Feb. 9, 1926. 1,572,036

C. L. RAYFIELD

CARBURETOR

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FIG. 1

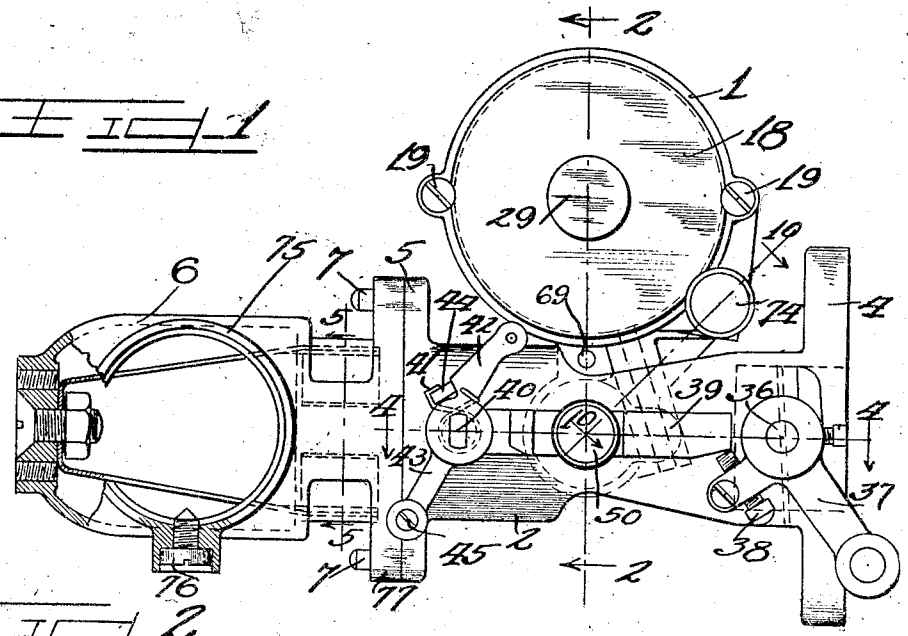
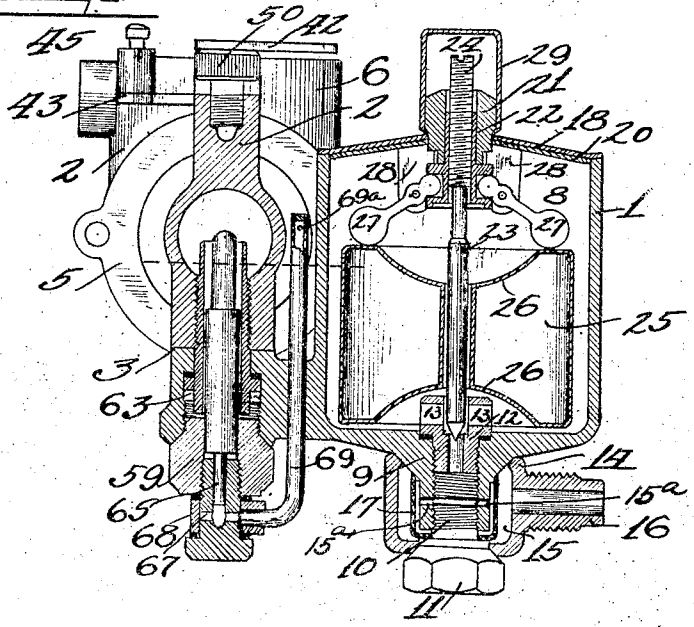


