Aug. 10, 1926.

1,595,315

C. L. RAYFIELD

CARBURETOR

Filed Oct. 27, 1921. 3 Sheets-Sheet 1

Fig 1

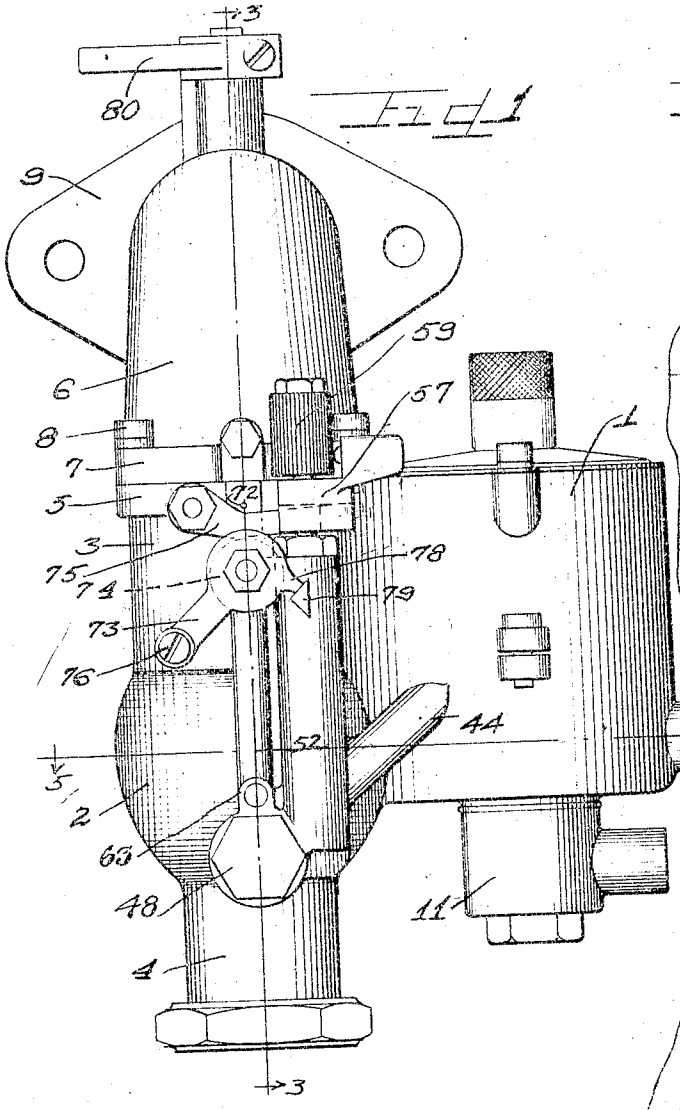
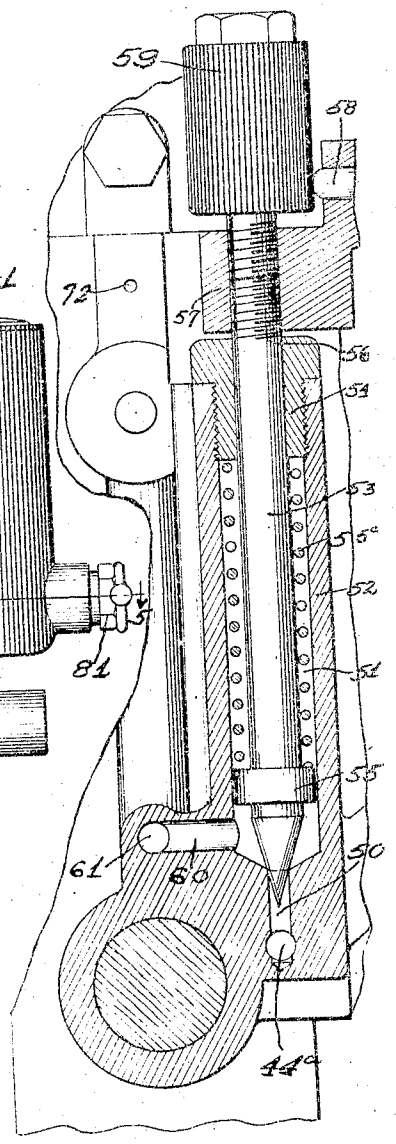


Fig 7



Witnesses

Oscar Hartmann.

