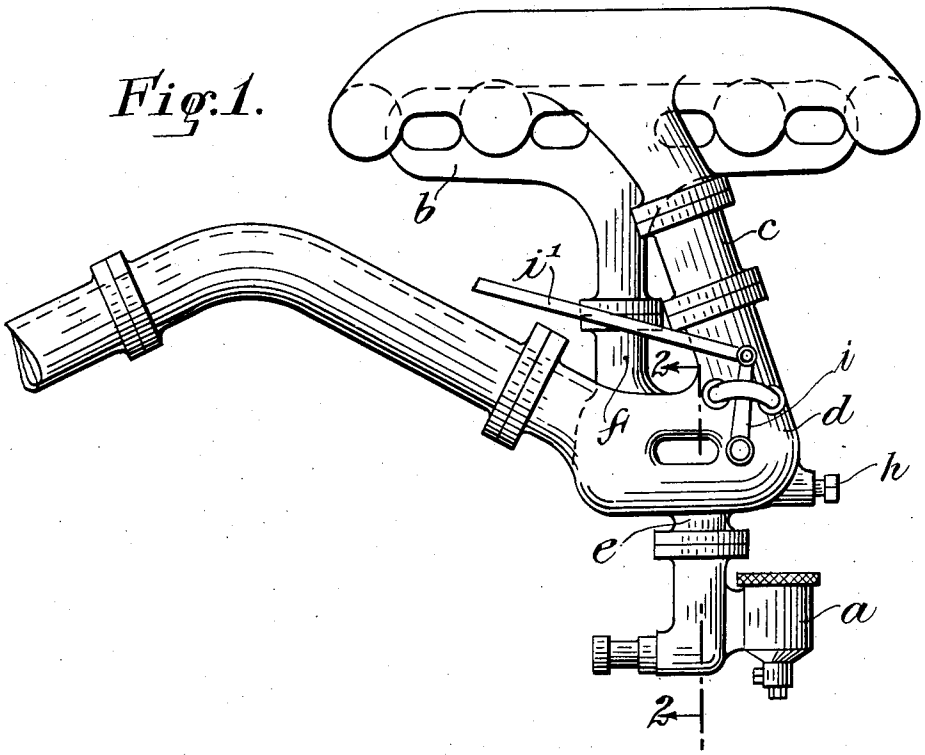
March 1, 1927. 1,619,050

G. WIRRER

APPARATUS FOR VAPORIZING HYDROCARBON MIXTURES

Filed July 27, 1923

Fig. 1.



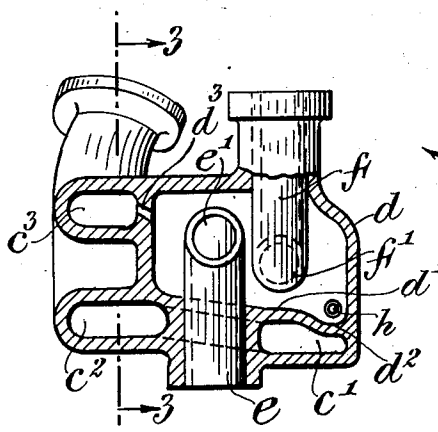


Fig. 2.

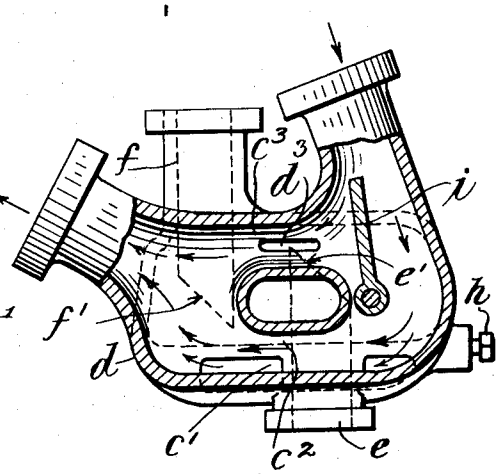


Fig. 3.

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UNITED STATES PATENT OFFICE.

GOTTFRIED WIRRER, OF PLAINFIELD, NEW JERSEY, ASSIGNOR TO INTERNATIONAL MOTOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

APPARATUS FOR VAPORIZING HYDROCARBON MIXTURES.

