(No Model.) 3 Sheets—Sheet 1.

I. R. BLUMENBERG & H. W. WHITING

HYDROCARBON VAPOR GENERATOR AND BURNER.

No. 275,124. Patented Apr. 3, 1883.

Fig. 1.

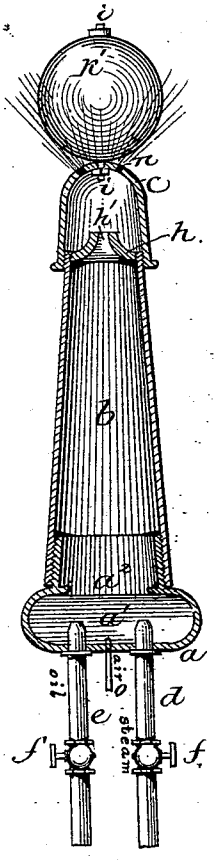


Fig. 2.

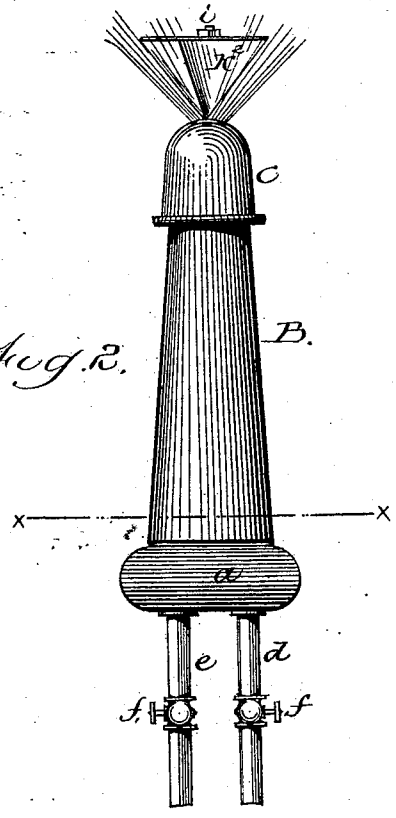


Fig. 3.

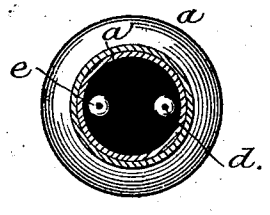
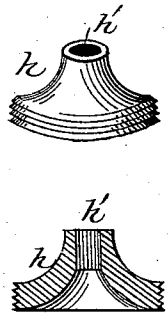


Fig. 4.



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(No Model.) 3 Sheets—Sheet 2.

I. R. BLUMENBERG & H. W. WHITING

HYDROCARBON VAPOR GENERATOR AND BURNER.

No. 275,124. Patented Apr. 3, 1883.