Carlton Hill

Inventor

CHARLES L. RAYFIELD.

by Charles L. Rayfield Atty.

Aug. 10, 1926. 1,595,315

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CARBURETOR

Filed Oct. 27, 1921 3 Sheets-Sheet 2

Fig. 2

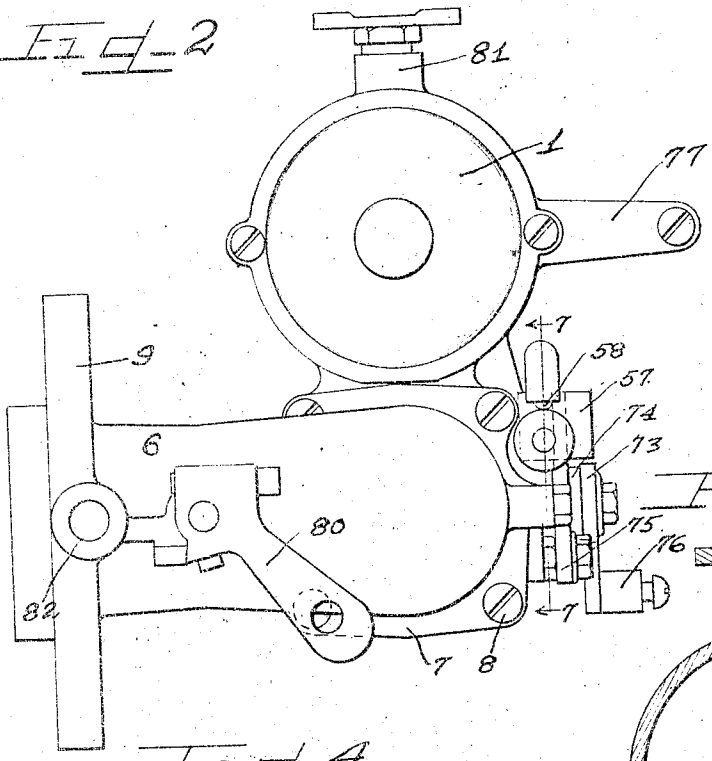


Fig. 5

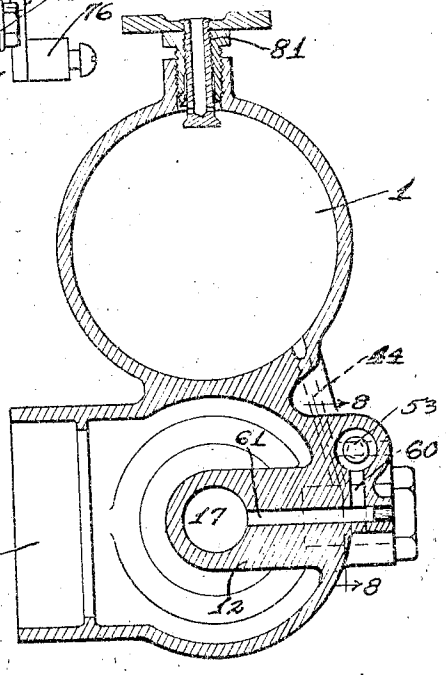
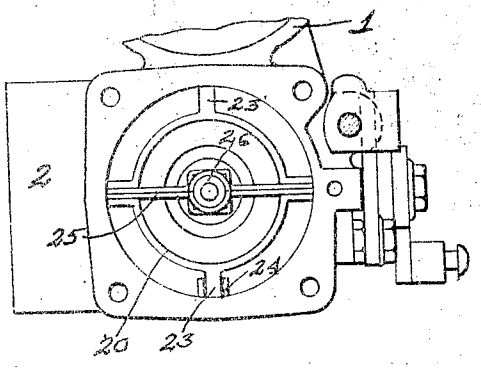


