Nov. 13, 1951 F. B. SWEENEY 2,574,670

CARBURETOR

Filed Nov. 23, 1945 2 SHEETS—SHEET 1

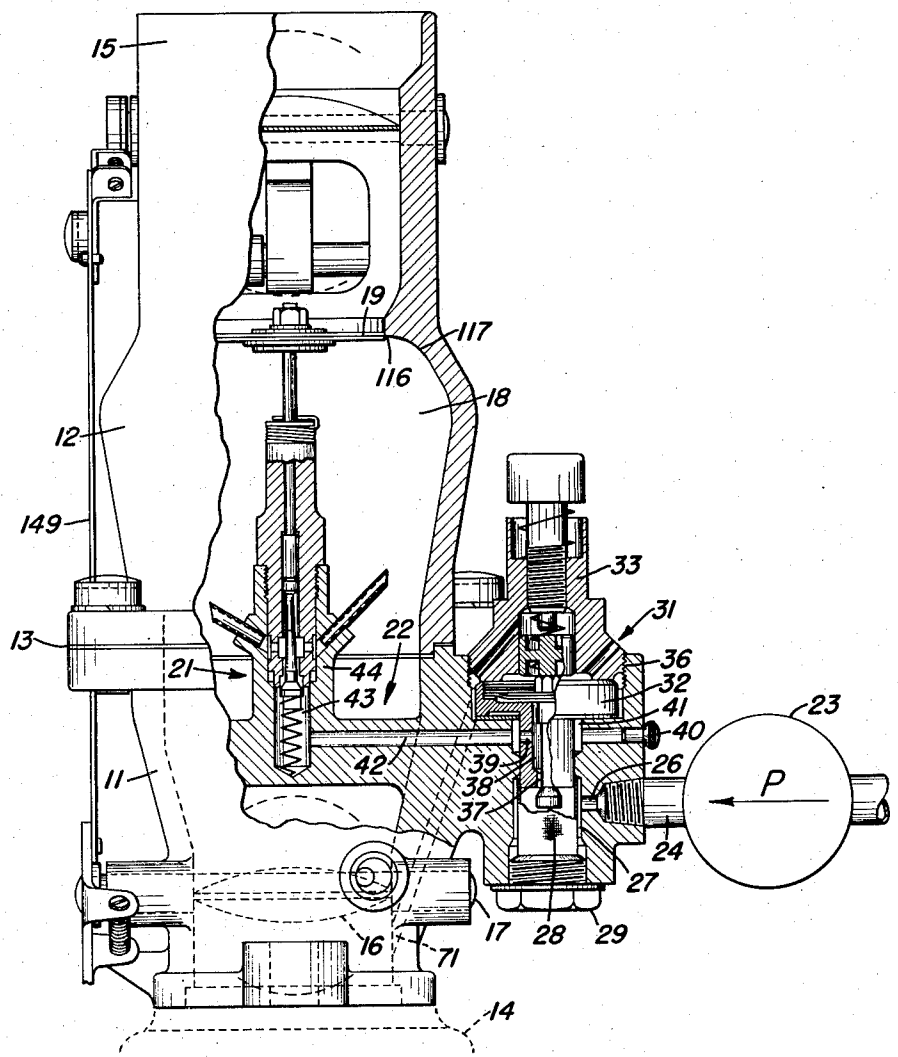


FIG. 1.

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Filed Nov. 23, 1945 2 SHEETS—SHEET 2

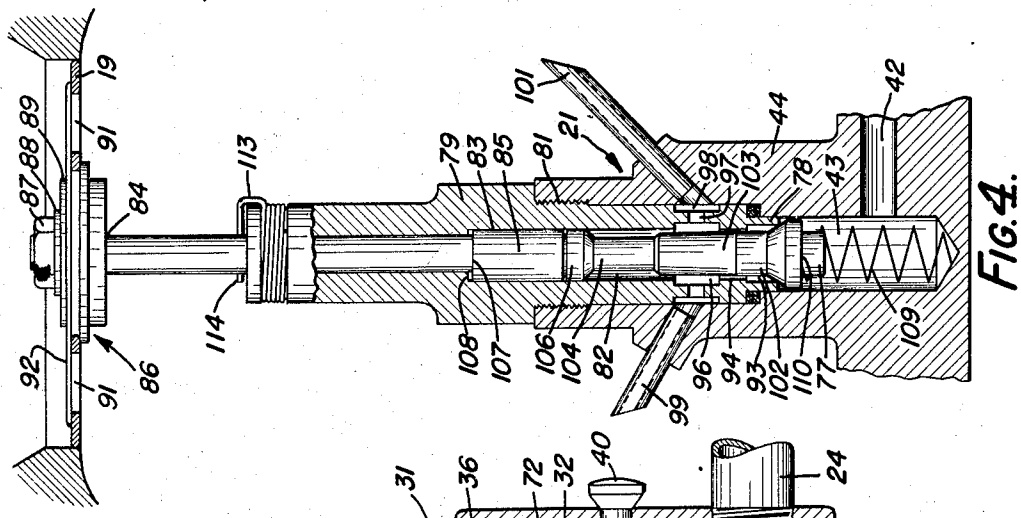


FIG. 4.

