April 19, 1927. W. T. SIMPSON 1,625,573

CARBURETOR

Filed Oct. 21, 1920 2 Sheets-Sheet 1

Fig. 1.

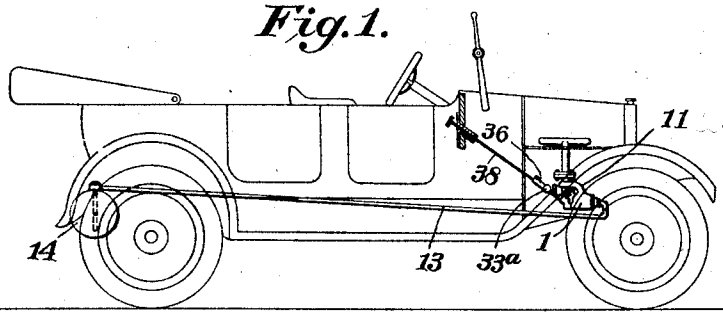


Fig. 12.

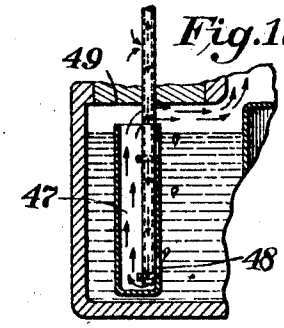


Fig. 2.

Fig. 3.

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Filed Oct. 21, 1920 2 Sheets-Sheet 2

Fig.4.

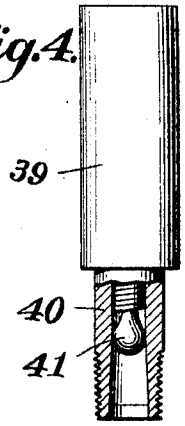


Fig.6.

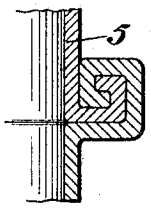


Fig.5.

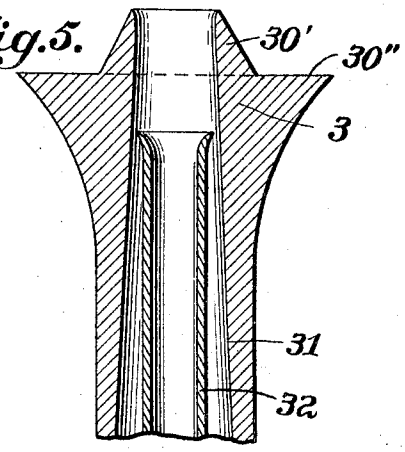


Fig.7.

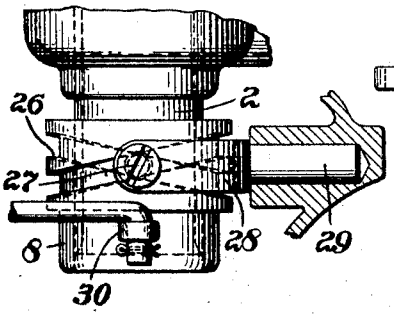


Fig.8.

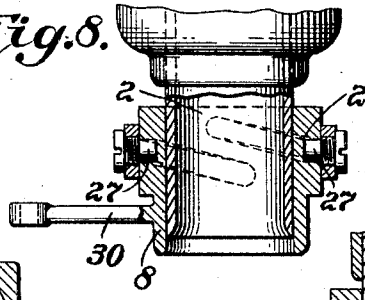


Fig.10.

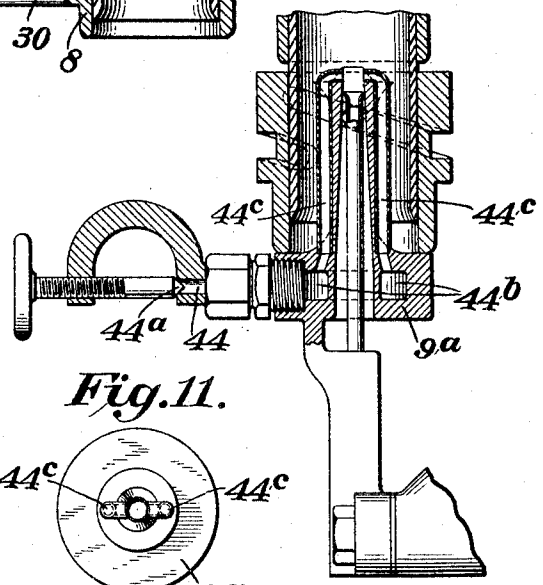


Fig.9.

