H. CARLE.

CARBURETER.

APPLICATION FILED AUG. 24, 1916.

1,243,038.

Patented Oct. 16, 1917.

3 SHEETS—SHEET 1.

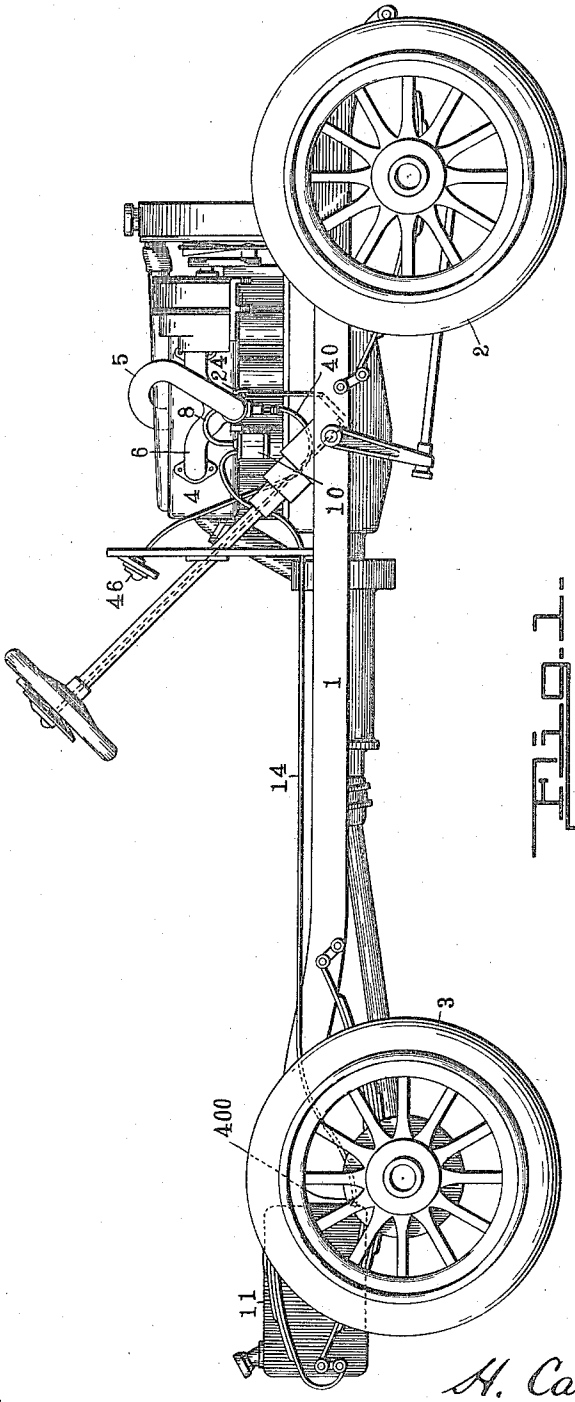



Fig. 1.

WITNESSES

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ATTORNEYS

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3 SHEETS—SHEET 2.

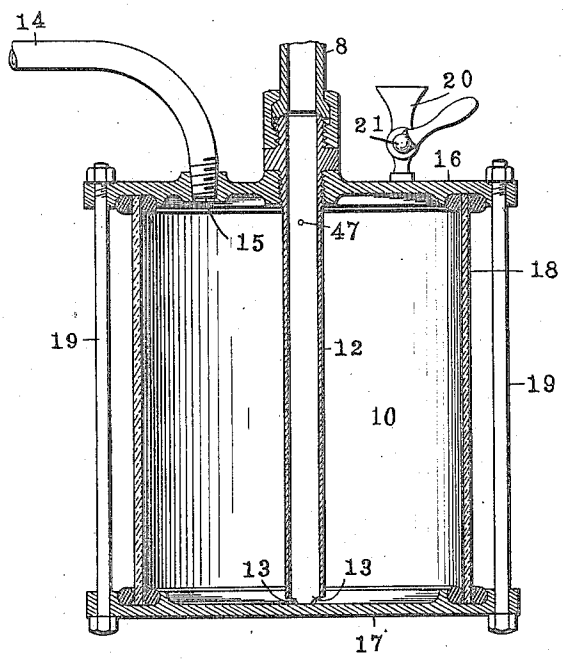



Fig. 2.

