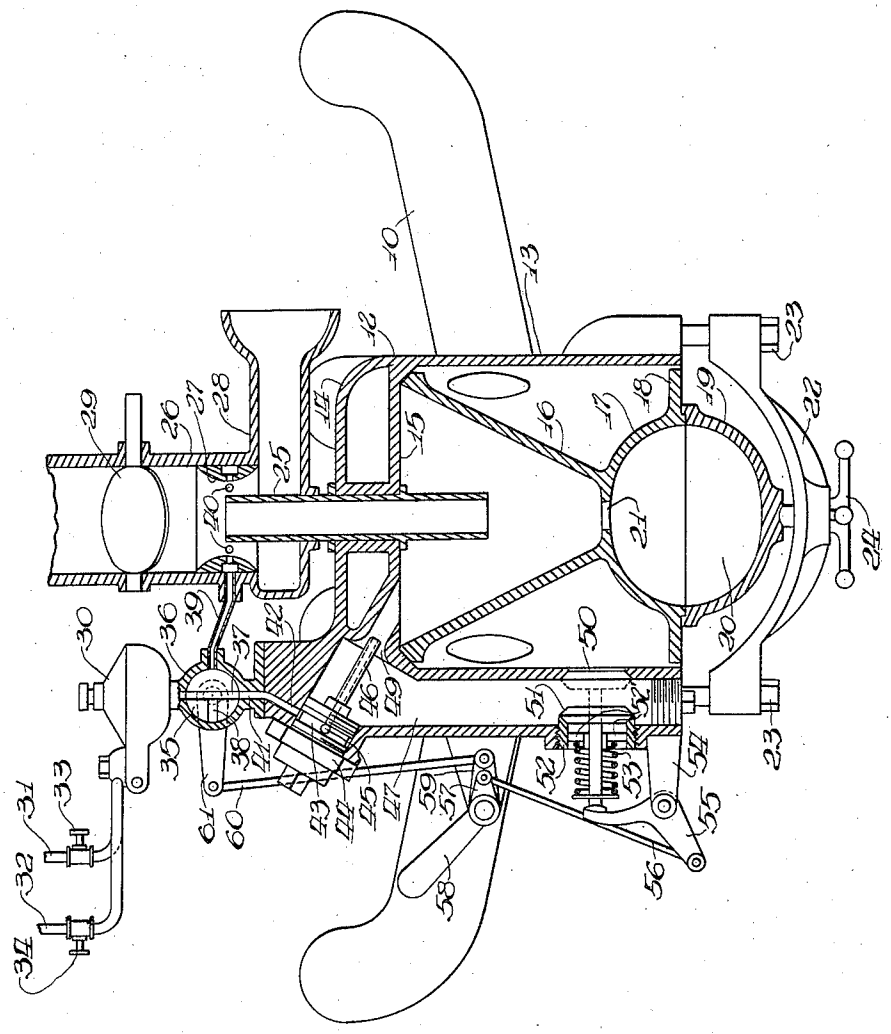
Aug. 27, 1935. H. H. TURNER 2,012,525

VAPORIZER

Filed Oct. 29, 1934



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Patented Aug. 27, 1935

2,012,525

UNITED STATES PATENT OFFICE

2,012,525

VAPORIZER

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Application October 29, 1934, Serial No. 750,543

8 Claims. (Cl. 123—119)

This invention relates to a charge forming device for internal combustion engines. More specifically it relates to an improved vaporizer and carburetor for handling heavy oils not adaptable for use in conventional carburetors.

In the operation of internal combustion engines it is desirable to use the lowest grade fuel which can be satisfactorily handled by the charge forming system of the engine. In the use of fuels of a lower grade than kerosene, it is necessary in spray carburetors to utilize heat in order to obtain a mixture which can be made sufficiently homogeneous to obtain satisfactory distribution in a manifold. The use of any petroleum product appreciably less in volatility than kerosene has resulted in many difficulties. The principal difficulty is the cracking of the fuel oil with the formation of sludge, free carbon, coke, ash, and other similar products.

Another difficulty is encountered in the metering of the fuel and in forming a satisfactory mixture at various load conditions of the engine and under various temperature conditions.

The utilization of hot exhaust gases as a means of direct heating of a sprayed fuel is shown in the Dasey Patent No. 1,344,793 dated June 29, 1920. As an improvement in the device shown in the Dasey patent the pending United States application, Serial No. 693,726 filed Oct. 16, 1933, in the name of Johnson et al., shows a vaporizer of a type in which applicant's improvement has been embodied.

The principal object of the present invention is to provide, in an improved fuel vaporizer and carburetor for handling low grade fuel, means to facilitate removal of the carbon deposit formed during operation. Another object is to provide a control mechanism operable to admit an oxidizing medium to the vaporizing chamber for the combustion of deposits therein with a shift from a low grade of fuel to a fuel readily vaporizable.

The above defined objects and others, which will be apparent from the description to follow, are attained by a device such as illustrated in the drawing, in which the single figure is a section taken through the center of a vaporizer particularly constructed to be applied to a multiple cylinder engine.

