June 5, 1928. 1,672,192

F. E. ASELTINE

CARBURETOR

Filed April 17, 1922 2 Sheets-Sheet 1

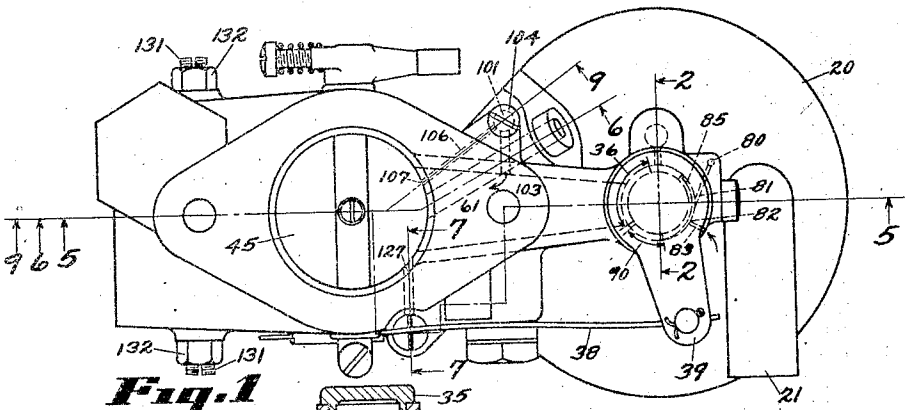


Fig. 1

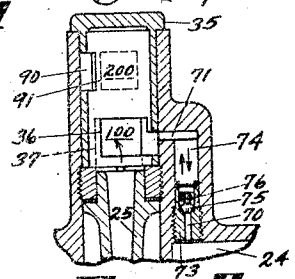


Fig. 2

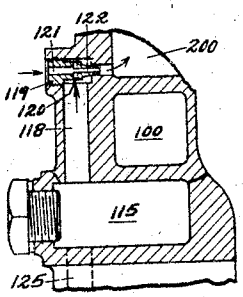


Fig. 3

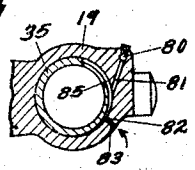


Fig. 4

Fig. 5

Witnesses
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F. E. ASELTINE

CARBURETOR

Filed April 17, 1922 2 Sheets-Sheet 2

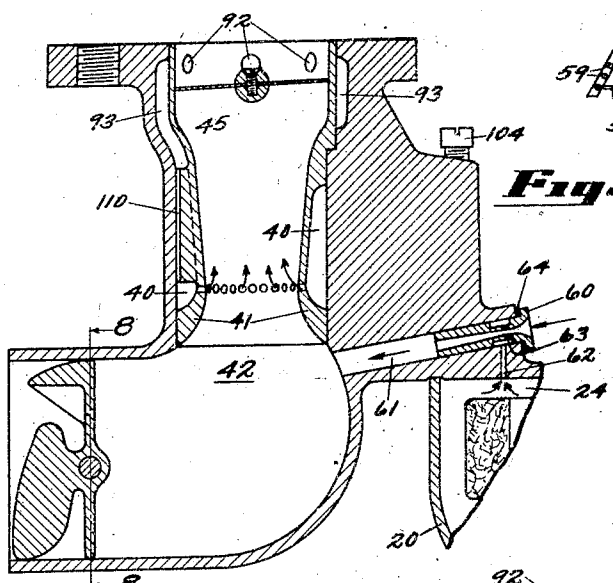


Fig. 6

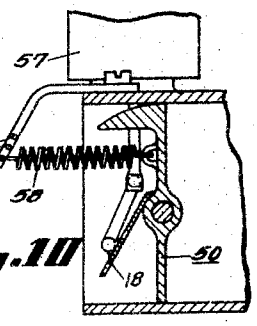


Fig. 10

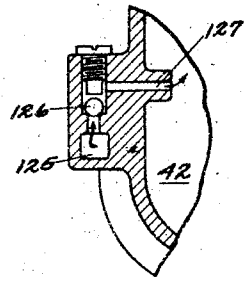


Fig. 7

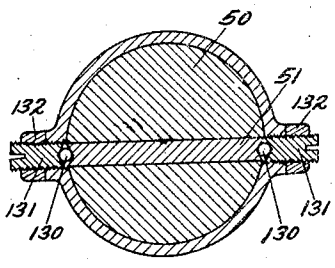


Fig. 8

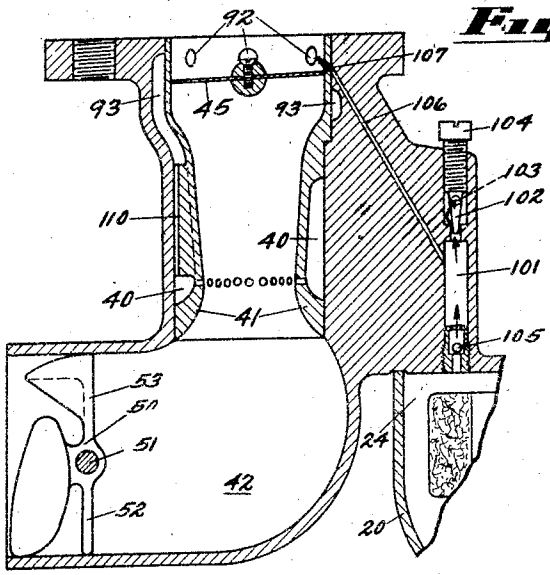


Fig. 9

Witnesses
Geo. E. Pasco.

Wm. L. Pasco

By

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Patented June 5, 1928. 1,672,192

UNITED STATES PATENT OFFICE.

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CARBURETOR.

Application filed April 17, 1922. Serial No. 554,190.

This invention relates to carburetors, especially those designed for supplying an atomized fuel mixture to an internal combustion engine.

Among the objects of this invention is to provide a vacuum or self-lifting carburetor which will supply a properly proportioned fuel mixture to the engine throughout the great variations in loads and speeds to which the engine may be subjected. A great defect in all previous self-lifting carburetors has been that either the vacuum which it has been necessary to maintain in order to lift the fuel varies so greatly that the correct proportioning of the mixture supplied is interfered with, or that under some conditions of engine operation the lifting vacuum falls to a point where it is unable to lift sufficient fuel for the engine. This invention is designed to overcome these difficulties.

Among the more specific objects of the invention is to provide for an adjustment of the richness of the mixture at small loads entirely independently of the richness at full loads: to provide a compensating by-pass around the main fuel atomizing venturi in order to give a more uniform mixture under various operating conditions: to provide a valve in the main air inlet which automatically produces a constant or slightly decreasing vacuum in the inlet as the flow of air therethrough increases to provide a manual control for varying the richness of the mixture by relieving the vacuum in the fuel chamber: and to provide a novel accelerating well for supplying an extra rich mixture upon sudden opening of the throttle valve.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein preferred forms of embodiments of the present invention are clearly shown.

In the drawings:

Fig. 1 is a plan view of the carburetor and shows various ducts and passages in dotted lines;

