Dec. 5, 1933. C. N. POGUE 1,938,497

CARBURETOR

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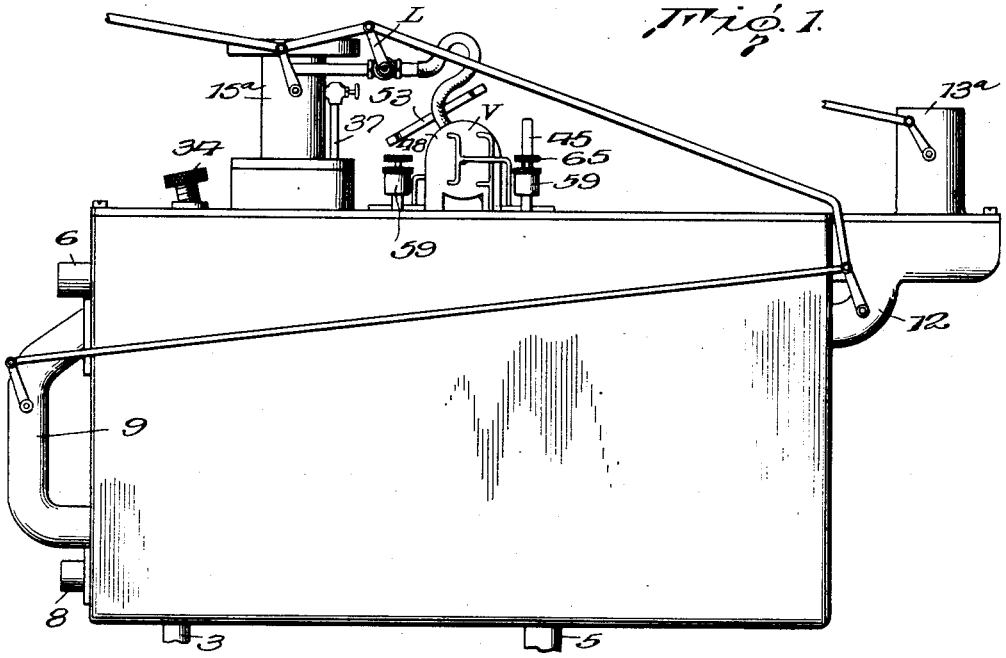
Fig. 1.



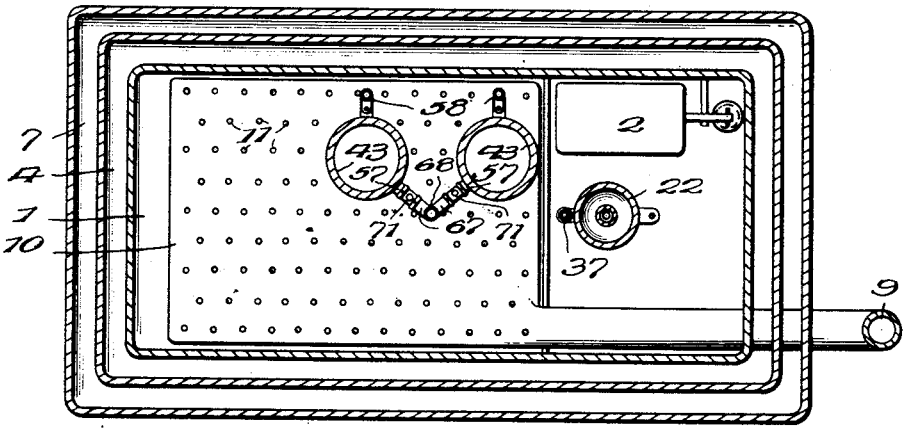


Fig. 3.

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CARBURETOR

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Fig. 2.