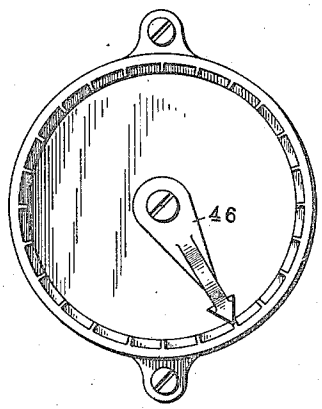



Fig. 3.

WITNESSES

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3 SHEETS—SHEET 3.

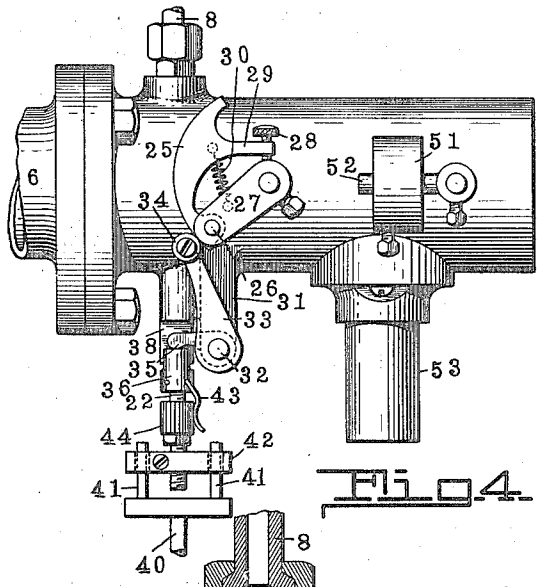



Fig. 4

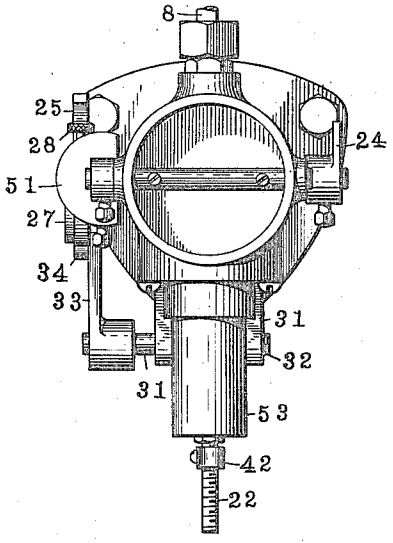



Fig. 5

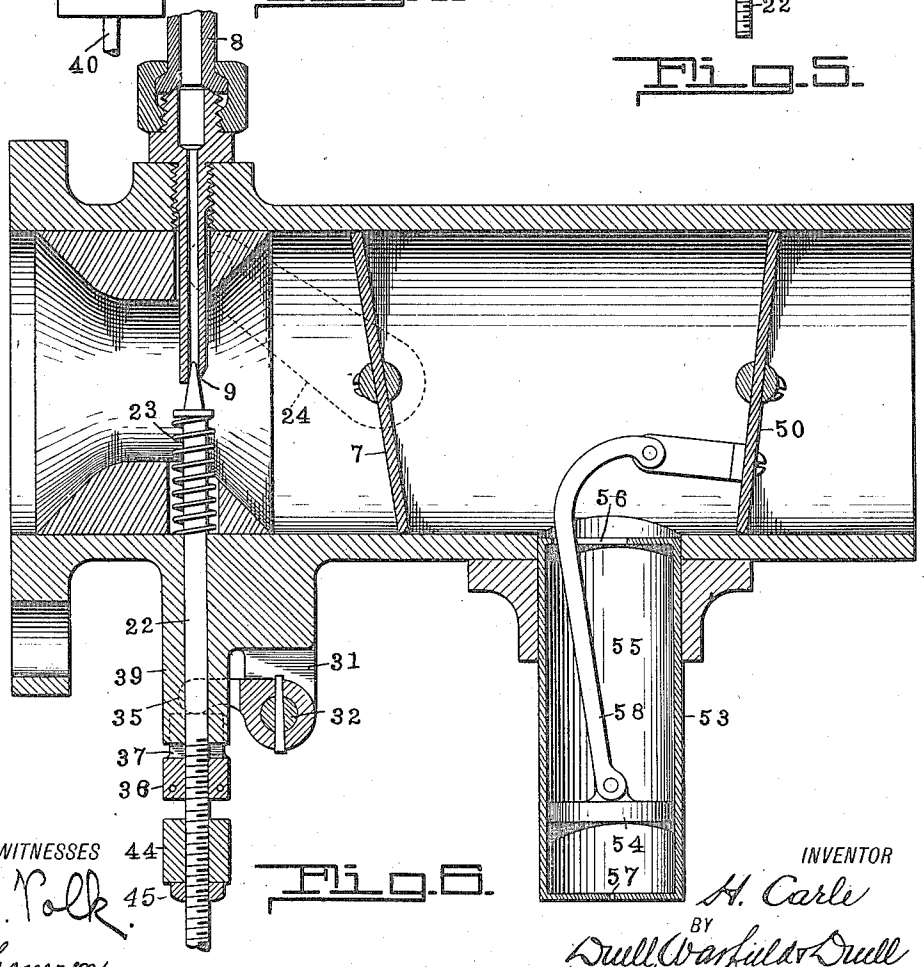



Fig. 6

WITNESSES

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# UNITED STATES PATENT OFFICE.

HAROLD CARLE, OF BUFFALO, NEW YORK, ASSIGNOR TO CARLE MOTOR PARTS CO., INC., OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

## CARBURETER.

1,243,038. Specification of Letters Patent. Patented Oct. 16, 1917.

Application filed August 24, 1916. Serial No. 116,599.

*To all whom it may concern:*

Be it known that I, HAROLD CARLE, a subject of the King of Great Britain, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements 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 oil feeding devices, and especially to devices of the character referred to for feeding fuel to internal combustion engines and controlling the mixture of air and fuel.

One of the objects of the invention is the provision of a practical apparatus for utilizing to better advantage that part of the power of the engine which is consumed in feeding fuel, so that the feeding of the fuel and the carbureting may be obtained with the consumption of less energy than heretofore, resulting in increased mileage.

Another object is the provision of a simple device for maintaining an auxiliary supply of fuel immediately responsive to the suction of the engine and not dependent on a gravity head of the main supply of fuel or that of the auxiliary supply.

Another object of the invention is the provision of a practical device for supplying an internal combustion engine with an efficient mixture when the head of fuel is insufficient to supply the fuel outlet by gravity, and without necessitating the use of mechanical valves in the fuel conduit.