Fig. 4



Witnesses

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3 Sheets-Sheet 3

Fig 3

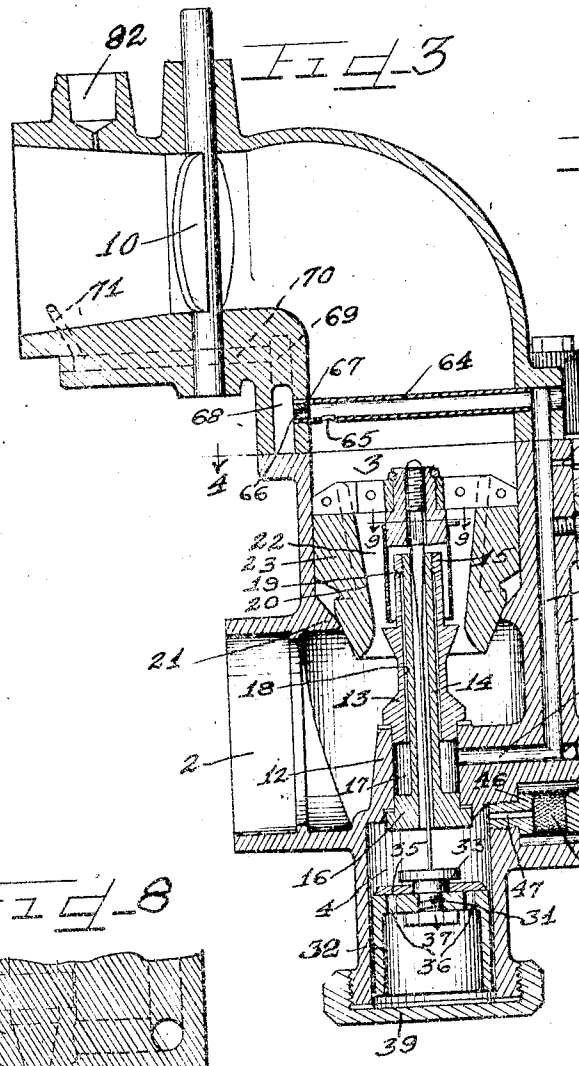


Fig 6

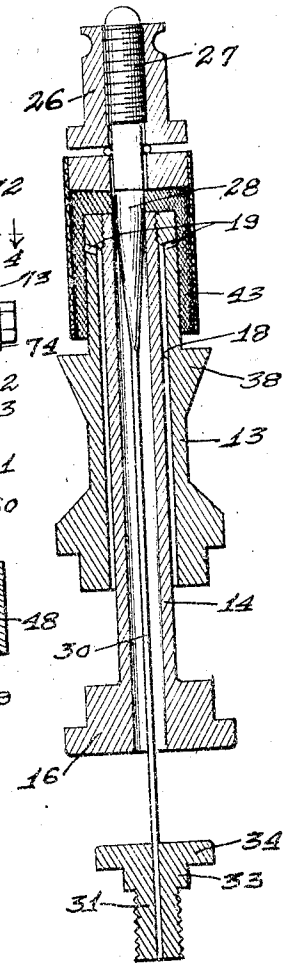


Fig 8

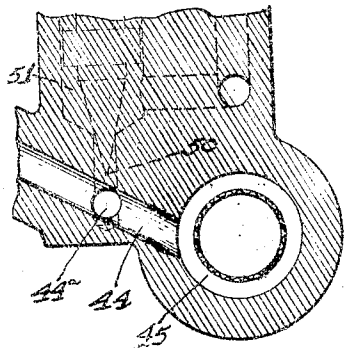
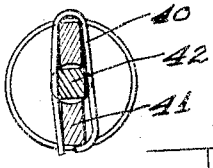


Fig 9



Witnesses

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Patented Aug. 10, 1926. 1,595,315

UNITED STATES PATENT OFFICE.

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

CARBURETOR.

Application filed October 27, 1921. Serial No. 510,708.

This invention relates to a carburetor and particularly to a carburetor which has few moving parts and which supplies properly proportioned fuel mixture in the proper quantities to insure the efficient operation of an internal combustion engine under all running conditions.

It is an object of this invention to provide a carburetor wherein means affording a movable Venturi chamber are connected by flexible connecting means with a plunger operating in a liquid dash pot and wherein said flexible connecting means acts to regulate the amount of fuel discharged through the main nozzle in accordance with the movement of the Venturi chamber.

It is also an object of this invention to provide a carburetor wherein a properly proportioned fuel mixture is introduced into the mixture outlet chamber for purposes of idling and for starting the motor.

