Feb. 27, 1945. F. P. ROUMILLAT 2,370,261

CHARGE FORMING DEVICE

Filed May 18, 1943

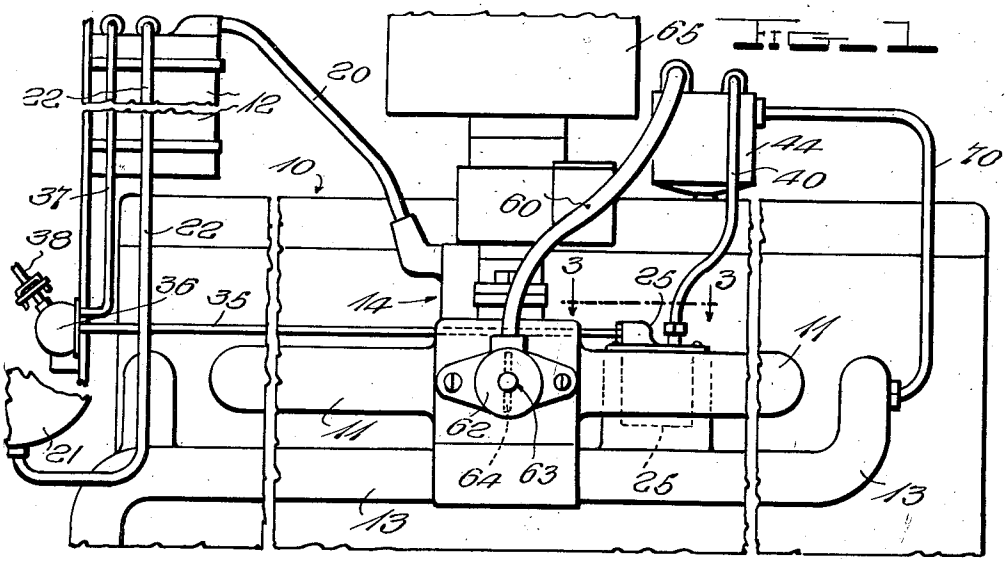

FIG. 1

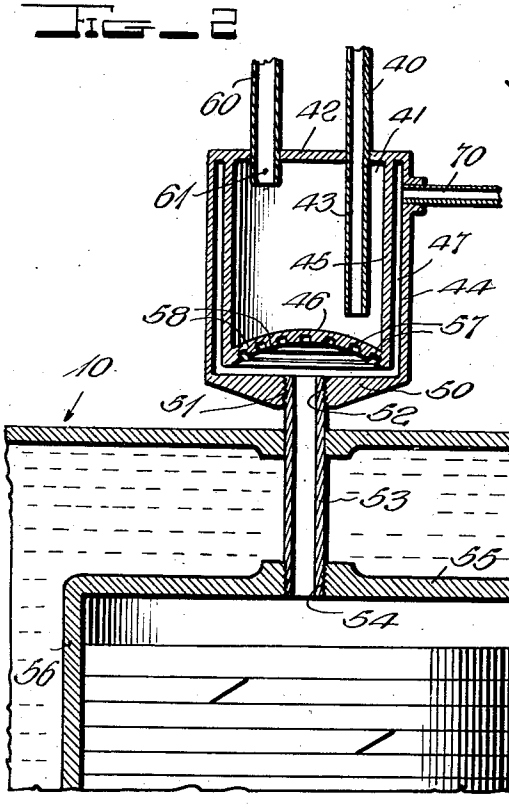

FIG. 2

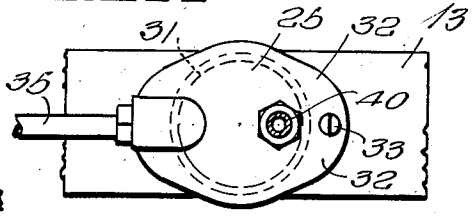

FIG. 3

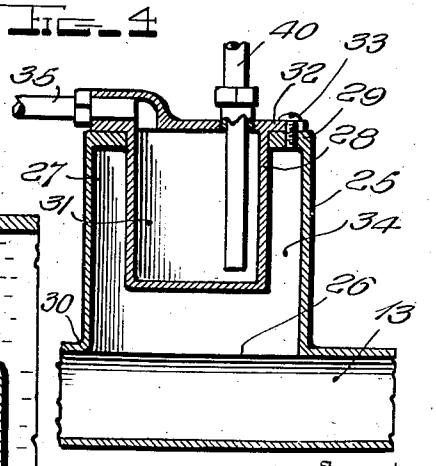

FIG. 4

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CHARGE FORMING DEVICE

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2 Claims. (Cl. 123—133)

This invention relates to a charge forming device.