Fig. 2 is a section on line 2—2 of Fig. 1 and shows the top part of the main atomizing venturi and compensating by-pass for rendering the mixture therefrom more uniform;

Fig. 3 is a section on line 3—3 of Fig. 5, and shows the means for drawing fuel up into the accelerating well;

Fig. 4 is a section on line 4—4 of Fig. 5 and shows the manually controlled air valve for relieving the vacuum in the float chamber;

Fig. 5 is a section on the irregular line 5—5 of Fig. 1 which is so taken to show a section through the accelerating well and its suction producing means and fuel exit nozzle;

Fig. 6 is a section on line 6—6 of Fig. 1, and shows the "booster" venturi for maintaining a vacuum in the float chamber;

Fig. 7 is a section on line 7—7 of Figs. 1 and 5 and shows the fuel exit nozzle of the accelerating well;

Fig. 8 is a section on line 8—8 of Fig. 6 and shows the ball bearing means for the automatic main air valve;

Fig. 9 is a section on line 9—9 of Fig. 1 and shows the means for adjusting the richness of the mixture at small throttle openings by using the relatively high vacuum above the throttle valve to increase the vacuum in the float chamber to a greater or less extent.

Fig. 10 shows a modified form of the automatic main air valve.

Similar reference characters refer to similar parts throughout the several views of the drawings.

In Fig. 5 numeral 20 designates the constant level fuel chamber which is supplied with fuel through the inlet 21, the constant level being maintained by the valve 22 which is operated by the float 23 in the well known manner. The main fuel atomizing means comprises the venturi 25 which draws fuel from the float bowl 20 up through the passage 26 into the annular space 27 and from thence into the venturi through the metering holes 28 at the throat. The venturi 25 is supplied with air through the primary air inlet 30 extending up through the center of the float bowl 20. The rich mixture produced by the venturi 25 passes up-

ward into the manually operated rotary cylindrical valve 35, which during ordinary running has its port 36 registering with port 37 of the fuel mixture passage 100 in the main carburetor casting 19. From passage 100 the rich mixture is lead into the annular space 40 which is between the walls of the main casting 19 and the secondary Venturi tube 41, which is separately formed and slipped down in the main duct of the carburetor. The main air supply for the engine enters through the air horn 42 after passing the automatic suction operated valve 50. The suction of the engine acting from the carburetor exit 43 draws this main air through the throat of the secondary venturi 41 where it picks up the rich mixture through the small holes 44 and thoroughly mixes with it and then passes on through the throttle valve 45 to the engine cylinders.