It is a further object of this invention to provide a carburetor having manually operated means for controlling the introduction of an accurately proportioned fuel mixture for starting purposes.

It is another object of this invention to provide a carburetor having a compound nozzle and a variable air inlet and having means surrounding the nozzle inside the air inlet for dividing the fuel leaving the nozzle.

It is an important object of this invention to provide a carburetor having means for controlling and proportioning the supply of fuel and air to afford an economical fuel mixture for various operating conditions.

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 shown on the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a side elevation of a carburetor constructed according to the principles of this invention.

Figure 2 is a top plan view of the carburetor.

Figure 3 is a section on the line 3—3 of Figure 1.

Figure 4 is a fragmentary section on the line 4—4 of Figure 3.

Figure 5 is a section on the line 5—5 of Figure 1 with parts omitted.

Figure 6 is an enlarged detail section of the nozzle taken at right angles to the section shown in Fig. 3.

Figure 7 is an enlarged fragmentary section on the line 7—7 of Figure 2 with parts in elevation.

Figure 8 is an enlarged fragmentary section on the line 8—8 of Figure 5, and

Figure 9 is an enlarged detail section on the line 9—9 of Figure 3 with parts omitted.

As shown on the drawings:

The main body of the carburetor of this invention comprises a unitary casing with a portion thereof affording a float chamber 1 while other portions thereof afford an air inlet chamber 2, a mixing chamber 3 and a dash pot cylinder or chamber 4. Formed on the upper end of the casing is an apertured flange 5 which supports a mixture outlet casing 6, said mixture outlet casing 6 being provided with a flange 7 resting on the flange 5 and secured thereto by means of machine screws 8 engaged through apertures therein and through the apertures in the flange 5. The mixture outlet casing 6 is provided with a suitable flange 9 whereby a horizontal portion thereof may be connected to the intake manifold of an internal combustion engine on which the carburetor is mounted, and the flow of fuel mixture through said mixture outlet casing is controlled by means of a butterfly throttle valve 10 which is mounted in the horizontal portion of the casing, as clearly shown in Figure 3. Liquid fuel is supplied from a source of fuel supply through a connection 11 to the float chamber 1 and the level of liquid fuel in said float chamber is maintained substantially constant by the usual float mechanisms mounted therein. Since these float mechanisms are well known and since the one employed in this carburetor embodies no part of the present invention it has not been shown and will not be described in detail herein. Extending into the air inlet chamber 2 is a chambered boss 12 which supports on its upper side a vertical tube 13 and which has a tube 14 extending therethrough and outwardly through the tube 13 to the upper end thereof where it is connected to said tube 13 by a threaded connection 15. A flange 16 is formed on

the lower end of the tube 14 and is fitted in an opening in the lower side of the boss 12 directly above the dash pot chamber 4 so as to provide a well 17 in said boss between said flange and the lower end of the tube 13. The external diameter of the tube 14 is less than the internal diameter of the tube 13 and consequently a passage 18 is provided between said tube leading outwardly from the well 17 and an outlet from said passage into the mixing chamber 3 is afforded by a plurality of apertures 19 in the tube 13 directly beneath the threaded connection 15.

