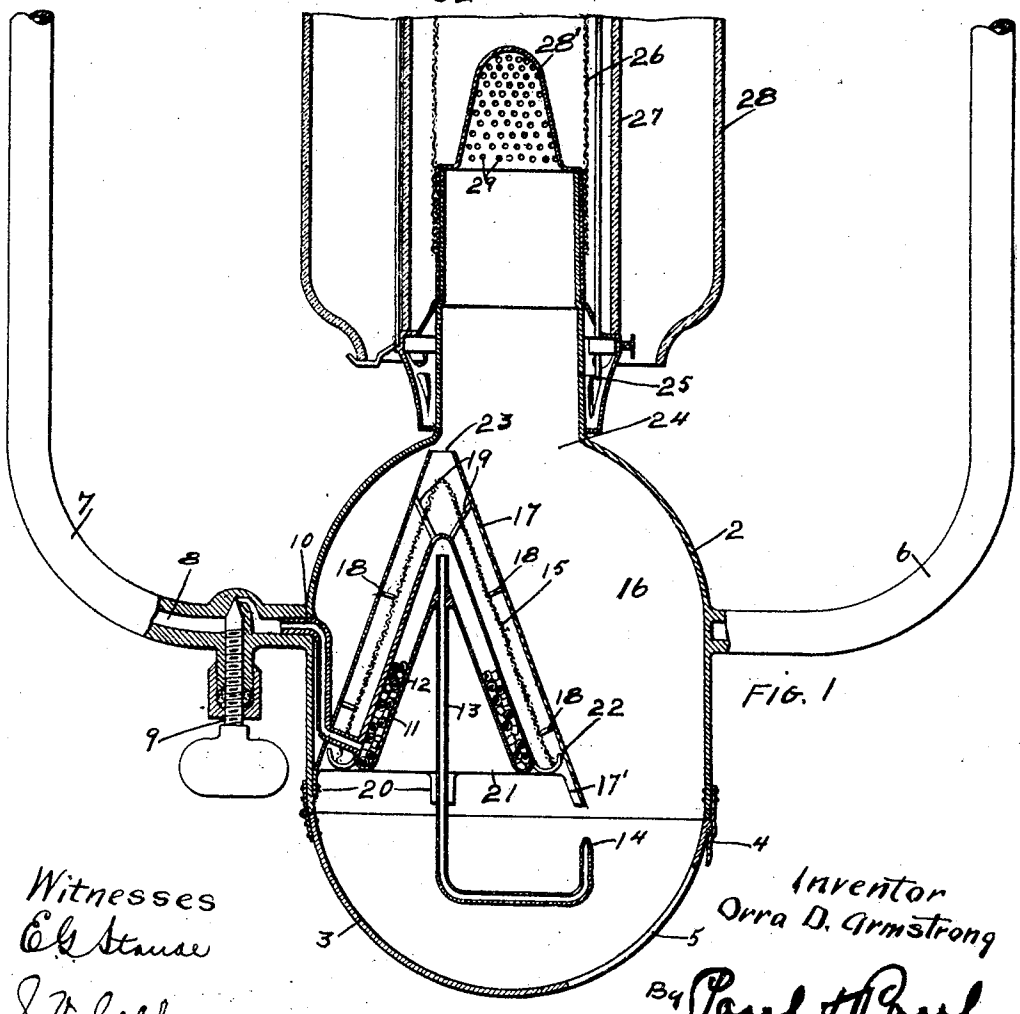



FIG. 1

Witnesses
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No. 777,997. Patented December 20, 1904.

# UNITED STATES PATENT OFFICE.

ORRA D. ARMSTRONG, OF MINNEAPOLIS, MINNESOTA.

## HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 777,997, dated December 20, 1904.

Application filed February 9, 1903. Serial No. 142,514.

*To all whom it may concern:*

Be it known that I, ORRA D. ARMSTRONG, of Minneapolis, county of Hennepin, State of Minnesota, have invented certain new and useful Improvements in Hydrocarbon-Burners, of which the following is a specification.

The invention relates to hydrocarbon or vapor burners, and particularly to that type employing an incandescent or gas mantle; and the primary object of the invention is to provide a vapor-burner in which the element of danger usually present in burners of this type and arising from the use of volatile liquids is entirely eliminated.

A further object is to provide a burner which will use a very low grade of oil, and hence be much less expensive to operate than burners of this type in general use.

Other objects of the invention will appear from the following detailed description.