In order to cause the carburetor to lift its own fuel a vacuum is maintained in the space 24 above the fuel level in the float bowl 20 by the following means. An approximately constant vacuum of one inch of mercury is maintained in the air horn 42 by means of the peculiar form of automatic suction operated valve 50. The eccentric pivot 51 of the valve divides the valve so that its lower area 52 is considerably less than the upper area 53. The upper part 53 is also provided with an arcuate lip or thickened portion 54, as clearly shown in Fig. 5, which prevents the valve from opening along its upper side until the valve has reached the dotted position 50'. It is thus seen that when a difference of pressure has been created on the two sides of the valve, the top of the valve will swing inwardly since its area is greater and air will be allowed to enter first at the bottom of the valve and for wider positions also at the top. The valve is restrained by the counter weight 55 which brings it back to closed position as the suction in air horn 42 dies down. The weight 55 is so disposed that the center of oscillation about pivot 51 of the weight of the entire valve is located approximately at position 56. It is thus seen that as the valve swings open to the wider positions the effective arm of the weight to close the valve decreases and hence the torque necessary to hold the valve open grows less as the valve opens wide. Also due to the lip 54, the effective area of the upper part of the valve remains constant for awhile and then decreases slowly as the valve opens while the effective area of the lower part decreases much more rapidly; hence the amount of suction in air horn 42 to hold valve 50 in its wider positions is less than the amount to hold it only slightly open. A third effect which tends to hold valve 50 open more easily as its angle of opening increases is the blast of air entering the air horn striking against the lower end of the weight 55 which acts as a vane to hold the valve open when it is at wide angles. Any one, two, or all three of these effects may be used to cause the suction in air horn 42 to remain approximately constant or preferably to decrease slightly as the amount of air flowing to the engine increases, that is, as the valve 50 opens wider. Preferably a dash pot 57 is provided to prevent valve 50 from fluttering excessively, which dash pot may be either air or oil damped and of any well known construction such as that illustrated in Fig. 5, or any other desired form. Fig. 10 shows a modification wherein the weight 55 is substituted by the light tension spring 58 suitably mounted at such an angle that its effective arm to close valve 50 decreases as the valve opens to wide positions, which will be obvious from Fig. 10. For the purpose of giving a greater effect to the spring 58 when desired, the extra holes 59 are provided to set the spring at such an angle as to give it a greater leverage upon the valve at wide positions. The vane 18 serves as a means for linking up the dash pot piston and at the same time acts similarly to the lower end of the weight 55 as described above, in assisting to hold the valve open when in wide positions by the impingement of the entering air blast thereupon. Thus it is seen as the amount of air flowing to the engine increases, that is as the throttle 45 is opened wide, the vacuum in air horn 42 decreases thus permitting greater volumetric efficiency and consequently greater power from the engine. The vacuum in space 24 in the float bowl is maintained by a "booster" venturi 60 (see Fig. 6) leading from the atmosphere into the air horn 42 through the passage 61 and a smaller passage 62 leading from space 24 into the throat of the venturi through the small holes 63 as clearly illustrated in Fig. 6. The "booster" venturi 60 is preferably designed to give about twice as much depression in space 24 as may exist in the air horn 42 at any time. Since the depression in space 42 will not vary greatly from 1" mercury the depression in space 24 will not vary greatly from 2" mercury which will be sufficient to lift fuel from the fuel tank (not shown) up into the float bowl 20 through duct 21.