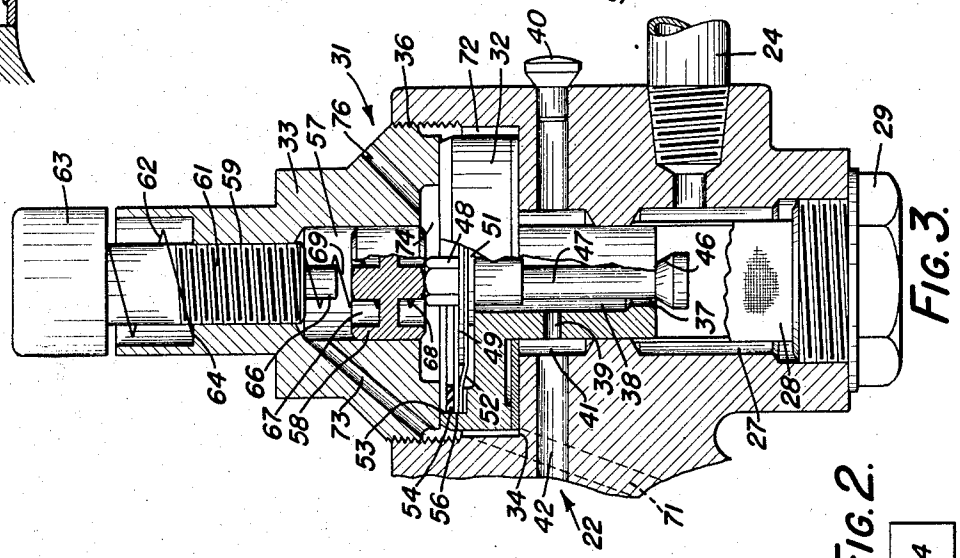


FIG. 3.

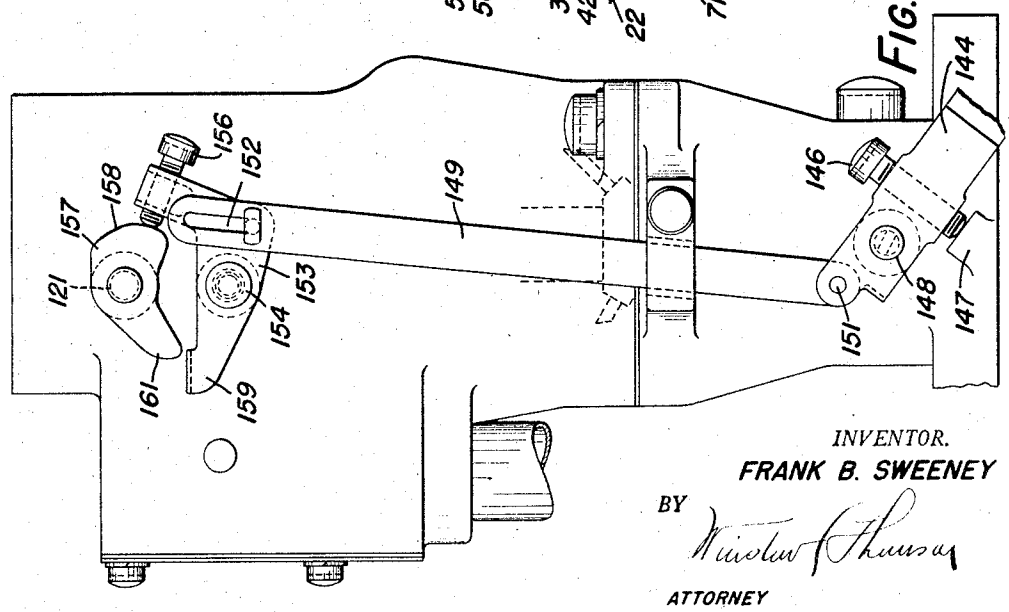


FIG. 2.