An object of the invention is the provision of an arrangement which is associated with the engine and also with the exhaust pipe for heating and vaporizing heavy oils or other combustible materials so that the vapors may be utilized in a gasoline engine.

Another object of the invention is the provision of a simple and efficient unit of small capacity which will readily convert heavy oils or other heavy hydrocarbon materials into vapors which may be combined with the proper quantity of air for forming the combustible material to be utilized in internal combustion engines ordinarily operated by gasoline.

A further object of the invention is the provision of a small and compact unit which is in communication with the combustion chamber of an internal combustion engine so that the hot gases of combustion may be utilized for converting a heavy fuel into vapors of such type that such vapors may be drawn into the combustion chamber with a suitable quantity of air for operating the engine.

In the drawing:

Fig. 1 is a fragmentary side view in elevation of an internal combustion engine showing my invention applied thereto.

Fig. 2 is a fragmentary elevational view in section of a unit for heating heavy fuels applied to an engine cylinder.

Fig. 3 is a horizontal section taken along the line 3—3 of Fig. 1.

Fig. 4 is a vertical section of a modified form of unit applied to the exhaust pipe of the engine.

Referring more particularly to the drawing, 10 designates an internal combustion engine normally operated by such fuel as gasoline of various grades and is provided with an intake manifold 11, a vacuum tank 12, an exhaust pipe 13 and an intake pipe 14.

The tank 12 is connected by a pipe 20 with the intake pipe 14 for the purpose of creating a vacuum in said tank for drawing fuel from a supply tank 21 through a pipe 22 which is in communication with the tank 12 as shown in Fig. 1.

A heating unit generally designated by the numeral 25 is in open communication with the exhaust pipe 13 as shown at 26 and the temperature of the exhaust gases at this point may run anywhere from 300° to 550° C. The unit consists of an inverted cup-shaped member 27 which has an opening 28 at its top 29. The lower edge 30 of the cup-shaped member is cut to conform to the opening 26 in the exhaust pipe 13 and this lower edge is welded or secured to the exhaust pipe in any approved manner.

A container 31 is mounted in the opening 28 in the top 29 and is provided with a flange 32 resting on the top and secured to said top by bolts 33. The container 31 is thus suspended from the top of the member 27 and has its walls spaced from the inner walls of the member 27 to provide an annular chamber 34 within said cup-shaped member 27.

Thus it will be seen that the container 31 is directly in contact with the heated gases of the combustion from the exhaust pipe 13.

The container 31 is supplied with heavy fuel by means of a pipe 35 which is in communication with a valve 36. This valve is also in communication with the vacuum tank 12 by means of a pipe 37. The pipe 37, as usual, extends downwardly into the fuel in the tank 12 so that when the valve 36 is operated by a rod 38 which extends to the dash of the automobile, fuel will flow from the tank to the container 31. This container is always filled with heavy fuel.

An outlet pipe 40 projects into the container 31 and then extends upwardly and enters a chamber 41 through the top 42 of said chamber as shown in 43.

The chamber 41 is the main heater of the heavy fuel and consists of an outer shell 44 which is spaced from the circular side wall 45 of the chamber 41 and also from the concave bottom wall 46 so that a heating chamber 47 embraces the side walls and the bottom of the chamber 41. The top of the shell 44 and the top 42 of the chamber 41 are formed in one piece. In other words, the chamber 41 and the shell 44 have a common top.

The bottom 50 of the shell 44 is thickened and is provided with a threaded opening 51 adapted to receive the threaded end 52 of a pipe 53, which may have treads throughout its length. This pipe extends downwardly and is threaded at 54 into the top 55 of one of the cylinders 56 of the internal combustion engine, and supports the shell 44.