The inlet of air to the mixing chamber 3 is controlled by a Venturi member 20 which normally rests on an annular integral flange 21 which is formed between the air inlet chamber 2 and the mixing chamber 3, and the interior of said member 20 is recessed to afford a Venturi chamber 22 which surrounds the upper end of the tubes 13 and 14 and which extends upwardly into the mixing chamber 3. Said member 20 is preferably constructed of light metal such as aluminum and consequently when a draft or suction is exerted thereon, it will be lifted upwardly, away from the flange 21, thus allowing more air to flow therethrough and therearound, provision being made for the air to flow outside said member 20 between fins 23 which are integral therewith and which slidably engage the interior of the carburetor casing. Said member 20 is prevented from rotation in the mixing chamber 3 by means of a pair of separated pins 24 which engage the outside of one of said fins 23 as clearly shown in Figure 4. Secured in the upper end of the member 20 are a pair of transverse members 25 which act to support an apertured internally threaded boss 26 in the center of the outlet of the Venturi chamber 22 and extending upwardly into the threaded aperture in said boss is an externally threaded portion 27 of a metering pin 28 which is adapted to seat in the upper end of the tube 14 and control the outlet of liquid fuel therefrom. A flexible portion 30 which preferably comprises a piece of piano wire extends downwardly through the interior of the tube 14 from the lower end of said metering pin 28, said flexible portion being secured to the metering pin by welding or in any other suitable manner, and the lower end thereof is secured to a threaded plug 31 which in turn is secured to the center of a piston 32 which is slidably mounted in the dash pot chamber 4. A flange 33 on said plug 31 extends about the upper end of the piston 32 and loosely engaged around said flange between the upper end of the piston and an extension 34 of said flange 33 is a plate 35 which acts to cover apertures 36 in the upper end of the piston 32 when said piston is traveling in an upward direction thus retarding the movement thereof, and which moves away from said apertures to allow liquid to flow therethrough and consequently permits a free downward movement of the piston. It will thus be noted that the piston 32 operating in the dash pot chamber 4 acts to steady and retard the upward movement of the member 20 without materially retarding the downward movement thereof. The flexible connection 30 between the metering pin 28 and the piston 32 permits a proper positioning of said metering pin in the upper end of the tube 14 and consequently prevents leakage. The plug 31 extends through the upper end of the piston 32 into the interior thereof as shown in Figure 3 and is secured in position by means of a nut 37.

The upward movement of the member 20, of course, allows more air to flow from the air inlet chamber 2 through the Venturi chamber 22 and the velocity of the air flowing through said Venturi chamber is increased by the provision of a tapered projection 38 on the outside of the tube 13 which increases the restriction at the throat of the venturi when said casing 20 is seated on the flange 21.

The controlling effect of the metering pin 28 may, of course, be adjusted by rotating the same which causes a movement of the threaded portion 27 in the boss 26. This rotation may be conveniently effected by removing a closure 39 which is threaded on the lower end of the dash pot chamber 4 and subsequently rotating the piston 32 which acts to rotate the flexible connection 30 and in turn to rotate said metering pin. In order that the metering pin may be locked in adjusted position, a spring 40 is provided which is engaged around a flattened extension 41 of the boss 26 and which engages a squared portion 42 formed between the metering pin 28 and threaded portion 27, this construction necessarily requiring at least a quarter turn of the metering pin. Said flattened extension is formed by milling a cut in the sides of the boss 26, as shown in Fig. 9. Secured to the lower end of the extension 41 is a cylindrical screen 43 which surrounds the outlet of the tubes 13 and 14 and through which liquid fuel that is delivered from said tubes must pass before entering the Venturi chamber 22.

Liquid fuel is supplied from the float chamber 1 to the dash pot chamber 4 through a passage 44 which leads into a well or recess 45. A plug 46 which is provided with an opening 47 leading into the dash pot chamber 4 is mounted in the inner end of said recess or well 45 and the outer end thereof is closed by a plug 48. In order to prevent dirt or other foreign matter entering the dash pot chamber, a screen 49 is provided which surrounds the plug 46 and the

entrance to the passage 47 therein. Communicating with the passage 44 is a passage 44ª which in turn communicates with a vertical passage 50 which opens into a recess 51 which is of larger diameter than said passage 50 and which is formed in a vertical boss 52 on the side of the carburetor casing. The flow of liquid fuel from the passage 50 into the recess 51 is regulated by a needle valve 53 which is axially mounted in said recess 51 and adapted to seat in the upper edge of the passage 50. Said needle valve 53 is slidably mounted in a plug 54 secured in the boss 52 at the upper end of the recess 51 and engaged between the inner side of said plug 54 and a collar 55 mounted on the needle valve near the lower end thereof is a helical spring 55ª which acts to normally maintain said valve seated in the upper end of the passage 50 to regulate the flow of liquid fuel therethrough. Adjustment of the needle valve 53 is afforded by the engagement of a threaded portion 56 thereof with a block 57 engaged thereon above said plug. Said block 57 is held from rotation relative to the needle valve by means which will be described hereinafter and the needle valve is locked in adjusted position relative to said block by means of a spring-pressed detent 58 mounted therein and engaging a ribbed adjusting nut 59 secured to the upper end of the needle valve.

