W. C. CARTER.

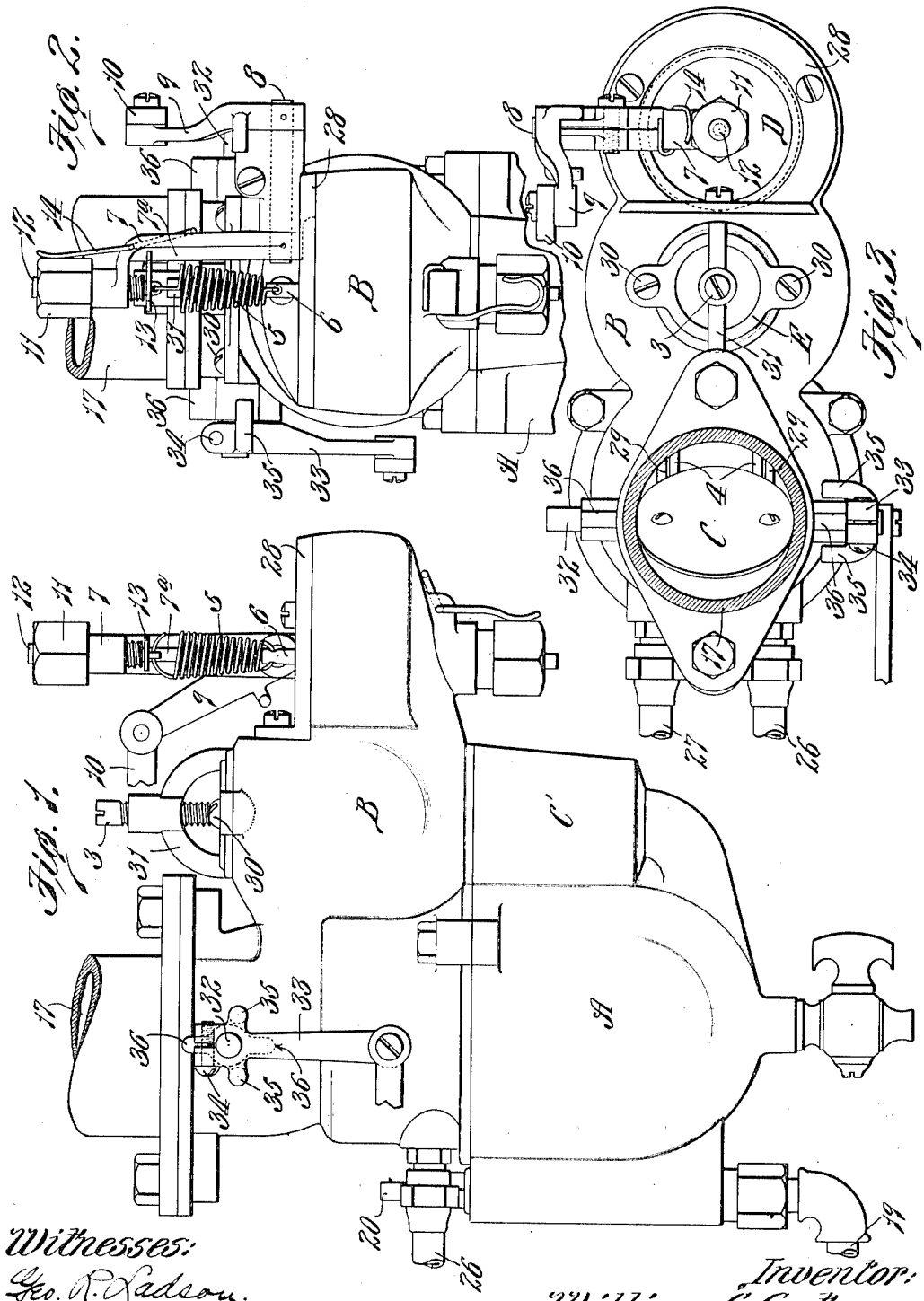
CARBURETER.

APPLICATION FILED NOV. 8, 1909.

1,040,619.

Patented Oct. 8, 1912.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 6.

