

E. B. BENHAM.

METHOD OF AND APPARATUS FOR CONVERTING LIQUID HYDROCARBONS INTO GAS OR VAPOR.

APPLICATION FILED JULY 13, 1908. RENEWED FEB. 24, 1912.

1,040,124.

Patented Oct. 1, 1912.

3 SHEETS-SHEET 1.

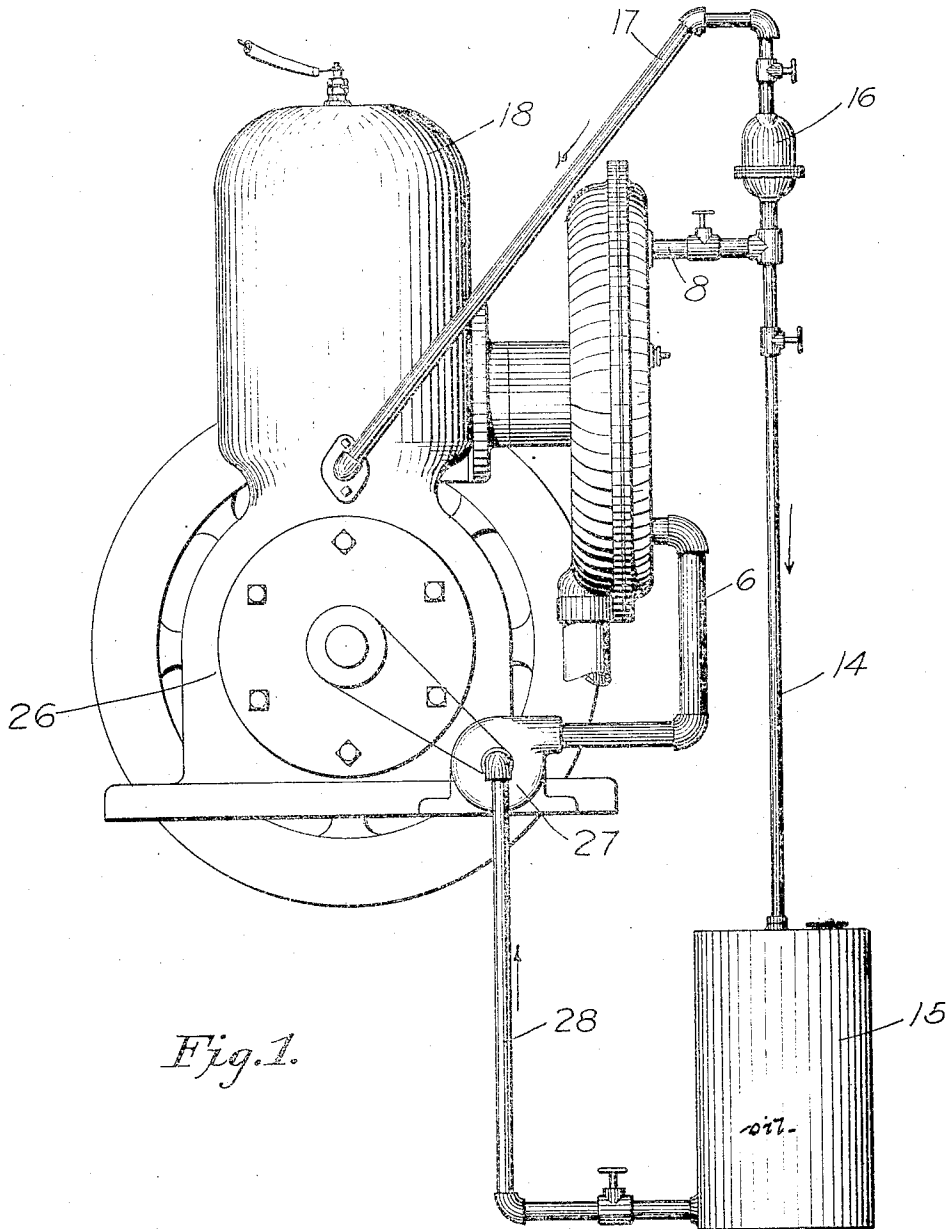


Fig. 1.