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2,574,670

UNITED STATES PATENT OFFICE

2,574,670

CARBURETOR

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Application November 23, 1945, Serial No. 630,257

7 Claims. (Cl. 261—37)

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My invention relates to carburetors and, more particularly, to a carburetor of the pressure injection type suitable for use with automotive or aircraft engines or any other type of gasoline engine propelled craft.

An object of my invention is to provide a simplified pressure injection carburetor which is economical in fuel consumption, simple in construction and relatively trouble free in operation.

Another object of my invention is to provide a pressure injection carburetor in which the fuel and air are accurately metered under substantially all conditions of operation to the end that the proper ratio of fuel to air is supplied to the engine for optimum results substantially throughout the range of operation of the engine.

Another object of my invention is to provide a pressure injection carburetor wherein means are provided for automatically supplying a rich mixture of atomized fuel when the engine is started.

Another object of my invention is to provide a pressure injection carburetor in which, under normal conditions of operation, the fuel pressure at the fuel metering valve is maintained substantially constant.

Another object of my invention is to provide a pressure injection type of carburetor in which an air metering means or disc governs the operation of the fuel metering valve so that the ratio of fuel to air is varied in the proper proportions for best operation under normal cruising conditions and, at the same time, provision is made for increasing the ratio of fuel to air automatically when the engine is at or near full load for any given engine speed or is being suddenly and rapidly accelerated.

A further object of my invention is to provide a pressure injection carburetor in which the fuel is introduced into the air stream under pressure and by means of nozzles so constructed and arranged as to secure better atomization of the fuel and substantially uniform co-mingling of the fuel vapor and air and distribution of fuel and air to the engine cylinders.

Still another object of my invention is to provide an improved temperature control for the air entering the carburetor particularly adapted for use in connection with a pressure injection carburetor, and in which all the air passing to the carburetor has a definite and measurable affect on the fuel metering valve and the supply of fuel to the carburetor.

My invention further contemplates the provision of improved means for idling the motor so

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that the motor will idle either when the engine is cold or when it is at running temperature without stalling and without the use of excessive fuel.

Other objects and advantages of my invention will be set forth more particularly in the claims and will be apparent from the following description, when taken in connection with the accompanying drawings, in which:

Figure 1 is a view partly in section and partially diagrammatic illustrating the pressure injection carburetor of my invention;

Figure 2 is a side elevation of the pressure injection carburetor of my invention looking from the left of Figure 1;

Figure 3 is an enlarged sectional view of a portion of Figure 1 showing the fuel pressure regulating valve together with its associated parts; and

Figure 4 is an enlarged sectional view of a portion of Figure 1 showing the air and fuel metering valves and their associated parts.

The carburetor of my invention comprises a main body section 11 and a mixing chamber section 12 which are provided with flanges secured together, as shown at 13. The carburetor is connected to the intake manifold, partially indicated at 14, of the engine with which the carburetor is associated. Above the mixing chamber section 12 is an air intake section 15. The particular carburetor illustrated is of the down-draft type which is the preferred form. However, this is primarily for purposes of illustration as the principles of my invention may be incorporated in other types of carburetors.

The carburetor is provided with the usual throttle valve 16, mounted on a shaft 17, carried in bores formed in bosses. The function and operation of a throttle valve are well known in the art to which this invention applies and no description of its function and operation is believed to be necessary. The main body section and the mixing chamber section are provided with passages which are connected to form an air flow passage 18 through which air flows to the intake manifold of the engine under the partial vacuum or sub-atmospheric pressure conditions created by the reciprocation of the pistons thereof.

The air flow passage 18 is normally almost closed by an air metering disc 19 which is movable from the closed position shown to a partially or fully open position, in accordance with the differential in pressure existent on opposite sides of the air metering disc. The air metering disc assumes a position dictated by the

pressure conditions existent and thus its position reflects or measures the volume of air passing through the air flow passage. While I have shown a disc air metering device and believe that this has distinct advantages, other air metering devices might be employed in combination with other parts of the carburetor of my invention.

The air metering disc 19 is connected, in a manner presently described, to a fuel metering valve generally indicated by the numeral 21. The fuel metering valve is located in the fuel line, generally designated by the numeral 22, the fuel line being connected to a fuel pump diagrammatically illustrated by the numeral 23.

The fuel pump 23 is driven in the usual manner from the engine cam shaft and is of a type in common use adapted to deliver gasoline to the fuel line at a substantially constant pressure regardless of engine operating speed. The fuel pump 23 is connected to the fuel line by a pipe 24 (Figure 3) which extends into a threaded opening formed in the main body section of the carburetor. A bore 26, communicating with the pipe 24, opens into a chamber 27 in which is housed a strainer 28. Access to the chamber 27 and the strainer 28 for the purpose of cleaning the same, is gained through an opening in the main body section which is closed by a threaded cap 29.