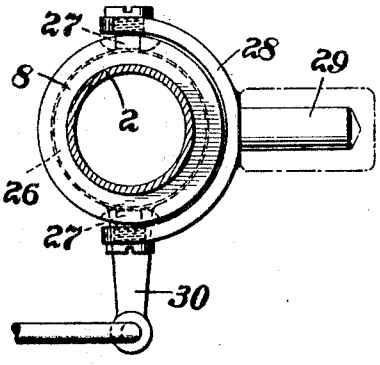


Fig.11.

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Patented Apr. 19, 1927. 1,625,573

UNITED STATES PATENT OFFICE.

WARD T. SIMPSON, OF ANN ARBOR, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ALBERT G. DICKINSON, OF GRAND RAPIDS, MICHIGAN.

CARBURETOR.

Application filed October 21, 1920. Serial No. 418,417.

One object of my invention is to provide a fuel feeding system for automobiles, motor boats and the like in which a carburetor of the vacuum feed type is employed, having capacity to draw the fuel into its fuel chamber directly from a tank located in a lower plane than itself.

Other objects of the invention will appear from the following description:

In the accompanying drawings:

Fig. 1 is a side view of the fuel feeding system adapted for use on automobiles or the like.

Fig. 2 is a central vertical section of the carburetor.

Figs. 3 and 4 are details of auxiliary valves which will operate to alter the character of the fuel mixture.

Fig. 5 is a detail view of the fuel ejection means.

Fig. 6 is a detail view of the seam of the float.

Figs. 7, 8 and 9 show details of the throttle valve operating means.

Figs. 10 and 11 are views of means for controlling the fuel supply.

Fig. 12 is a view of a modification of means for taking care of air which may enter the fuel chamber in ways which will appear hereinafter.

In carrying out the invention I maintain a vacuum in the fuel chamber which is higher than that in the engine manifold, by means hereinafter described, but it will be understood that I do not limit my invention in all of its aspects to this difference in the vacuum.

In these drawings 1 indicates the fuel chamber, 2 the mixing chamber, 3 the fuel ejection means, 4 the fuel inlet valve and 5 the float.

The mixing chamber consists of a tube which is straight throughout from its air intake end 6 to its upper end 7 at the engine intake. The throttle valve consists of a collar 8 surrounding the mixing tube and movable on said tube to and from a seat provided by a ring shaped member 9 which is fixed relatively to the chamber. This seat member or ring is spaced apart from but lies opposite to the inlet end of the mixing tube and the lower rounded edge of the throttle valve seats against this when closed. Opening of the throttle valve by moving same along the tube 2 will allow air to enter the intake to the mixing chamber through the space between the valve seat and the end of the mixing tube. The inlet end of the mixing tube is bevelled or flared. The air tube of the ejector at its base where it joins the valve seat ring is provided with a stream line formation 10, which will contribute to the ready entrance of the air into the mixing tube, from which point the air passes uniformly along all sides of the centrally disposed fuel ejection means and along a straight course to the engine intake. The throttle valve being arranged at the inlet end of the straight tube forming the mixing chamber is anterior to the mixing chamber and ejector and the mixing chamber is unobstructed and of full width above the ejector so that no obstruction is offered to the free flow of the mixture and as its course is straight it will not be thrown against the sides of the tube and thus no undue frictional resistance to the inflowing mixture will be offered and thus its velocity will not be reduced. The mixture will not strike upon any surface across its path upon which the fuel therein can collect or precipitate. The fuel chamber is connected at its upper part through an upwardly inclined slightly curved passage 11 with engine intake, the outlet from this passage being the annular space 12 around the mixing chamber tube and between it and the surrounding casing. Because the mixing tube extends across the passage 11 there will be a strong suction effect produced by the mixture, rushing from the mixing chamber into the engine intake, upon the said passage 11 and the upper space within the fuel chamber resulting in a high vacuum in the said chamber to lift the fuel directly through the pipe 13 from a tank 14 located below the level of the carburetor, with the result that the carburetor will draw its supply of fuel from this low tank without the interposition of the well known vacuum system. Any precipitation of the fuel on the walls of the engine intake will be directed back into the fuel chamber, for it will be noticed that the lower wall of the passage 11 extends around the outside of the mixing tube at 15 and beyond the same to merge into the outer wall 16. The wall 15 thus forms the floor by which precipitation will be caught to drain back into the fuel chamber. The passage 11 joins the casing at an enlargement thereof