Another object of the invention is to provide, for automobiles driven by internal combustion engines, an efficient flexible carbureting device of a simple character, wherein all moving mechanical parts of the fuel feeding system between the main fuel supply and the liquid fuel outlet may be omitted, as for instance floats, check valves, etc.

Another object of the invention is to provide a practical device of the character referred to, wherewith efficient mixtures for different speeds may be readily obtained.

Another object of the invention is to provide a device for maintaining a sufficient vacuum effect on the fuel outlet to efficiently feed the fuel when the engine is running, notwithstanding sudden variations in the vacuum effect on the fuel outlet.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings forming part of this specification, wherein similar reference characters refer to similar parts throughout the several views,—

Figure 1 is a side elevation of an automobile equipped with the invention.

Fig. 2 is a vertical sectional view of one of the fuel reservoirs.

Fig. 3 is a face view of an indicator.

Fig. 4 is a rear view of the passageway for the admission of air to the internal combustion engine.

Fig. 5 is an end view of the construction shown in Fig. 4.

Fig. 6 is an enlarged longitudinal vertical section through Fig. 4.

Viewed in certain aspects many of the advantages of the present invention pertain to internal combustion engines generally, whether stationary or portable, but as certain important advantages prominently appear when the invention is employed in connection with automobiles, the disclosure thereof is herein presented in connection with an automobile equipped therewith.