As stated above the automatic air valve 50 is so adjusted that when the engine is under full load the vacuum in air horn 42 gradually decreases as the engine speed increases, that is, the vacuum in 42 preferably decreases from approximately 1.1" mercury at 400 R. P. M. to approximately .9" mercury at 2,000 R. P. M. This decrease would necessarily entail a proportional decrease in the vacuum in space 24 of the float bowl

since the "booster" 60 is a constant multiplier, that is, the vacuum in the space 24 due to the "booster" 60 would decrease from 2.2" at 400 R. P. M. to 1.8" at 2000 R. P. M. Such a change in the vacuum above the fuel surface in the float bowl would greatly interfere with the richness of the fuel mixture produced by the main venturi 25, and especially so since the vacuum in passage 100 increases from approximately 1.1" mercury at 400 engine R. P. M. to approximately 3.2" mercury at 2000 R. P. M. In order to overcome an excessive increase in richness of the mixture from venturi 25 due to the combined effect of these two causes, a compensating by-pass 70 is provided between the exit end of venturi 25 and the space 24 above the liquid fuel (see Fig. 2). The by-pass 70 is preferably formed in an easily removable plug 73 screw threaded into passage 74 to permit easy changing of the size of the by-pass for adjusting the carburetor for different engines or conditions. Passage 74 is led into the interior of rotary valve 35 through the small hole 71 and the port 72 in valve 35 which remains in constant register with hole 71. Now it will be seen that when the vacuum in passage 100 is approximately 1.1" mercury at 400 R. P. M. the vacuum in space 24 tends to reach approximately 2.2" due to the "booster" 60. Hence air will flow down through by-pass 70 and tend to reduce vacuum in space 24 to approximately 2" mercury. However, when the engine reaches 2000 R. P. M. the vacuum in passage 100 has grown to approximately 3.2" while the vacuum in space 24 due to the "booster" 60 tends to fall to 1.8" as before stated. Hence air will now flow up through by-pass 70 and tend to increase vacuum in space 24 to 2" or more, preferably to approximately 2.3". For intermediate engine speeds the downward air flow through by-pass 70 gradually reduces to zero somewhere between 1000 and 1500 R. P. M., then changes direction to an upward flow and gradually increases with the engine speed. The degree of vacuum obtained in space 24 is in part regulated by the size of the by-pass duct 70. The duct 70 may be a simple metering plug, however, if desired, an upwardly opening check valve 75 may be located in plug 73 which has a duct 76 therethrough which is smaller than the passage 70. Therefore when the air flow is upward the check valve 75 is lifted from its seat and the effective size of the by-pass is that of duct 70; but when the air flow is downward valve 75 is closed leaving only the smaller duct 76 as the effective size of the by-pass. The effect of check valve 75 is to increase the vacuum in space 24 at the higher engine speeds above the usual 2" maintained at the lower speeds, in order to prevent the mixture becoming too rich at the higher speeds.

A manual means for adjusting the richness of the mixture from venturi 25 is also provided. A breather duct 80 leads through the wall of casting 19 from the space 24 to the port 81 (see Figs. 4, 5 and 1). A groove 85 of gradually tapering depth (see Fig. 4) is cut in the cylindrical wall of the rotatable valve 35 to register with the port 81 and the port 82 of the duct 83 leading to the atmosphere. As the valve 35 is rotated manually by means of the rod 38 connected to the arm 39 integral with valve 35, the tapered groove 85 restricts more or less the passage of atmospheric air through duct 83 into duct 80 and thence to space 24. By this means the vacuum in space 24 may be adjusted manually from the dash by the operator when at any time he desires a richer or leaner mixture. It will be noted that valve 35 may be rotated through an angle sufficient to give the proper travel to the breather valve 85 without interfering with the registering of ports 36 and 37 by making port 36 of sufficient width (see Fig. 1).

For starting purposes, the valve 35 is rotated clockwise as viewed in Fig. 1 until port 90 in the upper part of valve 35 registers with port 91 which leads through the passage 200 in casting 19 to the outlet 43 of the carburetor through the annular space 93 and the holes 92 above the throttle valve 45. When valve 35 has been thus rotated, port 36 will have gone out of register with the passage 100 which is thereby closed off, and the tapering breather valve 85 will be in a position to allow free flow of atmospheric air through ducts 83 and 80 to the space 24 in the float bowl. It is thus seen that in starting, there is a very slight or no vacuum on the fuel in the float bowl and the high suction on the venturi 25 due to its being connected to passage 200 which is in turn connected to the engine intake above the throttle 45, results in a very rich mixture. This use of valve 35 for starting is somewhat similar to and is used at such times as the air choke valve in ordinary carburetors. As soon as the engine is working properly the lever 39 is shifted back to its ordinary running position as shown in Fig. 1. The valve 35 is retained against axial motion by the screw 86 which has a point 87 projecting into a circumferential slot 88 cut in the wall of valve 35 (see Fig. 5). Preferably the ends of the slot 88 are so determined as to act with screw 86 as stops for the limiting positions of the valve 35.

