Aug. 6, 1957 L. B. READ 2,801,835

PRESSURE CARBURETOR

Filed April 9, 1953 3 Sheets-Sheet 1

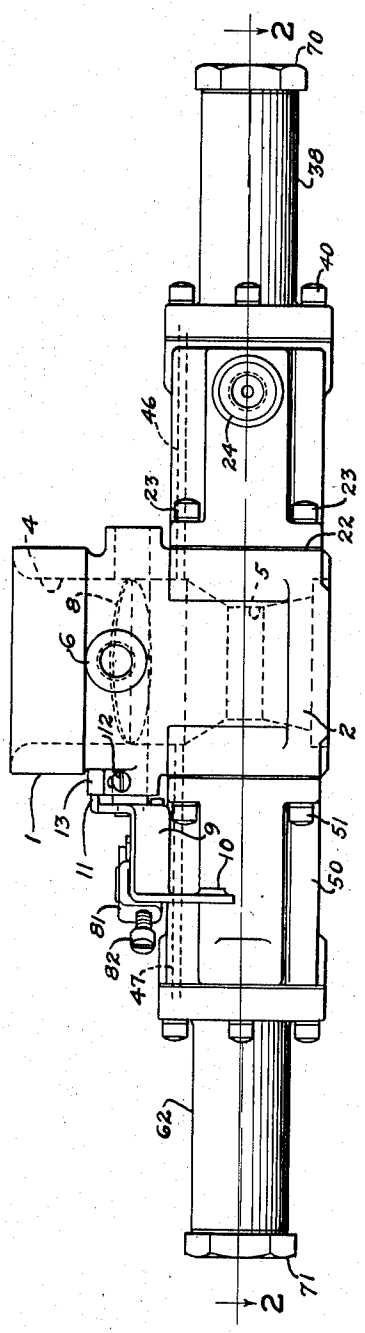


FIG. 1.

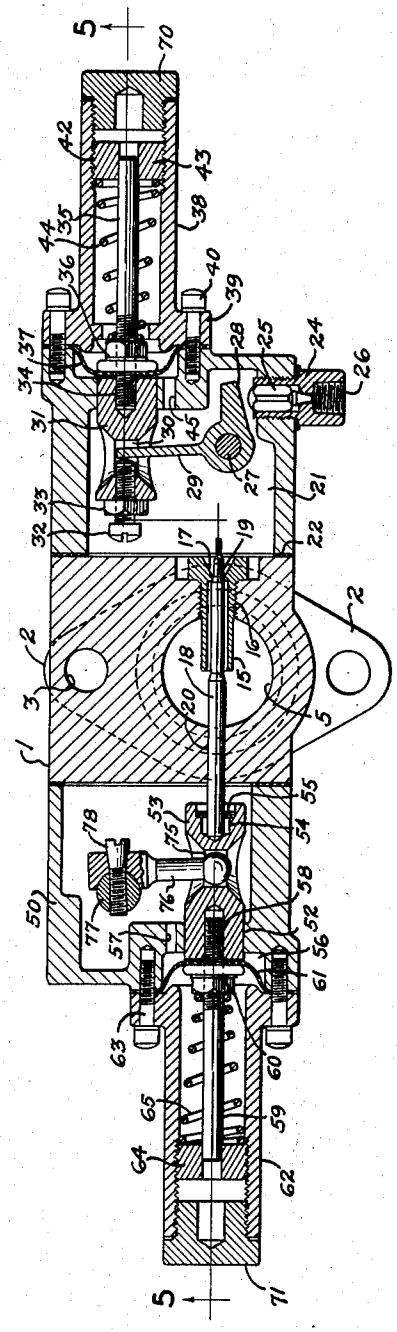


FIG. 2.