The invention consists generally in producing a non-luminous or Bunsen flame free from solid carbons and of intense heat from heavy hydrocarbons of high vaporization-points by introducing through suitable means a supply of hydrocarbon into the presence of a substance that is capable of producing "catalytic action" when exposed to the contact of air and an inflammable gas and continuing the vaporization of said hydrocarbon by heat from said substance through said action and conducting the greater part of said vapor mixed with air to a suitable burner.

Further, the invention consists in various constructions and combinations, all as hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a vertical section of a hydrocarbon-burner embodying my invention, the upper portion being broken away. Fig. 2 is a similar view showing my invention as applied to the ordinary lamp, the upper portion and the base being broken away.

In the drawings, 2 represents a suitable shell or base provided on its under side with a hinged door 3, normally held closed by a spring 4 and provided with an air-opening 5.

6 and 7 are rods secured to the base and supporting the same, and the rod 7 has a duct 8 leading to a suitable oil-supply. (Not shown.) A valve 9 is provided for regulating the flow of oil through the duct 8, and a tube 10 connects with the duct 8 at one end and communicates at its other end with the interior of a vapor-generator or retort 11. This retort is made, preferably, of thin material to hasten vaporization of the oil when exposed to heat and is preferably conical in form, as shown, though I do not confine myself to this shape. A substance such as wire-gauze clippings 12 is placed within the retort to increase the radiating-surface therein and hasten vaporization of the oil fed thereto. The bottom of the retort preferably extends up within the same to increase the heating-surface area, and a vapor-tube 13 is provided in said inner or bottom wall and extends downward from a point near the apex of the retort. This tube is preferably L-shaped in form and has a turned-up jet-discharge end 14. Over the retort and spaced a considerable distance therefrom I arrange a correspondingly-shaped mantle 15, which may be composed of any of the platinum group of metals, such as ruthenium, (Ru,) rhodium, (Rh,) osmium, (Os,) iridium, (Ir,) palladium, (Pd,) and platinum, (Pt.) These metals possess the peculiar property of condensing or "occluding" gases on their surfaces. The action, known as "catalytic," is maintained principally on the surfaces of the metals, some gases being absorbed and others merely condensed. The more surface there is exposed the greater the occluding or condensing action. These occluded gases possess very active properties. If they have any chemical affinity for one another, they will combine and produce heat, and the hotter the metals and gases become the more active will be the "action," which will continue as long as there are any combustible gases in the presence of the metal. Of the metals named I prefer to use "platinum" or "palladium," since these possess the desired action in a more marked degree, and I prefer to use the metals made in the form of a fine-wire gauze, as shown. The finer the wire in the gauze the more rapid will be the catalytic action when inflammable vapors

and air are present. The metals might be held in place in a finely-divided form by means of some refractory porous substance, such as asbestos or clay, in several ways, as by soaking it with any of the salts of the metals in solution and allowing the metals to be heated. This is especially true of the chlorid solutions of the metals, the heat driving off the chlorin, leaving the metals suspended in the pores of the substance in a finely-divided form, known to the chemists as "platinic asbestos." The metals used to produce catalytic action may exist in several different forms, known as "sponge" or "black," in the form of a porous substance as a sponge and a powder as black. The metals may be mixed with each other, if desired, and even alloyed with some other metals and the catalytic action still be maintained. The action may also be maintained with the salts and chlorids of these metals in a limited degree. The object of using this catalytic action is to produce heat in the vicinity of a volatile hydrocarbon, in this case within the retort, the intense heat from the action heating the retort-walls and vaporizing the oil therein and consuming only a small percentage of the discharged vapor and air and allowing the unconsumed vapor to be mixed with more air before it is finally consumed as a flame at the burner. The heat of the catalytic action is also used in superheating the gas and air before they are consumed. I prefer to use a heavy refined oil, such as kerosene, though other low-grade heavy oils may be used, any of which I am able easily to vaporize by means of this catalytic action, and while the invention is designed for use with hydrocarbons of the highest vaporization-points it may also be used with hydrocarbons of low vaporization-points, if preferred. A heavy oil that vaporizes only at a high degree of temperature can by means of this catalytic action be made to produce a bright incandescent light when used in connection with the ordinary gas-mantle, and it may also be used for heating purposes. In either case an absolutely safe and economical burner-flame is provided.