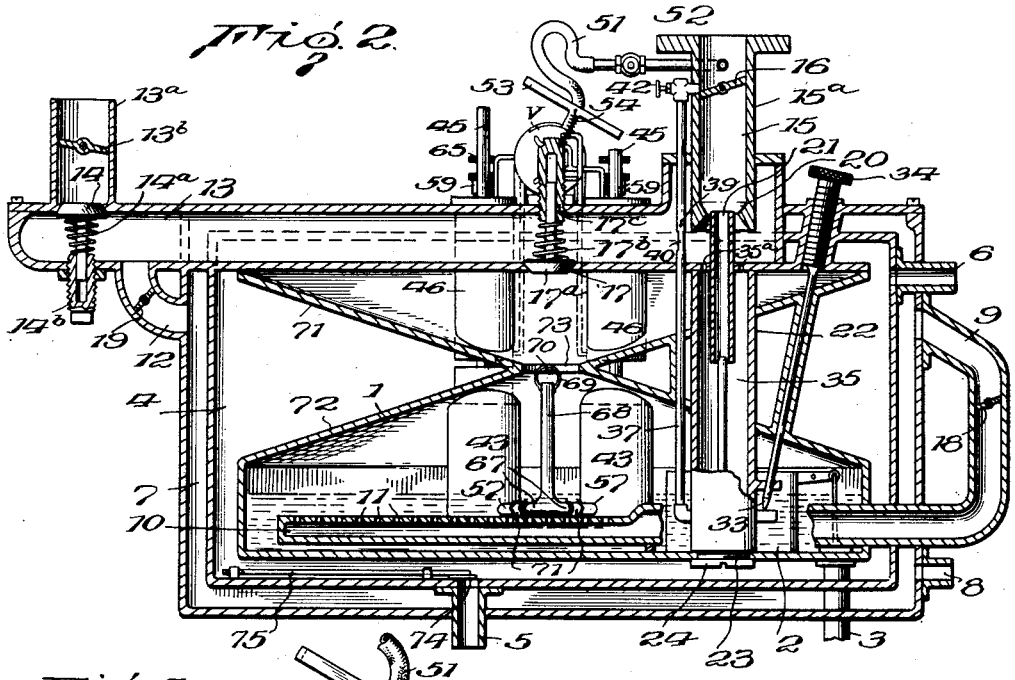


Fig. 5.

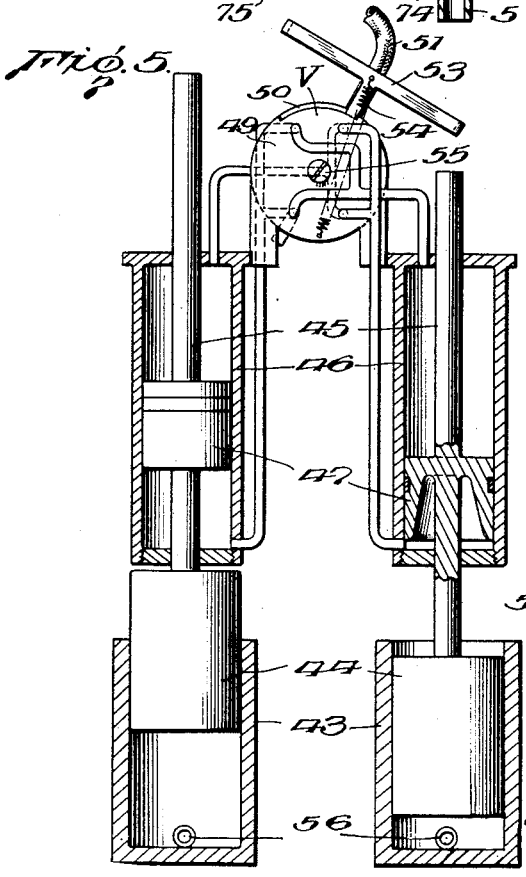
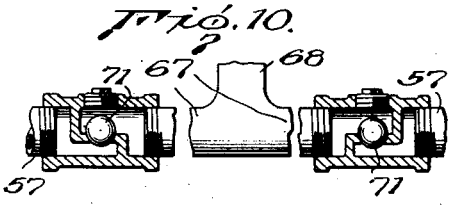


Fig. 10.



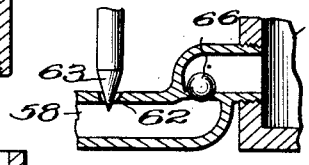


Fig. 9.

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Fig. 4.

