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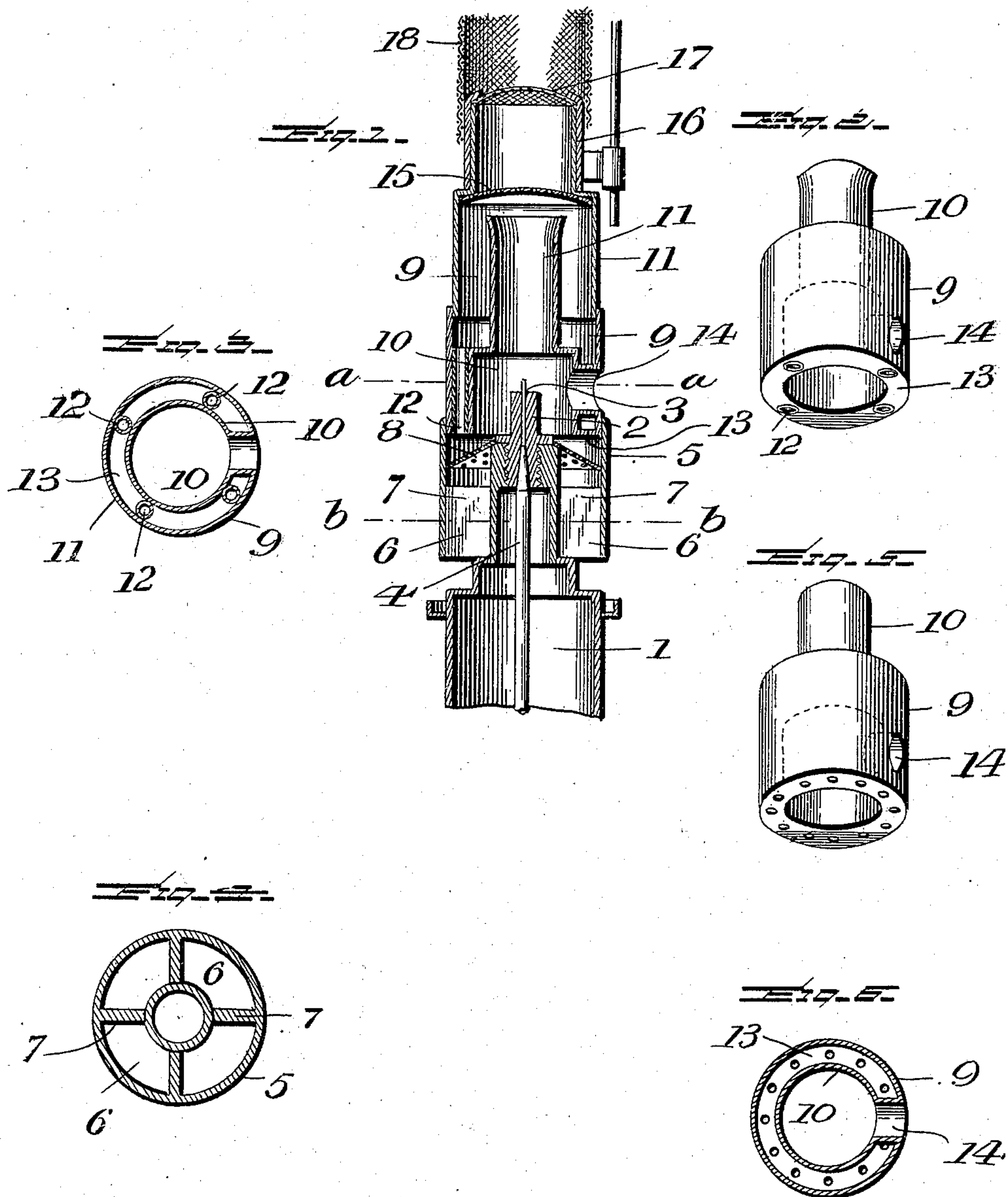
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A. HAYES.

METHOD OF VAPORIZING HYDROCARBON OILS.

(Application filed Nov. 5, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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METHOD OF VAPORIZING HYDROCARBON OILS.

SPECIFICATION forming part of Letters Patent No. 669,988, dated March 19, 1901.

Original application filed October 27, 1900, Serial No. 34,531. Divided and this application filed November 5, 1900. Serial No. 35,566. (No specimens.)

To all whom it may concern:

Be it known that I, ALBERT HAYES, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake, State of Utah, have invented certain new and useful Improvements in Methods of Vaporizing Hydrocarbon Oils, of which the following is a description, reference being had to the accompanying drawings and to the figures of reference marked thereon.

This application is a division of an application filed by me on the 27th day of October, 1900, Serial No. 34,531.