When the engine is running under light loads, that is when it has higher speeds for only a small opening of throttle 45, a different set of conditions exist throughout almost the entire carburetor. For instance, at an engine speed of 400 R. P. M. and light load the vacuum in air horn 42 will be only

about .7" or .8" mercury as compared to the 1.1" under heavy loads, this being due to the primary air through venturi 25 being more nearly able to satisfy the engine suction since its charge requirements are not so large. Of course as the vacuum in air horn 42 falls the vacuum due to the "booster" 60 in space 24 of the float bowl also falls proportionately to a value of 1.4" to 1.6" mercury. This material fall in the vacuum in space 24 would interfere with the mixture proportions as well as possibly be insufficient to raise the fuel from the main fuel tank to the float bowl. Therefore an entirely separate and distinct means has been devised for regulating the vacuum in space 24 during light loads and which will go out of action under heavy loads. The regulation of such vacuum under heavy loads by means of the compensating by-pass 70 has been fully described herein. A special advantage is also obtained by an independent regulation of the vacuum in space 24 at light loads since by this means the most efficient mixture for light loads may be used in the engine without affecting the kind of mixture which will be obtained under heavy loads. Therefore there has been provided the passage 101 through casting 19 (see Figs. 1 and 9) leading from space 24 through the adjustable valve 102, out into passage 200 through the hole 103, and thence to the space above the throttle valve 45. Now when the vacuum in space 24 tends to fall to 1.4" or 1.6" at light loads as above described, the very high vacuum above the throttle 45 acting through passage 200, hole 103, restricting valve 102 and duct 101 will cause air to flow up through this passageway and thus increase the vacuum in space 24. The valve 102 is adjustable by applying a screw driver to the screw 104 and by this means any desired vacuum in space 24 and hence any desired richness of mixture may be obtained at light loads. Preferably a vacuum of 2.1" or 2.2" is maintained in space 24 by adjusting the screw 104. As the load on the engine increases the throttle 45 is opened wider and simultaneously the high vacuum above the throttle decreases until at full open throttle the vacuum both above and below the throttle 45 is the same and only slightly above that in the air horn 42. As soon as the vacuum at the holes 92 falls below about 2" mercury the flow through passage 101 would reverse and air would enter space 24. To prevent this a check valve 105 is provided which prevents such reversal of flow and consequently permits duct 101 to function only at such times when throttle 45 is closed enough to maintain a vacuum of something over 2" mercury above the throttle. Of course if desired, check valve 105 may be spring tensioned or weighted to hold it closed until the vacuum above throttle 45 rises to any desired value above 2" mercury, depending on when it is desired to have the light load adjustment to come into action.

At dead idling position of throttle 45, as shown in Fig. 9, practically all the charge passing to the engine passes through the idling tube 110 connecting the lower annular space 40 to the upper annular space 93 and out through holes 92. If the mixture is excessively rich at this dead idling position of throttle 45, a duct 106 may be provided leading from the small port 107 immediately above the top of the throttle valve 45 down into the passage 101. Since the passage 106 forms a much less restricted conduit than that through the valve 102 it is obvious that at this one position of the throttle 45 the passage 106 permits a higher vacuum to be exerted upon the surface of the fuel in the float bowl 20 than at any other time. As soon as throttle 45 is opened the slightest amount the port 107 is shut off or falls below the throttle and hence goes out of action, leaving the conduit 200 through holes 92 and the adjusting valve 102 to take care of the light load adjustment. Of course duct 106 may be omitted without affecting the proper functioning of other parts of the carburetor, and in many cases it is not necessary or desirable.

In combination with this carburetor there has also been illustrated an accelerating well whose function is to cause the carburetor to supply a temporary extra rich mixture whenever the throttle valve is suddenly opened, thus preventing the engine misfiring on such occasions and giving it a more snappy acceleration. The casting 19 is provided with the well space 115 (see Figs. 5 and 3) located above the fuel level in the float bowl 20, and has a duct 116 leading down into the fuel therein and provided with a check valve 117 permitting fuel to flow only in the direction from the float bowl to the well 115. The well 115 also has a duct 118 leading upward and is connected to the high vacuum passage 200 through the small holes 120 in a plug 119 (see Fig. 3). This plug 119 is also provided with a way 121 leading to the atmosphere which is slightly larger than way 122 leading to the high vacuum passage 200. These holes 120 and ways 121 and 122 are so proportioned relatively to each other that the high vacuum, ranging from 10" to 20" mercury, ordinarily obtainable at part throttle in passage 200 will be maintained a vacuum in the accelerating well 115 of something like 2½" mercury, which being greater than the vacuum in space 24 will lift liquid fuel through check valve 117 and duct 116 and fill the well space 115. A very slight amount of fuel will be drawn through the holes 120 and passage 200 and on to the engine but the size of all the holes in plug 119 may be made so small as to make this amount i