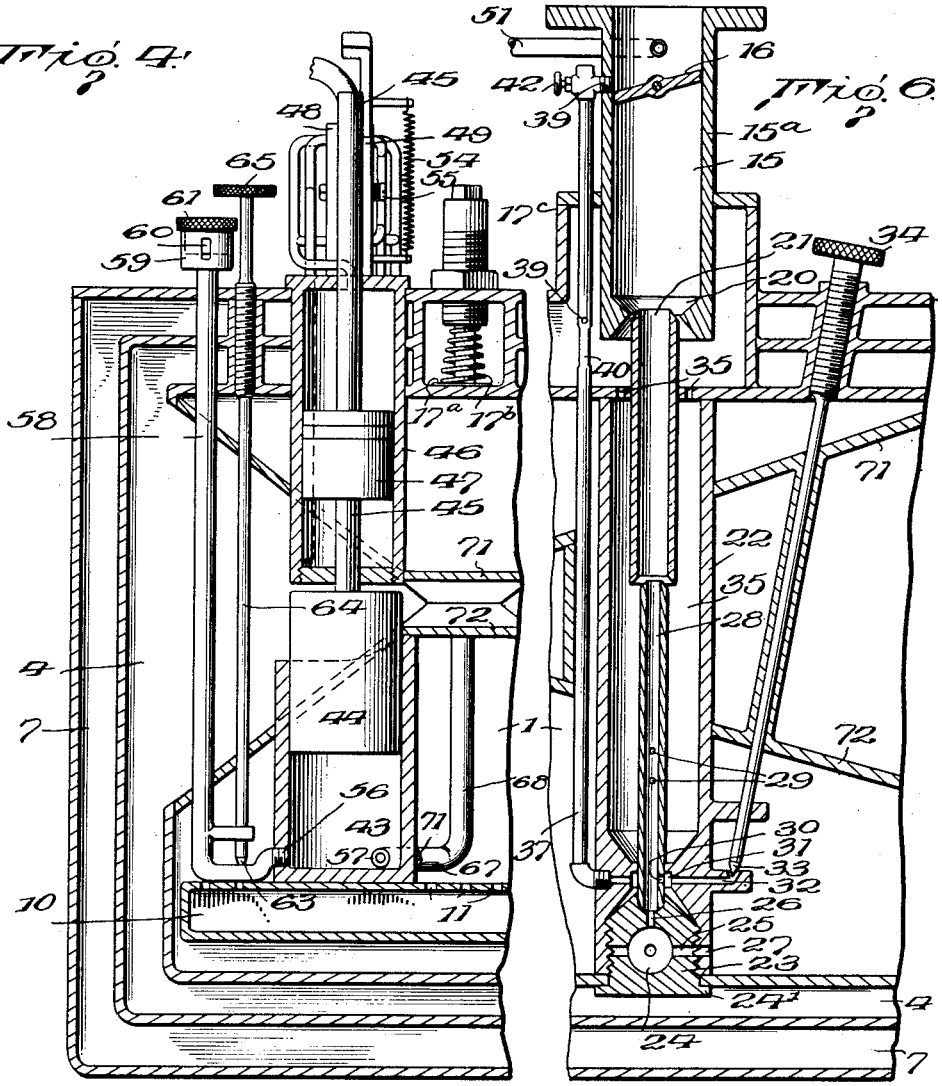


Fig. 6.

Fig. 7.

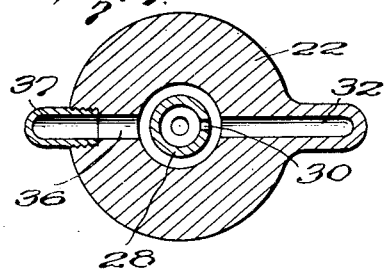
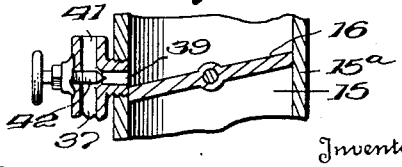


Fig. 8.



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UNITED STATES PATENT OFFICE

1,938,497

CARBURETOR

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Application November 12, 1932
Serial No. 642,434

11 Claims. (Cl. 261—124)

This invention relates to a device for obtaining an intimate contact between a liquid in a vaporous state and a gas, and particularly to such a device which may serve as a carburetor for internal combustion engines.

Carburetors as commonly used for supplying a combustible mixture of air and liquid fuel to internal combustion engines comprise a bowl in which a supply of the fuel is maintained in the liquid phase and a fuel jet which extends from said supply of liquid fuel and terminates in a passage through which air is drawn by the suction of the engine cylinders. On the suction, or intake stroke of the cylinders air is drawn over and around the fuel jet and a charge of liquid fuel is drawn therefrom and broken up and partially vaporized during its passage to the engine cylinders. However, I have found that in such carburetors a relatively large amount of the atomized liquid fuel is not vaporized and enters the engine cylinder in the form of microscopic droplets. When such a charge is "fired" in the engine cylinder only that portion of the liquid fuel which has been converted into the vaporous and consequently the molecular state, combines with the air to give an explosive mixture. The remaining portion of the liquid fuel which is drawn into the engine cylinders and remains in the form of small droplets does not explode and thereby impart power to the engine, but burns with a flame and raises the temperature of the engine above that at which the engine operates most efficiently, i. e., from 160° to 180° F.

According to this invention a carburetor for internal combustion engines is provided in which substantially all of the liquid fuel entering the engine cylinder will be in the vapor phase and consequently capable of combining with the air to form a mixture which will explode and impart a maximum amount of power to the engine, and which will not burn and unduly raise the temperature of the engine.

A mixture of air and liquid fuel in truly vapor phase in the engine cylinder is obtained by vaporizing all or a large portion of the liquid fuel before it is introduced into the intake manifold of the engine. This is preferably done in a vaporizing chamber, and the "dry" vaporous fuel is drawn from the top of this chamber into the intake manifold on the intake or suction stroke of the engine. The term "dry" as used herein refers to the fuel in the vaporous phase which is at least substantially free from droplets of the fuel in the liquid phase, which droplets on the "firing" of the air and fuel mixture in the engine cylinder would burn with a flame rather than explode.

More particularly the invention comprises a carburetor embodying a vaporizing chamber in the bottom of which a constant body of liquid fuel is maintained, and in the top of which there is always maintained a supply of "dry" vaporized fuel ready for admission into the intake manifold of the engine. The supply of vaporized liquid fuel is maintained by drawing air through the supply of liquid fuel in the bottom of the vaporizing chamber and also by constantly atomizing a portion of the liquid fuel therein so that it may more readily pass into the vapor phase. This is preferably accomplished by a double acting suction pump operated from the intake manifold which forces a mixture of the liquid fuel and air against a plate located within the chamber. To obtain a more complete vaporization of the liquid fuel the vaporizing chamber and the air to be commingled with the liquid fuel is preferably heated by the exhaust gases from the engine. The carburetor also includes means for initially supplying a mixture of air and vaporized fuel so that the starting of the engine will not be dependent upon the existence of a supply of fuel vapors in the vaporizing chamber.