through and beyond which the mixing tube is extended. An important purpose of this construction is to have the passage 11 open into the mixing chamber entirely around it, i. e., through 360 degrees, so that pulsations which exist in the passage 11, whose axis is substantially perpendicular to that of the mixing chamber at their juncture,—will be balanced as regards a lateral effect on the stream of mixture passing upward through the mixing tube, causing them—the pulsations—to be deflected longitudinally of the mixture stream, rather than laterally, and so preventing them from dislodging particles of fuel from the mixture and destroying its proportion.

The fuel inlet valve and its casing are of special construction so that the vacuum pressure within the fuel chamber will balance this valve, exerting both a closing and an opening effect thereupon. Thus the valve will be sensitive to the control of the float 5 and will not be affected by the presence of vacuum in the fuel chamber.

The fuel inlet valve 4 therefore consists of a rod seating itself upwardly at the inlet opening 17 through the box-like casing formed of the wall 18 and the upper and lower plugs 19, 20 which are screwed into place. The lower end of the valve rod passes out through an opening in the lower plug so that its lower end face is exposed to the vacuum pressure in the fuel chamber tending to open the valve, but as the upper end of the valve is exposed to the same vacuum pressure through the inlet opening 17, tending to close it, the valve will be balanced by this vacuum pressure and therefore it will be under the influence solely of the float. This is pivoted at 21 and is connected to the lower end of the valve stem by links, one on each side, and one of which is shown at 22. The fuel enters the valve box through its side at 23 and thus at a point intermediate of the ends of the valve, so that the balanced character of the valve is not affected by any head or fuel, as this exerts no more pressure to open it than it does to close it.

The valve has a tip 4^a connected by a ball joint to its stem whereby the tip may accommodate itself to its seat.

The throttle valve, in the example illustrated, and as shown in detail in Figs. 7, 8 and 9, is of rotary character. It has a helical cam groove 26 in its surface engaged by two pins 27 carried by a fork 28 which has its shank 29 journaled or swivelled in the frame so that there will be no tendency for the valve to bind.

The collar or sleeve is rotated by an arm 30 attached thereto and its rotation results in its longitudinal movement, to open or close.

The ejector comprises an air tube 31 surrounding the fuel tube 32, and open to atmosphere at its lower end, its bore tapering upwardly and terminating at a point above the fuel tube.

One feature concerning the ejector is that it is located high above the fuel level and as a result of this any pulsations from the engine will not be sufficient to pump fuel therefrom, and interfere with its proper proportioning of fuel to air.

Another feature concerning the ejector is that the tip thereof is located at a considerable distance above the point where the air, from the throttle valve 8, is introduced to the outer side thereof.

In the construction shown it will be noticed that the air entering below the throttle valve sleeve has an initial direction of movement substantially perpendicular to the general direction or axis of the ejector and if this point of initial entrance were close to the level of the tip, the air would not have an opportunity to "square away" on its course parallel with the ejector axis before reaching the tip, and particularly would this be the case with the throttle sleeve wide open, and there would be a material difference in the character and course of the air flow between the idling and wide open positions of the throttle, if the initial entrance of the air took place nearer the tip of the ejector.