In the drawing, a manifold 10 is illustrated as being integrally formed with a casing 12, which houses the vaporizer. Said casing consists of a cylindrical wall 13 closed at the top by spaced end walls 14 and 15 and open at the bottom. A conical vaporizing chamber 16 is fitted through the open end wall with the large diameter of the conical portion fitted in a gas-tight manner against the lower side of the end wall 15. At the bottom of the conical portion a hemispherical extension 17 is formed with a flange 18 fitting within the lower extremity of the cylindrical wall 13. A hemispherical cap 19 is fitted in a gas-tight manner over the extension 17, forming a substantial spherical expansion and receiving chamber 20. Said chamber communicates, through a restricted opening 21, with the interior of the conical vaporizing chamber 16. A clamping member 22 is secured to the bottom of the casing by cap-screws 23 and is provided with a clamping screw member 24 for clamping the cap 19 removably in position.

A mixture outlet conduit 25 extends upwardly through the spaced end members 14 and 15 from a central point in the vaporizing chamber 16 into the main air inlet conduit 26. Said conduit 25 terminates in the low pressure area of a Venturi throat formed in the conduit 26 by a suitably shaped member 27. An air inlet conduit 28 communicates with the conduit 26 at one end. The other end of said conduit, provided with a throttle valve 29, is adapted to communicate with the inlet manifold of the engine as in conventional engine design.

A conventional float bowl 30 is connected, as diagrammatically illustrated, with two sources of fuel 31 and 32, controlled, respectively, by valves 33 and 34. A three-way valve arrangement is provided at the outlet from the float chamber 30. A rotary valve member 35, fitted in a valve cage 36, is provided with a duct 37 extending on a diameter of the valve and a duct 38 at right angles to the duct 37. A fuel conduit 39 connects the valve cage with fuel discharge openings 40 in the Venturi member 27. A fuel outlet conduit 41 connects the valve cage with a conduit 42 formed in the casing 12 leading to an annular channel 43 formed in a fuel nozzle member 44. Said channel communicates through an opening 45 with a fuel nozzle 46.

The nozzle 46 extends through an exhaust gas conduit 47 cored in the casing 12 into a Venturi throat 49 communicating tangentially through the end wall 15 with the interior of the vaporizing chamber. The passage-way 47 communicates, through an opening 50 formed in the cylindrical wall 13, with the space between the wall 13 and the vaporizing chamber wall 16. Said space, as illustrated, communicates with the exhaust conduit 10 whereby hot exhaust gases are delivered to said space and therefrom through the opening 50 into the conduit 47.

In the outer casing wall forming the conduit 47

a poppet type valve 51 is mounted for reciprocation in a guide member 52 screw-fitted into an opening formed in the casing. The member 52 is cut away to form openings 52' for air flow when the valve 51 is off its seat formed around the interior end of the member 52. A spring 53 resiliently seats the valve 51 against the member 52.

A bracket 54, secured to the casing 12, pivotally supports a rocker arm 55, which is formed with a head engaging the stem of the valve 51. An actuating link 56 secured to the rocker arm 55 is secured to a lever arm 57 on a control lever 58. Said lever is also provided with a lever arm 59, to which a control link 60 is pivotally secured. The link 60 is also pivotally secured to a lever arm 61 secured to the rotary valve 35.

In the operation of the charge forming device as above described, the suction produced by the engine in the conduit 26 and the pressure produced by the exhaust in the manifold 10 gives an appreciable pressure differential between the inlet and outlet ends of the device. The flow of exhaust gases around the vaporizing chamber 16 through the opening 50 and the space 47, and through the Venturi throat 49 creates a suction therein which produces fuel flow through the nozzle 46. The particular metering means used on the nozzle 46 may be of any construction known in the carbureting art. The mixture of exhaust gas and fuel is heated in the vaporizing chamber and passes out through the conduit 25 to the Venturi throat formed by the member 27 where said mixture is mixed with air sufficient for complete combustion in the engine.

For starting an engine equipped with a device as above described, it is necessary to provide some auxiliary means, or to use a more volatile fuel. To provide for starting, a volatile fuel may be supplied through the conduit 31, assuming that the conduit 33 is utilized for supplying the heavy fuel. By operation of the lever 58, the float bowl is put into communication with the conduit 39 whereby fuel is delivered directly to the Venturi member 27 and out through the openings 40. When operating in this manner with a volatile fuel, ignition may be accomplished in the usual manner.

After the engine is in operation on a volatile fuel and is warmed up, whereby the exhaust gases heat the vaporizing chamber 16 to the required temperature, the lever 58 is shifted to put the fuel bowl into communication with the nozzle 46. The valves 33 and 34 are adjusted to deliver heavy fuel to the float bowl. In this position of operation, exhaust gases are delivered through the opening 50. Unvaporized fuel and other impurities and deposits, which form in the vaporizing chamber 16, collect on the walls thereof, some of the material passing downwardly and into the chamber 20. Said chamber serves, therefore, as a receptacle for such material in addition to an expansion chamber to remove to some extent the pulsating effect of the exhaust gas on the fuel metering nozzle 46.