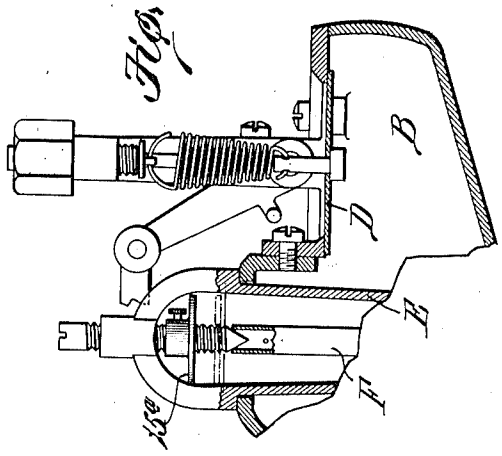


Fig. 5.

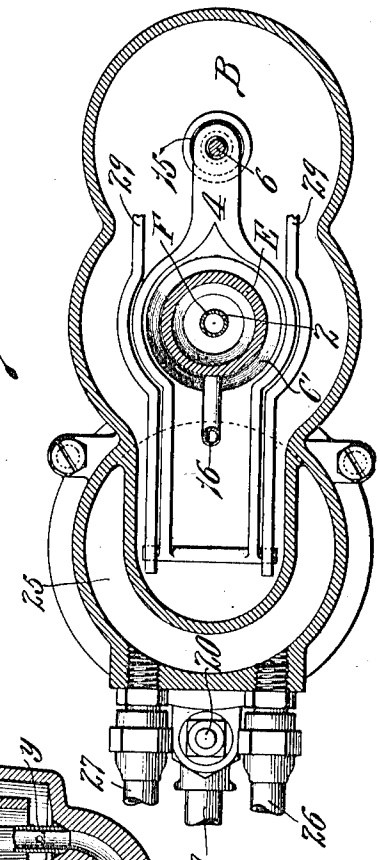
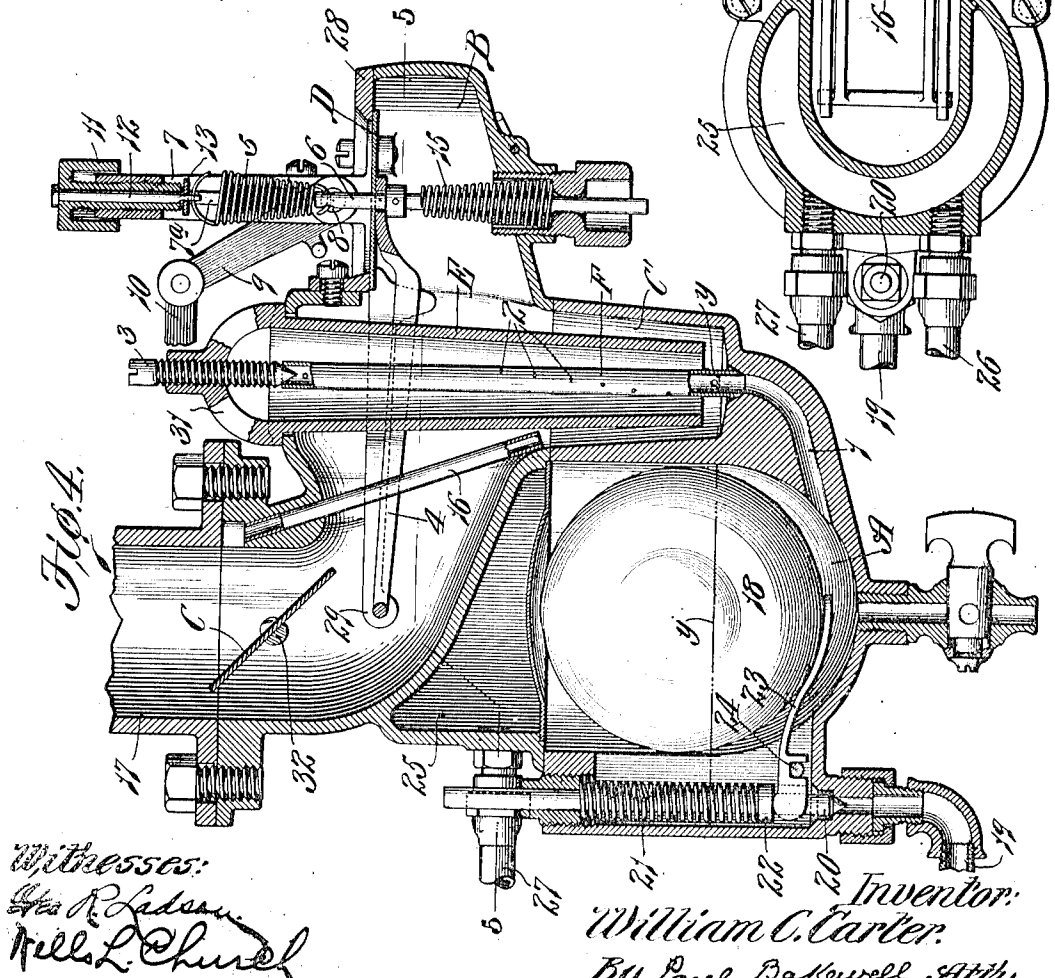