WITNESSES

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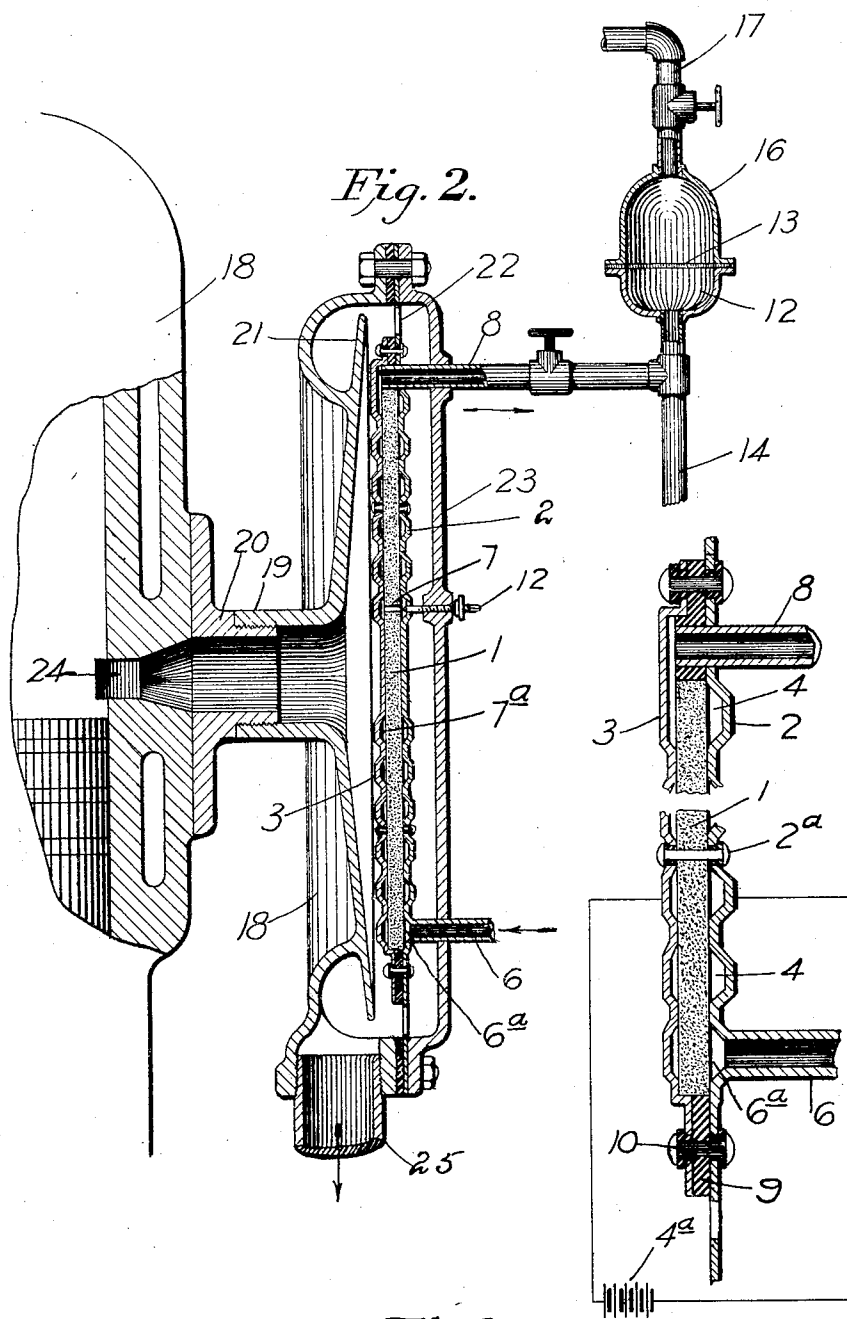
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3 SHEETS—SHEET 3.

Fig. 4.