The numeral 1 indicates the frame of an automobile provided with front and rear wheels 2 and 3, and a multiple-cylinder engine 4. The numeral 5 indicates the intake through which air is led to the manifold 6 and thence into the engine for developing power. As will be seen, it is located above the cylinders so as to heat the incoming air. As the engine operates, air is drawn into the engine cylinders by suction through the passageway formed by the intake 5 and the manifold 6, and a manually operable throttle valve 7 is employed to regulate the admission of air to be carbureted by the fuel emerging from outlet 9. Suitable connections are provided whereby the control of the throttle valve 7 may be effected conveniently by the driver. The numeral 8 indicates a fuel conduit having a fuel outlet 9; the numeral 10 indicates a chamber, or

auxiliary fuel reservoir, and the numeral 11 a main reservoir, the latter adapted to supply, or deliver, fuel to the auxiliary reservoir. The fuel outlet 9 is adapted to be subjected to the variations of external pressure in the air passageway, and preferably projects into the passageway in the path of the incoming air and between the manually operable valve and the engine. The fuel conduit 8 conducts fuel from the auxiliary reservoir 10 to the outlet 9, and, in the present embodiment, projects into the auxiliary reservoir as at 12, extending to the bottom of the reservoir where openings 13 are provided as a normal entrance for the fuel. Under certain conditions, as for instance in an automobile, it will be found convenient to locate the main reservoir 11 at the rear of the automobile, the fuel in the main reservoir being below the level of the outlet 9. When the fuel is drawn directly from the main reservoir to the engine, the power of the engine has to be expended in lifting fuel from the main reservoir to the fuel outlet 9, or higher should the connections require it. In the present embodiment the auxiliary reservoir 10 may be disposed adjacent the fuel outlet 9 and above the main reservoir 11, so as to provide an auxiliary supply of fuel at a less conduit distance from the fuel outlet 9 than the main reservoir. In the preferred arrangement, therefore, the pipe 14 conducting the fuel from the main reservoir to the auxiliary reservoir, delivers the fuel to the auxiliary reservoir above the level in the main reservoir, and also above the level of fuel in the auxiliary reservoir, the point of connection between the pipe 14 and the auxiliary reservoir being indicated at 15. The auxiliary reservoir is air tight except for certain openings hereinafter referred to, so that suction in the air passageway above referred to will be effective for the introduction of fuel from the main reservoir to the auxiliary reservoir and for the delivery of fuel from the auxiliary reservoir to the fuel outlet 9. In the embodiment illustrated, the chamber, or auxiliary reservoir comprises upper and lower metallic plates 16 and 17 between which a cylindrical glass wall 18 forming the sides of the receptacle is held by means of the bolts 19, a liquid-tight joint being provided where the cylinder 18 meets the plates 16, 17. Under certain conditions it may be desirable to introduce some fuel directly into the reservoir 10 independently of the supply from the main reservoir, and to provide for such introduction a funnel 20 communicates through the top plate 16 with the interior of the auxiliary reservoir 10, a valve 21 being employed to open and close the duct leading from the funnel to the reservoir.

The fuel outlet from the conduit 8 is preferably of such a character as to be controllable by a needle valve 22 which may be urged inwardly toward closing position by the spring 23, and is coöperatively connected with the throttle valve 7, so that the operation of the throttle valve operates the fuel outlet valve, or needle valve, 22. In the present embodiment the throttle valve 7 is a butterfly valve pivoted in the air passageway and having an arm 24 and suitable connections for manual control, as before referred to. Rotating with the valve 7 is a cam 25 pivotally connected at 26 to an arm 27 rotatable with the valve 7, said cam being adjustable so as to vary its eccentricity by means of a set-screw 28 passing through an arm 29 of the cam and abutting the side of the arm 27, there being a spring 30 holding the cam in its inner position relative to the arm 27. On a bracket or projection 31 depending from the air passageway is a rock-shaft 32 having at one end an arm 33 provided with a roller 34 to coöperate with the cam 25, and having at the other end an arm 35 coöperating with the needle valve 22. As the throttle valve 7 is manually operated in an opening direction, the cam 25 cooperates with the roller 34 to open the needle valve, the movement of the valve in the opposite direction permitting the spring 23 to move the needle valve toward closing position. In order to provide for the operation of the needle valve by the throttle valve, as just described, as well as permit the manual operation of the needle valve independently of the throttle valve, the needle valve 22 is adjustable, as by its stem being threaded in a member 36 with which the arm 35 directly coöperates to open the needle valve, the member 36 being forked as at 37 to engage the flat sides 38 of the bearing 39 through which the needle valve projects. By this construction it will be seen that though the needle valve may be in a position determined by the operation of the throttle, it may be adjusted relatively to the outlet 9 independently of the adjustment effected by the throttle, the rotation of the needle valve in the member 36 effecting the independent adjustment. Rotation of the needle valve for independent adjustment may be conveniently obtained through the instrumentality of a flexible shaft 40 having two pins 41 loosely engaging a piece 42 clamped to the stem of this valve, and adjustable on the stem by threaded engagement therewith. To yieldingly hold the stem against rotary movement, a spring 43 carried by the member 36 engages the toothed periphery of a piece 44 threaded on the stem for adjustment therewith, and held in adjusted position by a lock-nut 45.