Fig. 4.



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UNITED STATES PATENT OFFICE.

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CARBURETER.

1,040,619. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed November 8, 1909. Serial No. 526,823.

To all whom it may concern:

Be it known that I, WILLIAM C. CARTER, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Carbureters, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to carbureters, and particularly to multiple jet carbureters although some features of the invention are applicable to the other types of carbureters now in general use.

One object of my present invention is to provide a multiple jet carbureter that is compact and which will produce a uniform mixture at any speed of the motor with which the carbureter is used.

Another object is to provide a carbureter that can be installed with very little trouble and adjusted easily.

Another object is to provide a carbureter which is so constructed that the liquid fuel will not collect on the walls of the mixing chamber when the motor is throttled down, thus preventing a charge of raw fuel from entering the cylinders of the motor when the throttle valve is thereafter opened. And still another object of my invention is to provide a multiple jet carbureter of simple construction that can be manufactured at a low cost.

Figure 1 of the drawings is a front elevational view of a carbureter constructed in accordance with my invention; Fig. 2 is an end view of said carbureter; Fig. 3 is a top plan view; Fig. 4 is a vertical sectional view; Fig. 5 is a horizontal sectional view taken on approximately the line 5—5 of Fig. 4; and Fig. 6 is a vertical sectional view of a slightly modified form of my invention.

Referring to Figs. 1 to 5 of the drawings which illustrate the preferred form of my invention, A designates the float chamber of my improved carbureter, B designates the mixing chamber, and C designates the throttle valve that controls the passage of the mixture from the mixing chamber into the cylinders of the motor.

The mixing chamber is provided with an auxiliary air valve D which will be hereinafter described, and a vertically disposed air pipe E is arranged at approximately the center of the mixing chamber between the throttle valve and the auxiliary air valve. The mixing chamber is provided with a contracted portion C′ which is of approximately cylindrical shape, and the air pipe E projects into said contracted portion, as shown in Fig. 4. The lower end of this air pipe terminates a short distance from the bottom of the contracted portion C′ of the mixing chamber, and the outer surface of said pipe is spaced away from the inner surface of the walls of said contracted portion C′ so as to provide a passageway for the air that is drawn down through said pipe by the suction created in the mixing chamber, the upper end of said pipe, of course, being open, as shown clearly in Fig. 4.

The liquid fuel passes from the float chamber through a duct 1 into the lower end of a vertically disposed jet tube F that is arranged inside of the air pipe E, said tube being provided with a plurality of very fine ducts 2 that permit the liquid fuel to escape from said tube in the form of a fine spray and be vaporized by the air that passes down through the air pipe. The uper end of the jet tube is closed by a screw 3 so that the air which rushes down through the air pipe will suck the air out of the upper portion of the jet tube and thus create a partial vacuum in said tube which causes the liquid fuel to rise therein. When the speed of the motor increases, a greater suction will be produced in the mixing chamber and more air will be drawn down through the air pipe, thus creating a greater vacuum in the jet tube and causing the fuel to rise higher therein and bring more of the ports 2 into service. When the speed of the motor is reduced, the supply of air through the air pipe will be diminished and the supply of liquid fuel from the jet tube will also be cut down owing to the fact that the fuel in said tube drops or seeks a lower level whenever the vacuum in the upper part of the tube is reduced.

From the foregoing it will be seen that with a carbureter of this construction the supply of liquid fuel which emerges from the jet tube will vary automatically as the speed of the motor varies. Furthermore, the liquid fuel is split up or divided into such minute particles in passing through the small orifices in the jet tube that it becomes vaporized before it enters the mixing chamber.