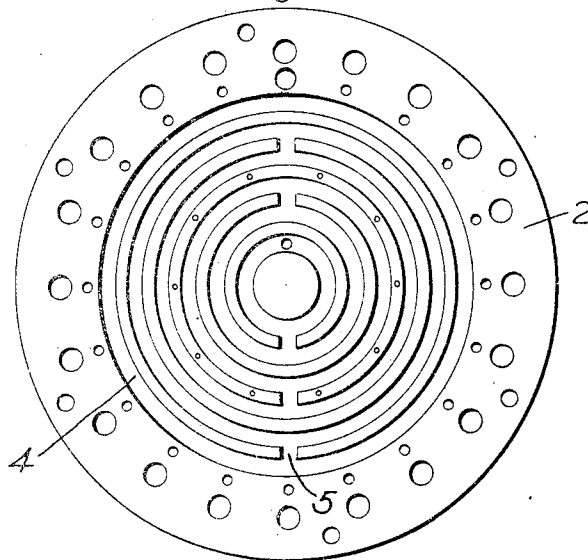


Fig. 5.

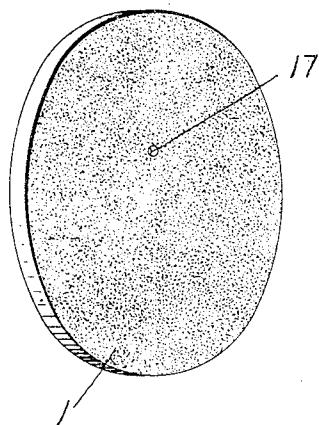
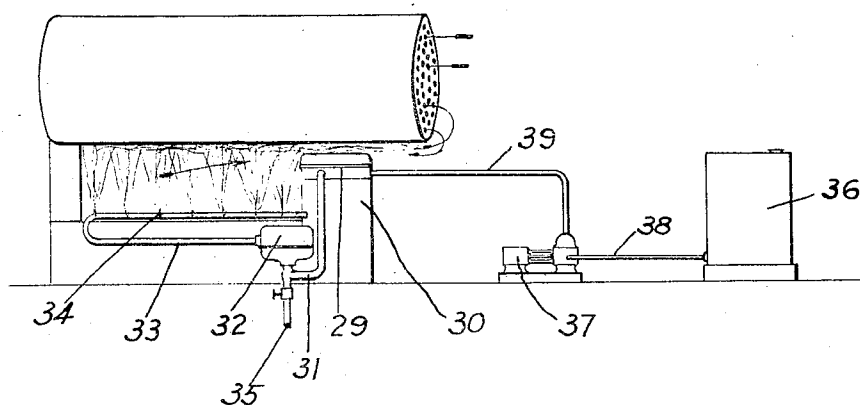


Fig. 6.



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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR CONVERTING LIQUID HYDROCARBONS INTO GAS OR VAPOR.

1,040,124.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed July 13, 1908, Serial No. 443,368. Renewed February 24, 1912. Serial No. 679,767.

To all whom it may concern:

Be it known that I, ELIJAH B. BENHAM, a citizen of the United States, residing at New London, in the county of New London and State of Connecticut, have invented a certain new and useful Method of and Apparatus for Converting Liquid Hydrocarbons into Gas or Vapor, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to a process of, and apparatus for, converting liquid hydrocarbons into gas or vapor, and comprises passing such hydrocarbons along the surface of a heated body of porous material, such as herein specified, and simultaneously causing the passage of an electric current through the hydrocarbon undergoing decomposition, also corresponding apparatus.

In U. S. Letters Patent No. 920,903, issued on May 11, 1909, I have set forth an improved method of and apparatus for converting liquid hydrocarbons into gas or vapor, the method comprising the passage of such hydrocarbon compounds through the pores of porous material, such as unglazed porcelain, pottery, etc., heated to above 300 degrees F.; the apparatus comprising a septum of such material, arranged to be heated by circulating around it hot gases, such as the exhaust gases of a gas engine, such septum inclosed between grooved plates the grooves of which form channels for the supply to the surface of the plate of the liquid to be vaporized or gasified, and for carrying away the vapor or gas produced. I have discovered that in this process an electric current may be generated, provided the said plates are connected in an electric circuit; that the decomposition of the hydrocarbons is facilitated by permitting the generation of such electric current; and that such decomposition is further facilitated by increasing such flow of current by including a suitable electric generator in the circuit. The present invention, therefore, includes the process of my said patent plus the passage of an electric current through the material undergoing decomposition, and the combinations of apparatus whereby such current is caused to pass.