My invention relates to improvements in vaporizing and burning hydrocarbon oils, particularly the heavier or less volatile oils, such as kerosene, for the production of heat for lighting or other purposes. Devices for this general purpose comprise generally an oil-supply, means for vaporizing the oil, means for mixing the vapor with air to form a combustible mixture having the general qualities of a gas, and a burner in which this gaseous mixture is burned. Where such devices are used for lighting purposes, a mantle of refractory material of the type generally known as "Welsbach" mantle is placed above the burner and is heated by it to incandescence. When such devices are used for heating purposes generally, the object to be heated is placed above the burner. In devices of this class the oil is vaporized in a closed tube, to the exterior of which the heat necessary to cause vaporization is applied and the vapor formed passes into the mixing-chamber without at any time coming in contact with the flame. The outlet for the vapor is necessarily made of very small diameter, and by reason of the changes in temperature to which it is subjected much difficulty is found in preventing the clogging of this outlet by the deposit of the tarry matters carried by the oil.

My improvement is designed to do away with this liability of clogging the vaporizer by doing away with the vaporizer and effecting the vaporization of the oil by the direct action of a flame upon the oil fed from the oil-supply; and my invention consists in the method of effecting the vaporization of the oil by forcing it in a fine stream or spray

through and in direct contact with an open flame, as hereinafter described, and particularly pointed out in the claims.

In the drawings which accompany and form part of this application I have shown one form of an apparatus by which my method may be carried out.

In the drawings, Figure 1 is a vertical sectional view of the apparatus. Fig. 2 is a perspective view of the double chamber. Figs. 3 and 4 are horizontal sectional views on lines *a a* and *b b* of Fig. 1. Fig. 5 is a perspective view of a modified form of the double chamber, in which the downtake-tubes are omitted; and Fig. 6 is a horizontal sectional view of the modified form corresponding to Fig. 3.

In the construction shown in the drawings, 1 is a chamber for containing a quantity of oil under pressure having at its upper end a nozzle 2, provided with an outlet 3, controlled by a needle-valve 4.

Any desired means for operating the valve to control the discharge of oil may be employed, and the supply of oil in the chamber may be maintained by any convenient means. The pressure on the oil in the chamber is preferably from forty to eighty pounds to the square inch; but the degree of pressure is not important so long as it is sufficient to cause the oil to be discharged from the outlet with considerable force.

Surrounding the upper end of the oil-chamber and extending nearly to the level of the nozzle 2 is a tube 5. Between this tube and the oil-chamber are formed air-passages 6. These passages in the construction shown are formed by arms 7 of the form shown in cross-section in Fig. 4, which extend inward from the tube 5 to the oil-chamber and extend longitudinally along the oil-chamber from the bottom of the tube to a point slightly below the top of the oil-chamber. Above these arms 7 is placed a ring 8 of perforated metal. The passages 6 may of course be formed other than by the arms 7 shown. It is essential only that they be so proportioned that the supply of air entering through them is somewhat restricted. The length of the passages is preferably such that the air will enter through them with some force. The perfo-

rated ring 8 serves to distribute the air entering through the passages equally on all sides of the center and acts also to further restrict the supply. The tube 5 prevents entrance of
5 air from the side, so that the only supply of air to the vaporizing-flame, hereinafter described, is the upward current through the passages 6.

Above the oil-chamber is arranged a double
10 chamber 9, comprising an inner or mixing tube 10 and an outer tube 11, the two tubes being spaced apart, as shown, so that a down-take-passage 12 is formed between them. The outer tube 11 is preferably of slightly smaller
15 diameter than the tube 5, so as to fit within its upper end. These tubes 4 and 5 may, however, be united by any convenient joint. The inner or mixing tube 10 is supported at its base from the outer tube by means of a ring
20 13 and has its upper end free. The upper end of the tube may, if preferred, be slightly flared, as shown in Figs. 1 and 2. The ring 13 is provided with perforations communicating with the passage between the two tubes.
25 If desired, the entire space between the mixing-tube and outer tube may form the down-take-passage, in which case the ring B should be provided with numerous small perforations, as shown in Figs. 5 and 6; but I prefer
30 to form such passage by a series of vertical tubes (shown in Fig. 3 as four in number) placed within the space between the two tubes, in which case the ring 13 will have only the perforations necessary to receive the
35 lower end of these vertical tubes. The inner or mixing tube is preferably made, as shown in Figs. 1 and 2, of large diameter at its base and for a portion of its length, its upper portion being of reduced diameter. At
40 a point a short distance above the base of the mixing-tube an air-inlet tube 14 passes through both tubes, so as to admit air to the interior of the mixing-tube. Two or more of these air-inlet tubes may be used, if desired.

45 Above the upper end of the mixing-tube I provide means for causing a portion of the gas formed therein to enter the down-take-passage 12, pass through the perforations in the ring 13, and enter the space below the
50 lower entrance of the mixing-tube. The means shown for this purpose consists of a diaphragm 15 of perforated metal; but any means which will obstruct the free escape of the gas may be used in place of the diaphragm.
55 Above the diaphragm 15 may be placed a burner 16, having a perforated top plate 17. If the device is to be used for lighting purposes, a mantle 18 is supported above the burner, as shown.