I have herein shown an air pipe E which is approximately funnel-shaped or enlarged

at its upper end. It is not absolutely necessary, however, to use an air pipe of this shape for an air pipe of the same cross sectional area throughout its entire length would produce equally good results. I prefer though to use a flared or tapered air pipe so that the velocity of the air will increase gradually as it travels downwardly through same and thus produce practically the same results as would be produced with a longer jet tube and an air pipe of the same cross sectional area throughout its entire length.

The quantity of air that enters the mixing chamber through the air pipe E is sufficient to produce a mixture of the proper richness up to a certain speed of the motor, but when the motor exceeds this speed the quantity of liquid fuel that emerges from the jet tube is so much greater than the quantity of air that passes down through the air pipe that too rich a mixture will be produced. Therefore, it is necessary to provide some means for admitting additional air into the mixing chamber to cut down the exceedingly rich charge of fuel that enters the mixing chamber when the motor attains a certain speed, and in the embodiment of my invention herein shown, the means for supplying this additional air is the air valve D, previously referred to. Said valve D is preferably carried by a pivoted arm 4, and a coiled contractile spring 5 is provided for holding said valve seated. The lower end of the spring 5 is connected to a pin or stem 6 which projects upwardly from the valve D, and the upper end of said spring is connected to an arm 7 that is adapted to be adjusted toward and away from the pivot of the arm 4 which carries the valve so as to vary the tension which said spring exerts on the air valve D. The arm 7 is secured to a rock shaft 8 provided with an arm 9 to which an operating device 10 is connected, said operating device preferably consisting of a link that can be controlled at a point some distance from the carbureter, as, for example, by the driver of the car on which the carbureter is used.

Instead of permanently connecting the upper end of the spring 5 to the arm 7 I prefer to adjustably connect said spring and arm together, the means herein shown for accomplishing this consisting of a nut 11 mounted on the arm 7 and provided with a central bore through which a headed pin 12 passes, the upper end of the spring being connected to the lower end of said pin. By turning the nut 11 the spring 5 can be shortened or lengthened and thus vary the tension of same. I prefer to use a cone-shaped spring 5 arranged in the manner herein shown, and I also prefer to provide the pin 12 with a laterally projecting wing 13 that travels on a guide 7^a on the arm 7 so as to prevent said pin from turning when the nut 11 is adjusted. The nut 11 is provided with a non-circular head or a head provided with one or more flat surfaces, and the arm 7 is provided with a spring 14 that bears against the nut 11 so as to hold it in its adjusted position. The spring 5 exerts a certain tension on the opening movement of the air valve when the rock arm 7 is in its normal position shown in Fig. 4 so that a certain suction in the mixing chamber will cause the air valve to open a certain distance, namely, a distance corresponding to the elongation of the spring 5. If the operator finds that the air valve does not open far enough when the arm 7 is in this position to admit sufficient air to produce a charge of the proper richness he moves said arm to the right, looking at Fig. 4, so as to shift the spring 5 from a vertical position into an approximately oblique position and thus reduce the tension which it exerts on the opening movement of the air valve. When the spring 5 is in this position, namely, an approximately oblique position, the lower end of same will swing downwardly a short distance when the valve starts to open, before the normal tension on the spring is again established, and consequently a greater quantity of air will enter the mixing chamber.

The nut 11 is only adjusted when the carbureter is installed, and thereafter the adjustment of the air valve is controlled by the link or operating device 10 which causes the spring 5 to be shifted or moved bodily.

If desired, a yielding buffer, such, for example, as a coiled expansion spring 15, can be arranged under the air valve, as shown in Fig. 4, so as to retard the opening movement of said valve when the motor is running at high speed. When the motor is running at slow speed or at medium speed, this spring 15 has no effect on the air valve, but when high speed is attained and the air valve tends to open a greater distance the spring 15 comes into service and exerts a yielding pressure on the air valve and consequently retards the opening movement of same. This spring 15 is not at all essential, however, to the successful operation of my carbureter for the same result could be accomplished in various other ways, such, for example, as by providing means for controlling the supply of air to the air pipe E.