The invention will be further described in connection with the accompanying drawings but this further disclosure and description is to be taken as an exemplification of the invention and the same is not limited thereby except as is pointed out in the subjoined claims.

In the drawings:

Fig. 1 is an elevational view of a carburetor embodying my invention,

Fig. 2 is a vertical cross sectional view through the center thereof,

Fig. 3 is a horizontal sectional view on line 3—3 of Fig. 2,

Fig. 4 is an enlarged vertical sectional view through one of pump cylinders and adjacent parts of the carburetor,

Fig. 5 is an enlarged view through the complete double-acting pump and showing the distributing valve associated therewith,

Fig. 6 is an enlarged vertical sectional view through the atomizing nozzle for supplying a starting charge for the engine,

Figs. 7 and 8 are detail sectional views of parts shown in Fig. 6, and

Figs. 9 and 10 are detail sectional views showing the inlet and outlet to the cylinders of the atomizing pump.

Referring to the drawings, the numeral 1 in-

dicates a combined vaporizing chamber and fuel bowl in which liquid fuel is maintained at the level indicated in Fig. 1 by a float valve 2 controlling the flow of liquid fuel through the pipe 3 which leads from the vacuum tank or other liquid fuel reservoir.

The vaporizing chamber 1 is surrounded by a chamber 4 through which hot exhaust gases from the engine enter by means of pipe 5 located at the bottom of the chamber. These gases pass around the vaporizing chamber 1 and thereby heat the chamber to accelerate vaporization of the liquid fuel, and then pass out through the upper outlet pipe 6.

The chamber 4 for the hot exhaust gases is, in turn, surrounded by a chamber 7 into which atmospheric air for vaporizing a part of the liquid fuel in the chamber 1 enters through a lower intake pipe 8. This air passes upwardly around the chamber 4 for the hot exhaust gases and becomes heated. A portion of the heated air then passes through a pipe 9 into an aerator 10 located in the bottom of the vaporizing chamber 1 and submerged in the liquid fuel therein. The aerator 10 comprises a relatively flat chamber which extends over a substantial portion of the bottom of the chamber and has a large number of small orifices 11 in the upper wall thereof. The heated atmospheric air entering the aerator passes through the orifices 11 as small bubbles which then pass upward through the liquid fuel. These bubbles, together with the heat imparted to the vaporizing chamber from the hot exhaust gases, cause a vaporization of a portion of the liquid fuel.

Another portion of the air from the chamber 7 passes through a connection 12 into the passage 13 through which air is drawn directly from the atmosphere into the intake manifold. The passage 13 is provided with valve 14 which is normally held closed by a spring 14*a* the tension of which may be adjusted by means of the threaded plug 14*b*. The passage 13 has an upward extension 13*a*, in which is located a choke valve 13*b* for assisting in starting the engine as will be more particularly pointed out below. The passage 13 passes through the vaporizing chamber 1 and has its inner end communicating with a passage 15 in a member 15*a* which is secured to the intake manifold of the engine. The passage 15 is provided with the usual butterfly valve 16 whereby the amount of fuel admitted to the engine cylinders, and consequently the speed of the engine may be regulated.

The portion of the passage 13 which passes through the vaporizing chamber has an opening 17 normally closed by a valve 17*a* which is held against its seat by a spring 17*b*, the tension of which may be adjusted by a threaded plug 17*c*. As air is drawn past the valve 14 and through the passage 13 on the intake or suction stroke of the engine the valve 17*a* will be lifted from its seat and a portion of the dry fuel vapors from the upper portion of the vaporizing chamber will be sucked into the passage 13 through the opening 17 and commingle with the air therein before it enters the passage 15.

In order that the amount of air passing from the chamber 7 to the aerator 10 and into the passage 13 may be regulated, the pipe 9 and the connection 12 are provided with suitable valves 18 and 19 respectively. As will be pointed out later on, the valve 18 in the pipe 9 is operatively connected to and works in synchronism with the butterfly valve 16 in the passage 15. The valve 19 is adjustable and is preferably connected to work in synchronism with the butterfly valve 16 as shown, but it is not essential that this valve and the butterfly valve 16 operate in synchronism.

The bottom of the passage 15 is made in the form of a venturi 20 and a nozzle 21 for atomized liquid fuel and air is located at or adjacent the point of greatest restriction. The nozzle 21 is preferably supplied with fuel from the supply of liquid fuel in the bottom of the vaporizing chamber and to that end a member 22 is secured within the vaporizing chamber by a removable threaded plug 23 having a flanged lower end 24. The plug 22 extends through an opening in the bottom of the chamber 1 and is threaded into the bottom of the member 22. This causes the bottom wall of the chamber 1 to be securely clamped between the lower end of the member 22 and the flange 24 and the member 22 thereby securely retained in place.