The chamber 27 is in communication with an enlarged opening in the main body section which is adapted to receive a regulating valve assembly, generally indicated by the numeral 31. The regulating valve assembly 31 comprises a valve body section 32 and a cap section 33. The valve body section 32 is supported by an annular wall provided in the casting which forms the main body section 11 of the carburetor. Interposed between the facing surfaces of the valve body section 32 and the annular wall formed in the casting is a gasket 34 to prevent leakage of fuel as will later appear. The cap section 33 of the regulating valve assembly is threaded into the casting as shown at 36. By threading the cap section inward, pressure is applied on the gasket 34 so as to form a seal between the surfaces.

The lower end of the valve body section 32, is provided with a valve seat 37 formed at the end of a bore 38. The bore 38 constitutes a part of the fuel line 22. Extending from the bore 38 are one or more radial passages 39 which open into an annular recess 41. The annular recess communicates with a transversely extending passage 42, one end of which is closed by a plug 40 and which also constitutes part of the fuel line 22. The transverse passage 42 connects with a vertically extending passage 43 formed in an upwardly extending part 44 (Figure 4), which houses the fuel metering valve assembly 21.

The pressure regulating valve includes a frusto-conical valve element 46, adapted to cooperate with the valve seat 37, to regulate the flow of fuel through the bore 38 and the fuel line 22. The valve element 46 is connected to a valve stem 47 which extends upward concentric with the bore 38. The valve stem 47 is threaded internally to receive a screw having a head 48. Interposed between the head 48 and the end of the valve stem 47 are a pair of backing plates 49 and 51. The backing plates serve to confine a resilient diaphragm 52 between them.

The margins of the diaphragm 52 are carried on an annular ledge formed in an enlarged recess 53 provided in the valve body section 32. An annular snap ring 54 confines the margins of the diaphragm and annular packing rings 56 are interposed between the parts on opposite sides of the diaphragm. From the above, it will be apparent that the margins of the diaphragm are rigidly held but the diaphragm is free to be flexed so as to move the valve element 46, from the position shown, to a closed position or any intermediate position in accordance with the degree of flexure of the diaphragm.

Formed in the cap section 33, is an enlarged cylindrical bore 57. A piston or pressure responsive element 58 is operable in the cylindrical bore 57 in accordance with variations in pressure existent on the opposite sides of the piston during the operation of the engine. The upper end of the cap section 33 has a threaded bore 59 adapted to receive an adjustment screw 61. A spring 62 is interposed between the thumb piece or head 63 of the screw and a shoulder 64. The spring serves to maintain the adjusting screw from being shaken loose from its desired position of adjustment.

A stop 66, projecting into the cylinder, is formed on the lower end of the adjusting screw which limits the upward movement of the piston 58. Annular recesses 67 are provided on opposite sides of the piston 58 for the seating of springs 68 and 69. For the purposes of this description, and as will presently appear, the lower spring 68 may be considered a pressure regulating spring, while the upper spring 69, which is the stronger of the two springs, may be termed a full load enrichment spring.

As shown more clearly in Figure 1, a bore 71 is provided in the main body section casting 11, which extends from the air flow passage on the lower side of the throttle valve 16, upwardly to an annular recess 72 (Figure 3) formed in the pressure regulating valve assembly. The annular recess 72 communicates through a bore 73 to the space in the cylinder 57 above the piston or pressure responsive element 58.

The space above the piston 58 is thus subjected to the vacuum or sub-atmospheric pressure conditions existent in the intake manifold. The vacuum conditions in the intake manifold, as is well known in the art to which this invention applies, is determined by the operating conditions under which the engine is functioning. It is sufficient for the purpose of this invention, to state that the degree of a vacuum existent in the intake manifold, and hence in the cylinder 57 above the piston 58, is decreased upon an increase in the load conditions imposed upon the engine or when the engine is being accelerated by opening the throttle more widely.

As illustrated in Figure 3, which is also true of all the views, the parts are shown in the position which they occupy when the engine is not operating. When the engine is started, a partial vacuum is produced in the intake manifold. This sub-atmospheric pressure after the engine is running is effective in the cylinder 57 above the piston, to draw the piston upward against the action of the spring 69 and into engagement with the stop 66.

