GAS METERING SYSTEM FOR CARBURETOR
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This invention pertains to improvements in the feeding and control of fuel to carburetors for internal combustion engines and is more particularly directed to an improved gasoline metering system for such carburetors.

One of the objects of this invention is to provide an improved gasoline metering system for carburetor which is highly efficient in operation and performance.

Still another object of this invention is to provide an improved gasoline metering system for a vapor type carburetor which is responsive to the high performance required of an internal combustion engine for use in a motor vehicle.

Still another object of this invention is to provide an improved gasoline metering system for applying fuel to the vaporization chamber of a carburetor which is highly responsive to acceleration, varying speeds, and varying load factors involved with the motor vehicle to which the device is applied.

Still another object of this invention is to provide an improved fuel control mechanism for a vaporization type carburetor.

Further features and advantages of this invention will appear from a detailed description of the drawings in which:

Fig. 1 is a diagram showing the circuit and essential apparatus for a gasoline metering system for vaporization carburetor incorporating the features of this invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

For illustrative purposes this invention is shown as applied to a carburetor having the base casting 10 having the usual flange surface 11 which is mounted in the usual manner on the intake manifold of the internal combustion engine. In the casting 10 there is formed the intake opening 12 in which is located the butterfly valve 13 mounted on the rock shaft 14 having the operating lever 15 fixed thereto, which lever in turn is connected to the usual foot throttle of the vehicle.

On top of the casting 10 is mounted the mixing chamber 16 having an inner lining 17 forming a venturi 18 communicating with a discharge passage bore 19. A vaporized gasoline discharge pipe 20 and a raw gasoline discharge pipe 21 open into the discharge bore 19 adjacent the venturi 18.

Fuel for operating the carburetor is derived from the fuel tank 22 of the vehicle and is drawn through the suction line 23 by the fuel pump 24 which discharges the fuel through the line 25 to a depulsing chamber 26 from which the fuel passes in substantially uniform flow through the line 27 into a thermastically controlled diverting valve 28.

Exhaust from the internal combustion engine is conducted through the exhaust pipe 29 in the direction indicated by the arrow 30 so that the chamber 31 is heated to high temperature from the discharged burnt gases coming from the internal combustion engine. The diverting valve 28 has a control stem 32 which is actuated by a suitable bi-metallic thermostat 33 which is actuated by the temperature in the chamber 31 as indicated diagrammatically by the line 34 so as to cause the fuel to be discharged when the engine is cold through the line 35 to the raw gasoline inlet pipe 36 having the discharge 21.

As the engine warms up fuel is then diverted from the line 27 to the line 37 which is connected to the inlet port 38 of the pre-heat chamber 39 of the control valve structure indicated generally at 40. The chamber 39 has an outlet port 41 connected into the metering rod chamber 42 in which is contained the movable metering rod 43, the metering rod being preferably supported by a diaphragm seal 44 suitably supported in the housing 45 and the upper cover plate member 46 of the control valve 40.

Discharge from the metering rod chamber 42 passes out beyond the point 47 of the metering rod 43 through the discharge opening 48 into the vaporization chamber 49 comprising the member 50 located in the exhaust chamber 51 surrounding the carburetor mixing chamber member 56 so that the vaporization chamber 49 is responsive to the heat from the exhaust gases from the internal combustion engine to cause fuel emitted from the discharge opening 48 into the chamber 49 to be changed from a vapor or liquid to a gaseous condition so that it discharges out through the vaporized gasoline discharge pipe 20 when the butterfly valve 13 is open during the normal operation of the engine.

The exhaust gas heat from the chamber 31 proceeds outwardly in the direction indicated by the arrow 51 to enter the inlet pipe 52 of a suitable pre-heater unit 53 and discharges out through the pipe 54 to the usual muffler and exhaust line of the vehicle, the air pre-heater 55 serving to heat the incoming air entering the air cleaner 55 as indicated by the arrows 56, which pre-heated air in turn is connected to the intake air port 57 in the direction indicated by the line 58 so that warm air is also applied to the venturi structure of the carburetor at the same time vaporized gasoline enters through the vaporized gasoline discharge pipe 20 of the carburetor.

Excess fuel supplied to the pre-heat chamber 39 of the control valve 40 passes out through the line 59 to a suitable pressure regulator valve 60 having a discharge line 61 for returning the fuel to the fuel tank 22 of the motor vehicle.

The metering rod 43 is regulated by the simultaneous application of control from the position of the foot throttle and the intake manifold vacuum pressure variations.

The rock shaft 14 of the butterfly valve 13 has a control arm 62 fixed thereto which is connected to a control rod 63 on the end of which is rigidly fixed the wedge 64 by engaging a slot 65 through which projects the reduced end portion 66 of the metering rod 43. The straight or parallel portion 67 of the wedge 64 slides on the abutment surface 68 of the cover plate 66 while the angular surface 69 of the wedge 64 engages the angular surface 70 of the vacuum control wedge 71.