The object of the invention is to facilitate the formation of vapor or gas from liquid hydrocarbons, such as crude oil, gasoline,

benzin, etc.; also, from other liquid compounds containing carbon and hydrogen in combination, such for example as alcohol; to which compounds I shall, for the purpose of this case, apply the term "hydrocarbon compounds", as well as to such hydrocarbon compounds as are contained in hydrocarbon oils and the like; and a further object of my invention is to provide improved and simple apparatus for carrying out the process.

In the accompanying drawings I illustrate certain of the many forms of apparatus which may be devised to operate according to my invention.

In said drawings: Figure 1 is an elevation, more or less diagrammatic, in its nature, of a gas engine and of one form of my improved oil-gasifying apparatus applied thereto; Fig. 2 shows a central vertical section of such oil-gasifying apparatus and of a portion of the cylinder of a gas engine adjacent thereto; Fig. 3 shows, on a somewhat larger scale, a detail section of the porous plate or septum and containing plates of the apparatus shown in Figs. 1 and 2; Fig. 4 shows a detail elevation of one of said containing plates, and shows that face of such plate which, in use, is against the face of the porous plate or septum; Fig. 5 shows a detail perspective view of the porous plate or septum; and Fig. 6 is a diagrammatic view illustrating the application of the apparatus to a furnace, such, for example, as a boiler furnace.

The apparatus shown in the said drawings is substantially identical with that shown in my said patent, except for the addition of electric circuit conductors and an electric generator, as hereinafter described.

In said drawings, 1 designates a porous disk, plate or septum, which may be constructed of any suitable material, but in my opinion is preferably constructed of unglazed porcelain or earthenware, and 2 and 3 designate respectively containing plates secured together and between which said plate 1 is located. These plates are commonly made of metal, such as sheet brass, copper, or other electric conducting material. As shown particularly in Fig. 3, plates 2 and 3 are insulated from one another by the septum 1, which is of an insulating material, but are electrically connected by circuit conductors which may include an

electric generator 4^a; any current passing through this circuit of necessity passing through the liquid, vapor or gas in transit from one side of the septum 1 to the other.

5 As shown particularly in Fig. 4, the faces of these plates 2 and 3 adjacent plate 1 are provided with a plurality of grooves 4, connected by passages 5; and plate 2 is provided with an inlet connection 6, communicating with one of the grooves of plate 2, as for example, the outer groove 6^a, an outlet connection 8 being also provided which communicates with one of the grooves of the plate 3, for example, the outer groove of such plate.

10 The structure 1—2—3— is inclosed within a chamber 23 provided with means for circulating heating gases around such structure 1—2—3, for the purpose of heating the same. In the particular construction shown, these heating gases are the exhaust gases of a gas engine 18, chamber 23 being provided with a central connection 19 adapted for connection to the exhaust pipe 20 of said gas engine, the exhaust gases passing directly from the exhaust port 24 of the engine into the heating chamber 23 and around the structure 1—2—3, so heating the same. I do not limit myself, however, to the heating of the porous material by the exhaust gases of an internal combustion engine, but may heat such material by other means, one instance of which is illustrated in Fig. 6.

15 The structure 1—2—3, is supported within chamber 23 by means of a flange with which plate 2 is provided, which flange is interposed between the two sections of chamber 23 where said sections meet and are bolted together; and in this flange are openings 22, permitting free circulation of gases to the rear side of the structure 1—2—3. The exhaust gases are led from chamber 23 by a pipe 25; and to conduct these gases to such pipe said chamber is provided with an annular passage guarded by a deflecting flange 21 extending nearly to the outside of the chamber, so that the gases may not pass too directly to the pipe 25, but may instead be caused to pass around the structure 1—2—3.