FIG. 2



Witnesses

H. G. Dicks

Charles W. Kelly

Inventor

Charles L. Rayfield

By Charles W. Kelly

Atty

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CARBURETOR

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FIG. 3

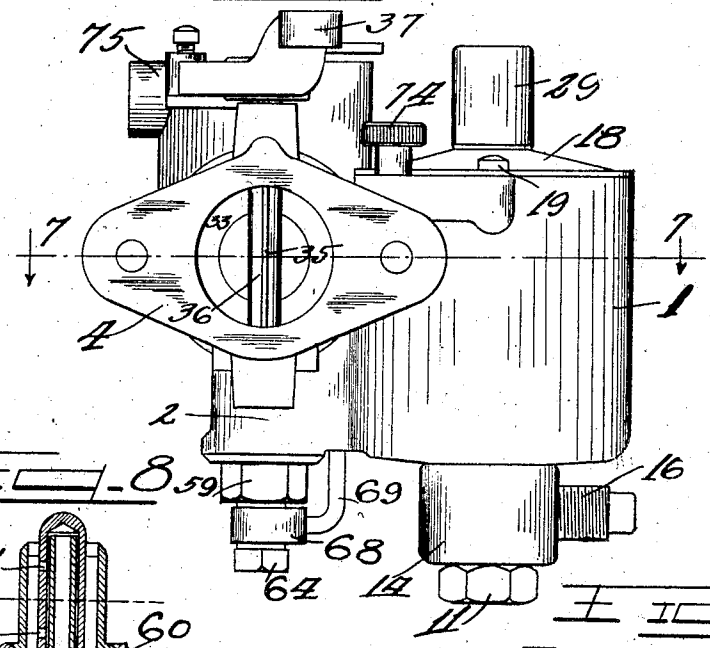


FIG. 8

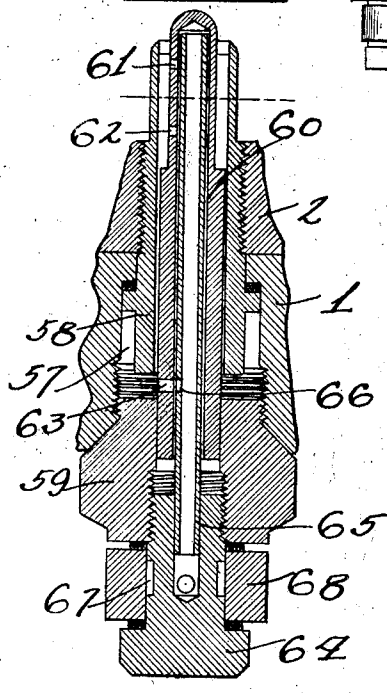
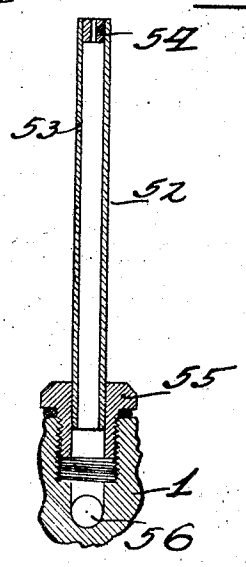


FIG. 9



Witnesses

H. G. Hanks

Charles Billings.

Inventor

Charles L. Rayfield

Charles O. Hicks

by

Atty.