The vacuum control wedge 71 is rigidly connected to a rod 72 which in turn is connected in the usual manner to a disc 73 of a vacuum cylinder 74 which in turn is connected by a pipe 75 to the intake manifold of the motor vehicle. A suitable compression spring 76 serves to normally push the rod 72 and diaphragm 73 to the left in Fig. 1 whenever vacuum in the pipe 75 decreases.

A final positioning wedge 77 held in place by the washer 78 and nut 79 on the metering rod 43 has an angular surface 80 engaging the angular surface 81 on the top of the vacuum control wedge 71.

In the operation of the device when the engine is cold and is to be started, fuel is then transmitted by the pump 24 through the line 35, and preferably through a needle valve 82 in the line 35 to the raw gasoline inlet line 21 to affect the initial starting of the engine. As soon as the hot exhaust gases begin to enter at 30 the diverter valve bi-metallic control 33 causes fuel from the line 27 to
be then transferred to the line 37 where it then begins to enter the metering chamber 42 and thus into the vaporization chamber 49 where it is changed from a liquid into a gaseous condition or discharged through the vaporized gasoline discharge pipe 20 into the carburetor to maintain the normal operation of the engine. It will be noted that a compression spring 83 in the control valve 40 serves to normally urge the metering pin toward a closed position. When stepping on the foot throttle of the engine, the control rod 63 pushes the wedge 65 to the right in the diagram, Fig. 1, to raise the metering rod 43 so as to allow more fuel to enter the vaporization chamber for acceleration and climbing hills or increases in speed of the motor vehicle. Further, it will be noted that when the throttle is opened causing a decrease in manifold vacuum the vacuum cylinder 74 likewise releases and allows the rod 42 under the influence of the compression spring 76 to move to the left to cause still further movement of the metering rod 43 to open position. Thus, there is provided a combined throttle position and vacuum control for the entrance of fuel into the vaporization chamber so that the motor vehicle may be operated under a wide range of acceleration or climbing or coasting conditions with a high degree of efficiency and smoothness of operation of the engine. While the apparatus herein disclosed and described constitutes a preferred form of the invention, it is also to be understood that the apparatus is capable of mechanical alteration without departing from the spirit of the invention and that such mechanical arrangement and commercial adaptation as fall within the scope of the appended claims are intended to be included herein.

Having thus fully set forth and described this invention what is claimed and desired to be obtained by United States Letters Patent is:
1. In a gasoline metering system for a carburetor having a butterfly control valve, a mixing chamber, a vaporization chamber connected to said mixing chamber, means for heating said vaporization chamber from the exhaust gas discharge from an internal combustion engine having said carburetor, a metering control valve connected into said vaporization chamber, means intercepting said vaporization chamber with said mixing chamber, a raw gasoline inlet in said mixing chamber, a source of fuel supply, a diverting valve connected to said mixing chamber means interconnecting said vaporization chamber with said mixing chamber, means for supplying fuel in liquid form to said pre-heat chamber.
2. In a gasoline metering system for a carburetor having a butterfly control valve, a mixing chamber, a vaporization chamber connected to said mixing chamber, means for heating said vaporization chamber from the exhaust gas discharge from an internal combustion engine having said carburetor, a metering control valve connected into said vaporization chamber, means intercepting said vaporization chamber with said mixing chamber, a raw gasoline inlet in said mixing chamber, a source of fuel supply, a diverting valve connected to said mixing chamber means interconnecting said vaporization chamber with said mixing chamber, means for supplying fuel in liquid form to said pre-heat chamber.
3. In a gasoline metering system for a carburetor of a motor vehicle engine having a butterfly control valve, a mixing chamber, a vaporization chamber connected to said mixing chamber, means for heating said vaporization chamber from the exhaust gas discharge from an internal combustion engine having said carburetor, a metering control valve connected into said vaporization chamber, means interconnecting said vaporization chamber with said mixing chamber, means for supplying fuel in liquid form to said pre-heat chamber.
4. In a gasoline metering system for a carburetor including a butterfly control valve, a mixing chamber associated with said butterfly control valve, a vaporization chamber, a communicating passageway between said chamber and said mixing chamber, a metering control valve connected to said vaporization chamber having, a metering rod, a discharge port associated with said metering rod opening into said vaporization chamber, means for normally urging said metering rod toward closed position relative to said discharge port, means for adjusting said metering rod relative to said discharge port upon the movement of said butterfly valve, said metering rod being responsive to manifold vacuum variations of the intake manifold associated with said carburetor for varying the position of said metering rod in said metering control valve.
5. In a gasoline metering system for a carburetor having a speed control butterfly valve, a mixing chamber in said carburetor, a vaporization chamber, means interconnecting said vaporization and mixing chambers, a metering control valve, a metering rod in said valve, a discharge opening between said metering control valve and said vaporization chamber, a metering rod chamber surrounding said metering rod connected to said discharge opening, a pre-heat chamber surrounding said metering rod chamber, a communicating port between said metering rod chamber and said pre-heat chamber, and means for supplying fuel in liquid form to said pre-heat chamber.
6. In a gasoline metering system for a carburetor having a speed control butterfly valve, a mixing chamber in said carburetor, a vaporization chamber, means interconnecting said vaporization and mixing chambers, a metering control valve, a metering rod in said valve, a discharge port between said metering control valve and said vaporization chamber, a metering rod chamber surrounding said metering rod connected to said discharge port, a pre-heat chamber surrounding said metering rod chamber, a communicating port between said metering rod chamber and said pre-heat chamber, and means for supplying fuel in liquid form to said pre-heat chamber including a fuel pump, a fuel tank connected to the suction of said pump, a fuel supply connected to the discharge from said pump and a diverting valve connected to the discharge from said vaporization chamber, a fuel supply line from said diverting valve connected to a raw gasoline inlet in the mixing chamber of said carburetor, a second line communicating between said diverting valve and said pre-heat chamber, and thermostatic means responsive to the heat surrounding said vaporization chamber for operating said diverting valve to apply fuel to raw gasoline inlet or said pre-heat chamber.
7. In a gasoline metering system for a carburetor having a speed control butterfly valve, a mixing chamber in said carburetor, a vaporization chamber, means interconnecting said vaporization and mixing chambers, a metering control valve, a metering rod in said valve, a discharge opening between said metering control valve and said vaporization chamber, a metering rod chamber surrounding said metering rod connected to said discharge opening, a pre-heat chamber surrounding said metering rod chamber, a communicating port between said metering rod chamber and said pre-heat chamber, and means for supplying fuel in liquid form to said pre-heat chamber.
chamber including, a fuel pump, a fuel tank connected to the suction side of said pump, a depulsing chamber connected to the discharge from said pump and a diverting valve connected to the discharge from said depulsing chamber, a fuel supply line from said diverting valve connected to a raw gasoline inlet in the mixing chamber of said carburetor, a second line communicating between said diverting valve and said pre-heat chamber, thermostatic means responsive to the heat surrounding said vaporization chamber for operating said diverting valve to apply fuel to either said raw gasoline inlet or said pre-heat chamber, means for applying exhaust gas heat to said vaporization chamber and to said thermostatically controlled diverting valve.