In Fig. 6 I have illustrated such a construction wherein the spring 15 is omitted and an adjustable valve 15^a is provided for varying the quantity of air that enters the upper end of the air pipe E. I do not wish it to be understood, however, that my broad idea is limited to an air-controlling device such as that shown in Fig. 6 for various other means could be employed for this purpose.

One of the novel features of my present invention consists in means for preventing the liquid fuel from collecting on the walls

of the mixing chamber when the motor is throttled down so that a charge of raw fuel will not pass into the cylinders of the motor when the throttle valve is thereafter opened. The means herein shown for accomplishing this desirable result consists of a short tube 16 arranged in the mixing chamber in such a manner that communication is established between the mixing chamber and the intake pipe 17 when the motor is throttled down. The upper end of the pipe 16 terminates at a point above the throttle valve, and the lower end of said pipe terminates adjacent the contracted portion C′ of the mixing chamber so that the small quantity of air and liquid fuel that is sucked into the mixing chamber when the motor is throttled down will pass through said pipe into the cylinders of the motor. Most of the carbureters that are now in general use are so constructed that when the motor is throttled down the air travels through the carbureter so slowly that the liquid fuel becomes deposited on the walls of the mixing chamber. Consequently, when the throttle valve is thereafter opened up a charge of practically raw fuel is drawn into the cylinders and the result is that the motor halts momentarily because the charge is too rich to produce an explosive gas. My improved carbureter overcomes this objectionable feature for the pipe 16 that establishes communication between the mixing chamber and the intake pipe when the throttle is closed, insures sufficient suction in the mixing chamber to cause the air to travel through same quickly enough to prevent the liquid fuel from becoming deposited on the walls of the mixing chamber. While I have herein shown this feature applied to a carbureter of the multiple jet type, I do not wish it to be understood that it is limited to such a structure, for this same idea could be embodied in any of the carbureters now in general use. I am aware that carbureters have heretofore been so constructed that communication between the float chamber and the intake pipe was established when the motor was throttled down so that the raw liquid fuel would be sucked directly into the cylinders without first passing through the mixing chamber. My invention is entirely different from this and consists broadly in constructing the carbureter in such a manner that the vaporized fuel which enters the mixing chamber when the motor is throttled down will travel through the mixing chamber quickly enough to prevent the fuel from becoming deposited on the walls of the mixing chamber.

A spherical-shaped float 18 is arranged in the float chamber A for actuating the valve which controls the supply of liquid fuel from the pipe 19 that leads to the supply tank, not shown, a valve 20 of the needle type being herein shown for this purpose. This valve 20 is held seated by means of a coiled expansion spring 21 that engages a collar 22 on the stem of the valve so as to force it downwardly, and said valve is raised or moved upwardly off its seat by means of a lever 23 that is acted upon by the float 18. This lever 23 is not permanently connected to the casting which forms the float chamber but merely rests loosely on a pin or cross web 24 which forms a fulcrum for the lever. The end of the lever which projects underneath the collar 22 on the stem of the valve 20, is preferably bifurcated so that it will straddle said stem, and, if desired, the upper side of the lever which contacts with said collar can be curved or rounded off slightly, as shown in Fig. 4, so as to prevent it from catching or sticking on the collar 22. The opposite end of said lever is curved slightly so that it will conform to the shape of the float 18, and said lever is preferably made of metal which can be bent so that the portion with which the float contacts can be so positioned that the valve 20 will automatically cut off the supply of fuel to the float chamber when the fuel in said float chamber reaches a certain level, for example, the level indicated by the dot and dash line y in Fig. 4. When the fuel in the float chamber falls below this level the float moves downwardly and thus causes the lever 23 to raise the valve from its seat and permit more liquid fuel to flow into the float chamber. The lever 23 is provided on its under side with a notch which receives the pin or cross web 24 that forms a fulcrum for said lever, and as the lever rests freely on said pin it can be assembled or disassembled quickly. The stem of the valve 20 projects upwardly through the top wall of an offset in the float chamber so as to enable the valve to be actuated manually. The casting which forms the mixing chamber is provided with a hollow or cored-out portion so as to form a water-jacket 25 that tends to keep the mixing chamber in a heated condition, said water-jacket being connected to the water-jackets on the cylinders of the motors by means of supply and return pipes 26 and 27.