Feb. 9, 1926. 1,572,036

C. L. RAYFIELD

CARBURETOR

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FIG. 4

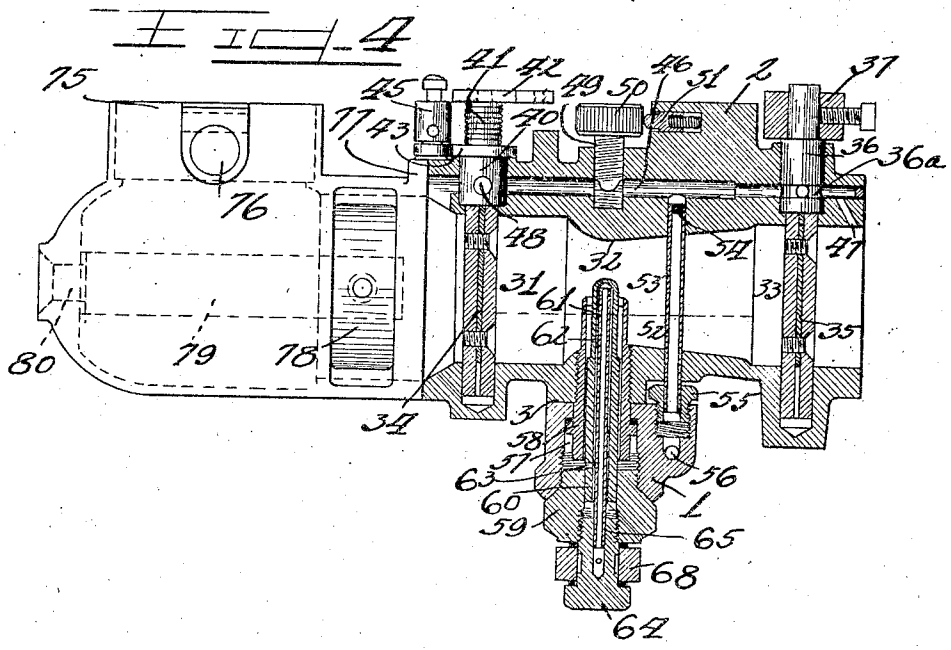


FIG. 10

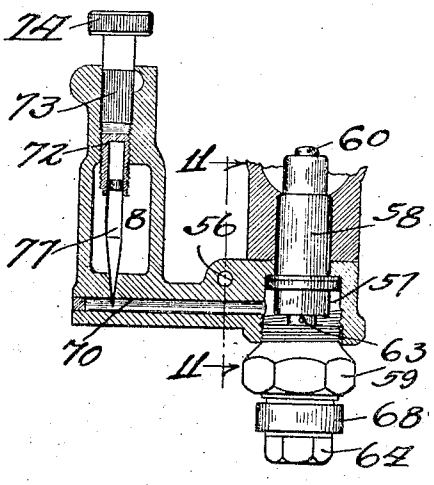
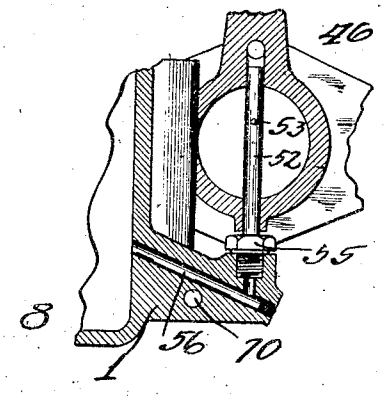


FIG. 11



Witnesses

H. W. Banks

Charles W. Hills

Inventor

Charles L. Rayfield

By Charles W. Hills

Atty.

Feb. 9, 1926. 1,572,036

C. L. RAYFIELD

CARBURETOR

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FIG. 6

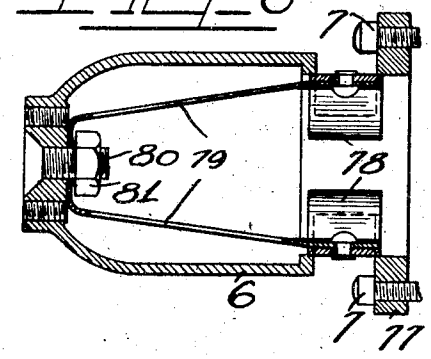


FIG. 5

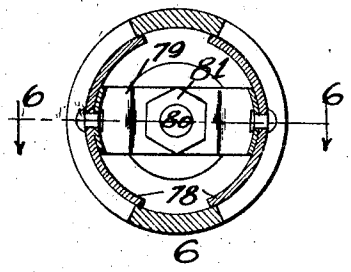
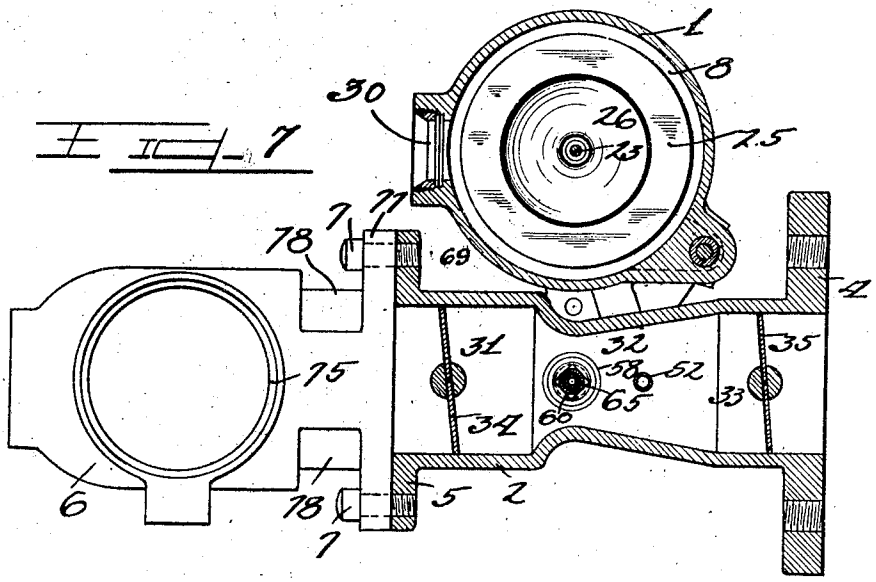


FIG. 7



Witnesses

H. G. Parks

Charles W. Fillo Jr.