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PRESSURE CARBURETOR

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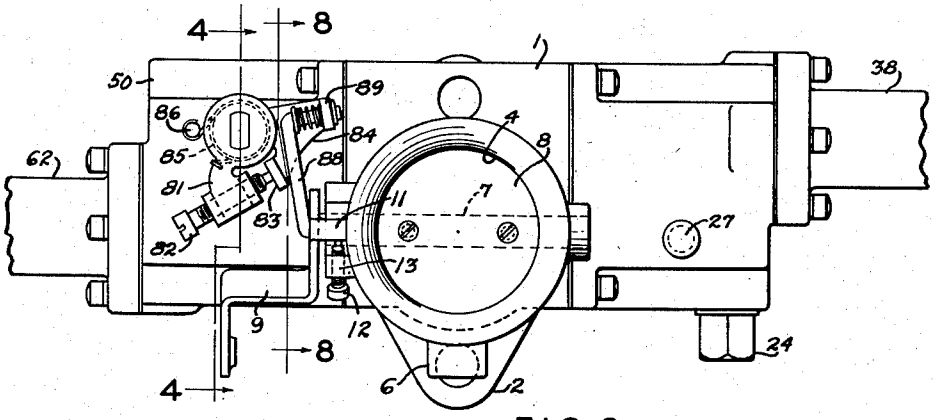


FIG. 3.

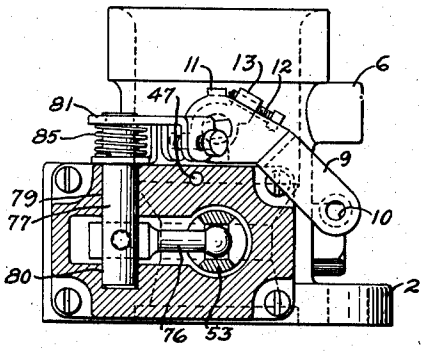


FIG. 4

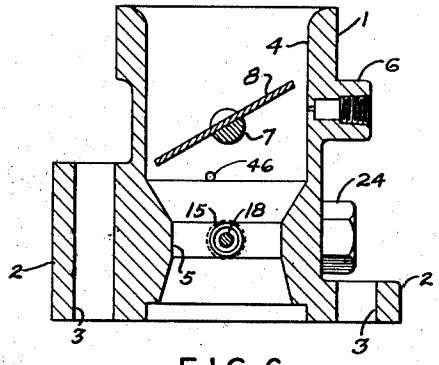


FIG. 6.

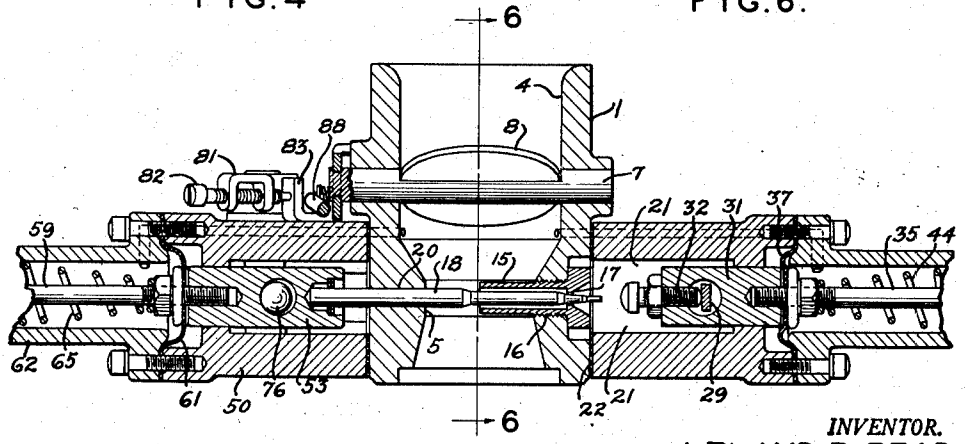


FIG. 5.

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PRESSURE CARBURETOR

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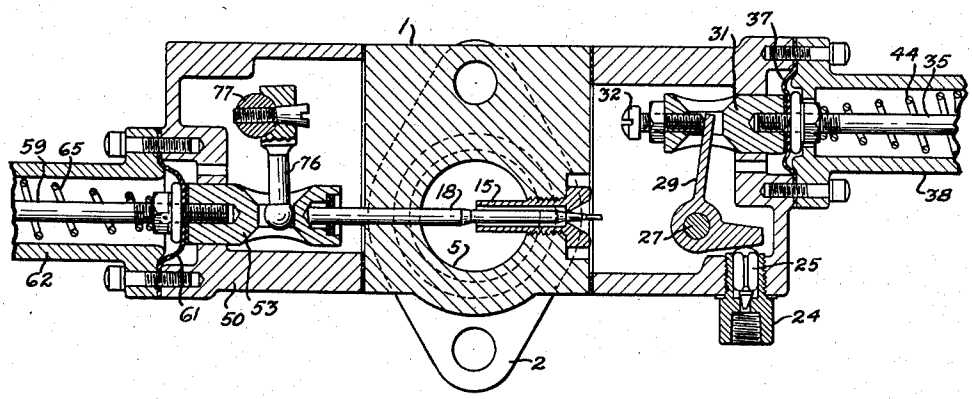


FIG. 7.