While by changing the spring 69, and employing a stronger or weaker spring, the piston may be forced to leave its seat when the degree of vacuum in the cylinder 57 decreases to any desired amount, I have found it desirable to employ a spring adapted to exert a pressure sufficient to force the piston out of engagement with

the end of the stop 66 when the sub-atmospheric pressure existent in the cylinder 57 corresponds or increases to approximately full load on the engine. By adjusting the thumb piece substantially the entire curve formed by plotting the fuel-air ratio against the air flow may be changed. That is, threading the thumb piece inwardly increases the pressure on the spring 68 which moves the valve element 46 to a more open position. The effect of this adjustment is felt over the entire range of operation of the engine, increasing the fuel flow for any given air flow.

The space 74 between the diaphragm and the lower side of the piston is vented through a passage 76 and hence, atmospheric pressure conditions are at all times existent in the space 74 above the diaphragm. From the above, it will be apparent that the position of the valve 46, with respect to its seat, is influenced under normal conditions of operation by the factors; the fuel pressure beneath the diaphragm; and the pressure regulating spring 68. Moreover, under certain operating conditions, as will presently appear, the position of the diaphragm and hence the valve 46, is affected by the spring 69 and the vacuum conditions existent in the intake manifold.

As shown most clearly in Figure 4, the fuel metering valve 21 includes a frusto-conical valve element 77, normally adapted to engage a seat 78, formed on the end of a valve housing member 79. The valve housing member is threaded into telescopic relation with the upwardly extending part 44 of the main casting of the carburetor, as shown at 81. The valve element 77 is integral with a valve stem 82 which is reciprocable in a bore 83 formed in the valve housing member 79. The upper end of the valve butts against the lower end of a stem 85 connected to the air metering disc 19.

Adjacent its upper end the stem 85 is provided with a shoulder 84 upon which is seated disc elements, generally indicated by the numeral 86. The upper end of the stem is threaded to receive a nut 87, a washer 88 and a backing plate 89 lying beneath the nut and being confined thereby. The air metering disc is preferably circular and has a pair of openings or ports 91. A flat thermostatic spring element 92 lies beneath the backing plate 89 and normally closes the ports 91. However, under certain conditions of operation, the thermostatic spring element 92 when heated may curl upwardly to uncover the ports 91.

The valve housing 79 at its lower end, has an enlarged part 93 of the bore 83 and above this is formed a cylindrical portion 94 of reduced diameter which constitutes a part of the metering section of the valve. Above the metering section is an enlarged portion 96 which connects with radial passages 97 which open into recesses 98 communicating with fuel nozzles 99 and 101. The valve stem has a cylindrical part 102 normally substantially in registry with the enlarged bore 93. Above the cylindrical part 102 is a tapered or other accurately formed section 103 which, when the valve 77, 78 is in a partially open position, registers with the cylindrical metering section 94.

Above the metering section of the valve stem is a part 104 of reduced diameter and above the reduced part 104 is a cylindrical section 106 which forms the abutment which is engaged by the end of the disc stem 85. The disc stem has a shoulder 107 adapted to engage a shoulder 108 formed

in the bore 83 to limit the upward movement of the air metering disc. A spring 109 is seated in the bottom of the passage 43 and engages the bottom of the valve stem, as shown at 110, to urge the valve stem and the disc stem in an upward direction to close the fuel valve and the air metering disc. Since movement of the air metering disc is transmitted to the fuel metering valve element 77 by the abutting relation of the stems, the fuel valve stem is substantially free floating so that the valve element 77 will accurately engage its seat 78.

At the upper end of the valve housing 79, a spring 113 is coiled around the circumference of the valve housing, as shown, and its end 114 encircles and presses on the disc stem. This pressure exerted on the stem dampens the vibration of the parts.

As shown in the drawings, even when the valve element 77 is on its seat 78, a clearance exists at the metering gap between the metering section 94 of the valve housing and the tapered metering section 103 of the valve stem. However, as soon as the valve element 77 moves off its seat, the flow of fuel to the engine nozzles comes under the control of the fuel metering elements 94, 103. Downward movement of the valve stem increases the clearance between the parts and additional fuel is supplied to the nozzles, assuming constant fuel pressure. The enlarged bore 93 acts as a well beneath the metering section in which, at all times, a reservoir of fuel is maintained. When the engine is operating and the valve 77, 78 is partially open the well of fuel is under pressure. This arrangement insures a steady and uniform flow of fuel throughout the annular space between the metering parts 94, 103. Moreover, since there is at all times a clearance at the metering section and fuel flows through this space under pressure, there is little likelihood that the metering section will become clogged with dirt.

It will also be observed that a well of fuel exists below the fuel metering valve. When the fuel metering valve is opened slowly the displacement of fuel in the well by the valve has almost no effect insofar as increasing the fuel flow through the metering section of the valve. However, if the engine is being accelerated rapidly, the displacement of the liquid in the well causes momentarily a somewhat increased fuel flow through the metering section of the valve.

