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APPARATUS FOR VAPORIZING HYDROCARBONS.

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1,309,514. Patented July 8, 1919.

Fig. 1

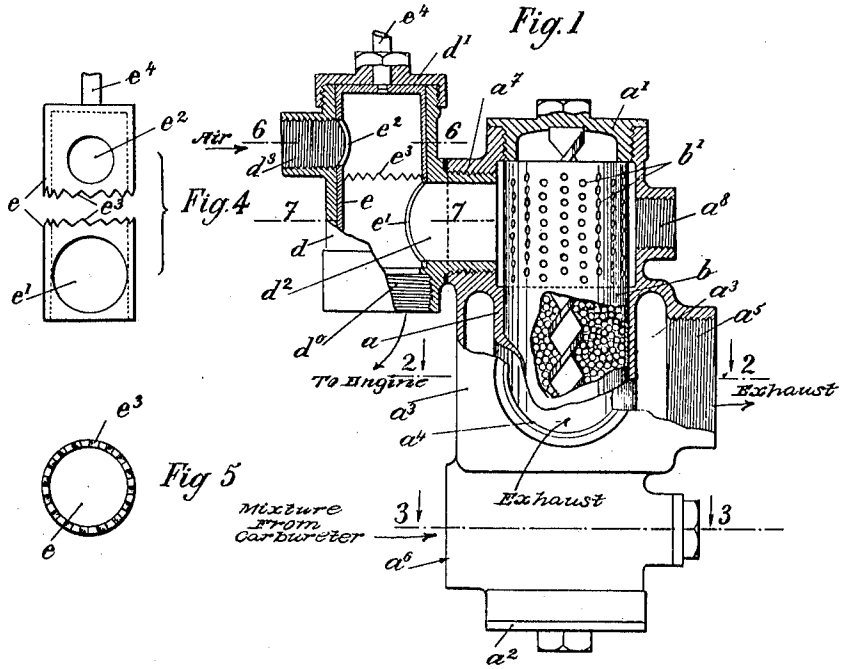


Fig. 4

Fig 5

Fig. 6

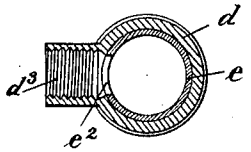


Fig. 2

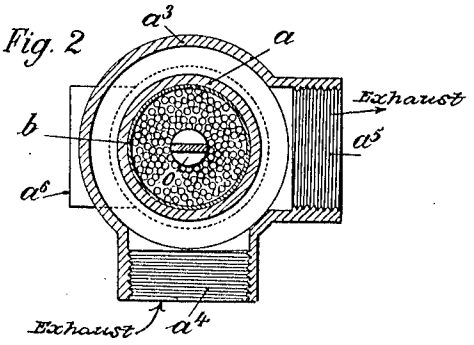


Fig. 7

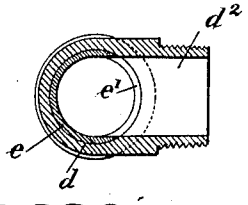
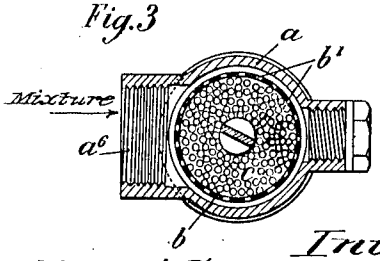


Fig. 3



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APPARATUS FOR VAPORIZING HYDROCARBONS.

1,309,514. Specification of Letters Patent. Patented July 8, 1919.

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To all whom it may concern:

Be it known that I, HENRI CHARLES EMPIS, a citizen of the Republic of France, residing at 150 Rue de la Pompe, Paris, France, have invented Improvements in Apparatus for Vaporizing Hydrocarbons, of which the following is a specification.

The high tension of spirit vapors enables an explosive mixture to be obtained without reheating and at ordinary atmospheric pressure, the said mixture being formed of such vapors and air, but this is not the case with petroleum such as used for lamps the vapor tension of which, at a temperature of 15° C., is almost zero. If it be desired to obtain the emission of the necessary vapors in a sufficient quantity from such petroleum it, therefore, becomes necessary to assist the evaporation of this hydrocarbon either by reducing the atmospheric pressure or else by raising the temperature of the liquid, or mixture, by means of external heating, or by means of compression.

Reheating by compression necessitates the use of special motors of the Diesel type for example and, as regards the injection of the petroleum into a rarefied atmosphere, it necessitates the use of special arrangements which, even if able under certain conditions to give fairly good results in feeding non-cylindrical motors, have so far not been found adaptable to the working of multi-cylindrical motors.

Now the object of the present invention is to provide a vaporizing apparatus of compact and simple construction whereby there is obtained the sufficient reheating of a preëxistent mixture of air and petroleum so as to form an explosive mixture that can be used directly in an explosion motor, the heating being effected at a relatively low temperature so as to avoid decompositions prejudicial to the good working of the motor, and also to avoid violent explosions and incrustations with dirt due to the depositing of solid carbon and residual products.