The plug 23 is provided with a sediment bowl 24 and extending from the bowl 24 are a plurality of small laterally extending passages 25 and a central vertical passage 26. The lateral passages 25 register with corresponding passages 27 located in the lower end of the member 22 at a level lower than that at which fuel stands in the chamber 1, whereby liquid fuel is free to pass into the bowl 24.

The vertical passage 26 communicates with a vertical nozzle 28 which terminates within the flaring lower end of the nozzle 21. The exterior diameter of the nozzle 26 is less than the interior diameter of the nozzle 21 so that a space is provided between them for the passage of air or air and vapor mixtures. The nozzle 26 is also provided with a series of inlets 29 for air or air and vapor mixtures, and a fuel inlet 30. The fuel inlet 30 communicates with a chamber 31 located in the member 22 and surrounding the nozzle 28. The chamber 30 is supplied with liquid fuel by means of a passage 32 which is controlled by a needle valve 33, the stem of which extends to the outside of the carburetor and is provided with a knurled nut 34 for adjusting purposes.

The upper end of the member 22 is made hollow to provide a space 35 surrounding the nozzles 21 and 28. The lower wall of the passage 13 is provided with a series of openings 35*a* to permit vapors therefrom to enter the space 35, from which they may pass through inlets 29 into the nozzle 28, and around the upper end of the nozzle 28 into the lower end of the nozzle 21.

Extending from the chamber 31 at the side thereof opposite the passage 32 is a passage 36 which communicates with a conduit 37 extending upwardly through the passage 13 and connecting through a lateral extension 39 with the passage 15 just above the butterfly valve 16. The portion of the conduit 37 which extends through the passage 13 is provided with an orifice 39 whereby air, or air and fuel vapors may be drawn from the passage 13 into the conduit 37 to commingle with, and atomize the liquid fuel being drawn through the conduit. To further assist in this atomization of the liquid fuel passing through the conduit 37, the conduit is restricted at 40 just below the orifice 39.

The upper end of the conduit 37 is in communication with the atmosphere through an opening 41 whereby atmospheric air may be drawn directly into the upper portion of the conduit. The relative proportion of atmospheric air and combustible vapors from the conduit 37 to be ad-

mitted into the intake manifold is controlled by a needle valve 42.

As the nozzle 21 enters directly into the lower end of the passage 15 suction in the intake manifold will, in turn, create a suction on the nozzle 21 which will cause a mixture of atomized fuel and air to be drawn therethrough directly into the intake manifold. This is found to be desirable in starting the engine, particularly in cold weather, when there might not be an adequate supply of vapors in the vaporizing chamber, or the mixture of air and vapors passing through the passage 13 might be too "lean" to cause a prompt starting of the engine. At such time, closing the choke valve 13*b* will cause the maximum suction to be exerted on the nozzle 21 and the maximum amount of air and atomized fuel to be drawn therefrom directly into the intake manifold. After the engine has been started only a small portion of the combustible air and vapor mixture necessary for proper operation of the engine is drawn through nozzle 21 as the choke valve will then be open to a greater extent and substantially all of the air and vapor mixture necessary for operation of the engine will be drawn through the lower end 20 of the passage 15, around the nozzle 21.

The conduit 37 extending from the fuel chamber 31 to a point above the butterfly valve 16 provides an adequate supply of fuel when the engine is idling with the valve 16 closed, or nearly closed.

The casings forming the chambers 1, 4 and 7 will be provided with the necessary openings, to be subsequently closed, whereby the various parts may be assembled, and so that the parts will be accessible after being assembled for adjustments or repairs.

In operation of the carburetor as so far described, the intake stroke of the engine creates a suction in the intake manifold which, in turn, causes atmospheric air to be drawn past the spring valve 14 into the passage 13 and simultaneously therewith a portion of the dry fuel vapors from the top of the vaporizing chamber 1 are drawn through the opening 17 past the valve 17*a* to commingle with the air passing through the passage. The commingled air and fuel vapors then pass through the passage 15 to the intake manifold and engine cylinders.

The drawing of the dry fuel vapors into the passage 13 creates a partial vacuum in the chamber 1 which causes atmospheric air to be drawn into the chamber 7 around the heated chamber 4 from which it passes through connection 12 and valve 19 into passage 13, and through pipe 9 and valve 18 into aerator 10, from which it bubbles up through the liquid fuel in the bottom of chamber 1 to vaporize more liquid fuel.

To assist in maintaining a supply of dry fuel vapors in the upper portion of the vaporizing chamber 1, the carburetor is provided with means for atomizing a portion of the liquid fuel in the vaporizing chamber 1. This atomizing means preferably comprises a double-acting pump which is operated by the suction existing in the intake manifold of the engine.

The double-acting pump comprises a pair of cylinders 43 which have their lower ends located in the vaporizing chamber 1, and each of which has a pump piston 44 reciprocably mounted therein. The pistons 44 have rods 45 extending from their upper ends. These rods pass through cylinders 46 and have mounted on them, within the cylinders 46, pistons 47.