Inventor

Charles L. Rayfield

By Charles W. Fillo Atty

Patented Feb. 9, 1926. 1,572,036

UNITED STATES PATENT OFFICE.

CHARLES L. RAYFIELD, OF CHICAGO, ILLINOIS, ASSIGNOR TO BENEKE MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CARBURETOR.

Application filed April 30, 1920. Serial No. 377,923.

To all whom it may concern:

Be it known that I, CHARLES L. RAYFIELD, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Carburetors; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

This invention relates to a plain tube carburetor for internal combustion engines in which the mixture of combustible hydrocarbon is automatically varied with varying conditions of engine speed and load. Such variations have hitherto been often obtained by the provision of automatically actuated movable valves and interconnected shutters for controlling the air inlet. These movable valves and shutters, however, required certain adjustments which it was not within the ability of the ordinary user to make.

It is one of the principal objects, therefore, of this invention to provide an improved plain tube carburetor for internal combustion engines of such construction that the mixture of hydrocarbon fuel passing therethrough is automatically varied to be adapted to varying speed and load conditions of the engine.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

The invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a top plan view of a carburetor embodying the principles of this invention showing a part of the air inlet thereof in section.

Figure 2 is a section on line 2—2 of Figure 1 with parts in elevation.

Figure 3 is a view in elevation of the gas outlet end of the carburetor.

Figure 4 is a section on line 4—4 of Figure 1 with parts omitted and with parts shown in elevation.

Figure 5 is a section on line 5—5 of Figure 1.

Figure 6 is a section on line 6—6 of Figure 5.

Figure 7 is a section on line 7—7 of Figure 3 with parts in elevation.

Figure 8 is an enlarged fragmentary detail section showing the main inlet nozzle.

Figure 9 is an enlarged fragmentary detail section of the auxiliary nozzle.

Figure 10 is an enlarged fragmentary section on line 10—10 of Figure 1.

Figure 11 is an enlarged fragmentary section on line 11—11 of Figure 10.

As shown on the drawing:

The carburetor comprises in general the cast casings 1 and 2, which are secured together at 3, as clearly shown in Figure 2. The casing 2 is provided at one end with a flange 4, which is adapted to be secured to the intake manifold of an internal combustion engine and at the opposite end with a flange 5, to which the air inlet casing 6 is secured by means of the machine screws 7. A float chamber 8 is provided inside the casing 1 and an apertured internally threaded boss 9 is formed on the lower portion of said casing. For closing the outer end of the aperture in the boss 9 a threaded plug 10 having a hexagonal head 11 is inserted therein. A centrally apertured plug 12 having a passage 13 therein is engaged in the inner end of the aperture in the boss 9. In order to introduce liquid fuel into the chamber 8, an annular casting 14 is engaged around the internally apertured boss 9 between the bottom of the casing 1 and the hexagonal head 11 of the plug 10. In this way an annular chamber 15 is provided which is in communication with the aperture in the boss 9, through suitable openings 15ª in said boss just above the top of the plug 10 therein. Said casting 14 is provided with an integral centrally apertured externally threaded boss 16 whereby it may be connected with a fuel supply tube. A screen 17 is engaged around the boss 9 inside the chamber 15 to prevent dirt or foreign matter from entering the carburetor.