Application filed July 27, 1923. Serial No. 654,099.

This invention relates to apparatus for the practice of the method of vaporizing fuel described and claimed broadly in the co-pending application filed by the present applicant on April 21, 1922, Serial No. 555,845, in accordance with which it is proposed to separate out from the explosive mixture the heavy ends of liquid fuel, subject such liquid fuel to a vaporizing heat and re-introduce such vaporized fuel back into the mixture for introduction at a predetermined temperature into an internal combustion motor. The apparatus includes an arrangement described in the co-pending application also filed by the present applicant on June 29, 1923, Serial No. 648,470, wherein the inlet riser is broken and the open ends of the broken section are so formed and disposed within the separator chamber as to cause the mixture to take such a course as will best insure the collection of the unevaporated ends without impairing seriously the flow of the mixture. More specifically the upper end of the lower section of the riser within the vaporization chamber is so formed as to direct the mixture against the wall of the chamber where the unevaporated portions of the fuel may collect over a large superficial area and the lower end of the upper section of the riser is so formed as to receive the onflowing mixture only after it has described a very circuitous course which brings it over the inner wall of the chamber to the greatest possible extent. In the latter application the separator chamber communicates with a vaporizing chamber for the heavy fuel ends which is disposed at a point remote from the separator and is subjected to the heat of the exhaust gases whereby the heavy ends are evaporated and returned to the mixture while the mixture itself is not subjected to the direct heat of such exhaust gases. While the prior arrangement is effective in withdrawing the unevaporated portions of the fuel to enable a mixture of a constant temperature and density to be introduced into the inlet manifold, it is sometimes desirable to vary the temperature and density of the mixture according to the working conditions of the motor. The present improvements relate particularly to the construction of a separator which will permit of a control of the withdrawal of the unevaporated portion of the fuel from the mixture during its passage to the inlet manifold whereby at low motor speeds and under light loads all the unevaporated ends of the liquid fuel will be withdrawn while at higher motor speeds and under heavy loads a predetermined proportion of the unevaporated ends will be withdrawn and evaporated without excessive overheating of the air forming a part of the mixture. This purpose is accomplished in the preferred form of the invention by utilizing a separator similar in function and design to that disclosed in application No. 648,470, but the evaporating chamber, instead of being separate and remote from the separating chamber so that the separating chamber is not subjected to the heat of the exhaust gases is coincident therewith and the exhaust gases heat the gaseous mixture as well as the unevaporated fuel collected in the separating chamber. The exhaust gases are conducted in heat interchanging relationship with the walls of the separating chamber by passages arranged in parallel and the flow of the gases through certain of said passages is controlled by a valve or the like whereby the heating of the mixture is controlled.

The improvements will be described with greater particularity hereinafter in connection with the embodiment illustrated in the accompanying drawings, wherein:

Figure 1 is a view in elevation of the inlet riser, combined separator and evaporator chamber and exhaust pipe showing the relation of parts.

Figure 2 is a view in vertical section of the combined separator and evaporator chamber taken in the plane indicated by the line 2—2 in Figure 1 and looking in the direction of the arrows.

Figure 3 is a view in vertical section through the separator taken on the plane indicated by the line 3—3 in Figure 2 and looking in the direction of the arrows.

In accordance with the improved method in said co-pending application Serial No. 555,845 the mixture after being formed in the usual manner is passed to the inlet manifold and devices are provided for separating out the unevaporated heavy liquid fuel ends. The apparatus used for separating the heavy ends from the mixture is similar in principle and design to that disclosed in co-pending application Serial No. 648,470 but instead of withdrawing the