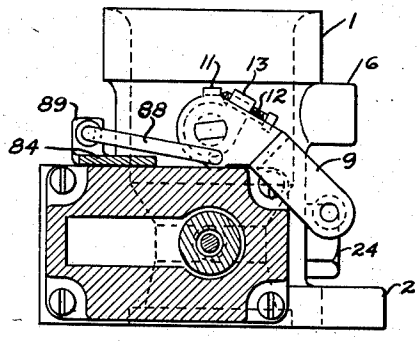


FIG. 8.

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United States Patent Office

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2,801,835

PRESSURE CARBURETOR

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Application April 9, 1953, Serial No. 347,734

11 Claims. (Cl. 261—51)

This invention relates to carburetors suitable for motor vehicles and, more particularly, to carburetors of the pressure type as distinguished from the more conventional float bowl kind. The carburetor of this invention is designed to comprise components especially suited for production by die-casting methods, and contains parts which are readily interchangeable to eliminate production and assembly difficulties.

It is widely recognized in the art that each engine requires a carburetor tailored to fit its requirements. Furthermore, even individual models of the same engine require minor changes over the previous models. Because of this, the problem of adequate supply and replacement stocks for individual makes of carburetors becomes excessively large.

It is also well understood that present-day motor vehicle needs require carburetors which are immune to violent accelerations and decelerations due to sharp turns and violent braking. The float bowl type of carburetor thus presents many problems in order to render it reasonably satisfactory in performance to suit these conditions.

It is an object of this invention to provide a carburetor with as many interchangeable parts as possible to simplify its production.

It is also an object of this invention to provide a mechanism which, by substitute or interchangeable parts, may be readily adapted to different engine requirements.

It is also an object of this invention to provide a pressure carburetor with a throttle positioned to avoid icing effects.

It is also an object of this invention to provide a carburetor with a throttle-operated fuel metering control which is modulated to compensate for changes in load on the engine.

It is a further object of this invention to provide a carburetor of the pressure type wherein the supply of fuel is directly controlled by throttle position, and wherein this mechanism is provided with a modulating means to supply fuel during engine operation at idle speeds.

In the drawings,

Fig. 1 is a front elevation of a carburetor according to this invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a top plan view of the structure in Fig. 1.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Fig. 5 is a vertical section of the carburetor shown in Fig. 1, showing the position of the parts at part-throttle.

Fig. 6 is a vertical section on the line 6—6 of Fig. 5.

Fig. 7 is a horizontal sectional view of the carburetor shown in Fig. 1, showing the position of the parts at dead-idle position of the throttle.

Fig. 8 is a sectional view on the line 8—8 of Fig. 3.

Referring now to Figs. 1 and 3, Fig. 1 shows a combined air horn or throttle body 1 which is a separate piece and, as such, can be readily produced in various sizes so as to be interchangeable in the carburetor assembly in order to suit different engines. This throttle body 1 has flanges 2 provided with stud holes 3 suitably positioned for

attachment to the manifold of the particular engine for which they are designed. A mixture conduit 4 extends vertically through the throttle body, and formed integral therewith is a venturi having a throat 5. On the side of the throttle body is a threaded boss 6 which connects to a port in the mixture conduit. This connection is provided for the usual vacuum-operated spark advance. Above the venturi is rotatably mounted a throttle shaft 7 carrying throttle valve 8, and also throttle-operated arm 9, which, in turn, has a connection 10 for the usual manual control provided in the motor vehicle. Operating arm 9 has an upstanding lug 11 engaging one end of idle speed adjusting screw 12 threaded through lug 13 formed integral with the throttle body.