For closing the float chamber, the cover plate 18 is removably secured on the casing 1 by machine screws 19 and beneath and secured to said cover plate 18 is an annular plate 20, which engages the inner periphery of the upper portion of the casing 1, as shown in Figure 2. Secured in a central

aperture in the cover plates 18 and 20 is a centrally apertured plug 21 having an internally threaded sleeve 22 slidably mounted in the aperture therein. Adjustably secured in the sleeve 22 is a valve 23, the upper portion 24 of which is threaded and engaged in the thread in said sleeve 22. Said valve 23 is adapted to seat in the central aperture in the plug 12 to control the supply of liquid fuel entering the chamber 8, and is adapted to be controlled by the metal float 25 which is engaged therearound and guided thereby. The float 25 comprises a hollow metal cylinder having concavely recessed ends 26. The upper recessed surface 26 of the float 25 is adapted to engage the outer end of the levers 27 which are pivoted on bosses 28 on the cover plate 18 and which have their inner ends loosely engaged by hinges on the slidable sleeve 22. Thus movement of the float 25 causes engagement of the surface 26 with the levers 27 and thereby causes a sliding movement of the valve 23 attached to the sleeve 22, controlling the amount of liquid fuel entering the chamber 8. Adjustments of the valve 23 may of course be effected by rotating the threaded portion 24 thereof in the sleeve 22 and thereby changing the longitudinal position of the valve. A cap 29 is frictionally engaged over the plug 21 for covering the upper portion of the valve 23. In order to ascertain the level of the liquid fuel in the chamber 8 the transparent view aperture 30 is provided in the casing 1, as shown in Figure 7.

The interior of the casing 2 is formed to provide the air inlet chamber 31, the Venturi carbureting chamber 32, and the fuel outlet chamber 33. For controlling the entrance of air into the air chamber 31, a valve 34 is pivoted in the outer end thereof, while a throttle valve 35 pivoted in the outer end of the chamber 33 controls the passage of fuel therethrough. The throttle valve 35 is provided with a stem 36, which extends upwardly through the casing 2 and is reduced at the outer end thereof having the throttle lever 37 secured on said reduced portion. The movement of said throttle lever 37, and consequently the movement of the throttle valve 35, is controlled by the adjusting screw 38, which is engaged through a boss on said throttle lever 37 and which abuts against the boss 39 on the casing 2, thus limiting the movement of the throttle lever. As shown in Figures 1 and 4, the air inlet valve 34 is normally held in open position by a coil spring 41, which is engaged around the upper portion of the stem 40 of said valve and which has one end thereof secured to the casing 2 and the opposite end secured to a lever 42 on the upper end of the stem 40. A lever 43 is loosely engaged around the stem 40 beneath the spring 41 and said lever 43 is provided with an upward projection 44, which is adapted to engage against a projection formed on the outer side of the lever 42. For attaching an operating wire an apertured binding post 45 is secured on the outer end of the lever 42.

The casing 2 is provided with an auxiliary air and fuel passage 46 in the upper portion thereof, one end of said auxiliary air and fuel passage communicating with the air inlet chamber outside the valve 34 and the opposite end of said passage communicating with the fuel outlet chamber 33 outside the valve 35 and through a groove 36^a in the stem 36, by means of a passage 47, as shown in Figure 4. An aperture 48 is provided in the air inlet valve stem 40 whereby the opening through the passage 46 is maintained when said valve 34 is in closed position. To adjust the quantity of air passing through said passage 46, a screw 49 is engaged transversely thereof in the casing 2. Said adjusting screw 49 is provided with a knurled head 50, which is engaged by the spring pressed detent 51, whereby said head 50 and the screw 49 are held in adjusted position.

From the above description it is apparent that the passage 46 and also the main longitudinal passage through the carburetor are of constant size regardless of suction and that the effective size of said passages is manually regulated by adjustment of the valves 49 and 34 respectively.

Secured in the casing 1 and extending transversely of the outer end of the Venturi chamber 32 and opening into the auxiliary air passage 46 is the idler nozzle 52. Said idler nozzle 52 is provided with a high speed aperture 53 opening into the Venturi chamber 32 on the side adjacent the air inlet valve, or in other words upstream therein. The upper end of said idler nozzle 52 is provided with an apertured plug 54, which opens into the auxiliary air passage 46. As shown in Figure 4, a passaged plug 55 is engaged in the casing 1 and said idler nozzle 52 is supported in the passage therein. A passage 56 cored in the casing 1 provides direct communication from the float chamber 8 to said passaged plug 55 and the idler tube 52.