The cylinders 46 are connected at each end to a distributing valve V which is adapted alternately to connect the cylinders with the intake manifold so that the suction therein will cause the two pistons 44 to operate as a double-acting suction pump.

The distributing valve V comprises a pair of disks 48 and 49 between which is located a hollow oscillatable chamber 50 which is constantly subjected to the suction existing in the intake manifold through a connection 51 having a valve 52 therein. The chamber 50 has a pair of upper openings and a pair of lower openings. These openings are so arranged with respect to the conduits leading to the opposite ends of the cylinders 46 that the suction of the engine simultaneously exerts a force tending to cause one piston 47 to be raised, while the other piston 47 is being forced down.

The oscillatable chamber 50 has a T-shaped extension 53 extending therefrom. The arms of the extension are alternately engageable by the upper ends of the piston rods 45 to cause a shifting of the position of the chamber 50 of the distributing valve V to cause the proper conduits leading to the cylinders 46 to be brought into communication with the intake manifold.

A spring 54 causes a quick opening and closing of the ports leading to the cylinders 46 so that at no time will the suction of the engine be exerted on both pistons 47.

The tension between the disks 48 and 49, and the oscillatable chamber 50 may be regulated by a screw 55.

The particular form of the distributing valve V is not claimed herein so a furtther description of its operation is not here necessary. As far as the present invention is concerned any form of means for imparting movement to the pistons 47 may be substituted for the valve V and its associated parts.

The cylinders 43 are each provided with inlets and outlets 56 and 57, each located below the fuel level in the chamber 1. The inlets 56 are connected to horizontally and upwardly extending conduits 58 which pass through the carburetor to the outside thereof. The upper ends of these conduits are enlarged at 59 and are provided with a vertically extending slot 60. The enlarged ends 59 are interiorly threaded to receive plugs 61. The position of the plugs 61 with respect to the slots 60 determines the amount of air which may pass through the slots 60 and consequently into the cylinder 43 on the suction stroke of the pistons 44.

The upper walls of the horizontal portions of the conduits 58 have an opening 62 for the passage of liquid fuel from the chamber 1. The extent to which liquid fuel may pass through these openings is controlled by needle valves 63, whose stems 64 pass upwardly through and out of the carburetor and terminate in knurled adjusting nuts 65.

The horizontal portion of each conduit 58 is also provided with a check valve 66, shown in Fig. 10, which permits atmospheric air to be drawn into the cylinders through the conduits 58 but prevents liquid fuel from being forced upwardly through the conduits on the down stroke of the pistons 44.

The outlets 57 connect with horizontally extending pipes 67 which merge into a single upwardly extending open-ended pipe 68. The upper open end of the pipe 68 terminates about midway of the height of the vaporizing chamber 1 and is provided with a bail 69 which carries a deflecting

plate 70 positioned directly over the open end of the pipe 68.

The horizontally extending pipes 67 are provided with check valves 71 which permit the commingled air and fuel to be forced from the cylinders 43 by the pistons 44, but which prevent fuel vapors from being drawn from the chamber 1 into the cylinders 43.

In operation, the pistons 44 on the up strokes draw a charge of atmospheric air and liquid fuel into the cylinders 43, and on the down stroke discharge the charge in an atomized condition through the pipes 67 and 68 against the deflecting plate 70. The deflecting plate 70 further atomizes the particles of liquid fuel so that they will readily vaporize. Any portions of the liquid fuel which do not vaporize drop down into the supply of liquid fuel in the bottom of the vaporizing chamber where they are subjected to the vaporizing influence of the heated bubbles of air coming from the aerator 10, and may again pass into the cylinders 43.

As previously stated the vaporized fuel for introduction into the intake manifold of the engine are taken from the upper portion of the vaporizing chamber 1. To ensure that the vapors in this portion of the chamber 1 shall contain no, or substantially no entrained droplets of liquid fuel, the chamber 1 is divided into upper and lower portions by the walls 71 and 72 which converge from all directions to form a central opening 73. With the vaporizing chamber thus divided into upper and lower portions which are connected only by the relatively small opening 73 any droplets entrained by the bubbles rising from the aerator 10 will come in contact with the sloping wall 72 and be deflected back into the main body of liquid fuel in the bottom of the chamber. Likewise, the droplets of atomized fuel being forced from the upper end of the pipe 68 will, on striking the plate 70 be deflected back into said body of liquid fuel and not pass into the upper portion of the chamber.

In order that the speed of operation of the atomizing pump may be governed by the speed at which the engine is running, and further that the amount of air admitted from the chamber 7 to the aerator 10, and to the passage 13 through the connection 12 may be increased as the speed of the engine increases the valves 18, 19 and 52 and butterfly valve 16 are all connected by suitable linkage L so that as the butterfly valve 16 is opened to increase the speed of the engine the valves 18, 19 and 52 will be correspondingly opened.