appreciable. The lower part of well 115 is provided with a fuel outlet duct 125 which leads through a check valve 126 to an exit nozzle 127 in the main air stream to the mixing venturi 41 (see Figs. 5 and 7). The operation of the accelerating well is as follows. When the throttle 45 is in the more nearly closed positions there is a high vacuum in passage 200 as above described, which vacuum acting through plug 119 will maintain a vacuum in the well space 115 of about 2½″ mercury as above described. Hence fuel will be drawn up through check 117 and fill the entire well space, the check valve 126 closing in the meantime to prevent the vacuum in the well being relieved by air from the air horn 42. Now when the throttle is suddenly opened the vacuum in passage 200 immediately falls to something like 1″ mercury. Since the way 121 in plug 119 is considerably larger than way 122, atmospheric air will now pass from way 121 down through holes 120 and relieve the suction in the well space 115. The check valve 117 of course will now close and the vacuum of approximately 1″ in the air horn 42 will open the check valve 126 and spray the fuel out into the entering air through the relatively large nozzle 127. As soon as the throttle is again closed sufficiently to build up a high vacuum in passage 200 the action of plug 119 reverses and again builds up a vacuum in the well 115 above that in the float bowl, hence well 115 again fills up with fuel and remains so until the throttle is again opened to a wide position.

It is thought that the structure as well as the operation of this invention will be perfectly clear to those skilled in the art from the above description taken with the drawings. It may be well however to point out more particularly certain details of construction which are of special importance or advantage. It is important that the "booster" venturi 60 be well packed to prevent leakage from the atmosphere around it into the duct 62. For this purpose a gasket 64 has been used in this particular case.

It is also important that the venturi 25 be well packed at both ends in order that any leakage around it into space 27 may not interfere with the richness of the mixture produced by it. For this purpose gaskets 31 and 32 are used and the venturi 25 is pressed in tight contact with the gaskets by means of the screw plug 33. The venturi 25 is easily removable by removing the rotary valve 35 and applying a screw driver to the slot 34 in plug 33. For different engines or different conditions of operating, differently designed venturies 25 may be used to give the correct mixture without varying the other parts of the carburetor.

Since the automatic air valve 50 should operate with as little friction as possible so that it will maintain the same pressures during the opening movement as during the closing movement, its spindle 51 may be provided with ball bearing supports as illustrated in Fig. 8. The balls 130 are supported by the screw threaded plugs 131 which are screw threaded into small bosses on the air horn 42 and provided with lock nuts 132 as clearly illustrated.

While the forms of mechanisms herein shown and described, constitute preferred forms of embodiments of the present invention, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What I claim is as follows:

1. In a fuel lifting carburetor for variable speed engines, a constant level fuel chamber, a passage communicating therewith above the normal level of fuel therein, means acting through said passage to produce a vacuum in said chamber tending to decrease slowly as the engine speeds up; a Venturi tube constituting a primary fuel atomizing means and receiving fuel from the constant level chamber, the vacuum at the suction end of said venturi increasing as the engine speeds up; and a compensating duct between the suction end of the venturi and the space above the fuel in the constant level chamber, whereby the richness of the atomized mixture is rendered more uniform as the engine speed varies.

2. In a fuel lifting carburetor, a fuel reservoir, means communicating therewith operative to produce therein a vacuum tending to decrease as the engine speeds up; a Venturi tube constituting a fuel atomizing means and receiving fuel from the fuel reservoir, the vacuum at the suction end of the venturi increasing as the engine speeds up; a by-pass duct between the suction end of the venturi and the space above the liquid in the fuel chamber to cause the venturi to give a more uniform mixture as the engine speed varies.

3. In a carburetor having a main induction passage and a throttle valve therein: a high vacuum chamber in communication with the space above the throttle valve and arranged to deliver fuel mixture thereto; a fuel reservoir effectively closed to the atmosphere and having means to maintain a relatively constant vacuum therein compared to the widely varying engine suction additional means connected to the high vacuum chamber for increasing the vacuum in the fuel reservoir when the throttle is in nearly closed positions; and means to render said additional means inoperative when the throttle is open to wide positions.