Extending transversely of the mixture conduit adjacent the throat of the venturi 5 is a fuel nozzle 15 secured in the throttle body by a threaded connection 16. The nozzle has a metering passage and seat 17 which opens outwardly, and this opening is controlled by a metering rod 18 shown in seated position at 19 in Fig. 2. In this position the fuel nozzle is tightly closed. The metering rod 18 is slidably mounted in an aligned passage 20 in the opposite side of the throttle body, and is operated by a mechanism which will be later described. To the right of the throttle body is removably secured a fuel reservoir 21. This reservoir is sealed to the throttle body by a gasket 22 and attached in any suitable manner, preferably by cap screws 23. One side of the fuel reservoir has a threaded opening receiving seat 24 provided with a needle valve 25 and a threaded boss 26 for direct connection to a fuel pressure source. The control for the needle valve includes a bell crank pivoted about the pin 27 within the fuel reservoir which has a presser foot 28 engaging one end of the needle valve for urging it towards its seat. The opposite arm 29 engages within an opening 30 of a slidable plunger 31 guided in an opening in one wall of the fuel reservoir. This plunger 31 has an adjusting screw 32 carrying a lock nut 33 suitable to adjust the size of the opening within the plunger 31 to control the pressure within the fuel reservoir in a manner later described. Opposite the adjusting screw the plunger 31 has a threaded socket 34 which receives a stem 35. On the stem is a nut and washer assembly 36 which engages and clamps a diaphragm 37 against the end of the plunger. A housing 38 surrounds the stem and has a flange portion 39 provided with suitable holes by which cap screws 40 secure the housing to the fuel reservoir. The diaphragm 37 forms a seal between the fuel reservoir and the housing 38. Screw threads 42 are formed internally of the outer end of housing 38, and are engaged by corresponding threads on a combination guide and abutment member 43. The guide has a suitable aperture for receiving the outer end of the stem 35, and is adjustable within the housing to vary the compression in spring 44. Pressure within the reservoir acts on one side of diaphragm 37 through passage 45 while pressures posterior the throttle act on the opposite side through passage 46.

On the opposite side of the throttle body is a housing 50 secured to the throttle body by a plurality of cap screws 51. Housing 50 and reservoir 21 are formed from identical die castings. The housing is suitably apertured at 52 to slidably support a plunger 53. A socket 54 in the plunger 53 receives one end of metering rod 18. The rod is securely locked in the socket by suitable keepers 55. The opposite end of plunger 53 extends into a cup-shaped pocket 56 which is provided with a passage 57 communicating between the socket and the housing. This end of the plunger has an internally threaded socket 58 threadedly engaging with stem 59. On this stem is a nut and washer assembly 60 which engages and clamps diaphragm 61 against one end of the plunger. A housing 62 sur-

rounds the stem 59 and is detachably secured to the housing 50 by a series of cap screws 63, and the joint between the two is sealed by diaphragm 61. One end of the housing 62 is internally threaded to receive a combination guide and abutment member 64 provided with a central aperture for the stem 59. This provides an adjustable abutment for compression spring 65, which bears against the end of the plunger. Housing 62 and housing 38 are substantially identical, and are sealed with identical plugs 70 and 71. One side of diaphragm 61 is exposed to pressures within housing 50 through passage 57, while the opposite side of diaphragm 61 is exposed to pressures posterior the throttle 8 through passage 47. Pressures within housing 50 will be near atmospheric because of leakage about countershaft 77.

The means of operating the plunger 53 from the throttle is best illustrated in Figs. 2 and 4.