The main inlet nozzle assembly is secured in the casings 1 and 2 at the junction 3, as shown in Figure 4. An internally threaded annular recess 57 is formed in the casing 1 below the junction 3 and a flanged externally threaded sleeve 58 is engaged in said recess and through a threaded aperture in the casing 2 and extends into the contracted portion of the Venturi carbureting chamber 32. A centrally apertured threaded plug 59 is engaged in the lower portion of the chamber 57 and said plug 59 carries a tube 60, which communicates with the cen-

tral aperture therein and extends upwardly through the sleeve 58 into the chamber 32, as clearly shown in Figures 4 and 8. Bleeder apertures 61 and 62 are provided in the upper portion of said tube 60 and in the lower portion thereof a passage 63 is provided communicating with the chamber 57. The lower end of the aperture in the plug 59 is threaded and the centrally recessed threaded plug 64 is engaged in said threaded portion. Supported in the central recess in said plug 64 and extending upwardly inside the tube 60 is a tube 65, which is provided with an aperture 66 communicating with the aperture 63 in the tube 60. A peripheral recess 67 in the plug 64 communicates with the central recess therein and with the interior of the tube 65. An annular casing 68 is engaged around said annular recess 67 and provides communication between said recess and a vertical air tube 69, which is secured in said casing, and is provided with an aperture 69^a. By this construction atmospheric pressure from the tube 69 is always exerted on the interior of the tube 65 and passages communicating therewith. As shown in Figure 10, a passage 70 is cored in the casing 1 and provides communication between the float chamber 8 and the chamber 57 surrounding the main inlet nozzle. For controlling the flow of liquid fuel through the passage 70, a needle valve 71, which is rotatably supported in the casing 1, is engaged in the communicating passage between the float chamber 8 and the passage 7. Said needle valve 71 is secured in a threaded sleeve 72, which is engaged in a threaded aperture in the casing 1 and which is provided with a vertically grooved portion 73 which is engaged by a spring pressed detent (not shown) for locking it in adjusted position. A knurled head 74 is provided in the sleeve 72 for rotating the same to adjust the position of the needle valve 71.

The casing 6 provides means for connecting the air chamber 31 with a source of warm air supply. The boss 75 on said casing 6 is adapted to receive a pipe leading from a source of warm air supply and the set screw 76 acts to secure said pipe in the boss 76. Said casing 6 is also provided with a flange 77 having apertures therein which register with the apertures in the flange 5 on the casing 2, and through which the machine screws 7 are engaged to secure the casing 6 to the casing 2. Adjacent the flange 77 opposite portions of the casing 6 are cut away to provide openings therein. Said openings are normally closed by plates 78, which are engaged thereover inside the casing 6. Said plates 78 are supported on the outer ends of the forked portion of the thermostatic element 79, which is secured to the inner side of the end of the casing 6 by the bolt 80 engaged therethrough. For securing the thermostatic element 79 securely in position in the casing, a nut 81 is engaged on the inner end of the bolt 80. The thermostatic element 79 is composed of two adjacent continuous strips of metal of different expansibility so that when said metals are heated the relatively different expansion thereof will cause the plate 70 covering the openings in the casing 6 to be moved inwardly and thus allow cool air to enter the casing 6 and the air chamber 31 communicating therewith.

The operation is as follows:

Liquid hydrocarbon fuel is introduced into the float chamber 8 through the apertured boss 16 in the casing 14 and the constant level of fuel in said float chamber is maintained by the action of the float 25 and the valve 23 connected thereto in a manner which is well known in the art. Said valve 23 may be adjusted longitudinally by rotating the threaded portion 24 thereof in the internally threaded sleeve 22.

When the motor is running idle the apertured plug 54 in the idling nozzle 52 is the only source of fuel supply in action. Air is supplied to the jet from said plug through the passage 46, and the amount of air passing therethrough may be regulated by means of the screw 49, whereby the amount of air passing through said passage 46 may be increased or diminished, thus strengthening or weakening the mixture supplied to the motor when running idle. Liquid fuel is supplied to the nozzle 52 through the passage 56, which leads directly to the chamber 8.

Closing the air inlet or choke valve 34 closes the entrance to the passage 46 and also to the air inlet chamber 31. This is accomplished manually by the operation of the lever 43 from the front of the engine or of the lever 42 from the rear thereof. If desired said lever 42 may be secured in any adjusted position desired and the lever 43 used for operating the choke or air inlet valve 34 when starting the engine.