4. In a carburetor having a main induction passage and a throttle valve therein: a high vacuum chamber in communication with the space above the throttle valve and arranged to deliver fuel mixture thereto; a

fuel reservoir effectively closed to the atmosphere and having means to maintain a relatively constant vacuum therein compared to the widely varying engine suction; additional means connected to the high vacuum chamber for increasing the vacuum in the fuel reservoir when the throttle is in nearly closed positions; and a check valve to close said additional means from the fuel reservoir when the throttle is open to wide positions.

5. In a carburetor having a throttle and a fuel bowl wherein a subatmospheric pressure is maintained, in combination; a fuel chamber, a fuel duct leading from the fuel bowl to said chamber, a one way flow means in said duct, means for drawing fuel into said chamber by the vacuum above the throttle when said throttle is towards its closed position, and means for discharging fuel from said chamber into the blast passing through the carburetor when the throttle is opened.

6. In a carburetor having a throttle and a fuel bowl wherein a subatmospheric pressure is maintained, in combination, a fuel chamber, a fuel duct leading from the fuel bowl to said chamber, means for drawing fuel into said chamber by the vacuum above the throttle when said throttle is towards its closed position, a fuel exit from said chamber having a one way flow means therein and discharging into the blast through the carburetor, and means for increasing the pressure in said chamber above that at the fuel exit when the throttle is opened, whereby fuel is discharged into the blast.

7. A carburetor for variable speed engines comprising a fuel reservoir, an atomizing means supplied with fuel from said reservoir by suction, the suction affecting supply of fuel to said means tending to increase as the engine speed increases, means for producing vacuum in said reservoir, and supplementary vacuum producing means, means for increasing the vacuum in said reservoir as the engine speeds up.

8. A carburetor comprising a fuel reservoir, a fuel atomizing means including a venturi to which fuel is supplied from said reservoir, the suction effective to supply fuel to the said venturi tending to increase as engine speed increases, a primary means operative to produce a vacuum in said reservoir and a secondary means also operative to produce a vacuum in said reservoir the total vacuum tending to increase as the engine speed increases.

9. Structure as set forth in claim 8, the said secondary means comprising a passage leading to the reservoir from the mixture passage beyond the said venturi.

10. In a fuel lifting carburetor for variable speed engines, a fuel reservoir, means for producing therein a vacuum tending to be above that desired for low engine speeds and below that desired for high engine speeds, and means for modifying such vacuum by admitting air into said reservoir at low engine speeds and withdrawing air therefrom at higher engine speeds.

11. In a fuel lifting carburetor, a throttle valve, a fuel reservoir, a fuel mixing device, a passage delivering mixture from said mixing device below the throttle, a second passage delivering mixture above the throttle, means for controlling flow through said passages, means for producing vacuum in said reservoir, and means rendered effective by said flow controlling means for decreasing such vacuum when mixture is taken through the second passage.

12. In a fuel lifting carburetor, the combination of an air supply passage, a fuel reservoir, means for producing a vacuum therein to cause flow of fuel thereto, a supplemental fuel receptacle, means for connecting said receptacle to a source of higher vacuum than is produced in said reservoir, means for conveying fuel from said reservoir to said receptacle under the influence of said higher vacuum, means for discharging the fuel from said receptacle into the air supply passage, and means for preventing flow through said discharge means into said receptacle and return flow through said connecting means into said reservoir.

13. An engine carburetor having a fuel reservoir and primary and auxiliary air supply passages, and means for drawing fuel into said reservoir by suction comprising a plurality of vacuum producing devices independently connected to said reservoir, the effective suction in said reservoir being the resultant of the joint and simultaneous action of said devices, one of said devices being affected by conditions of air flow in the primary passage and another by the conditions of flow in the auxiliary passage.

14. A carburetor having a fuel reservoir, a primary mixing venturi and a second mixing device adapted to supply auxiliary air to the rich mixture supplied thereto from the said venturi, means for drawing fuel into the reservoir by suction comprising a plurality of vacuum producing devices independently connected to said reservoir, the effective suction in said reservoir being the resultant of the joint and simultaneous action of said vacuum producing devices, one of said devices being affected by the flow of the auxiliary air and another being affected by the vacuum on the delivery side of the said primary venturi.

15. A varburetor for internal combustion engines comprising a constant level fuel reservoir, an intake passage and a fuel nozzle therein from which fuel is caused to flow by suction, a plurality of independent means for producing a vacuum in the fuel reservoir, whereby the effective suction in said

reservoir is the resultant of the joint and simultaneous action of all of said independent vacuum producing means, said vacuum producing means comprising a plurality of conduits connecting the intake passage and fuel reservoir, each of said conduits alternately acting as a suction passage and a means for admitting air to said fuel reservoir.