As the pressure in the air passageway reduces under the influence of the suction of the engine, air is drawn in through said passageway, the throttle valve and the needle

valve being open. Suction is therefore as well effected through the conduit 8, the auxiliary reservoir, and the pipe 14, with the result that fuel is delivered from the main reservoir 11 through the pipe 14 to the auxiliary reservoir. When the auxiliary reservoir has filled sufficiently to cover the openings 13, or just prior to the liquid level covering such openings, the continued suction through the conduit 8 will result in the delivery of fuel through the conduit toward the outlet 9, mixed with some gas from the auxiliary reservoir should the opening 13 be not completely covered. Under these circumstances the mixture of gas and fuel delivered through the conduit 8 may vary in proportions, and as the main air for combustion will be introduced through the passageway controlled by the throttle valve, it conduces to better efficiency to place sufficient fuel in the auxiliary reservoir through the funnel 20 so as to provide a substantial depth of fuel above the openings 13, but leaving a space in the reservoir above the fuel which is filled by gas or air, as the conditions of operation may determine. Under such circumstances fuel alone will be drawn through the conduit 8, the valve 21 being of course closed. Assuming the auxiliary reservoir to have been partially filled as just stated, the auxiliary reservoir will serve as a combined gas and fuel chamber, and when the external pressure at the fuel outlet 9 reduces below that in the auxiliary reservoir, the gas in said reservoir will expand and thereby effect delivery of fuel to the outlet from the auxiliary reservoir, and delivery of fuel from the main reservoir to the auxiliary reservoir, the latter being directly the result of the difference in pressure between atmospheric pressure acting on the surface of the liquid in the main reservoir and the reduced pressure in the auxiliary reservoir due to expansion of the gas therein. The proper proportions of fuel and air delivered into the air passageway for known conditions may be determined by setting the cam 25 so as to open the needle valve a proper amount for a certain opening of the throttle valve. Should the proper proportions of mixture be not effected through the coöperative relation between the throttle and the needle valves, the needle valve may be adjusted by means of the flexible shaft 40 to regulate the outlet 9 until the proper mixture results. The flexible shaft 40, for operation, is connected to a button or arm 46 within convenient reach of the operator, preferably on the dash, as illustrated.