In the improved vaporizer the heating surface is formed simultaneously by the walls of a cylinder containing balls, grains or fragments of very small diameter, and by the surface of these balls which, being kept continually in motion by the suction of the motor itself, are heated not only by contact with the said walls but also by the transmission of heat through the mass.

The accompanying drawings show a vaporizer embodying the invention, merely by way of example but by no means in a restrictive sense as to details.

Figure 1 shows the apparatus partly in elevation with portions removed and partly in central vertical section.

Figs. 2 and 3 are horizontal sections corresponding to the lines 2—2 and 3—3 of Fig. 1 respectively.

Fig. 4 is a detail elevation of the two-part inner tube of a control throttle with which the apparatus may be fitted, the two parts of the tube being shown separated.

Fig. 5 is a plan of the part tube shown in the lower portion of Fig. 4;

Figs. 6 and 7 are sections corresponding to the lines 6—6 and 7—7 respectively of Fig. 1.

The vaporizer illustrated comprises a cylindrical chamber a closed at its ends by covers or plugs a^1, a^2 and surrounded over the whole or a part of its height with a cylindrical envelop or casing a^3 adapted to be connected at a^4 to the exhaust piping for the discharge of the burnt gases coming from the motor and at another part a^5 to the exhaust port.

The chamber a communicates on the one hand, at a^6, with the device, or carbureter mixing valve, (not shown) for feeding the air and hydrocarbon mixture and, on the other hand, at a^7, with the suction piping of the motor. In this chamber, which forms the vaporizer proper, there are placed balls, grains or fragments of very small diameter (as illustrated in Figs. 1, 2 and 3) said balls, grains or fragments being kept continually in motion by the suction action of the motor itself. These balls or the like may be retained within the chamber by interposing metal gauze or perforated plates between them and the feed ports a^6, a^7. It is however preferable, as shown in drawing, to arrange within the chamber, conveniently by giving its ends a diameter superior to the diameter of its central portion, a tube b equal in length to that of the chamber and perforated at its two ends as shown at b^1 in Figs. 1 and 3. A helical baffle c may be arranged in the center of the mass of balls or the like so as to insure their rapid and regular displacement from the center of the chamber toward the walls thereof.

The interposition of these heated balls, which are constantly in motion from the

warm periphery of the chamber a toward the center of the latter, also results in prolonging the duration of the contact with the hydrocarbon and furthermore these insure a regular distribution of the calories arising from the current of heat and thus prevent the accumulation of too high a caloric reserve in the walls of the chamber a. On the other hand, owing to the combined movement of the balls there can be no obstruction in the chamber to the passage of the hydrocarbon therethrough. Finally, seeing that the column of balls is raised at each suction, the individual balls tend to move apart, any variation in this suction causing a reduction or increase of the existing space. The consequent result is that the resistance offered by the interposition of the balls in question varies together with the acceleration, the least resistance corresponding to the greatest acceleration. The relationship between the proportions of petroleum and air constituting the mixture thus remains substantially constant whatever be the speed of the motor. On the other hand the temperature of the mixture admitted to the cylinder, which temperature tends to increase or diminish according to the duration of the contact of the mixture with the warm balls, varies in inverse proportion to the speed of the motor, the shortest contact being produced at the moment of the greatest acceleration that is to say precisely at the moment when the reheating of the apparatus by the waste gases is not intense.

A cock, not shown, fitted to the lower portion of the chamber a, enables this chamber to be drained off, when desired.

The upper portion of the chamber a may be formed with an aperture a^8 to permit of separate feeding, or distinct feeding, either of air or of air and spirit.

In the case of motors controlled by allowing full supply or by cutting off the supply entirely it will be well, in order to avoid the cooling of the apparatus which would result from the passage therethrough of the non-carbureted air reëntering through the escape piping during a portion of the cycle, to arrange in this pipe a non-return valve between the motor and the apparatus.

In the cases of motors regulated by throttling the admission, the orifice a^7 may be fitted with a so-called butterfly valve or throttle device which may be constructed as shown in Fig. 1 and in Figs. 4 to 7. In this arrangement the throttle device comprises an external cylindrical casing d which is open at one end d^0 and closed at the other end by a cap d^1. The casing is formed with an aperture d^2 whereby it is placed in communication, through the aperture a^7, with the chamber a, and is connected to the suction of the motor at the open end d^0. Within the casing there rotates, with slight friction a concentric tube e formed with an orifice e^1 corresponding to the orifice d^2 of the casing. The effect of the rotation of the tube e is therefore to cause a variation of the sectional area of the suction orifice of the vaporizer.