One desirable feature of a carbureter of the construction herein illustrated is that it is compact and can be manufactured at a low cost, the various parts of the carbureter being so designed that very little lathe work is necessary in manufacturing same. The float chamber and also the contracted portion of the mixing chamber are formed of a single casting, and the main portion of the mixing chamber consists of a single casting. A plate 28 is detachably connected to the casting which constitutes the mixing chamber so as to form a portion of the top wall thereof and also a seat for the auxiliary

air valve, and said plate is provided with integral arms 29, as shown in Fig. 5, that project into the mixing chamber so as to form a support for the arm or lever 4 which carries the auxiliary air valve. The air pipe E is so designed that it can be formed of cast metal, and said pipe is retained in position by means of screws 30 that pass through flanges on the upper end thereof, as shown in Fig. 3, said pipe having a cross piece 31 for supporting the screw 3 which closes the upper end of the jet tube and also clamps said tube in position. The shaft or stem 32 of the throttle valve projects some distance from each side of the casting that forms the mixing chamber, and an arm 33 is detachably connected to said stem, preferably by means of a clamping screw 34 that binds the bifurcated upper end of said arm tightly to the stem. The arm 33 is provided with stops 35, and the casting in which the stem of the valve is journaled, is provided with wings 36 with which the stops 35 cooperate so as to limit the opening and closing movement of the throttle valve. With such a construction it is a very simple matter to arrange the operating arm 33 of the throttle valve on either side of the carbureter by loosening the screw 34 which clamps said arm to the stem of the throttle valve.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a carbureter, a mixing chamber having a portion in which the heavy particles of the fuel tend to collect, a throttle valve, and a conduit leading from said portion and terminating at a point between the throttle valve and the cylinder of the motor so as to prevent the heavy particles of the fuel from collecting and remaining in the mixing chamber when the motor is throttled down.

2. In a carbureter, a mixing chamber having a contracted portion and tapered walls which terminate at the upper edge of said contracted portion, a throttle valve arranged adjacent the upper end of said mixing chamber, a multiple jet tube projecting upwardly through the contracted portion of the mixing chamber, an air pipe surrounding said jet tube and terminating above the bottom of the contracted portion of the mixing chamber, and a conduit having its lower end terminating inside of the mixing chamber and its upper end terminating at a point between the throttle valve and the cylinder of the motor.

3. In a carbureter, a mixing chamber having a contracted portion, an air pipe projecting into said contracted portion and spaced away from the walls thereof, means for introducing fuel inside of said air pipe, and a conduit having one end terminating adjacent the passageway between said air pipe and contracted portion of the mixing chamber and its opposite end terminating at a point between the throttle valve and the cylinders of the engine.

4. In a carbureter, a vertically disposed multiple jet tube having its upper end closed and its lower end communicating with a supply of liquid fuel, and an open-ended air pipe surrounding said jet tube and tapering inwardly from its upper toward its lower end.

5. In a carbureter, a jet tube having its upper end closed and its lower end communicating with a supply of liquid fuel, a member which surrounds said jet tube to form an air passageway, the upper end of said member being open to the atmosphere and of greater diameter than the lower end of same, and a mixing chamber communicating with the lower end of said member, the suction in said mixing chamber causing air to be drawn downwardly through said member.

6. In a carbureter, a mixing chamber provided at its lower end with a contracted portion, a tapered air pipe projecting into said contracted portion and having its upper end open and of a greater diameter than its lower end, and a jet tube arranged inside of said air pipe and having its upper end closed and its lower end communicating with a supply of liquid fuel, said tube being provided with a plurality of jets or orifices that permit the liquid fuel to escape therefrom as it rises and falls in said tube.

7. In a carbureter, a vertically disposed air pipe having its upper end open and its lower end communicating with the mixing chamber of the carbureter, a jet tube arranged inside of said pipe, a cross piece or web at the upper end of said pipe, and a screw mounted in said web and projecting into said jet tube to close the upper end thereof and also retain it in position.

8. A carbureter having an air passage therethrough provided with a depression to hold a quantity of fluid fuel, a source of fuel supply communicating with said depression, a throttle in said air passage, and a suction passage leading from said depression and communicating with the air passage on the engine side of said throttle.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this fifth day of November 1909.

WILLIAM C. CARTER.

Witnesses:
WELLS L. CHURCH,
GEORGE BAKEWELL.