In order to provide for the automatic receipt by the auxiliary reservoir from the main reservoir of sufficient fuel to cover the normal entrance for fuel 13 to a substantial depth, and provide the air or gas chamber above the surface of the fuel in the auxiliary reservoir, an opening is provided in the auxiliary reservoir through which gas may escape as the liquid rises in the auxiliary reservoir above the openings 13, this opening being disposed at such a point as to assure the provision of an expansible body of gas or air in the auxiliary reservoir above the surface of the fuel therein. In the present embodiment the opening for the escape of air or gas is provided by a port which establishes communication between the interior of the auxiliary reservoir and the conduit 8 leading to the fuel outlet 9. The port, indicated at 47, above the normal entrance 13, leads from the conduit 8 and opens into the auxiliary reservoir, so that gas is trapped by the fuel in the reservoir rising above this port. This port is spaced from the normal fuel entrance 13 relative to the depth of liquid in the auxiliary reservoir, and passage therethrough is restricted to a sufficient extent to assure that the expanding gas in the auxiliary reservoir will have its greatest effect in delivering fuel through the normal fuel entrance 13 rather than through the port. In the present embodiment this restriction is accomplished by making the port 47 of less area than the area of the normal entrance for fuel to the conduit 8, and as the efficiency of the feeding of fuel increases as the area of the port decreases, the port should be made as fine as possible consistent with permitting the air or gas to escape for the purpose before mentioned. In the present embodiment the port is a mere pin opening of about ten one-thousandths of an inch in diameter, is continuously open, and is situated adjacent the top of the auxiliary reservoir so as to permit of as great a supply of fuel in the auxiliary reservoir as possible consistent with maintaining the gas chamber above the fuel.

It will now be perceived that the auxiliary reservoir is subjected to internal gas pressure for delivery of fuel to the fuel outlet 9, and it will be understood that the construction of the auxiliary reservoir is such that the gas trapped therein expands so as to exert pressure upon the liquid therein, the arrangement of said reservoir in the present embodiment providing an air-tight receptacle, except for the openings hereinbefore mentioned. In the operation of the device involving the passage or port 47, the suction stroke of the engine reduces the pressure in the air passageway 5, 6, and the suction effect resulting in the conduit 8, auxiliary reservoir 10 and main reservoir 11, effects feeding of fuel from the main reservoir to the auxiliary reservoir, and the auxiliary reservoir will continue to receive fuel until the fuel level has risen therein to cover the port 47, and while rising in the auxiliary reservoir some of the fuel will be

drawn through the conduit 8 to the fuel outlet 9, together with some air or gas which is present in the upper portion of the reservoir. When the port 47 is covered by the rising fuel, the main feed of fuel in the conduit 8 will be through the normal entrance 13, although a small portion thereof may be drawn into the conduit through the port 47. When the port 47 is very small however, the amount of gas drawn therethrough is rather negligible in so far as deleteriously affecting the proportions of the mixture is concerned.

From the foregoing it will be perceived that there is provided in the auxiliary reservoir a gas pressure above the fuel therein, which operates expansively to feed fuel to the outlet when the suction effect in the air passageway decreases below that in the auxiliary reservoir, and this whether the port 47 be present or not. In either instance the expansive energy of the air in the auxiliary reservoir assists in the feeding of the fuel and takes just so much load off the engine, thus increasing the efficiency of the latter. It will be observed that the disposition of the reservoirs and the fuel outlet relative to each other is such that the conduit 8 and the pipe 14 may be in continuously open condition during the operation, thus avoiding the necessity for using check valves, floats, etc. With the continuously open condition of the conduit 8, port 47, and pipe 14, it is preferred that the fuel level in the main reservoir be below that in the auxiliary reservoir, and that the port 47 be in a horizontal plane between that of the fuel outlet 9 and the pipe connection, or point where the pipe 14 connects with the main reservoir, indicated at 400, the connecting point of the pipe 14 with the auxiliary reservoir being in a plane between that of the port 47 and that of the fuel outlet 9. With such arrangement flooding of the auxiliary reservoir is avoided even though the apparatus be inverted, as may happen in an aeroplane, or accidentally.