The cone 15 is preferably arranged near one side of the base or shell in position to be engaged by a portion of the vapor from the tip 14. This jet, as shown in Fig. 1, is above the air-opening, and the vapor as it is discharged from the jet will be mixed with air, a portion of it passing up beside the cone 15 and the remainder into a mixing-chamber 16 within said base, or all the vapor may be passed up through or beside the cone. In this chamber the air and gas are thoroughly mixed and superheated and finally pass to the burner proper. To obtain a more intimate mixture of the air and gas, it is preferable to have the vapor discharged with considerable velocity. This may be accomplished by air-pressure in the oil-reservoir, by suitable tubes or weights, or by the gravity of the oil itself. As the mixture of vapor and air in the vicinity of the catalytic action is in a highly-explosive state and needs only ignition temperature to explode or burn it, I may prefer to prevent the mixture from burning in the base by providing a conical screen 17, arranged over the cone 15 and the retort and connected to the cone 15 by arms 18. Similar arms 19 connect said screen to the top of the retort, and lugs 20 are provided at the base of said screen and secured to the walls of the shell 2. A flange 21 is preferably provided at the base of the retort, extending down around the lower edge of the cone 15 and having an opening 22 above the tip 14, through which the vapor passes to the gauze cone. The screen has a deflector 17′ in the path of the vapor-jet, causing a portion of it to pass up into contact with the mantle and the remainder into the mixing-chamber 16. The upper end of the screen 17 has a discharge-opening 23, through which the superheated gas passes and mingles with the gas and air from the mixing-chamber on their way to the burner. This protecting-screen may, however, be dispensed with by varying the size of the wire in the cone 15, so as to keep its temperature below that of the ignition temperature of the explosive mixture. The heat of the catalytic action keeps the walls of the base 2 and the screen 17 sufficiently hot to prevent the gas from condensing on their surfaces, and as the gas is discharged into the air from the retort and mingles with the cold air it is condensed and upon passing in proximity to the heated gauze cone or screen is reconverted into a gas and superheated. The base 2 at the top is provided with an opening 24, through which the superheated gas passes to a burner-tube 25, above which is the usual gas-mantle 26, inclosed by chimney 27 and by cylinder 28, if preferred. As the amount of air needed in proportion to the vapor of a heavy oil is very great, I prefer to provide some means to permit a greater volume of air in proportion to the increased volume in the chamber below to pass into the space inclosed by the mantle 26 and at the same time direct the mingled gases against the sides of the mantle and prevent them from "firing back" into the mixing-chamber below. I therefore provide a cone-shaped cap 28′, having a series of perforations 29 and arranged on the upper end of the tube 25. This cap has a greater area than the cross-section of the tube 25 and allows such a considerable volume of air and gas to pass therethrough as is necessary to produce the best results at the mantle.

In Fig. 2 I have shown my invention adapted for use in an ordinary lamp having an oil-reservoir 30, a burner 31, provided with the usual wick 32, and a chimney 33. The wick is adjusted, as shown in the figure, a consid-

erable distance above the tip of the burner, and over the wick I arrange a gauze cone similar to the one shown in Fig. 1. To start the catalytic action, the wick is lighted, and as soon as it becomes hot the flame is blown out, and the cone having become heated and catalytic action created will stay hot and become even hotter after the flame is put out and continue the vaporization of the oil brought up by the wick. When the action has once commenced, the gauze cone will become red-hot and will stay so so long as there are air and inflammable vapor in the presence of the metal, and it is immaterial how the oil is vaporized. If it takes place in the presence of the metal and a supply of air, the action will be established and will increase rapidly as the temperature rises.

The heat produced by this catalytic action, as described with reference to Fig. 1, being in close proximity to the generating-chamber and not in any way depending upon the heat of the flame above for its generation, the material employed in the construction of the generator may be made very light and preferably of low conductive properties. By making the generator of comparatively thin material and surrounding it with an intense heat a very high degree of temperature can be quickly obtained that is necessary for the vaporization of a heavy oil. The supply of oil to the generator can of course be readily regulated by the valve 9, and the temperature around the generator can be varied by increasing or decreasing the volume of metal in the gauze cone. To start the lamp, an alcohol-torch or other means of supplying heat is applied to the generator. When this has been heated sufficiently to vaporize the oil, the valve 9 is opened and the oil flowing into the generator is immediately vaporized and discharged through the jet 14 into the mixing-chamber. The lower projecting edge of the screen 17 deflects a portion of the vapor, causing it to pass up beside the cone 15, that has previously been heated by the action of the torch, and from the retort, and the gas becoming occluded or condensed and burning on the surface of the cone causes it to become heated to a red heat. The generator is kept hot by radiation from the cone and the hot gases, and the vapor in the mixing-chamber is also heated by radiation and by mingling with the unconsumed vapor from the cone and rises in a superheated state to the burner-mantle. The vapor continues to be discharged from the retort and mixing with the air flows past the heated cone, and the action is continued as long as the oil flows into the retort.

I claim as my invention—

1. The combination, with a burner, of a substance capable of producing "catalytic action" in the presence of air and an inflammable vapor, and a liquid-hydrocarbon conductor wherein the oil is vaporized by radiation from said substance, for the purpose specified.