As shown in Fig. 1 the casing may be formed with another aperture d^3 connected to an additional air and fuel feed. In this case the tube e is preferably divided into two parts Figs. 1 and 4, one of which is formed with the aperture e^1 hereinbefore referred to and the other of which is formed with an aperture e^2 corresponding to the aperture d^3 of the casing. These two parts engage one with the other either by means of teeth e^3, as shown in the drawing, or by means of inclined or square teeth and they are adjusted by a common operating member which acts upon a stem e^4 passing through the cap d^1. By turning the two parts of the tube e in relation to each other after having released them the angular position of the orifices e^1, e^2 may be varied in relation to each other and, consequently, the relation of the throttling of the mixture coming from the vaporizer and of the additional air and fuel mixture may be varied.

As will be understood the invention is not strictly limited to the arrangements hereinbefore described and shown with reference to the accompanying drawings as, without departing from the invention, modifications may be made in the constructional details according to circumstances and practical requirements.

What I claim is:—

1. In an apparatus for vaporizing hydrocarbons for internal combustion explosion motors, a chamber having a perforated tube therein provided with means for utilizing hot exhaust gases from the motor for heating the same, an inlet branch through which a mixture of air and hydrocarbon is fed to said chamber and tube, an outlet branch for connecting the chamber and tube to the suction pipe of the motor, and a mass of small bodies of heat conducting material located within said perforated tube and adapted to be kept in motion by the suction of the motor as the hydrocarbon passes through the chamber and tube from the said inlet branch to the said outlet branch.

2. In an apparatus for vaporizing hydrocarbons for internal combustion explosion motors, a chamber having means for heating the same by hot exhaust gases from the motor, an inlet branch through which a mixture of air and hydrocarbon is fed to the chamber, an outlet branch connecting the chamber to the suction pipe of the motor, a tube arranged within the chamber and formed with perforations at the upper and lower ends thereof and intermediately imperforate, and a column of spherical bodies of heat conduct-

ing material within the tube and kept in motion by the suction of the motor as the hydrocarbon passes through the chamber from the inlet branch, with which one end of said tube is in communication, to the said outlet branch, with which the other end of the tube communicates.

3. In an apparatus for vaporizing hydrocarbons for internal combustion explosion motors, a chamber provided with means for externally heating the same by exhaust gases from the motor, an inlet branch through which a mixture of air and hydrocarbon is fed to the chamber, an outlet branch connected to the chamber and the suction pipe of the motor, a tube arranged within said chamber and formed with perforations solely at the ends thereof and intermediately imperforate, one end of the tube being in communication with the said inlet branch and the opposite end of the tube in communication with said outlet branch, a column of spherical bodies of heat conducting material located within the tube and kept in motion by the suction of the motor as the hydrocarbon passes through the chamber from the inlet to the outlet branch, and a centrally arranged baffle within the tube to constantly deflect the spherical bodies toward the wall of the tube.

4. In an apparatus for vaporizing hydrocarbon for internal combustion explosion motors, a chamber provided with external means for heating the same by hot gases from the motor, an inlet branch through which a mixture of air and hydrocarbon is fed to the chamber, an outlet branch connected to the chamber and to the suction pipe of the motor, a mass of small bodies of heat conducting material located within the chamber and kept in motion by the suction of the motor as the hydrocarbon passes through the chamber from the said inlet branch to the outlet branch, and means for controlling the exit quantity of the mixture from the chamber through said outlet branch.

5. In an apparatus for vaporizing hydrocarbons for internal combustion explosion motors, a vaporizing chamber having supply and outlet means, the outlet means being adapted to be connected to the suction pipe of a motor, a valve casing fitted to the outlet means of the chamber and having mixture inlet and outlet branches and an auxiliary inlet branch, the outlet branch of the valve casing being adapted to be connected to the inlet port of a motor, and a rotary valve in said casing controlling all of the branches thereof.

6. In an apparatus for vaporizing hydrocarbons for internal combustion explosion motors, a vaporizing chamber having an inlet and an outlet for ingress and egress of fuel relatively thereto, the outlet of the chamber being connectible to a motor, a valve casing fitted to the outlet of the chamber and having mixture inlet and outlet branches, the outlet branch of the valve casing being connectible to the inlet port of a motor, and a rotary valve in said casing controlling the branches thereof and formed in two parts capable of adjustment one in relation to the other, one of said rotary valve parts controlling the inlet of mixture to the valve casing and the other part controlling the inlet of additional air and fuel.

7. In an apparatus for vaporizing hydrocarbon for internal combustion motors, a chamber, a jacket around said chamber adapted to be connected to the hot exhaust gas conduit of a motor, an inlet branch through which a mixture of air and hydrocarbon is fed to said chamber, an outlet branch whereby said chamber is connected to the suction pipe of the motor, a tube within the chamber having perforate ends and intermediately imperforate, and a mass of small bodies of heat conducting material located within said tube and kept in motion by the suction of the motor as the hydrocarbon passes through the chamber from the inlet to the outlet branch, the tube having communication with the inlet and outlet branches at its opposite extremities.

Signed at Paris, France, this 28th day of August, 1917.

HENRI CHARLES EMPIS. [L. S.]

Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."