Fig. 5

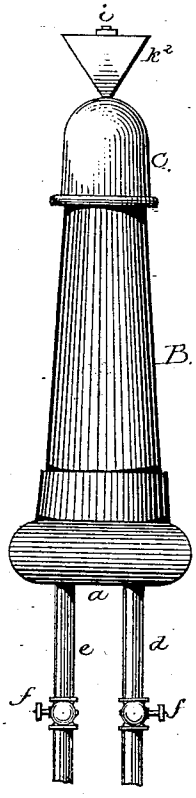


Fig 6

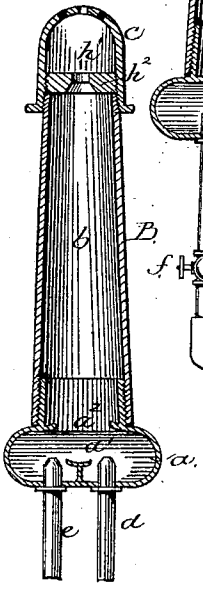


Fig. 7

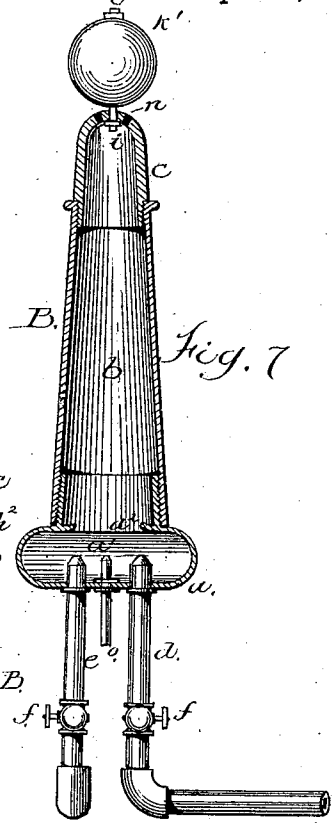


Fig. 9

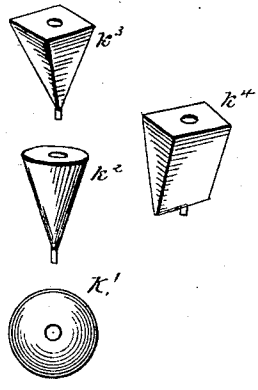
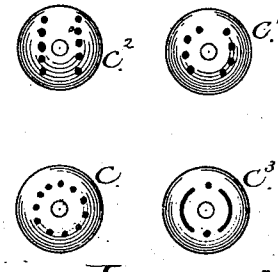


Fig. 8.



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(No Model.) 3 Sheets—Sheet 3.

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HYDROCARBON VAPOR GENERATOR AND BURNER.

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Fig. 10.

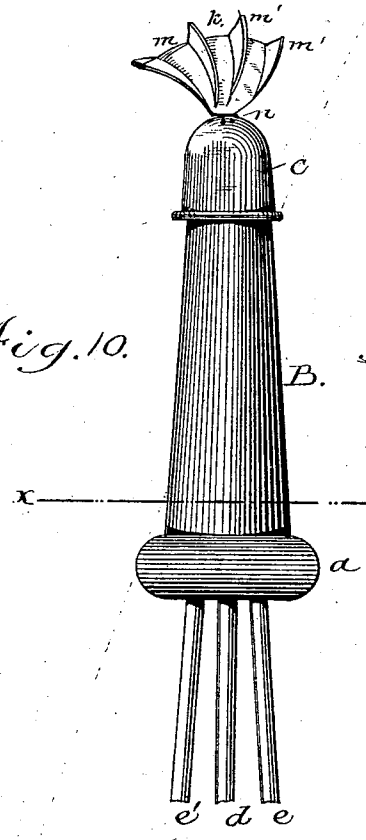


Fig. 12.

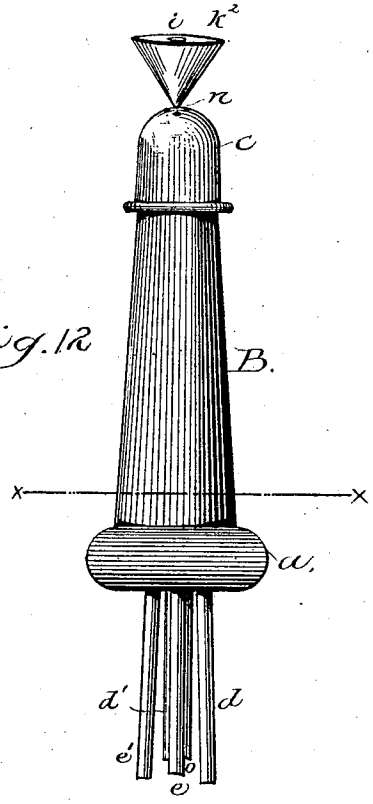


Fig. 11.

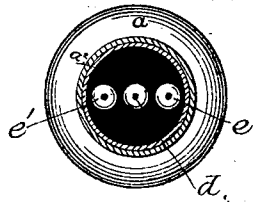
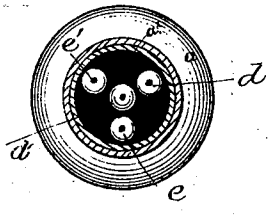


Fig. 13.



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UNITED STATES PATENT OFFICE.

ISRAEL R. BLUMENBERG, OF WASHINGTON, DISTRICT OF COLUMBIA, AND HENRY W. WHITING, OF PHILADELPHIA, PA., ASSIGNORS TO THE HYDROCARBON BURNER AND FUEL COMPANY, OF PHILADELPHIA, PA.

HYDROCARBON-VAPOR GENERATOR AND BURNER.

SPECIFICATION forming part of Letters Patent No. 275,124, dated April 3, 1883.

Application filed January 6, 1883. (No model.)