8. In a gasoline metering system for a carburetor having, a speed control butterfly valve, a mixing chamber in said carburetor, a vaporization chamber, means interconnecting said vaporization and mixing chambers, a metering control valve, a metering rod in said valve, a discharge opening between said metering control valve and said vaporization chamber, a metering rod chamber surrounding said metering rod connected to said discharge opening, a pre-heat chamber surrounding said metering rod chamber, a communicating port between said metering rod chamber and said pre-heat chamber, means for supplying fuel in liquid form to said pre-heat chamber including a fuel pump, a fuel tank connected to the suction of said pump, a depulsing chamber connected to the discharge from said pump and a diverting valve connected to the discharge from said depulsing chamber, a fuel supply line from said diverting valve connected to a raw gasoline inlet in the mixing chamber of said carburetor, a second line communicating between said diverting valve and said pre-heat chamber, thermostatic means responsive to the heat surrounding said vaporization chamber for operating said diverting valve to apply fuel to either said raw gasoline inlet or said pre-heat chamber, means for applying exhaust gas heat to said vaporization chamber and to said thermostatically controlled diverting valve, and means for conducting exhaust gas from said engine to an air inlet pre-heater for said carburetor.

9. In a gasoline metering system for a motor vehicle having, a butterfly speed control valve, a mixing chamber, a vaporization chamber, a passageway communicating between said vaporization chamber and said mixing chamber of said carburetor, an exhaust manifold surrounding said vaporization chamber to apply exhaust gas heat to said vaporization chamber, a metering control valve including a body portion for communication with said vaporization chamber having a pre-heat chamber, a metering rod chamber, a communicating passageway between said pre-heat and metering rod chambers, a metering rod in said metering rod chamber, means for actuating said rod by the movement of said butterfly valve and variations in vacuum pressure in the intake manifold associated with said carburetor, a source of fuel supply including a fuel pump, a diverting valve thermally responsive to the temperature of said exhaust gases applied to said vaporization chamber, a raw gasoline inlet connected to one discharge port from said diverting valve, and a line connected from the other discharge port of said diverting valve into said pre-heat chamber of said metering control valve, and a discharge line from said pre-heat chamber connected through a pressure control valve to a fluid reservoir for said carburetor system.

References Cited in the file of this patent

UNITED STATES PATENTS

1,564,039 Whitehorn December 1, 1925
2,033,575 Hochreiter et al. March 10, 1936