60 If the device is to be used for heating purposes generally, the article to be heated may be arranged in any convenient manner above the burner.

65 Any means for effecting the initial vaporization of the oil, which is permitted to escape under pressure from the nozzle 2, may be employed, as well as the particular means shown

and described in the application above referred to, of which this application is a division. The vaporization once started air en-
70 tering through the air-inlet 14 mingles with the vapor in the mixing-tube and passes upward above its end. A portion of the gas thus formed is deflected downward, by the means
75 above described, into the down-take-passage and passing through the perforated ring 13 is ignited in the space surrounding the nozzle 2. As the only upward exit-space is through the mixing-chamber, the flame will be drawn in-
80 ward and upward into this exit. Access of air, except through the inlet-passages 6, directly below the flame, is cut off by the tube 5, and the air entering through these passages will tend to spread the flame into a substantially conical
85 form about the outlet of the oil-chamber, the apex of the cone being within the mixing-tube directly above and in line with the outlet of the oil-chamber. The heat of this flame will vaporize the oil discharged through this out-
90 let and the air entering through the air-inlet 14, as above described, will be mixed with this vapor to form a gas, the main portion of which will pass upward through the diaphragm to the burner. The vaporization be-
95 ing once begun will be continued so long as oil is supplied from the chamber.

By causing the flame to assume a substantially conical form I secure a high degree of heat at practically a single point, the apex of
100 the cone, which is directly above and in the path of the oil discharged from the nozzle 2. The heat at this point is sufficient to cause complete vaporization of kerosene or other of the heavier hydrocarbon oils without highly
105 heating the oil-chamber or the exterior walls of the chamber in which the vaporization is effected. If any of the oil-vapor thus formed fails to be completely mixed with the air which enters above the flame, it will, being
110 heavier than the completely-mixed air and vapor, be carried into the down-take-passage to the flame, where it will be burned with the air entering through the inlet-passages.

While in the construction shown the gas formed passes directly to a burner, it should
115 be understood that, if desired, the gas may be conveyed to an explosive-engine or may be used for any purpose for which it may be adapted. It should also be understood that my invention is not limited to the use of the
120 particular construction shown, but comprehends, broadly, the method of vaporization hereinafter claimed, irrespective of any specific apparatus.

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

1. The method of vaporizing and burning hydrocarbon oils, which consists in forcing
130 the oil in a fine stream or spray through a flame, mixing air with the vapor formed by the action of the flame upon the oil to form a gas, and conducting the gas to a burner.

2. The method of vaporizing hydrocarbon

oils, which consists in forcing the oil in a fine stream or spray through a flame, mixing air with the vapor formed by the action of the flame upon the oil to form a gas, and maintaining the vaporizing-flame by gas thus formed.

3. The method of vaporizing hydrocarbon oils, which consists in forcing the oil in a fine stream or spray through a flame maintained within a tube or chamber and inwardly directed toward the path of the stream or spray of oil.

4. The method of vaporizing hydrocarbon oils, which consists in forcing the oil in a fine stream or spray through a flame maintained within a tube or chamber and inwardly directed toward the path of the stream or spray of oil and admitting air above the flame to mix with the vapor formed by the action of the flame upon the stream or spray of oil.

5. The method of vaporizing hydrocarbon oils, which consists in forcing the oil in a fine stream or spray into the open end of a tube or chamber, maintaining a flame about the open end of the tube or chamber, creating a current of air in the direction of the stream or spray of oil to force the flame into the chamber to vaporize the oil by direct contact therewith.

6. The method of vaporizing hydrocarbon oils, which consists in forcing the oil in a fine stream or spray into the open end of a tube or chamber, maintaining a flame within the open end of the tube or chamber to vaporize the oil by direct contact with the flame, mixing air with the vapor to form a gas and supplying gas thus formed to the vaporizing-flame.

7. The method of vaporizing hydrocarbon oils, which consists in forcing the oil in a fine stream or spray into the open end of a tube or chamber, maintaining a flame at the open end of the tube or chamber, creating a current of air in the direction of the stream or spray of oil to force the flame into the chamber to vaporize the oil by direct contact therewith, supplying air above the flame to mix with the vapor to form a gas, and supplying gas thus formed to the vaporizing-flame.

8. The method of vaporizing hydrocarbon oils which consists in causing a flame to assume a substantially conical form, forcing oil in a fine stream or spray through the apex of the cone of flame, and admitting air above the flame to mix with the vapor.

9. The method of vaporizing hydrocarbon oils which consists in causing a flame to assume a substantially conical form by drafts of air directed against it from below, forcing oil in a fine stream or spray through the cone of flame from beneath, and admitting air above the flame to mix with the vapor.

10. The method of vaporizing hydrocarbon oils which consists in forcing the oil upward in a fine stream or spray through a flame to which air is supplied from below only, admitting air above the flame to mix with the vapor and maintaining the flame by means of the gas thus formed.

In testimony whereof I affix my signature in presence of two witnesses.

ALBERT HAYES.

Witnesses:

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