16. A carburetor for internal combustion engines comprising a constant level fuel reservoir, an intake passage having a throttle, a fuel nozzle therein from which fuel is caused to flow by suction, means for producing a vacuum in said fuel reservoir which increases as the throttle is opened and a supplementary means independent of said first mentioned means for producing a vacuum in said fuel reservoir which decreases as the throttle is opened, whereby the vacuum in the fuel reservoir is maintained nearly constant throughout wide variations in engine speed.

17. A carburetor for internal combustion engines comprising a constant level fuel reservoir, an intake passage having a throttle, a fuel nozzle therein from which fuel is caused to flow by suction, a suction passage for producing a vacuum in said fuel reservoir which increases as the throttle is opened and a second suction passage for producing a vacuum in said fuel reservoir which decreases as the throttle is opened, both of said suction passages communicating with the intake passage anterior to the throttle valve.

18. A carburetor for internal combustion engines comprising a constant level fuel reservoir, an intake passage having a throttle, a fuel nozzle therein from which fuel is caused to flow by suction, means for producing a vacuum in said fuel reservoir which increases as the throttle is opened and a supplementary means independent of said first mentioned means for producing a vacuum in said fuel reservoir which decreases as the throttle is opened, whereby the mixture proportions are maintained substantially constant and means for temporarily admitting air to said reservoir to provide a richer mixture.

19. A carburetor for internal combustion engines comprising a constant level fuel reservoir, an intake passage having a throttle, a fuel nozzle therein from which fuel is caused to flow by suction, means for producing a vacuum in said fuel reservoir which increases as the throttle is opened, and a plurality of supplementary means for producing a vacuum in said fuel reservoir which decreases as the throttle is opened.

20. A carburetor for internal combustion engines comprising a constant level fuel reservoir, an intake passage having a throttle, a fuel nozzle therein from which fuel is caused to flow by suction, means for producing a vacuum in said fuel reservoir which increases as the throttle is opened, and a plurality of supplementary means for producing a vacuum in said fuel reservoir which decreases as the throttle is opened, one of said supplementary means comprising a suction passage connecting the fuel reservoir with the intake passage posterior to the throttle valve.

21. A carburetor for internal combustion engines comprising a constant level fuel reservoir, an intake passage having a throttle, a fuel nozzle therein from which fuel is caused to flow by suction, a primary means for producing a vacuum in said fuel reservoir which increases as the throttle is opened comprising a suction passage connecting the fuel reservoir with the intake passage, and a plurality of supplementary means for producing a vacuum in said fuel reservoir which decreases as the throttle is opened, one of said means comprising a suction passage connecting the fuel reservoir with the intake passage on the same side of the throttle as said primary vacuum producing means.

22. A carburetor for internal combustion engines, having in combination, a constant level fuel reservoir, a primary mixture passage having fuel and air inlets, a primary mixture conduit conveying mixture to the engine for normal operation, a supplementary conduit for conveying primary mixture to the engine for starting purposes, means for producing a partial vacuum in the fuel reservoir under all operating conditions, means for admitting air to the fuel chamber to reduce the partial vacuum therein, and a valve for simultaneously controlling both said mixture conduits and said air admitting means.

23. A carburetor for internal combustion engines having in combination, a constant level fuel reservoir, an air intake passage, a primary conduit for conveying fuel to the intake passage for normal operation of the engine, a supplementary conduit for conveying fuel to the intake passage for starting purposes, means for maintaining a subatmospheric pressure in the fuel reservoir at all times when the engine is running, means for admitting air to the fuel reservoir to reduce the vacuum therein, and means for simultaneously rendering effective said supplementary fuel conduit and air admitting means.

24. In a fuel lifting carburetor, the combination of an air intake passage, a main fuel reservoir, means for producing a vacuum therein under all conditions of engine operation to lift fuel thereto from the main fuel supply, a supplementary fuel reservoir connected to said main fuel reservoir, a discharge passage connecting said reservoir with the intake passage, means for produc-

ing a greater vacuum in said supplemental reservoir than in said main reservoir on closing movement of the throttle to fill said supplemental reservoir with fuel, said vacuum being reduced as the throttle is opened until it is less than that in the main fuel chamber to permit flow of fuel through said discharge passage, and means operating to prevent the greater vacuum in the main reservoir drawing fuel from the supplemental reservoir during flow of fuel from the latter into the intake passage.

In testimony whereof I hereto affix my signature.

FRED E. ASELTINE.