As shown in Fig. 2, the passage of the exhaust gases from the engine to the heating chamber 4 located between the vaporizing chamber and the air chamber 7 is controlled by a valve 74. The opening and closing of the valve 74 is controlled thermostatically and in accordance with the temperature prevailing in the chamber 4, by means of an adjustable metal rod 75 having a high coefficient of expansion, whereby the optimum temperature may be maintained in the vaporizing chamber irrespective of the surrounding temperature.

From the foregoing description it will be understood that the present invention provides a carburetor for supplying to internal combustion engines a commingled mixture of air and liquid fuel vapor free from microscopic droplets of liquid fuel which would burn rather than explode in the cylinders and that a supply of such dry vaporized fuel is constantly maintained in the carburetor.

I claim:

1. A carburetor for internal combustion engines comprising a vaporizing chamber, a double acting suction pump for continuously pumping liquid fuel to be atomized within said chamber whereby vaporization of the liquid fuel therein is accelerated, and means whereby vapors may be withdrawn from said chamber.

2. A carburetor for internal combustion engines having a butterfly valve for regulating the amount of fuel passing to the intake manifold comprising a vaporizing chamber divided into an upper compartment and a lower compartment, the top of the lower compartment sloping upwardly and the bottom of the upper compartment sloping downwardly to a passage connecting said compartments, means for maintaining a supply of liquid fuel in the lower part only of the lower compartment, an aerator located in the lower compartment below the fuel level, means whereby a portion of the atmospheric air to be drawn into the engine cylinders is caused to pass through the aerator and to bubble up through the liquid fuel with resulting vaporization of the fuel in the space thereabove, a passage for conducting vapors from the upper compartment to the intake manifold of the engine, a passage for conducting air from the atmosphere to the intake manifold a heating chamber surrounding the vaporizing chamber, a chamber surrounding said heating chamber into which atmospheric air may pass, means for admitting air from said last mentioned chamber into the atmospheric-air passage leading to the intake manifold, and means operated in accordance with the setting of the butterfly valve for regulating the amount of air passing from said last mentioned chamber into the said atmospheric-air passage.

3. A carburetor for internal combustion engines comprising a vaporizing chamber divided into an upper compartment and a lower compartment, the top of the lower compartment sloping upwardly and the bottom of the upper compartment sloping downwardly to a passage connecting said compartments, means for maintaining a supply of liquid fuel in the lower part only of the lower compartment, an aerator located in the lower compartment below the fuel level, means whereby a portion of the atmospheric air to be drawn into the engine cylinders is caused to pass through the aerator and to bubble up through the liquid fuel with resulting vaporization of the fuel in the space thereabove, a passage for conducting vapors from the upper compartment to the intake manifold of the engine, a passage for conducting air from the atmosphere to the intake manifold a heating chamber surrounding the vaporizing chamber, a chamber surrounding said heating chamber into which atmospheric air may pass, and means for admitting air from said last mentioned chamber into the atmospheric air passage leading to the intake manifold.

4. A carburetor for internal combustion engines comprising a vaporizing chamber divided into an upper compartment and a lower compartment, means for maintaining a supply of liquid fuel in the lower part only of the lower compartment, an aerator located in the lower compartment below the fuel level, means whereby atmospheric air to be drawn into the engine cylinders is caused to pass through the aerator

and to bubble up through the liquid fuel with resulting vaporization of the fuel in the space thereabove, a pipe for conducting air directly from the atmosphere to the intake manifold of the engine, a passage through which vapors from the upper compartment pass into said atmospheric-air passage for introduction into the intake manifold, and means for maintaining the latter passage closed except on the suction stroke of the engine.

5. A carburetor for internal combustion engines comprising a vaporizing chamber, means for maintaining a supply of liquid fuel in the bottom only of said chamber, means whereby a portion of the atmospheric air to be drawn into the engine cylinders is caused to pass through the liquid fuel in the bottom of said chamber and thereby cause vaporization of a portion of the liquid fuel, a passage for conducting air from the atmosphere to the intake manifold, a passage through which vapors from the vaporizing chamber may pass to the intake manifold, a valve normally preventing the passage of vapors from the vaporizing chamber to the intake manifold, said valve being ineffective to control passage of air through said air passage, said valve being automatically opened during operation of the engine to an extent proportional to the extent to which the pressure in the intake manifold is reduced, the vapor space in the vaporizing chamber being sufficiently large that upon any stroke of the engine only a minor portion of the vapors therein will pass from the vapor space of said chamber to the intake manifold.

6. A carburetor for internal combustion engines comprising a vaporizing chamber, means for maintaining a supply of liquid fuel in the bottom only of said chamber, means whereby a portion of the atmospheric air to be drawn into the engine cylinders is caused to pass through the liquid fuel in the bottom of said chamber and thereby cause vaporization of a portion of the liquid fuel, a passage for conducting air from the atmosphere to the intake manifold, a passage through which vapors from the vaporizing chamber may pass to the intake manifold, a suction-operated valve normally preventing the passage of vapors from the vaporizing chamber to the intake manifold, said valve being ineffective to control passage of air through said air passage, said valve being automatically opened upon a reduction in pressure in the intake manifold and to an extent proportional to the extent to which the pressure therein is reduced, the vapor space in the vaporizing chamber being sufficiently large that upon any stroke of the engine only a minor portion of the vapors therein will pass from the vapor space of said chamber to the intake manifold.

