April 3, 1934. C. H. KENNEWEG 1,953,809

LIQUID FUEL OR CARBURETOR COOLER

Filed March 31, 1932

Fig. 1.

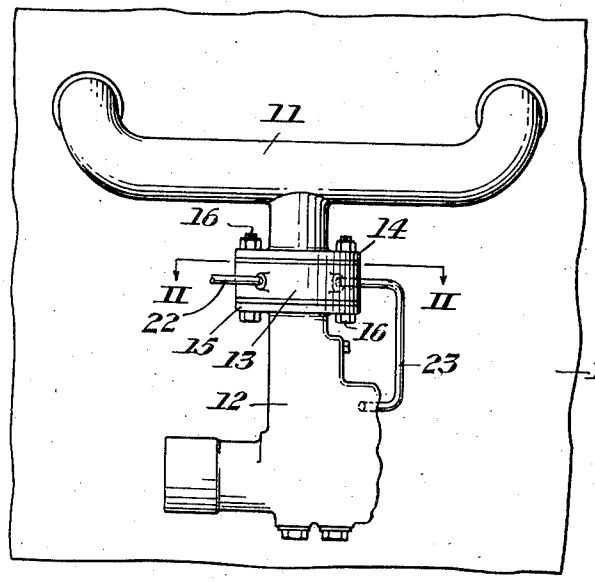


Fig. 2.

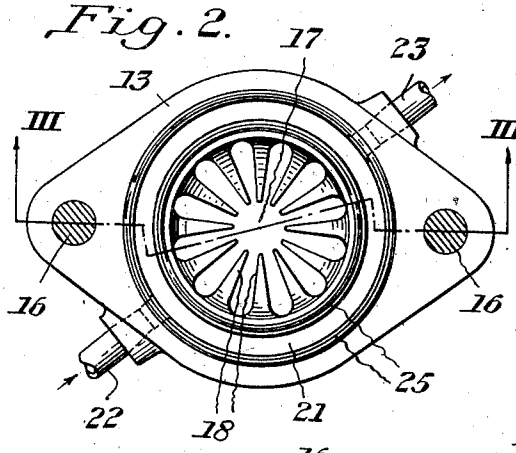


Fig. 4.

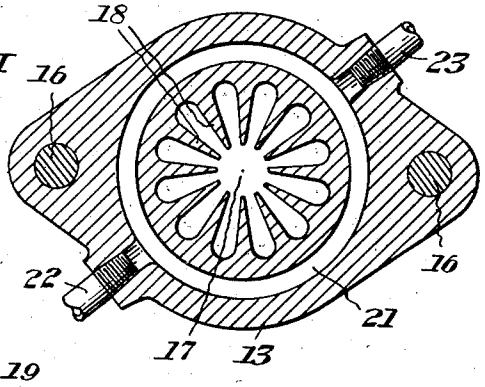
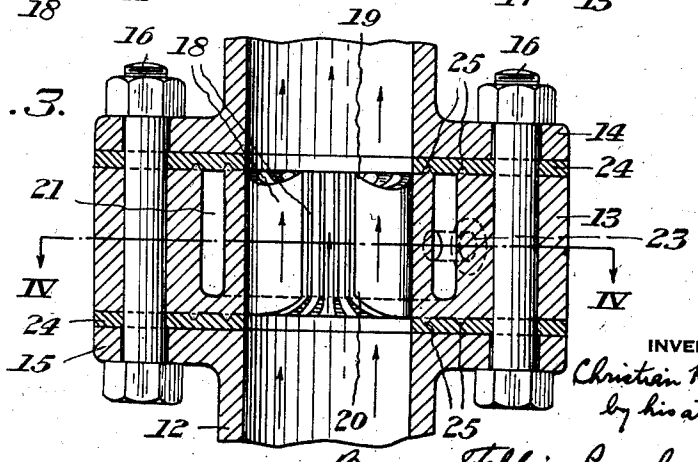


Fig. 3.



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LIQUID FUEL OR CARBURETOR COOLER

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Application March 31, 1932, Serial No. 602,154

1 Claim. (Cl. 261—11)

My invention relates to internal combustion engines and, in particular, to engines of the carburetor type.

Certain difficulties have been experienced in the operation of carburetor engines on highly volatile hydrocarbon compounds, and the difficulties have increased in proportion to the volatility of the fuel. It has been found that the carburetor of an internal combustion engine of a motor car or an airplane often attains a high temperature, especially during summer operation at which the carburetor's function is materially impaired. The carburetor normally operates as an accurate fuel and air metering device. When the carburetor is heated to a certain temperature, the fuel in the carburetor bowl begins to evaporate rapidly, approaching a boiling condition. If this condition persists for any considerable period of time, the carburetor will not only fail accurately to measure the fuel and air but will restrict the supply of fuel to the engine to such an extent that it stops. This condition is known to the automotive industry as vapor lock.

A further disadvantage resulting from the overheating of the carburetor is that the viscosity of the fuel is decreased as the temperature rises. The fuel flows more readily under high temperature and the balance of the fuel and air mixture for which the engine is adjusted is upset, with a decrease in thermal efficiency. Tests show that thermal efficiencies decrease from 25 to 35% as a result of thinning out and fractional evaporation or slight boiling of the fuel in the carburetor bowl. A decrease in the thermal efficiency is accompanied by a corresponding increase in fuel consumption for a given output.

The difficulties above mentioned have been experienced frequently in connection with ordinary motor gasoline. The difficulties, however, are multiplied when high-test gasoline is employed. As a result, millions of gallons of highly volatile gasoline are being thrown on to the low-grade fuel market in competition with coal and fuel oil because its high volatility produces the vapor lock condition above described. The more highly volatile portion of a refinery output, of course, is the cream of the product as far as energy content is concerned but the difficulties which have been had with vapor lock have prevented the use of this otherwise very desirable fuel.