Of particular importance is the fact that the wall of the air flow passage (Figure 1) from the point 116 which marks the closed position of the air metering disc, slopes outwardly and downwardly as shown at 117. The outward and downward sloping shape of the wall is accurately determined so that for any part-open position of the air-metering disc and the fuel metering valve, the proper ratio of fuel to air will be supplied in accordance with the speed and load at which the engine is operaing. In general, the air flow passage is shaped so that the fuel to air ratio is decreased with increased air flow and heavier loads preferably until approximately full throttle position is reached.

In the operation of the carburetor thus far described, fuel is supplied to the fuel line 22 from the pump at substantially constant pressure. This pressure with the particular fuel pump employed is approximately five pounds. This constant pressure may be any desired amount and is dictated by the particular pump with which most automotive engines are equipped. The resistance to flow caused by the fuel passages, between the fuel pump and the space below the

diaphragm, drops the fuel pressure in the particular design shown, above the valve **37**, **46**, to about three pounds. It is the function of the diaphragm and pressure regulating spring **68** to maintain this pressure substantially constant so as to maintain a substantially constant pressure of fuel at the valve **77**, **78**. An increase in the pressure in the bore **38** and hence in the space below the diaphragm, exerts pressure on the diaphragm against the action of the spring **68**, to cause the valve element **46** to move to a more closed position. In such adjusted position, the resistance to fuel flow is increased thus decreasing the pressure in the fuel supply line **22** or maintaining the pressure at the valve **77**, **78** constant.

The above action will occur if the pump is not delivering fuel at constant pressure. However, the more important cause of fluctuating pressure results from demand for fuel caused by fluctuations in the position of the air metering disc. When the engine demands more fuel due to greater air flow, the fuel metering valve opens more widely and causes a drop in the fuel pressure at the fuel metering valve. However, this drop in pressure immediately results in a lessening in pressure on the underside of the diaphragm. This action opens the valve **37**, **46** more widely to decrease the resistance to fuel flow through the valve **37**, **46** to permit a larger portion of the pressure of the pump to be available at the fuel metering valve. It will thus be appreciated that the diaphragm is constantly correcting for fluctuations in fuel demand to maintain the fuel pressure at the metering valve substantially constant to insure accurate metering. In this manner the fuel pressure is maintained substantially constant under average or cruising conditions of operation of the engine.

Under certain conditions of operation it is desirable to increase the fuel-air ratio. Such a condition occurs, for example, when the engine is under heavy or substantially full load, as when the engine is going up a hill, when the engine is being rapidly accelerated or driven at substantially full speed. As previously mentioned, the position of the parts shown in the drawings is that when the engine is at rest. As soon as the engine is running the piston **58** moves upward to engage the stop **66**. It is maintained in this position as long as the partial vacuum in the intake manifold is at a high value. However, should the engine become heavily loaded, or should the engine be rapidly accelerated, a pressure increase (decrease in the partial vacuum) in the intake manifold occurs, resulting in an increase in pressure in the cylinder **57** above the piston.

This increased pressure, assuming it is large enough, results in the spring **69** urging the piston in a downward direction toward engagement with the head of the nut **48** increasing the pressure on spring **68**. I have found in practice, that it is desirable that this action occur when the sub-atmospheric pressure in the cylinder **57** is such that it approximates full load on the engine or approximately full throttle position. However, the sub-atmospheric pressure conditions at which this action should occur is a matter of choice and may be made any desired amount within reasonable limits. In general, it may be made to occur at any point in the curve formed by plotting the fuel-air ratio against the air flow.

The piston is ineffective to exert any influence on the diaphragm until the pressure in the cylinder **57** above the piston is greater than the set value. However, as soon as the piston moves off its seat **66**, it immediately exerts an influence on the diaphragm either through the spring **68** or directly upon engaging the head **48** of the nut. In any event, the diaphragm is moved downward so as to increase the opening through the valve **37**, **46**; decrease the resistance to fuel flow therethrough; and increase the fuel pressure available in the fuel passage **22** and at the valve **77**, **78**. This increase in fuel pressure for any particular position of the air metering disc and the fuel metering valve, increases the fuel flow through the fuel metering valve and hence, the discharge of fuel through the nozzles **99** and **101**. Thus the fuel-air ratio is increased automatically at or near full load for any particular engine speed or when the engine is suddenly accelerated.