To all whom it may concern:

Be it known that we, ISRAEL R. BLUMENBERG and HENRY W. WHITING, citizens of the United States of America, residing respectively at Washington, District of Columbia, and Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Hydrocarbon-Vapor Generators and Burners and Flame-Expanders, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention relates to improvements in hydrocarbon burners for furnaces and other mechanical purposes; and it consists in constructing within the bulbous base of a burner a globulous chamber connected by a small orifice with an adjoining compartment, and in so constructing and arranging the chambers and the induction-pipes that the jets of steam and oil used in forming the vapor when injected therein, while tending to create a vacuum at the periphery of the globulous chamber, will form double eddying currents, and thereby become thoroughly mingled before being ejected through the burner-tip.

It also consists in a diaphragm having a contracted orifice located in the vapor-generating chamber, in combination with contracted orifice connecting the globulous receiving and cylindrical mingling chambers, to facilitate the mingling of the vapor and concentrate the force of the vapor-currents and cause them to flow with greater head as they pass through and from the burner-tip, whereby more complete combustion is obtained, all of which will be more particularly pointed out hereinafter.

Similar letters of reference indicate corresponding parts.

Figure 1 is a longitudinal section of an articulated burner, showing the various interior chambers, the steam and oil induction pipes, the air-blast pipe, the diaphragm having a passage therein, together with a flame-expander. Fig. 2 is an elevation of the same, showing another form of flame-expander. Fig. 3 is a cross-section of the latter figure, taken at the line x, looking into the globulous chamber, and showing the nozzles of the induction steam and oil pipes. Fig. 4 is the removable diaphragm h, partly perspective and in section, h' marking the passage therethrough. Fig. 5 is an elevation of a complete burner surmounted with an inverted cone-shaped flame-expander. Fig. 6 is a longitudinal section of a burner, showing a partition in the chamber between the steam and oil induction pipes, and a diaphragm having a passage or throat exposed in place between the burner-tip and the chambers below. Fig. 7 is a longitudinal section of a burner, showing an air-blast pipe in addition to the steam and oil induction pipes, the whole crowned with a spherical flame-expander. Fig. 8 is a plan, severally, of a number of burner-tips, showing the arrangement of the orifices for the exit of the vapor. Fig. 9 is a perspective, severally, of a number of flame-expanders. Fig. 10 is an elevation of a burner having an additional oil-induction pipe, and showing a revolving winged flame-expander. Fig. 11 is a cross-section of the same, taken at the line x. Fig. 12 is an elevation of a burner provided with sets of steam and oil induction pipes, an air-blast pipe, and showing a cone-shaped flame-expander. Fig. 13 is a cross-section of the same cut off at the line x, showing the interior arrangement of the pipes.

a is the bulbous base of an articulated burner, B, within which is a globulous chamber, a', having a small outlet, a^2, connecting with the compartment b. Into the globulous chamber a' are introduced and secured the nozzle ends of the steam and oil induction pipes d and e, respectively, and, when required, an air-blast pipe, o.

b is a cylindrical, or, if desired, a bulbous, tube, preferably smaller at the upper than at the lower end, which screws onto the bulbous base a, and serves in conjunction with the chamber a' as a vapor generating and mingling compartment.

c is a thimble-shaped burner-tip, which screws onto the smaller end of the cylindrical tube b, completing the shell of the burner proper. The burner-tip is perforated for the passage of the vapor, and carries the flame-expander.

c' c^2 c^3 are modifications of the burner-tip c,

showing various arrangements of the perforations *n*.

k is a revolving flame-expander, having wings *m'*, by which, through the flow of the vapor, it is revolved on its axis at the tip of the burner.

k' k² k³ k⁴ are modifications of the same, being respectively the sphere, the inverted cone, the inverted pyramid, and the prism.

h is a removable diaphragm having a passage-way therein for the vapor.

d, *e*, and *o* are metal pipes secured by one end, respectively, in the burner. These pipes serve as steam and oil induction pipes or conduits and an air-blast pipe.

f is a suitable stop-cock.

B is the complete articulated burner ready for use.