Referring to Fig. 2, plunger 53 has a socket 75 which receives the ball end of a lever 76. The socket is slightly larger than the ball end to provide some lost motion for a purpose that will later be discussed. Lever 76 is rigidly secured to a countershaft 77 by a tapered pin 78 extending through the lever 76 and threadedly engaging a transverse passage in the shaft 77. This shaft is suitably mounted top and bottom in bearings 79 and 80, best shown in Fig. 4. Fixedly secured to the upper end of countershaft 77 is an arm 81. The outer end of this arm is threaded to receive an adjusting screw 82, which, in turn, bears against an abutment 83 of an actuating arm 84 rotatably mounted on the countershaft 77. A torsion spring 85 fixedly attached at 86 to the housing 50 is wound around the countershaft 77 and engages arm 81 to maintain engagement between the adjusting screw 82 and abutment 83. Throttle-actuating arm 9 is connected by way of a link 88 to a lug 89 on the outer end of actuating lever 84, so that, when the throttle is opened, rotation of the arm 9 will be transmitted to the actuating lever 84, and by abutment 83 to the arm 81 to rotate countershaft 77 against the tension of spring 85 to produce like movement of the ball-end lever 76 which will engage the outer side of the socket 75 and withdraw the stepped metering rod 18 from seating engagement within the metering orifice 17. By means of the adjusting screw 82 the amount of clearance of the ball end and the plunger socket may be adjusted, and this expedient provides a control of the mixture at idle, since the clearance just mentioned determines the amount of displacement of the metering rod from its seat by action of the suction on the diaphragm 61. Thus, the permissible range of movement produced by the diaphragm is controlled by the amount of clearance between the inside face of the ball and the socket.

The fuel pressure, on the other hand, may be determined in two ways, either by adjustment of the set screw 32 or of the combination guide and abutment 42 to increase or decrease the effect of spring 44.

Operation

It will be apparent from the structure just described that movements of the throttle arm in an opening and closing direction will produce corresponding movements of the metering rod to increase and decrease the size of the metering orifice as required. This particular throttle-actuating mechanism also provides for adjustment of the metering rod for proper mixture during engine idling conditions, as well as for fully sealing the discharge orifice 17 when the engine is at rest.

From the above description of the throttle linkage, it will be understood that the connection between the throttle and the plunger is such that only opening movements of the throttle are directly transmitted to the plunger actuating the metering rod, and that some clearance exists between the ball end of the arm 76 and the socket 75.

In the first instance, when the engine is at rest, there will be no suction imposed on the outer surface of the

diaphragm 61. Consequently, compression spring 65 will hold the metering rod on its seat 17 to prevent the leakage of gasoline from the nozzle 15. When the engine is started, however, suction will exist on the outer side of the diaphragm 61 which will compress spring 65 slightly until one side of the socket 75 engages with the ball end on lever 76. This will crack the needle valve from its seat sufficiently to provide enough fuel from the end of nozzle 15 for idle conditions. As the throttle is gradually opened, the stepped portions on the metering rod will provide the necessary increase in orifice size to properly meter the fuel for steady running.

This carburetor also incorporates not only modulation of the metering rod control as above explained, but also modulation of the fuel pressure in the reservoir to accommodate the requirements of the engine for enriched mixture during acceleration and heavy loads, as well as a leaner mixture for low load conditions on the engine. To accomplish these results, the carburetor has a fuel control which regulates the fuel pressure in the reservoir in accordance with suction acting on the outside of diaphragm 37.

Referring to Fig. 7, the position of the parts corresponds with the conditions existing at idling speeds. From this figure it can be readily seen that the amount of opening of needle valve 25 is controlled by fuel pressure on one side of diaphragm 37 and suction acting on the other opposed by a predetermined resistance in spring 44. In this position, the valve is shown practically closed. Suction will be high, and fuel pressure low. At part-throttle, however, fuel pressure must increase to compensate for the drop in suction acting on this diaphragm. Consequently, the flow through the orifice 17 will increase, not only due to the movement of the metering rod, but also due to this pressure increase in the reservoir. At high speed, suction acting on the diaphragm will be negligible. Therefore, the fuel pressure must increase a corresponding amount to the drop in suction. At any throttle position, however, should the engine load increase suddenly, suction will immediately drop to produce an increase in fuel pressure in the reservoir. Conversely, at any throttle position, if the load on the engine is decreased, suction will increase, immediately lowering the fuel pressure within the reservoir a corresponding amount by closing the needle valve 25. If the throttle is suddenly opened, suction will immediately decrease, thereby immediately stepping up fuel pressure. By this simple arrangement of parts, all of the necessary functions are performed. This carburetor will meter the fuel not only according to position of the metering rod and fuel pressure, but also according to the aspiration at the throat of the restriction, since this likewise will produce an increase in fuel flow at high rates of air flow. This carburetor, therefore, presents many possible variations in fuel flow by several distinct and separate means, since fuel flow may be controlled by aspiration, fuel pressure, or metering rod calibration. Thus a flow curve suitable for any type of engine may be obtained.