7. A carburetor for internal combustion engines comprising a vaporizing chamber, means for maintaining a supply of liquid fuel in the bottom only of said chamber, means whereby a portion of the atmospheric air to be drawn into the engine cylinders is caused to pass through the liquid fuel in the bottom of said chamber and thereby cause vaporization of a portion of the liquid fuel, a passage for conducting air from the atmosphere to the intake manifold, a passage connecting the vapor space of the vaporizing chamber to said air passage, a valve normally preventing the passage of vapors through said last mentioned chamber, said valve being automatically opened during operation of the engine to an extent proportional to the extent to which the pressure in the intake manifold is reduced, the vapor space in the vaporizing chamber being sufficiently large that upon any stroke of the engine only a minor portion of the vapors therein will pass from the vapor space of said chamber to the intake manifold.

8. A carburetor for internal combustion engines comprising a vaporizing chamber, means for maintaining a supply of liquid fuel in the bottom only of said chamber, means whereby a portion of the atmospheric air to be drawn into the engine cylinders is caused to pass through the liquid fuel in the bottom of said chamber and thereby cause vaporization of a portion of the liquid, an atomizing nozzle in the vaporizing chamber for atomizing another portion of liquid fuel, a passage for conducting air from the atmosphere to the intake manifold, a passage through which vapors from the vaporization chamber may pass to the intake manifold, a valve normally preventing the passage of vapors from the vaporizing chamber to the intake manifold, said valve being ineffective to control passage of air through said air passage, said valve being automatically opened during operation of the engine to an extent proportional to the extent to which the pressure in the intake manifold is reduced, the vapor space in the vaporizing chamber being sufficiently large that upon any stroke of the engine only a minor portion of the vapors therein will pass from the vapor space of said chamber to the intake manifold.

9. A carburetor for internal combustion engines comprising a vaporizing chamber, means for maintaining a supply of liquid fuel in the bottom only of said chamber, means whereby a portion of the atmospheric air to be drawn into the engine cylinders is caused to pass through the liquid fuel in the bottom of said chamber and thereby cause vaporization of a portion of the liquid, an atomizing nozzle in the vaporizing chamber for atomizing another portion of liquid fuel, means for continuously pumping liquid fuel through said nozzle when the engine is operating, a passage for conducting air from the atmosphere to the intake manifold, a passage through which vapors from the vaporizing chamber may pass to the intake manifold, a valve normally preventing the passage of vapors from the vaporizing chamber to the intake manifold, said valve being ineffective to control passage of air through said air passage, said valve being automatically opened during operation of the engine to an extent proportional to the extent to which the pressure in the intake manifold is reduced, the vapor space in the vaporizing chamber being sufficiently large that upon any stroke of the engine only a minor portion of the vapors therein will pass from the vapor space of said chamber to the intake manifold.

10. A carburetor for internal combustion engines comprising a vaporizing chamber, means for maintaining a supply of liquid fuel in the bottom only of said chamber, means whereby a protion of the atmospheric air to be drawn into the engine cylinders is caused to pass through the liquid fuel in the bottom of said chamber and thereby cause vaporization of a portion of the liquid fuel, a passage for conducting air from the atmosphere to the intake manifold, an atomizing nozzle in said passage for atomizing liquid

fuel therein, a passage through which vapors in the vaporizing chamber may pass to the intake manifold, a valve normally preventing the passage of vapors from the vaporizing chamber to the intake manifold, said valve being ineffective to control passage of air through said air passage, said valve being automatically opened during operation of the engine to an extent proportional to the extent to which the pressure in the intake manifold is reduced, the vapor space in the vaporizing chamber being sufficiently large that upon any stroke of the engine only a minor portion of the vapors therein will pass from the vapor space of said chamber to the intake manifold.

11. A carburetor for internal combustion engines comprising a vaporizing chamber, means for maintaining a supply of liquid fuel in the bottom only of said chamber, means whereby a portion of the atmospheric air to be drawn into the engine cylinders is caused to pass through the liquid fuel in the bottom of said chamber and thereby cause vaporization of a portion of the liquid fuel, an atomizing nozzle in the vaporizing chamber for atomizing another portion of liquid fuel, means for continuously pumping liquid fuel through said nozzle when the engine is operating, a passage for conducting air from the atmosphere to the intake manifold, a liquid fuel atomizing nozzle in said air passage, a passage leading from the vapor space of the vaporizing chamber to said air passage, a valve normally preventing the passage of vapors from said last mentioned passage to the air passage, said valve being automatically opened during operation of the engine to an extent proportional to the extent to which the pressure in the intake manifold is reduced, the vapor space in the vaporizing chamber being sufficiently large that upon any stroke of the engine only a minor portion of the vapors therein will pass from the vapor space of said chamber to the intake manifold.

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