After the engine has been in operation for a substantial length of time, an appreciable carbon deposit, depending upon the grade of fuel used, may form upon the wall of the vaporizing chamber. Such a deposit insulates the wall from heat transmission and reduces the efficiency of the device, particularly from the vaporizing standpoint. It is particularly to remove such deposits and to overcome this difficulty of operation that the present device was constructed. By operating the lever 58, the valve 51 is shifted to seat around the opening 15 and to thereby close said opening. At the same time fuel is delivered directly to the Venturi member 27. With the vaporizing chamber in a highly heated condition as the result of continued operation, air admitted through the member 52 rapidly oxidizes the deposits in the vaporizing chamber and puts the device in condition for continued operation or for renewed operation without an initial start.

Although applicant has shown and described a particular form of his improved charge forming device for internal combustion engines, it is to be understood that he claims as his invention all modifications falling within the scope of the appended claims.

What is claimed is:

1. A charge forming device for internal combustion engines comprising a main air inlet, a suction producing means associated with said inlet, a vaporizing chamber, an outlet conduit leading from said chamber to the suction producing means, an exhaust gas conduit communicating with the vaporizing chamber, a suction producing means in said conduit, a fuel supply chamber, valve controlled means for supplying fuel from said chamber to the suction producing means in the main air inlet and to the suction producing means in the exhaust gas conduit, means for supplying air to said exhaust gas conduit, and means for regulating the supply of exhaust gas and air to said conduit.

2. A charge forming device for internal combustion engines comprising a main air inlet, a suction producing means associated with said inlet, a vaporizing chamber, an outlet conduit leading from said chamber to the suction producing means, an exhaust gas conduit communicating with the vaporizing chamber, a suction producing means in said conduit, a fuel supply chamber, valve controlled means for supplying fuel from said chamber to the suction producing means in the main air inlet and to the suction producing means in the exhaust gas conduit, means for supplying air to said exhaust gas conduit, and a single valve for regulating the supply of exhaust gas and air to said conduit.

3. A charge forming device for internal combustion engines comprising a main air inlet, a suction producing means associated with said inlet, a vaporizing chamber, an outlet conduit leading from said chamber to the suction producing means, an exhaust gas conduit communicating with the vaporizing chamber, a suction producing means in said conduit, a fuel supply chamber, means for supplying fuel from said chamber to the suction producing means in the exhaust gas conduit, means for supplying air to said exhaust gas conduit, and means to cut off the supply of exhaust gas thereto.

4. A heavy fuel vaporizer and carburetor for internal combustion engines comprising a mixture inlet, a Venturi throat in said inlet, a vaporizing chamber, an outlet conduit leading from said chamber to the Venturi throat, an inlet conduit communicating with the engine exhaust conduit and with the vaporizing chamber, a Venturi throat in said conduit, means for supplying fuel to said Venturi throats, and means to cut off the supply of exhaust gas to the vaporizing chamber and to supply air thereto.

5. A heavy fuel vaporizer and carburetor for internal combustion engines comprising a mixture inlet, a Venturi throat in said inlet, a vaporizing chamber, an outlet conduit leading from

said chamber to the Venturi throat, an inlet conduit communicating with the engine exhaust conduit and with the vaporizing chamber, a Venturi throat in said conduit, means for supplying fuel to said Venturi throats, and a single valve to cut off the supply of exhaust gas to the vaporizing chamber and to supply air thereto.

6. A heavy fuel vaporizer and carburetor for internal combustion engines comprising a mixture inlet, a Venturi throat in said inlet, a vaporizing chamber, an outlet conduit leading from said chamber to the Venturi throat, an inlet conduit communicating with the engine exhaust conduit and with the vaporizing chamber, a Venturi throat in said conduit, means for supplying fuel selectively to each of the Venturi throats, and valve control means operatively connected to said means to cut off the supply of exhaust gas to the vaporizing chamber and to supply air thereto when fuel is supplied to the mixture inlet Venturi throat.

7. A heavy fuel vaporizer and carburetor for internal combustion engines comprising a mixture inlet, a Venturi throat in said inlet, a vaporizing chamber, an outlet conduit leading from said chamber to the Venturi throat, an inlet conduit communicating with the engine exhaust conduit and with the vaporizing chamber, a Venturi throat in said conduit, means for supplying fuel to each of the Venturi throats, and a single valve to cut off the supply of exhaust gas to the vaporizing chamber and to supply air thereto when fuel is supplied to the mixture inlet Venturi throat.

8. A charge forming device for internal combustion engines comprising a main air inlet, a suction producing means associated with said inlet, a vaporizing chamber, an outlet conduit leading from said chamber to the suction producing means, a heating jacket around said chamber, means for supplying exhaust gas to said jacket, an exhaust gas conduit connected with said jacket and communicating with the vaporizing chamber, a suction producing means in said conduit, a fuel supply chamber, valve controlled means for supplying fuel from said chamber to either the suction producing means in the main air inlet or to the suction producing means in the exhaust gas conduit, means for supplying air to said exhaust gas conduit, and valve means for regulating the supply of exhaust gas and air to said conduit.

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