Leading from the lower end of the recess 51 is a passage 60 which communicates with a passage 61 leading into the well 17 and consequently a limited supply of liquid fuel is supplied to said well from the recess 51 through said passages. Communicating with the passage 61 and extending upwardly therefrom is a passage 62 which is formed in an integral boss 63 on the outside of the carburetor casing and said passage 62 extends upwardly into the flange 7 on the casing 6 where it communicates with a tube 64 extending transversely across the inner end of said casing. Said tube 64 is provided with an aperture 65 whereby air may enter the same from the mixing chamber 3 and a plug 66 in the end of said tube having a restricted aperture 67 therein affords an auxiliary nozzle which discharges a fuel mixture into a passage 68 which is formed in and which communicates with the interior of said casing outside the throttle valve 10 by means of passages 69, 70 and 71 which are shown in dotted lines in Figure 3. In order that the mixture of liquid fuel and air for idling the engine may be properly proportioned, an air bleed aperture 72 is formed in the boss 63 opening into the passage 62 near the upper end thereof.

Means are provided for lifting the needle valve 53 away from its seat in the upper end of the passage 50 and for closing the air bleed aperture 72 in order to supply a rich mixture for starting the engine on which the carburetor is mounted. For this purpose, a lever 73 is rotatably mounted on the outside of the boss 63 directly beneath the air bleed aperture 72 and mounted on the inside face of said lever 73 and rotatable therewith is an eccentric cam 74 which is adapted to engage the under side of a lever 75 which is pivotally mounted on the carburetor casing and the outer end of which is engaged in a recess in the under side of the block 57 to lift said block and the needle valve 53 upwardly and to prevent said block from rotation. Said lever 75 is of course adapted to be moved upwardly when the lever 73 and the cam 74 are rotated and when this upward movement of the lever 75 is effected, it acts to close the outer end of the air bleed aperture 72 and consequently prevents the admission of air into the passage 62. Said lever 73 may be conveniently rotated by securing a suitable connection such as a flexible rod or Bowden wire to the terminal 76 thereon and for convenience in guiding this connection, a guiding boss 77 is provided on the float chamber 1. The return rotation of the lever 73 is limited by the engagement of a boss 78 on said lever with a stop 79 on the outside of the boss 52. The operation of the throttle valve 10 is controlled by an adjustable lever 80 which is secured to the outer end of the shaft on which the same is pivoted and which is adapted to be adjusted to limit the amount of closing movement of the valve. In order that the float chamber 1 may be conveniently drained, a suitable drain valve 81 is provided. A suitable fitting 82 is also provided whereby a connection with any vacuum operated installation as a fuel supply system may be made.

The operation is as follows:

The tubes 13 and 14 afford a compound nozzle whereby liquid fuel is introduced into the Venturi chamber 22 where it is mixed with the air flowing therethrough and conducted into the mixing chamber 3 and outwardly through the casing 6 past the throttle valve 10 to the intake manifold of the engine. Fuel supplied from the well 17 is discharged through the apertures 19 and acts to provide a supply for operation of the engine at intermediate speeds and also to supply additional fuel when it is desired to rapidly accelerate the engine. The main fuel feed at higher speed is provided by the tube 14 which forms the interior of the compound nozzle and as the speed increases and the member 20 is lifted the metering pin 28 is, of course, lifted, enlarging the opening in the upper end of said tube, and more liquid fuel is allowed to be drawn therefrom to mix with the additional quantities of air which pass through the carburetor due to the lifting of said member

20. All of the fuel leaving the passage 18, of course, passes outwardly through the apertures 19 in the nozzle 13, while the fuel leaving the tube 14 is discharged directly from the end of said tube and in each case this fuel necessarily passes outwardly into the Venturi chamber 22 through the screen 43 which aids materially in the breaking up and atomization thereof. In view of the fact that the supply of liquid fuel to the well 17 is restricted by the needle valve 53, it is apparent that said well will act to supply only a limited amount of fuel such as is demanded for purposes of rapid acceleration and that the fuel supply therefrom will cease upon the attainment of the increased speed, the fuel for normal operation at such speeds being supplied through the main nozzle, i. e., the tube 14. The well 17 also provides a source of liquid fuel supply which furnishes the limited amount of fuel required to keep the engine running when the throttle valve 10 is closed. When the engine is idling, fuel is drawn upwardly from said well 17 through the passages 61 and 62, air being bled into the aperture 72 entering into the passage 62, and from said passage 62 fuel is led through the tube 61 where additional air is introduced through the bleed aperture 65, the consequent idling mixture being discharged into the passage 68 through the nozzle which is afforded by the aperture 67 in the plug 66. From the passage 68, fuel mixture for idling purposes is delivered through the passages 69, 70 and 71 to the interior of the casing 6 outside the throttle valve 10.