I claim:

1. A carburetor for a motor vehicle engine having a plurality of separately replaceable units comprising a rectilinear body, a mixture conduit in said body eccentrically located with respect to a transverse medial plane passing through said body parallel with the axis of said mixture conduit, a fuel nozzle in said mixture conduit symmetrically located therein and parallel to said medial plane, a throttle valve in said mixture conduit, and a plurality of substantially identical interchangeable housings including substantially identical eccentrically located chambers for fuel control means, said housings being symmetrically arranged with respect to the transverse medial plane passing through said body and said housings and detachably secured in reverse relative position

to opposite sides of said carburetor body whereby only one of said chambers is aligned with said fuel nozzle.

2. A carburetor having a mixture conduit, a fuel reservoir, a fuel nozzle in said conduit connected to said reservoir, a first means in said conduit including a throttle arranged for independently producing variable fuel pressures at said nozzle, and independently acting means for controlling the rate of fuel discharge from said nozzle, said first means comprising a fuel pressure regulator having a progressively variable action to modulate fuel pressures at said nozzle in accordance with the combined action on said regulator of variable positive fuel pressures existing in said reservoir and negative pressures posterior said throttle, and said independently acting means comprising a fuel metering means for said nozzle comprising a metering rod connected to said throttle by connecting means including a lost motion connection providing free limited movement of said rod from a normally closed position to an idling position within said nozzle when the throttle is closed, said throttle acting through said connecting means to move said metering rod between idling and full open positions, and a modulating device operable responsive to suction in said conduit at engine idling speed to move said rod from its closed position to its idling position.

3. The combination defined in claim 2, wherein said means in said conduit includes a venturi device.

4. A carburetor for a motor vehicle engine, comprising a body including a mixture tube having a throttle and a fuel nozzle, a metering rod for said nozzle, a fuel reservoir for said body to supply fuel to said nozzle, and a control linkage for said rod actuated from said throttle, said control linkage including a lost motion connection operative throughout the range of throttle positions, said connection providing free limited motion of said rod between closed and idle positions when the throttle is in dead idle position, and a modulating device including a member connected to said rod and automatically operable to move said rod a predetermined distance from its closed position to its idling position for modifying the action of said control linkage through said lost motion connection as a function of engine suction at low engine speeds.

5. A carburetor for a motor vehicle engine comprising a body including a mixture tube having a throttle and a fuel nozzle, a metering rod for said nozzle, a fuel reservoir for said body to supply fuel to said nozzle, and a control linkage for said rod actuated from said throttle, said control linkage including a lost motion connection operative throughout the range of throttle positions, said connection providing free limited motion of said rod between closed and idle positions when the throttle is in dead idle position, means to adjust the amount of lost motion in said connection, and a modulating device including a member connected to said rod and automatically operable to move said rod a predetermined distance from its closed position to its idling position for modifying the action of said control linkage through said lost motion connection as a function of engine suction at low engine speeds.

6. A carburetor having a mixture conduit, a throttle and a fuel nozzle in said conduit, a venturi in said conduit, a fuel reservoir adjacent said conduit, a variable metering orifice between said reservoir and said nozzle whereby the pressure downstream of said orifice will vary as a function of engine speed and throttle opening, a metering rod in said orifice, a control linkage including a lost motion type of connection between said throttle and said rod, said connection providing free limited motion of said rod between closed and idle positions when the throttle is in dead idle position, a suction operated device actuated through a separate connection with said mixture conduit and separately connected to said rod, and a pressure regulator for said reservoir having a

connection with said mixture conduit posterior of said throttle for adjusting the fuel pressure upstream of said orifice as a function of engine load, whereby fuel metering is controlled exclusively as a function of manifold pressure when said throttle is closed, and by the variables of engine speed, throttle opening and manifold pressure in all open positions of said throttle, said connection being operative throughout the range of throttle positions.