I have invented means for preventing the carburetor of an internal combustion engine from attaining temperatures such that vapor lock will result. While this is the most important result produced, a corresponding increase in efficiency and decrease in fuel consumption is experienced. In accordance with my invention, I take advantage of the cooling effect produced by the vaporization of the volatile fuel for cooling the liquid fuel being supplied to the carburetor bowl or to the fuel pump. The carburetor or fuel pump is thereby maintained at a temperature much lower than has heretofore been possible, with the desirable results above mentioned. It is well known that the evaporation of any liquid requires a certain amount of heat and that such heat is absorbed from surrounding media. The invention utilizes the cooling effect produced by the vaporization of fuel which takes place in the carburetor outlet for cooling the fuel entering the carburetor bowl or the pump.

A present preferred embodiment of the invention comprises a radiating device adapted to be placed between the intake manifold of the internal combustion engine and the carburetor supplying vapor thereto, although it may also be incorporated as an integral part of the carburetor discharge throat. The radiating device is provided with an axial passage having radiators therein. The vaporized fuel from the carburetor is drawn through the passage with the result that heat is abstracted from the radiators. Surrounding the radiators is a passage to which the fuel supply line is connected. The fuel is thus led around the radiators so that the liquid fuel is cooled. It is then conducted to the carburetor bowl where it is vaporized in the usual manner. The vaporization of each successive volume of fuel acts to cool succeeding volumes of liquid fuel being delivered to the carburetor bowl.

For a complete understanding of the invention, reference is made to the accompanying drawing illustrating such preferred embodiment. In the drawing:—

Figure 1 is a side elevation of a portion of an internal combustion engine;

Figure 2 is a top plan view of the radiation or cooling device;

Figure 3 is a sectional view thereof taken along the line III—III of Figure 2; and

Figure 4 is a sectional view taken along the line IV—IV of Figure 3.

Referring in detail to the drawing, a portion of an internal combustion engine is indicated diagrammatically at 10. An inlet manifold 11 suppling fuel to the engine cylinders is connected to a carburetor indicated in part at 12. A radiation or carburetor cooling device 13 is connected between the inlet manifold 11 and

the carburetor 12. The inlet and outlet of said manifold and carburetor, respectively, are flanged as at 14 and 15 for receiving the device 13 therebetween. Bolts 16 secure the device 13 rigidly to the manifold and carburetor.

The cooling device 13 has an axial bore 17 through which fuel from the carburetor is drawn into the manifold for completion of the vaporization and delivery to the engine cylinders. Radial projections or radiators 18 extend into the bore 17 from the body of the cooling device 13. The radiators are curved upwardly at both the top and bottom of their inner ends as at 19 and 20. Any liquid fuel collecting on said radiators is thereby drawn toward the center of the bore 17 by the vapor traversing the cooling device and thereby vaporized.

The body of the cooling device 13 is provided with a circumferential passage 21. An inlet connection 22 supplies fuel to said passage from the storage tank. An outlet conduit 23 delivers liquid fuel from the passage 21 to the bowl of the carburetor 12. Heat insulating gaskets 24 are disposed between the device 13 and the flanges 14 and 15 for insulating the cooling device from the engine and carburetor so that the cooling effect produced thereby will not be lost by conduction of heat from other parts of the engine thereto. Ribs 25 on the device 13, on being forced into the gaskets, provide a fluid-tight construction.

The operation of the device is fairly obvious. Fuel supplied to the device by the conduit 22 passes through the passage 21 and the conduit 23 into the carburetor bowl. The liquid fuel is drawn from the carburetor by the suction stroke of the engine cylinder and is vaporized as it passes out of the carburetor and through the device 13 into the manifold 11. The vaporization of the liquid fuel abstracts heat from the surrounding media and the radiators 18 facilitate the absorption of heat from the device 13 by the vaporization of the liquid. The cooling of the radiators 18 cools the entire device 13 including the liquid fuel subsequently supplied thereto and traversing the passage 21. As a result, the fuel supplied to the carburetor bowl through the conduit 23 is much cooler than it ordinarily would be and the temperature of the carburetor bowl is thereby reduced.

The highly objectionable condition of vapor lock is thus effectively avoided, the thermal efficiency of the engine increased and, correspondingly, the fuel consumption reduced. The invention, furthermore, makes possible the use of the more highly volatile fractions of hydrocarbon distillation for automotive and airplane engines and provides a good market for this superior type of fuel, the use of which has heretofore been almost entirely precluded by the conditions of vapor lock above mentioned. The objectionable decrease in the viscosity of the liquid fuel because of carburetor heating is also eliminated. The carburetor, furthermore, continues to perform accurately its function of measuring air and fuel input to the engine.

It is obvious that the invention is applicable to any internal combustion engine of the carburetor type, although its chief field of utility is in automotive and aviation engines.

Although I have illustrated and described herein but one present, preferred embodiment of the invention, it will be apparent that it may be practiced in other forms without departing from the spirit of the invention or the scope of the appended claim.

I claim:

In an internal combustion engine carburetor, an inlet for liquid fuel and an outlet for fuel vapor, a conduit for delivering liquid fuel to said inlet, and a heat exchanger in said conduit, said heat exchanger having separate passages in heat exchange relation for said liquid and vapor fuel, respectively, for subjecting the liquid fuel passing through the exchanger to the cooling effect produced by the vaporization taking place in the carburetor and manifold.

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