The diameter of the chamber *a* is greater than the diameter of the body *b*, to which it is secured and forms the base; and the orifice a^2, by which the chamber *a'* and compartment *b* communicate, is preferably less in diameter than the compartment *b*. The chamber *a'* is globulous in form, and so constructed, and the induction steam and oil pipes are so arranged, that the jets of steam and oil employed in forming the vapor will, while tending to create a vacuum at the periphery of the chamber *a'*, form double eddying currents of vapor while passing through and from one chamber into the other, whereby the oil will be thoroughly vaporized and the two completely mingled before reaching the burner. This end will be more fully realized when the removable diaphragm *h*, with its outlet *h'*, smaller in diameter than the orifice a^2, has been introduced into the throat of the burner between the burner-tip *c* and the mingling-compartment *b*. Into the base *a*, entering the chamber *a'*, are introduced and secured the nozzle ends of one or more steam-pipes, *d*, and one or more oil-induction pipes, *e*, one, two, three, or more each, as experience may suggest or the power demand, and, when required, an air-blast pipe, *o*. These pipes are connected by the opposite ends to a steam-boiler, an oil-tank, and a blast, respectively, and each is provided with a suitable stop-cock, *f*, for governing the flow.

The mingling-compartment *b* is a plain cylinder, preferably smaller at the upper than at the lower end; or, if desired, it may be slightly bulbous. This tube or cylinder *b* is the body of the burner, and is secured by a screw or otherwise onto the bulbous base *a*, and receives on its smaller end the burner-tip *c*, and is provided with a screw or shoulder for securing the diaphragm *h* in place. The steam and oil vapor, passing from the globulous chamber *a'* by the orifice a^2, enters this compartment in a series of currents, which, when set back upon themselves, by coming in contact with the diaphragm *h*, intermingle with each other and become thoroughly mingled *in unum*.

The metal diaphragm *h* has a passage, *h'*, through which the vapor passes from the mingling-chamber to the burner-tip, and is so constructed that when it is desired to use it, either to cause the vapor to the more thoroughly mingle or to concentrate the force and give greater head to the flow of vapor, it may be inserted and secured in the throat of the burner by a screw or any approved method. The passage *h'*, though it may be of any form of construction, is preferably funnel-shaped, growing smaller toward the burner-tip, and will best serve the purpose by terminating in a nozzle.

It will be observed that the burner is to be used in furnaces and under boilers varying considerably in length, that a burner which throws a flame but ten feet would be useless under a boiler thirty to forty feet in length. By inserting the diaphragm *h* and modifying the form of the passage *h'*, this embarassment is in a great measure overcome, and then by introducing the air-blast pipe *o* the flame can be wholly controlled and the end sought be accomplished.

The burner-tip *c* is a plain thimble-shaped cap, which is secured onto the upper or smaller end of the cylindrical shell *b* by a screw or any other suitable device, and it is perforated in the end, as shown by *c*, *c'*, c^2, and c^3, Fig. 8, for the passage of the vapor, and has a bolt-hole for the bolt *i* employed in securing thereon the flame-expander. As the flame of the burner is generated at the tip of the burner, it is preferably made of material that will best withstand the action of the flame, the perforations *n* being so arranged as to throw the jets of vapor in the direction of the lateral limits of the flame-expander.

The flame-expander *k* has an irregularly inverted cone-shape body, *m*, provided with spirally-adjusted wings *m'* thereon. This expander works upon a journal-bolt, *i*, by which it is held in place at the tip of the burner-tip *c*, and is by the flow of the vapor and rush of the flames so revolved on its axis that it gives an agitated rolling motion to the flame. The flame-expanders *k'*, k^2, k^3, and k^4, having no wings, do not revolve, but simply spread the flame out under the crown-sheet of the boiler or to the full width of the furnace.

The steam-induction pipes *d d'* are ordinary metal pipes with a valve, *f*, by which the quantity of steam admitted to the chamber *a'* can be regulated. These pipes are introduced into and secured in the base of the burner. The oil-induction pipes *e e'* are also small metal pipes provided with valves *f*, by which the oil flow is regulated. The end of these pipes are also introduced and secured in the base of the burner.

The pipe *o* is an ordinary small metal pipe provided with a stop-cock connecting with an air-blast, one end to be secured in the base of the burner when used. The interior or end of these pipes within the burner is made small for two purposes: first, that they may not admit too large a quantity into the burner

at the one time, and, second, to prevent the vapor from forcing itself backward into the pipes.

Having now fully described our invention, what we claim as novel, and desire to secure by Letters Patent, is—

1. In a device for generating and burning hydrocarbon vapor, globulous and cylindrical chambers connected by a conduit or orifice smaller in diameter than either of said chambers, the former chamber entered by steam and oil induction pipes, in combination with a vapor burner-tip, substantially as shown and described.

2. The flame-expander *k*, provided with wings *m'*, spirally adjusted thereon, in combination with the vapor generator and burner B, substantially as shown and described.