20 In carrying out my process, by apparatus such as shown in Fig. 2, hydrocarbon, usually in liquid form, is delivered under pressure (such as may be produced, for example, by the pump 27 shown in Fig. 1) through pipe 6 to the grooves of plate 2, and these grooves distribute the hydrocarbon over the surface of the plate 1, the hydrocarbon passing through the pores of said plate and being collected on the other side of such plate in the grooves of plate 3, and in its passage through the pores of plate or septum 1 being converted into a gas or vapor, which gas or vapor is carried off by pipe 8.

25 As previously explained, the connection of plates 2 and 3 in an electric circuit fa-

cilitates the decomposition of the hydrogen-carbon compounds contained in materials such as herein specified as to be used in making gas, the decomposition being further facilitated by supplying to the circuit in which said plates 2 and 3 are, more or less additional current, such as may be supplied by a battery or other generator 4^a.

30 In some cases it is thought desirable to provide means for feeding a greater amount of liquid through the apparatus than can be passed through the pores of plate 1, and in such case a small opening 7 is provided in said porous plate, so permitting a portion of the oil to pass in liquid or vapor form from the grooves of plate 2 to the grooves of plate 3 without passing through the pores of plate 1. This is permissible, and not inconsistent with the production of a gas or vapor well adapted for use in internal combustion engines, burners, etc., because the heat of plate 3 is such, ordinarily, that the oil so passing, if not already volatilized, will be volatilized before it reaches pipe 8.

35 In the arrangement shown in Fig. 1 I have illustrated an oil tank 15 from which the oil is drawn, through a pipe 28, by means of a pump 27, and thence delivered under pressure to the pipe 6; and I have shown a trap 16 into which the gas or vapor is delivered from pipe 8, said trap being usually provided with a screen, sieve, or other suitable filtering device, 13 (Fig. 2), to hold back any liquid which may be carried by or condensed from the gas or vapor, such liquid being returned by the pipe 14 to tank 15; the gas or vapor passing from trap 16 through pipe 17 to the inlet port of the engine 18.

40 The apparatus used for carrying out my invention may, of course, be arranged to be heated in various different ways. The gas or vapor produced may also be used for many other purposes than that of operating a gas engine. In the construction shown in Fig. 6 I have shown a gas making device 29 (which may be supposed to be substantially identical with the structure 1—2—3 shown in Fig. 2), mounted upon the bridge wall 30 of a boiler furnace, in such manner that the flame and products of combustion of such furnace in passing over the bridge wall will heat the said gas making apparatus; and I have shown oil supplied to this gas making apparatus from a tank 36 by means of pipes 38 and 39 and pump 37, and have indicated a pipe 31 for drawing off the gas and passing it to a trap 32 corresponding substantially to the trap 16 shown in Fig. 2, the gas being led from said trap through a pipe 33 to burners 34; the drip, if any, passing out through the drip pipe 35.

What I claim is:—

1. The hereindescribed method of con-

verting hydrocarbon into gas or vapor, which comprises passing such hydrocarbons along or through the pores of heated porous material and permitting the passage of an electric current through such hydrocarbons during such passage.

2. The hereindescribed method of converting hydrocarbons into gas or vapor, which comprises passing such hydrocarbons along or through the pores of heated porous material, and simultaneously passing through such hydrocarbons an electric current in excess of that due to the flow and decomposition of the hydrocarbons.

3. Apparatus for converting hydrocarbons into gas or vapor, comprising a porous body, means for heating same, means for passing hydrocarbon along or through the pores of such body, and means for passing an electric current through the hydrocarbon.

4. Apparatus for converting hydrocarbons into gas or vapor, comprising a porous

body, means for heating same, means for passing hydrocarbon along or through the pores of such body, and means for passing an electric current through the hydrocarbon, comprising an electric generator.

5. Apparatus for converting hydrocarbons into gas or vapor, comprising a porous body, means for heating same, and means for passing hydrocarbon along or through the pores of such body, and for passing an electric current through the hydrocarbon, comprising conducting plates on opposite sides of the porous body and electrically insulated thereby from each other but included in an electric circuit.

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

ELIJAH B. BENHAM.

Witnesses:

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W. HAMPTON DE FONTAINE.