heavy ends to a chamber at a point remote from the mixture for evaporation, the separation and evaporation occur in the same chamber. The present devices are designed to control the amount of liquid fuel particles remaining in the mixture to suit the purposes of motors operating under different speed and load conditions. Metering devices of any suitable form are indicated conventionally at *a*, the inlet manifold at *b*, the exhaust pipe at *c* and the combined separator and vaporizer chamber at *d*. The mixture formed by the metering device *a* rises through the pipe section *e* which terminates within the chamber *d*. Adjacent the riser section *e*, but with its lower end disposed generally below the level of the upper end of said section *e* is a second riser section *f* which communicates with the inlet manifold *b*. The general relationship between the sections *e* and *f*, in the preferred embodiment is shown in Figure 2 where it appears that the upper edge of section *e* is inclined as indicated at *e'* and is so presented to the side wall of the chamber *d* as to direct the mixture towards the side wall and disperse it over a large superficial area. Similarly the lower edge of the other section *f* is inclined as indicated at *f'* and faces in the opposite direction so that the gaseous mixture within the chamber *d* before flowing into the section *f* must circulate throughout the chamber *d*. This relationship of sections *e* and *f* insures the collection of the liquid fuel particles carried in suspension in the mixture along the walls of the chamber *d* and their constant separation out from the gaseous mixture which is free to flow without appreciable loss of pressure up through the section *f* to the inlet manifold *b*. By having the chamber of greater volumetric capacity than the pipe *e* the velocity of the gas passing through the chamber is decreased, thereby insuring the separation out of the maximum quantity of unevaporated fuel ends. The relationship between risers *e* and *f* and the method of separating the liquid fuel particles from the mixture is disclosed in co-pending application Serial No. 648,470. However in the apparatus of the co-pending application, the liquid fuel, separated out from the mixture, is withdrawn and conducted to a vaporizing chamber remote from the point of separation, the entire liquid evaporated and the vapor returned, thereby insuring a dry gas going to the manifold *b*. Under certain conditions of operation however it is desirable, as pointed out hereinbefore, to admit the mixture to the manifold carrying a predetermined amount of fuel particles. To permit this the separation and vaporization are carried out in the same chamber and the temperature of the chamber is controlled. In the preferred embodiment the bottom wall *d'* of the chamber *d* is inclined as indicated in Figure 2 and is formed at the lowermost point with a depression d^2 in which the liquid particles of fuel draining down the inclined bottom will collect. In order to supply heat to chamber *d* the chamber is preferably cast integral with a section of the exhaust pipe *c*. The passage for the exhaust gases through this section is subdivided as at *c'*, c^2 and c^3, Figure 2. The passage *c'* is disposed adjacent the depression d^2 for the purpose of furnishing a constant supply of heat to the liquid fuel contained therein to vaporize it. A supplementary heating device, such as electric coil *h*, may be disposed in the depression d^2 whereby liquid gasoline may be quickly vaporized to provide the motor with an initial rich starting mixture. The temperature of the separating chamber *d* is regulated by the flow of hot exhaust gases through passages c^2 and c^3. The flow of the heating medium through these two passages is controlled by valve *i* operated by lever *i'*. Passage c^3 is in contact over a considerable area with the inner wall of chamber *d* and hot gases passing through this passage will influence to a great extent the temperature of the chamber. Passage c^2 however, is practically not in contact with the inner wall of the chamber and will have comparatively little influence on the temperature therein. This passage may be considered as a by-pass for the heated gases around the chamber. By means of valve *i*, as will be plain upon an inspection of Figure 3, the flow of the exhaust gases through the passages c^2 and c^3 and consequently the temperature of the chamber *d* may be controlled. A passage d^3 is formed between passage c^3 and chamber *d* to permit hot exhaust gas to enter the separator to dilute the mixture to a certain extent whereby a higher compression pressure is obtained and vaporization is facilitated.

The scope of the invention will appear from the appended claims which are intended to cover all equivalent forms of the devices herein shown.

What I claim is:

1. In combination with an inlet manifold and a metering device for hydrocarbon fuel, a collecting chamber having an inclined bottom wall, a passage for exhaust gases formed in said wall adjacent the extreme inclined portion thereof, a second passage formed in and adjacent to a wall of the chamber remote from first mentioned passage, a third passage substantially remote from a wall of said chamber and means to control the flow of exhaust gases in the second and third passage.

2. In combination with an inlet manifold and a metering device for hydrocarbon fuel, a collecting chamber having an in-

clined bottom wall, a passage for exhaust gases formed in said wall adjacent the extreme inclined portion thereof, a second passage formed in and adjacent to a wall of the chamber remote from said first mentioned passage, a third passage cast integral with said chamber but substantially remote from a wall thereof, a valve to control the flow of exhaust gases in the second and third passages and a passage for exhaust gases from the second passage into the chamber.

This specification signed this 24th day of July A. D. 1923.

GOTTFRIED WIRRER.