3. The removable diaphragm *h*, having a single passage, *h'*, and a thimble-shaped removable vapor-tip, *c*, in combination with a conical cylindrical chamber, *b*, and globulous chamber *a'*, connected by a conduit or orifice, a^2, smaller in diameter than either of said chambers, in a device for generating and burning hydrocarbon vapor, substantially as shown and described.

4. The combination of globulous chamber *a'* and a conical cylindrical chamber, *b*, connected by a small conduit or orifice, a^2, the whole constructed and arranged for receiving and mingling oil and steam into hydrocarbon vapor, steam and oil induction pipes, and an adjustable or removable diaphragm, *h*, in a device for generating and burning hydrocarbon vapor, constructed, adjusted, and arranged substantially as shown and described.

5. A hydrocarbon-vapor generator and burner consisting of a globulous chamber within a bulbous base, communicating with a conic cylindrical mingling-chamber through a narrow conduit, a^2, a thimble-shaped removable burner-tip provided with numerous radiating vapor-exits, perforations, and steam and oil induction pipes, all constructed, adjusted, and arranged substantially as shown and described.

6. The combination of globulous chamber *a'*, conic cylindrical chamber *b*, connected by a conduit, a^2, smaller in diameter than either of said chambers, and the removable thimble-shaped burner-tip *c*, in a device for generating and burning hydrocarbon vapor, substantially as shown and described.

7. The combination of the large globulous chamber *a'*, conic cylindrical chamber *b*, communicating contracted conduit or orifice a^2, removable diaphragm *h*, having a single funnel-shaped passage, *h'*, and a removable burner-tip, *c*, constructed, adjusted, and arranged substantially as shown and described.

8. The combination of the large bulbous base *a*, induction steam and oil pipes *d* and *e*, provided with valves *f*, large globulous chamber *a'*, and conic cylindrical chamber *b*, connected by a contracted conduit or orifice, a^2, a removable diaphragm, *h*, having a single orifice, *h'*, and a removable burner-tip, *c*, arranged substantially as shown and described.

9. In combination, a device for generating and burning hydrocarbon, as shown, terminating in a thimble-shaped removable burner-tip, *c*, having numerous small radiating perforations, and a spiral-winged flame-expander, *k*, secured on the end of the burner-tip, substantially as shown and described.

10. In combination, the removable numerously-perforated thimble-shaped burner-tip *c*, carrying on its apex a revolving spiral-winged flame-expander, *k*, in a device for generating and burning hydrocarbon vapor, substantially as shown and described.

11. In combination, the thimble-shaped burner-tip *c*, having radiating perforations *n* in the end thereof, and a winged flame-expander secured on its apex, as shown, in a device for generating and burning hydrocarbons, substantially as shown and described.

12. In combination, the induction steam-pipes *d*, oil-pipes *e*, air-blast pipe *o*, all adjusted in the bulbous base *a*, globulous chamber *a'*, vapor-exit orifice a^2, conic cylindrical chamber *b*, removable diaphragm *h*, having a single funnel-shaped passage, *h'*, and removable burner-tip *c*, in a device for generating and burning hydrocarbon vapors, substantially as shown and described.

13. The combination of flame-expander *k*, burner-tip *c*, perforations *n*, removable diaphragms *h*, having single vapor-passage *h'*, conic cylindrical chamber *b*, vapor-exit orifice a^2, globulous chamber *a'*, steam and oil induction pipes *d* and *e*, and air-blast pipe *o*, in a device for generating and burning hydrocarbon vapor, all constructed and adjusted substantially as shown and described.

14. The combination of flame-expander *k*, removable burner-tip *c*, having numerous radiating perforations, *n*, cylindrical chamber *b*, exit-orifice a^2, globulous chamber *a'*, induction steam and oil pipes *d* and *e*, and air-blast pipe *o*, in a device for generating and burning hydrocarbon vapor, substantially as shown and described.

15. The combination of the flame-expander *k*, removable burner-tip *c*, having numerous radiating perforations, *n*, cylindrical mingling-chamber *b* and *a'*, vapor-exit orifice a^2, and induction steam and oil pipes *d e*, in a device for generating and burning hydrocarbons, substantially as shown and described.

In testimony whereof we have affixed our signatures, in presence of two witnesses, this 20th day of December, 1882.

ISRAEL R. BLUMENBERG.
HENRY W. WHITING.

Witnesses:
A. P. RUTHERFORD,
HENRY POLSZ.