The supply of fuel for idling enters the gas outlet ahead of the throttle valve 35, around a passage 36^a in the stem thereof, and through the passage 47. Sufficient fuel will be supplied through said passage to idle the engine when throttle valve is entirely closed.

The main nozzle system is filled through the aperture 63 to a level equal to the level of the fuel in the float chamber, the normal level being shown by dotted lines in Figures 2, 4 and 8. The air pressure through the aperture 69^a in the upper end of the air inlet tube 69 forces fuel through the main nozzle which is formed between the tube 60 and the sleeve 58 surrounding said tube. As soon as the liquid fuel is exhausted from the air supply tube 69, air is fed through the aperture 69^a therein

through the whole main inlet nozzle system. This air is first bled through the air bleeder aperture 61 and at higher speed is bled through the bleeder aperture 62 due to the lowering of the fuel level, thus supplying a proper mixture for the speed at which the engine is operating. At high speeds additional fuel is introduced into the mixture from the high speed aperture 53 and the idling tube 52, said fuel being drawn through said high speed aperture due to the vacuum produced when the engine is running at high speed. This operation is due to the fact that with said tube 52 located to one side of the narrowest point of the venturi 32 the static force exerted by the increased suction at high speed will be greater than the dynamic force exerted by the flow of air against the aperture 53, it being understood that as the venturi widens the air speed therethrough decreases proportionately and at greater ratio than the decrease in suction.

The idling or low-speed tube 52 is always directly connected to the float chamber, and thus, as soon as the motor is shut down to an idling speed, there is plenty of gas available to idle the motor.

This invention, therefore, provides a plain tube carburetor wherein the mixture is automatically varied to suit the engine speed and in which this variation of mixture is accomplished without the use of movable valves. The value of the automatic adjustments of this carburetor is enhanced by the provision of a thermostatically controlled air inlet. The air inlet 6 is connected with a source of warm air supply which enters the carburetor. If the air should become excessively warm the action thereof on the thermostatic element 79 will cause the cover plate 78 to be drawn inwardly and thus allow cool air to enter the chamber 31. At high speed the suction of the engine will also draw the plates 78 inwardly against the spring action of the thermostatic element 79 and additional cool air is thus supplied to the engine. Adjustment of the amount of liquid fuel supplied to the main inlet system through the passage 70 from the float chamber 8 may be effected by rotating the needle valve 71 and thus enlarging or decreasing the size of the passage between the float chamber 8 and the passage 7.

The carburetor provided by this invention is essentially of the plain tube or rigid type and, due to the double nozzle construction, a proper supply of gas is assured at all times and danger of explosions in the carburetor due to backfiring is obviated.

I am aware that numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted otherwise than necessitated by the prior art.

I claim as my invention:

1. In a carburetor, the combination of a main mixing chamber, an auxiliary mixing passage, a fuel supply chamber, an inlet nozzle communicating with the fuel supply chamber and extending into the main mixing chamber, a second inlet nozzle communicating separately with the fuel supply chamber and opening into the auxiliary mixing passage and having an aperture opening into the main mixing chamber for introducing additional liquid fuel therein when a high vacuum is produced.

2. In a carburetor, the combination with a casing having constant size manually regulable passages therein, of a nozzle opening into one of said passages, and a second nozzle opening into both of said passages and communicating separately with the fuel supply chamber.

3. In a carburetor, a fuel chamber, a main mixing chamber, an auxiliary mixing passage, and a plurality of fuel nozzles communicating separately with the fuel chamber and opening into said mixing chambers, one of said fuel nozzles opening into both said mixing chamber and said mixing passage.

4. In a carburetor, a fuel supply chamber, a main mixing chamber, an auxiliary mixing passage, an air inlet communicating with both said chamber and passage, fuel nozzles communicating separately with the fuel supply chamber and opening into said mixing chamber and passage, and means for simultaneously cutting off communication between the air inlet and both said mixing chamber and passage.

5. In a carburetor, a fuel supply chamber, a main mixing chamber, a fuel nozzle therefor, an auxiliary mixing passage, a second fuel nozzle communicating separately with the fuel supply chamber and opening into said auxiliary mixing passage, said latter nozzle having an opening therein communicating upstream in said main mixing chamber.

In testimony whereof I have hereunto subscribed my name.

CHARLES L. RAYFIELD.