7. In a carburetor for an internal combustion engine, an air induction passage having a venturi therein, a throttle in said passage anterior said venturi, a fuel discharge nozzle to discharge fuel from a source of fuel under pressure into said venturi posterior to the throttle, a metering rod connected to and actuated by said throttle and operable to vary the flow of fuel through said nozzle and movable between a closed position and a full open position responsive to corresponding movement of the throttle, resilient means yieldably resisting movement of said metering rod from its closed position toward its open position, and pressure responsive control means operable responsive to variations in pressure in said passage between the throttle and venturi, automatically operable to move said metering rod a predetermined distance from its closed position to its idling position responsive only to engine suction at idling speed when the throttle is in dead idle position, said control means comprising a suction chamber closed at one end thereof by a diaphragm connected to said metering rod.

8. In a carburetor for an internal combustion engine, an air induction passage having a venturi therein, a throttle in said passage anterior said venturi, a fuel discharge nozzle to discharge fuel from a source of fuel under pressure into said venturi posterior to the throttle, a metering rod connected to and actuated by said throttle and operable to vary the flow of fuel through said nozzle and movable between a closed position and a full open position responsive to corresponding movement of the throttle, resilient means yieldably resisting movement of said metering rod from its closed position toward its open position, and pressure responsive control means operable responsive to variations in pressure in said passage between the throttle and venturi, automatically operable to move said metering rod a predetermined distance from its closed position to its idling position responsive only to engine suction at idling speed when the throttle is in dead idle position, said control means comprising a suction chamber closed at one end thereof by a diaphragm connected to said metering rod, and connecting means interconnecting said throttle and metering rod providing free limited movement of said metering rod relative to the throttle when the latter is in dead idle position.

9. In a carburetor for an internal combustion engine, an air induction passage having a venturi therein, a throttle in said passage anterior said venturi, a fuel discharge nozzle to discharge fuel from a source of fuel under pressure into said venturi posterior to the throttle, a metering rod connected to and actuated by said throttle and operable to vary the flow of fuel through said nozzle and movable between a closed position and a full open position responsive to corresponding movement of the throttle, resilient means yieldably resisting movement of said metering rod from its closed position toward its open position, and pressure responsive control means operable responsive to variations in pressure in said passage between the throttle and venturi, automatically operable to move said metering rod a predetermined distance from its closed position to its idling position responsive only to engine suction at idling speed when the throttle is in dead idle position, said control means comprising a suction chamber closed at one end thereof by a diaphragm connected to said metering rod, and connecting means interconnecting said throttle and metering rod providing free limited movement of said metering rod relative to the throttle when the latter is in dead idle position, said connecting means including a lost motion connection movable

with said metering rod responsive to movement of said throttle toward its full open position.

10. In a carburetor for an internal combustion engine, an air induction passage having a venturi therein, a throttle in said passage anterior said venturi, a fuel discharge nozzle to discharge fuel from a source of fuel under pressure into said venturi posterior to the throttle, a metering rod connected to and actuated by said throttle and operable to vary the flow of fuel through said nozzle and movable between a closed position and a full open position responsive to corresponding movement of the throttle, resilient means yieldably resisting movement of said metering rod from its closed position toward its open position, pressure responsive control means automatically operable to move said metering rod a predetermined distance from its closed position to its idling position responsive only to engine suction at idling speed when the throttle is in dead idle position, said source of fuel under pressure comprising a fuel chamber having an inlet controlled by a valve, and another pressure responsive control means to operate said valve to control the flow of fuel through said inlet into said fuel chamber.

11. In a carburetor for an internal combustion engine, an air induction passage having a venturi therein, a throttle in said passage anterior said venturi, a fuel discharge nozzle to discharge fuel from a source of fuel under pressure into said venturi posterior to the throttle, a metering rod connected to and actuated by said throttle

and operable to vary the flow of fuel through said nozzle and movable between a closed position and a full open position responsive to corresponding movement of the throttle, resilient means yieldably resisting movement of said metering rod from its closed position toward its open position, pressure responsive control means automatically operable to move said metering rod a predetermined distance from its closed position to its idling position responsive only to engine suction at idling speed when the throttle is in dead idle position, said source of fuel under pressure comprising a fuel chamber having an inlet controlled by a valve, and another pressure responsive control means operable responsive to variations in pressure in said passage between the throttle and venturi to operate said valve to control the flow of fuel through said inlet into said fuel chamber.

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