The needle valve 53 may of course be adjusted to vary the amount of fuel which is allowed to enter the well 17 by rotating the ribbed adjusting nut 59. Since the amount of fuel entering the well 17 may be accurately regulated and since the air bleed apertures 72 and 65 are designed to introduce the proper quantity of air into the fuel which is supplied for idling purposes, it is apparent that the correct mixture for idling the engine will be supplied at all times.

By operating the lever 73, the needle valve 53 may be raised away from its seat to increase the fuel supplied to the well 17 and since this operation of the lever 73 also moves the lever 75 to close the air bleed aperture 72, a correctly proportioned rich fuel mixture for starting the engine will be supplied to a point posterior to the throttle valve through the passages 61, 62 and 64, 68, 69, 70, 71.

All of the parts of the carburetor of this invention are easily accessible for adjustment and repair and since there are few moving parts, there is little likelihood of the carburetor getting out of order. Access to the dash pot chamber 4 may be had by removing the closure 39 which is threaded on the bottom thereof and after this closure is removed, it is possible to turn the piston 32 to adjust the metering pin 28, said metering pin being conveniently locked in adjusted position by means of the spring 40 which engages the squared portion 42 thereof.

The flexible connection 30 between the metering pin and the piston 32 permits a correct positioning of the metering pin even in cases where the alignment between the piston and the metering pin is not exact, and since the correct position of the metering pin is assured, any flooding from the main nozzle of the carburetor under starting conditions is avoided. The piston 32 in the dash pot chamber 4 acts to regulate the upward movement of the member 20 and since the metering pin 28 acts to allow the main nozzle, i. e. the tube 14, to discharge more fuel as said member moves upwardly, it is apparent that the fuel mixture discharged from said main nozzle will be properly proportioned at all times. It will be apparent from the foregoing specification that this invention provides a carburetor which supplies an economical properly proportioned fuel mixture for all running conditions, which will not leak when the engine is not running, and which possesses few moving parts and is consequently not liable to get out of order.

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, a fuel supply chamber, a dash pot chamber communicating therewith, a mixing chamber, a nozzle opening into the mixing chamber and communicating with the dash pot chamber, a casing affording a Venturi chamber slidably mounted in the mixing chamber and surrounding the nozzle, a metering pin connected to said casing and adapted to vary the area of the opening in said nozzle, a piston in the dash pot chamber, and a flexible wire connection between the metering pin and said piston.

2. In a carburetor, a fuel supply chamber, a dash pot chamber communicating therewith, a mixing chamber, a nozzle opening into the mixing chamber and communicating with the dash pot chamber, a casing affording a Venturi chamber slidably mounted in the mixing chamber and surrounding the nozzle, means connected to said casing for controlling the fuel discharged from the nozzle, a piston in the dash pot chamber, and a flexible wire connection between the fuel controlling means and said piston.

3. In a carburetor, a fuel supply chamber, a fuel outlet chamber, a throttle valve therein, a compound nozzle, separate fuel pas-

sages connecting the supply chamber with the nozzle outlets, a connection between one of said fuel passages and the fuel outlet chamber outside the throttle valve, means for admitting air to said connection, and means for increasing the amount of fuel flowing through said passage and simultaneously decreasing the amount of air admitted to said connection.

4. In a carburetor, a fuel supply chamber, a fuel outlet chamber, a throttle valve therein, a compound nozzle, separate fuel passages connecting the supply chamber with the nozzle outlets, a connection between the fuel outlet chamber and the upper one of said fuel passages outside the throttle valve, means for admitting air to said connection, and cam-controlled manually operated means for increasing the amount of fuel permitted to flow through said passage and simultaneously decreasing the amount of air admitted to said connection.

In testimony whereof I have hereunto subscribed my name.

CHARLES L. RAYFIELD.