In order to further increase the efficiency of the engine and to facilitate and secure its steady operation notwithstanding unskilful manipulation of the throttle valve, means are provided for automatically controlling the vacuum effect in the air passageway adjacent the fuel outlet under the influence of the suction. By the provision of this latter means, any tendency of the suction on the fuel inlet to decrease abnormally is counteracted by an increase in the vacuum effect in said passageway and vice versa, so that should the throttle valve be suddenly opened when the engine is operating at low speed, a sufficient vacuum effect in the passageway is maintained to efficiently feed fuel through the conduit 8, and as the engine speeds up the automatic means referred to permits the freer introduction of air into the passageway so as to decrease the vacuum effect. In the present embodiment this automatic control is effected by means of an air inlet valve 50 adapted to be given an opening movement automatically as the vacuum effect in the passageway increases, and a closing movement automatically as the vacuum effect in the passageway decreases. The regulating position of this valve is automatically determined by the degree of vacuum in the air passageway, and means are provided adapted to yieldingly resist the opening movement of this automatic valve, the resisting effect of this means decreasing as the valve is opening. To this end, with the valve 50, which in the present embodiment is a butterfly valve pivotally operating in the passageway, is arranged a member tending to close the same and to permit the valve to open, the closing effect of this member increasing as the valve is closing. The member is embodied in a weight 51 movable with the valve from a position of effective torque when the valve is shut to a position of substantially no torque when the valve is open, this weight being pivotally supported so that its turning moment decreases as the valve is opening, and becomes zero, or practically so, when the valve is fully open. Specifically, the weight 51 is connected to a pivoted arm 52 to which the valve is in turn connected, and the weight is adjustable on the arm 52 toward and from the pivotal axis thereof. Movement of the valve 51 in one direction is automatically effected by an air motor adapted to be energized by the difference in pressure in the air passageway relative to the atmospheric pressure, the cylinder of such a motor being indicated at 53 connected to the outer wall of the passageway. The air motor comprises a cylinder 53 and a piston 54, the chamber 55 at one side of the piston being exposed to the pressure in the passageway through the opening 56, and the chamber at the other side of the piston communicating with the outer air by a restricted passageway 57 which may be made large or small in accordance with the rapidity of action desired, the passageway 57 providing, as it were, a means adapted to yieldingly restrain operation of the motor. The piston 54 is connected to the valve 50 by the bent connecting rod 58. In starting, the valve 50 will be closed, or nearly so, and a relatively high degree of vacuum will be produced in the air passageway between the valve 50 and the engine. Energetic feed of fuel through conduit 8 is thereby effected at starting, and the valve 50 gradually opens as the excess pressure on the outer side of the piston thereof, through the opening 57, overcomes the inertia of the parts. Should

the throttle valve be suddenly widely opened when running, thus tending to decrease the vacuum effect in the air passageway, the automatic valve 50 will still retain its control to temporarily preserve the prevalent vacuum and will open gradually as speed is obtained, so that there is practically no back firing, spitting, etc., in the air passageway.

Thus by the above described invention is accomplished, among others, the objects hereinbefore referred to.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

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

1. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, a fuel reservoir adapted to supply fuel to said outlet, and means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit.

2. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, a fuel reservoir adapted to supply fuel to said outlet, and means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit, said port being above the normal entrance for fuel into said conduit from the reservoir.

3. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, a fuel reservoir adapted to supply fuel to said outlet, and means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit, the level of fuel in said reservoir being below that of said fuel outlet.

4. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, an auxiliary fuel reservoir adapted to supply fuel to said outlet, means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit, a main reservoir, and a pipe adapted to supply fuel to said auxiliary reservoir and in which main reservoir the fuel level is normally below that in said auxiliary reservoir, said port being in a horizontal plane between that of said fuel outlet and the pipe connection with the main reservoir, the connection of said pipe to the auxiliary reservoir being in a plane between that of said port and that of said fuel outlet.

5. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, a fuel reservoir adapted to supply fuel to said outlet, and means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit, said port being above

the normal entrance for fuel into said conduit from the reservoir, the level of fuel in said reservoir being below that of said fuel outlet.

6. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, an auxiliary fuel reservoir adapted to supply fuel to said outlet, means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit, said port being above the normal entrance for fuel into said conduit from the reservoir, a main reservoir, and a pipe adapted to supply fuel to said auxiliary reservoir and in which main reservoir the fuel level is normally below that in said auxiliary reservoir, said port being in a horizontal plane between that of said fuel outlet and the pipe connection with the main reservoir, the connection of said pipe to the auxiliary reservoir being in a plane between that of said port and that of said fuel outlet.

7. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, an auxiliary fuel reservoir adapted to supply fuel to said outlet, means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit, the level of fuel in said reservoir being below that of said fuel outlet, a main reservoir, and a pipe adapted to supply fuel to said auxiliary reservoir and in which main reservoir the fuel level is normally below that in said auxiliary reservoir, said port being in a horizontal plane between that of said fuel outlet and the pipe connection with the main reservoir, the connection of said pipe to the auxiliary reservoir being in a plane between that of said port and that of said fuel outlet.

8. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, an auxiliary fuel reservoir adapted to supply fuel to said outlet, means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit, said port being above the normal entrance for fuel into said conduit from the reservoir, the level of fuel in said reservoir being below that of said fuel outlet, a main reservoir, and a pipe adapted to supply fuel to said auxiliary reservoir and in which main reservoir the fuel level is normally below that in said auxiliary reservoir, said port being in a horizontal plane between that of said fuel outlet and the pipe connection with the main reservoir, the connection of said pipe to the auxiliary reservoir being in a plane between that of said port and that of said fuel outlet.

9. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, a fuel reservoir adapted to supply fuel to said outlet, and means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet, the area of said port being less than that of the normal fuel entrance to said conduit.

10. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver fuel to said passageway, a fuel reservoir adapted to supply fuel to said outlet, and means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit, said conduit being continuously open to said fuel outlet.

11. In an apparatus of the character described, in combination, an internal combustion engine, a passageway adapted to lead fuel thereto, a fuel outlet adapted to deliver

fuel to said passageway, a fuel reservoir adapted to supply fuel to said outlet, means for maintaining a gas for pressure on the fuel in said reservoir so that when the external pressure on the outlet is reduced said gas acts expansively to deliver fuel from said reservoir toward said outlet comprising a port adapted to establish communication between the interior of said reservoir and the fuel conduit leading to said outlet from the reservoir, passage through said port being restricted relative to that through said conduit, said conduit being continuously open to said fuel outlet, and a main reservoir adapted to supply said auxiliary reservoir and in continuously open communication therewith.

12. In apparatus of the character described, in combination, an internal combustion engine, a conduit adapted to supply liquid fuel thereto, a combined gas and fuel chamber adapted to deliver liquid fuel through said conduit under the influence of the suction of the engine, a main fuel reservoir adapted to deliver fuel to said chamber by said suction, and a port establishing communication between the interior of said chamber and said conduit, said port being of less area than the normal entrance for fuel to said conduit.

13. In an apparatus of the character described, in combination, an internal combustion engine, a conduit adapted to supply liquid fuel thereto, a combined gas and fuel chamber adapted to deliver liquid fuel through said conduit under the influence of the suction of the engine, a main fuel reservoir adapted to deliver fuel to said chamber by said suction, and a port establishing communication between the interior of said chamber and said conduit, said port being of less area than the normal entrance for fuel to said conduit and above said entrance.

14. In an apparatus of the character described, in combination, an internal combustion engine, a combined gas and fuel chamber, a conduit projecting into said chamber having a normal entrance for receipt of fuel therefrom under the influence of the suction of the engine, a continuously open port in said conduit within said chamber, of less area than said normal entrance and above the same, a main fuel supply adapted to deliver fuel to said chamber under the influence of said suction, and a manually operable valve adapted to control discharge of fuel through said conduit.

15. In an apparatus of the character described, in combination, an internal combustion engine having a passageway for the introduction of fuel, a manually operable valve adapted to regulate the admission of air to said passageway, a fuel outlet adapted to be exposed to the pressure in said passageway between said valve and the engine, an auxiliary fuel reservoir subjected to internal gas pressure for delivery of fuel therefrom to said outlet, a main reservoir adapted to deliver fuel to said auxiliary reservoir, the said elements being so arranged that when the pressure in said passageway reduces below that in said auxiliary reservoir the gas in said reservoir expands, thereby effecting delivery of fuel to said outlet from said auxiliary reservoir and delivery of fuel from said main reservoir to said auxiliary reservoir, and a continuously open port adapted to establish communication between the interior of said auxiliary reservoir and the conduit leading therefrom to said outlet, said port being spaced from the normal fuel entrance of said conduit relative to the depth of the fuel in said auxiliary reservoir and of less area than that of said normal entrance.

In testimony whereof I affix my signature, in the presence of two witnesses.

HAROLD CARLE.

Witnesses:
KARL W. SMITH,
JAS. A. HOLMES.