2. The combination, with a burner, of a substance capable of producing "catalytic action" in the presence of air and an inflammable vapor, a retort adapted to contain oil in proximity to said substance, and means for delivering a hydrocarbon in liquid form to said retort.

3. The combination, with a burner, of a substance capable of producing "catalytic action" in the presence of air and an inflammable vapor, a retort in proximity to said substance, an oil-supply duct leading to said retort, and a vapor-duct leading from said retort and arranged to direct a portion of the vapor therefrom against said substance, for the purpose specified.

4. The combination, with a burner, of a suitable base or casing provided beneath the same, a retort arranged within said base and connected with a hydrocarbon-supply, a vapor-discharge tube leading from said retort, and a substance capable of producing "catalytic action" provided near said retort and in the path of the vapor from said discharge-tube, substantially as described.

5. The combination, with a burner provided with an incandescent mantle, of a substance capable of producing "catalytic action" in the presence of air and an inflammable vapor, means for delivering a liquid hydrocarbon in proximity to said substance to be vaporized thereby, and means for discharging a portion of the vapor upon the surface of said substance.

6. The combination, with a suitable base and a burner mounted thereon provided with an incandescent mantle, of a retort arranged in said base and connected with an oil-supply, a vapor-discharge tube leading from said retort, a substance capable of producing "catalytic action" inclosing the said retort and in the path of the vapor from said discharge-tube, and a suitable screen inclosing said substance.

7. The combination, with a burner provided with an incandescent gas-mantle, of a cone-shaped retort or generator provided with an oil-supply duct, a vapor-discharge tube leading from said retort, and a gauze cone inclosing said retort and spaced therefrom and capable of producing "catalytic action" when heated and exposed to the vapor from said vapor-tube.

8. The combination, with a burner provided with an incandescent mantle, of a retort having an oil-supply duct, a vapor-discharge tube leading from said retort, a platinum covering for said retort spaced therefrom and in the path of the vapor from said tube.

9. The combination, with a burner provided with a gas-mantle, of a base or casing having a suitable air-opening beneath the same, a cone-

shaped retort provided within said base and communicating with a hydrocarbon-supply, an L-shaped vapor-tube leading from said retort, and a platinum-gauze cone fitting over said retort and spaced therefrom and in the path of the vapor from said tube.

10. The combination, with a casing or base 2 having an air-opening 5 and an incandescent-mantle burner mounted thereon, of a cone-shaped retort 11 provided within said base at one side of the center thereof, an oil-duct leading to said retort, a vapor-tube 13 leading from said retort and having an upwardly-turned end 14 above said air-opening, a platinum cone 15 fitting over said retort and spaced therefrom, and a deflector provided in the path of the vapor from said discharge-tube, for the purpose specified.

11. A substance capable of producing "catalytic" action in the presence of air and an inflammable vapor, in combination with a retort inclosed by said substance and adapted to contain a hydrocarbon in liquid form.

12. In a device of the class described, a substance capable of producing "catalytic action" in the presence of air and an inflammable vapor, in combination with a liquid-hydrocarbon conveyer inclosed by said substance and heated by radiation therefrom to vaporize the oil in said conveyer.

13. The combination, with an air-chamber, of an oil-receptacle or reservoir therein having receiving and discharging orifices, and a substance capable of producing "catalytic action" when exposed to air and an inflammable vapor contiguous to said reservoir, for the purpose specified.

14. In a device of the class described, a conical retort adapted to contain oil and having receiving and discharge openings, in combination with a platinum mantle inclosing said retort.

15. The combination, with a suitable burner, of a retort adapted to contain a liquid hydrocarbon and having inlet and outlet orifices, and a substance capable of producing catalytic action in the presence of air and an inflammable vapor arranged to vaporize the oil in said retort and be kept hot by contact with the vapor mixed with air therefrom.

16. The combination, with a suitable burner, of a vaporizing receptacle or chamber having inlet and outlet orifices, and a substance capable of producing catalytic action located near said receptacle and in the path of the vapor discharged therefrom and said receptacle being kept hot by radiation from said substance, substantially as described.

17. The combination, with a burner provided with an air-chamber, of a retort located in said chamber and having inlet and discharge orifices, and a substance capable of producing catalytic action arranged near said retort to heat the same by radiation and said substance being arranged to contact with the vapor from said discharge-orifice, substantially as described.

In witness whereof I have hereunto set my hand this 5th day of February, 1903.

ORRA D. ARMSTRONG.

In presence of—
RICHARD PAUL,
S. V. GRIFFIN.