The bottom 46 of the chamber 41 is bowed inwardly and is provided with a plurality of grooves 57 in order to form ribs 58 and this construction increases the heating surface of the bottom 46.

A discharge pipe 60 has one end projecting into the chamber 41 as shown at 61. This pipe extends downwardly and enters a mixing chamber

62 which is connected with the intake manifold 11 of the engine.

The mixing chamber 62 is provided with an air intake as shown at 63 and the air entering the intake is combined with the hot vapors supplied to the mixing chamber by the pipe 60. The mixing chamber is in communication with the various cylinders through the intake manifold.

A butterfly valve shown in dotted lines at 64 is operated by the foot accelerator in the usual manner.

The operation of my device is as follows: The engine may be started in the usual manner by a light fuel such as gasoline or high test gas and after the engine has become sufficiently heated and hot gases are passing through the exhaust pipe 13, the chamber 25 will heat the heavy fuel in the container 31.

The chamber 31 is completely filled with heavy fuel from the valve 36 and tank 12 at all times and this hot fuel is conducted by the pipe 40 to the second heating chamber 41 where the fuel is intensely heated and converted into hot vapors. These hot vapors are then drawn into the mixing chamber 62 and after being mixed with the air from the inlet 63, the mixture is then drawn into the combustion chambers of the engine. Additional air, however, is supplied through the cleaner 65.

As has been stated, the temperature of the heavy fuel in the container 31 is considerably raised since the temperature of the exhaust gases in the chamber 34 varies between 300° and 550° C. This heated oil is then carried to the second heating chamber 41 where the heavy fuel is converted into vapors.

In view of the fact that the pipe 53 connects the space in the shell 44 located between the concave surface 46 of the chamber 45 and the bottom 50 of the shell, said bottom is intensely heated. Since the temperature of the combustion chamber may be raised as high as 1800° C. during the firing stroke, therefore, the hot oil which enters the chamber 41 will be converted into highly heated vapors before said vapors enter the mixing chamber 62.

In order to maintain the high temperature in the shell 44, an extremely small pipe 70 is connected between the shell and the exhaust pipe although the diameter of the pipe is sufficient to carry off the gases in the shell.

The pipe 70 controls the volume of hot gases flowing through the chamber 41 and therefore controls the temperature of said chamber. By restricting or enlarging the passage in pipe 70 in any suitable manner by making the pipe larger or smaller or by the use of a valve a range of temperature may be had from a very few degrees to 1800° C.

I claim:

1. In an internal combustion engine having a mixing chamber, a charge forming device comprising a shell having a fuel chamber therein, a second shell enclosing the first shell and forming therewith a heating chamber, means supplying said fuel chamber with a heavy fuel, the fuel chamber having one end curved outwardly from the adjacent end of the heating chamber and forming therewith an enlarged heating space, a pipe directly connecting the space with a combustion chamber of an engine cylinder so that the curved bottom will be subjected to the intense heat of the gases from the combustion chamber, the mixing chamber connected with the intake manifold of the engine, a pipe connecting said fuel chamber with the intake manifold of the engine for supplying the engine cylinders with highly heated vapors, and means for supplying air to the mixing chamber, the curved bottom where the most intense heat is applied by the combustion gases from the combustion chamber being roughened for increasing the radiating surface.

2. In an internal combustion engine having a mixing chamber in communication with the intake manifold of the engine, a charge-forming device comprising a shell having a fuel chamber therein, a second shell enclosing the first shell to form an annular heating chamber of narrow width around the side walls of the first shell, the inner ends of the shells being spaced from each other with said end of the first shell curved inwardly to provide an enlargement of the heating chamber, the other end of the shells having a common closure formed integrally with said shells, a pipe supporting the shells on the engine and placing the enlargement of the heating chamber in direct communication with the combustion chamber of an engine cylinder so that the curved end of the first shell is subjected to the most intense heat of gases from the combustion chamber and means supplying heated vapors of heavy fuel to the fuel chamber.

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