As soon as the engine operating conditions return to normal, as when the load on the engine is decreased or the acceleration of the engine is terminated, the partial vacuum in the cylinder **57** increases again. The piston returns into engagement with the stop **66** and complete control of the diaphragm is taken over by the fuel pressure beneath the diaphragm and the spring **68**. Thus the mechanism shown in Figure 3 is a combined pressure regulating valve and full load enrichment valve, the system functioning to maintain the fuel pressure continuously constant during normal conditions of operation and functioning to increase the presssure, and hence the fuel flow, under temporary engine load conditions. The full load enrichment device not only enriches the mixture when the engine is under heavy load, is rapidly accelerated or driven with substantially full throttle but also has a function during starting. At cranking speed, the engine does not develop sufficient vacuum to lift the piston into engagement with its stop. Consequently a rich mixture is being supplied to the engine for starting by this and additional means as will presently appear. Thus the additional charge of fuel for starting is atomized in the same manner as the regular fuel supply to the carburetor instead of being drawn into the carburetor in a large unvaporized stream as in the conventional carburetor.

As previously mentioned, Figure 1 is a diagrammatic view and the nozzles **99** and **101**, in this view, are shown out of their true position. Actually they are positioned at right angles to the position shown in Figure 1. The true position of the nozzles is shown in Figure 4 in which position the nozzles are in a plane parallel to the plane of the row of cylinders. While I have shown only two nozzles, it will be appreciated that any desired number of nozzles may be employed.

The nozzle **99** is provided with a bore, which is in communication with one of the recesses **98**, while the nozzle **101** is provided with a bore which is in communication with the other recess **98**. The nozzles are designed to provide unequal flow resistance. This may be accomplished either by making the bores of unequal diameter, or by having the nozzles of unequal length as shown in the drawings. The purpose of this arrangement is to cause the flow of the fuel to take place through the nozzle **99** at low air flows and have the nozzle **101** function primarily at relatively high air flows.

It will be appreciated that the greater length of the nozzle **101** will cause the fuel to discharge through the short nozzle **99** when the volume of

fuel being supplied is within the capacity of the nozzle 99. When the volume of fuel flow increases, the resistance to flow through the nozzle 99 increases and at a certain point, the resistance to flow through the nozzle 99 becomes sufficient to enable a portion of the fuel to be discharged through the nozzle 101.

It will be appreciated that the fuel is discharged from the nozzles 99 and 101 under pressure into a stream of air flowing at high velocity. The effect of the positive discharge of fuel into the air stream is augmented due to the fact that a partial vacuum exists in the air flow passage under all normal conditions of operation. Thus there is a relatively large pressure difference between the pressure of the fuel and the pressure of the air. This increased pressure difference assists in securing better atomization of the fuel and more uniform distribution of the fuel through the air stream flowing through the air passage. Of particular importance in securing better atomization of the fuel is that the plane of the air metering disc is normal to the direction of air flow. This arrangement results in extremely turbulent air conditions in the air flow passage assisting in breaking up the fuel as it is discharged under pressure into the air stream.

While I have shown the preferred form of the carburetor of my invention it will be apparent that various changes and modifications may be made therein, particularly in the form and relation of parts, without departing from the spirit of my invention as set forth in the appended claims.

I claim:

1. In an internal combustion carburetor having a fuel line through which fuel is pumped at substantially constant pressure and wherein the engine has an intake manifold comprising, in combination, pressure regulating means in said line, means for controlling the resistance to fuel flow of said pressure regulating means to maintain the fuel pressure on the discharge side of said pressure regulating means substantially constant under the normal range of conditions of engine operating load, and means subject to intake manifold pressure for decreasing the resistance to flow of said pressure regulating means to increase the fuel to air ratio only upon a predetermined increase in the load on the engine above the normal range.

2. In an internal combustion carburetor having a fuel line through which fuel is pumped at substantially constant pressure and wherein the engine has an intake manifold comprising, in combination, a valve in said line, means for controlling the position of said valve to maintain the fuel pressure on the discharge side of said valve substantially constant under the normal range of intake manifold pressure, and means movable at least partly by intake manifold pressure only when said pressure is above the normal range for increasing the fuel pressure on the discharge side of said valve.

3. An internal combustion engine carburetor having an air passage connected to the intake manifold comprising, in combination, a member in said air passage movable from a position substantially to close said passage to an open position in accordance with the pressure conditions existent in said air passage, a fuel line through which fuel is discharged under pressure into said air passage, a fuel metering valve in said fuel line operatively connected to said member, means including a pressure regulating valve in said line

for maintaining the pressure of fuel at the metering valve substantially constant under the normal range of engine load conditions, and means subject to engine manifold pressure for opening said pressure regulating valve to a greater extent to increase the fuel pressure at the metering valve upon the engine being subjected to predetermined increased load conditions above the normal range.

4. An internal combustion engine carburetor having an air passage connected to the intake manifold comprising, in combination, a member in said air passage movable from a position substantially to close said passage to an open position in accordance with the pressure conditions existent in said air passage, a fuel line through which fuel is discharged under pressure into said air passage, a fuel metering valve in said fuel line operatively connected to said member, a substantially constant pressure fuel pump, means including a pressure regulating valve in said line between the fuel pump and the metering valve for maintaining the pressure of fuel at the metering valve substantially constant under normal load conditions, and means including pressure responsive means acting on said pressure regulating valve for increasing the fuel pressure at the metering valve upon the engine being subjected to predetermined increased load conditions.

5. An internal combustion engine carburetor having an air passage connected to the intake manifold comprising, in combination, a member in said air passage movable from a position substantially to close said passage to an open position in accordance with the pressure conditions existent in said air passage, a fuel line through which fuel is discharged under pressure into said air passage, a fuel metering valve in said fuel line operatively connected to said member, a pressure regulating valve in said line, means including a pressure responsive element for controlling the regulating valve so as to maintain a substantially constant pressure of fuel at the metering valve under the normal range of conditions of operation of the engine, and means including a second pressure responsive element subject to intake manifold pressure for modifying the controlling action of said first pressure responsive element to increase the fuel to air ratio when the engine is subjected to predetermined increased load conditions above the normal range.

6. In an internal combustion engine carburetor having an air passage connected to the intake manifold and a throttle located in the air passage, in combination, a member in said air passage movable from a position substantially to close said passage to an open position in accordance with the pressure conditions in said air passage, a fuel metering valve, means connecting said fuel metering valve and member so that the amount of movement of the fuel metering valve is substantially proportional to the amount of movement of said member, a fuel line connected to a source of fuel under pressure through which fuel is discharged under the metering action of said fuel metering valve into said passage, means between the source of fuel and the fuel metering valve for maintaining the pressure of fuel at said fuel metering valve substantially constant during normal running conditions of the engine comprising a pressure regulating valve in said fuel line, a pressure responsive element connected to said pressure regulating valve, said pressure responsive element on one of its sides being subject to the pressure of fluid on the discharge side of said pressure regulating valve, a spring on the

other side of said pressure responsive element urging said pressure regulating valve toward a more open position, means for modifying the action of said pressure responsive element comprising a pressure responsive member engaged on one side by said spring, a second spring on the other side of said pressure responsive member, and means for subjecting said other side of the pressure responsive member to the fluctuations in intake manifold pressure.

7. An internal combustion engine carburetor having an air passage connected to the intake manifold comprising, in combination, means for metering the air flowing through said passage, a fuel metering valve, means responsive to the air metering means for actuating the fuel metering valve, a fuel line through which fuel is fed at substantially constant pressure, means including a pressure responsive element for normally maintaining a constant fuel pressure at the fuel metering valve regardless of the volume of fuel flowing through said fuel metering valve, means subject to intake manifold pressure for increasing the pressure of fuel at said fuel metering valve and the flow of fuel therethrough, said last mentioned means including a second pressure responsive element, a spring urging said second pressure responsive element into engagement with said first pressure responsive element, means including a connection to the intake manifold for subjecting the said second pressure responsive element to intake manifold pressure and within the normal range of fluctuations in intake manifold pressure to retain said second pressure responsive element ineffective to exert any influence on said first pressure responsive element, said second pressure responsive element being movable into effective engagement with said first pressure responsive element under the influence of said spring to increase the pressure on said first pressure responsive element upon a predetermined increase in intake manifold pressure above the normal range.

FRANK B. SWEENEY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,191,488	Watts	July 18, 1916
1,787,230	Atkins	Dec. 30, 1930
1,826,630	Moore	Oct. 6, 1931
1,933,365	Chandler et al.	Oct. 31, 1933
1,942,004	Schramm	Jan. 2, 1934
1,955,037	Viel	Apr. 17, 1934
1,982,049	Fageol	Nov. 27, 1934
2,128,079	Dawes	Aug. 23, 1938
2,166,899	Blattner	July 18, 1939
2,216,422	Schimanek	Oct. 1, 1940
2,262,408	Read	Nov. 11, 1941
2,318,216	Garretson	May 4, 1943
2,392,055	Mennesson	Jan. 1, 1946
2,445,099	Wirth	July 13, 1948
2,447,264	Beardsley	Aug. 17, 1948
2,448,131	Williams et al.	Aug. 31, 1948
2,499,554	Wirth	Mar. 7, 1950