I have made the exterior of the ejector of such form that the small amount of air entering the throttle during idling will not be impeded on its way to the tip, so as to get a fast stream line flow, i. e., where it contacts with the ejector air tube and for this reason the base of the air tube is of the conical form 10 but with sides slightly curved inwardly, so that the direction of the flow of air will be changed gradually and progressively.

It will be further noticed that the air is directed to the ejector from all sides uniformly and each point around the circumference is equally and directly supplied from the edge of the throttle, there being no obstructions at any point around the ejector base, and no voids in the flow of air.

The fuel pipe 29 is flared outwardly at its upper end to form a restricted space between its edge and the wall of the air tube and the result of this is that the air rushes by at high velocity and this makes depression just above the fuel pipe and within the upper end of the air tube to pull the fuel through the pipe.

The air tube in the construction shown is open at its lower end to the outside air.

This air tube at its upper end has an exterior flare towards the wall of the mixing tube so that a restricted space is formed at *a* for the passage of the air which is directed outwardly against the fuel chamber wall and

is thence deflected inwardly towards the center of the mixing chamber and the high velocity of the air at the said restriction makes depression in a conical area above the air tube. This depression exerts further pull on the fuel to draw it from the fuel pipe. At the top of the ejector the air tube is provided with a cone 30′ which reaches up into the conical area of depression, providing a thin lip so that any liquid which may lodge here can pass down along the side of the cone and spread out over the horizontal surface 30″ to the outer edge thereof, where it will meet the high velocity air and be carried into the mixing chamber. These details are shown particularly in Fig. 5.

It will be noted that the construction and operation of this ejector are such that two conical areas of depression are induced over the outlet of the fuel tube 32 by the air flowing by it at high velocity, one within the air tube and the other just above the air tube. That is to say, two such areas of depression exist when the throttle valve 8 is at all open; only one exists when it is fully closed. The suction of these areas exerted on the fuel tube outlet when my construction is used is very much greater than is developed by any of the usual forms of fuel ejection means, as has been found by experiment and measurement, and it is at all times greatly inexcess of any depression existing in the fuel chamber at any time. The delivery of fuel to the mixing chamber is therefore assured in ample quantity, in fact is at some points in the operation greater in volume than is desirable, and I have accordingly provided means to counterbalance or reduce the high proportion of fuel to air in the mixture at certain times as found desirable.

For this purpose I provide, in one form of my invention, a tube 33 extending to the fuel conduit 32 at a downward inclination, having a globular formation at 33ª with an air port 34 and a valve pin 35 having a shank mounted in the extension 36. This valve pin is adapted to seat against the tapered part of the tube at 37 and it gages the size of the air inlet port.

While I have referred to valve or pin 35 as a metering pin, it will be understood that this term is used for convenience and not because it controls fuel in the same way that so-called metering pins do. It will be noticed that the larger the opening is at this valve the less fuel will be drawn from the fuel tube 32, instead of the greater amount, as is the case in ordinary practice. This is because the larger the amount of air which can pass into fuel conduit, the smaller will be the amount of fuel drawn from the pipe. The result is that while the outlet of the fuel pipe remains the same, the capacity of the ejector to deliver fuel is not altered, but the quantity of fuel is reduced as desired by operating the air metering pin 35.

The construction is such that no fuel vapor pockets exist in the feed line between the fuel chamber and the ejector in which fuel vapor may collect from the fuel and interfere with the proper feed.

I provide means for preventing air from the metering tube from being drawn back through the fuel conduit into the body of fuel. This means consists of the ball check valve 45 which is arranged to move substantially horizontally, though at a slight incline, along the bottom of the chamber 46 in which it is located, and against a stop 46′. The air would pass back through the conduit at times due to the vacuum existing in the fuel chamber and the check valve prevents this, and thus prevents fuel from being carried up with the air from the top of the supply as it otherwise would, and to the intake, and thus interfere with the predetermined regulated feed of fuel which the mixture proportioning means are adapted to supply.

It will be noticed that the tube 33 adjacent the pin 35 is tapered from its open end inwardly. The pin is of the same diameter as the bore of the tube at the small end of the taper and the pin in closing the tube extends into the said bore at the small end of the taper, and across the inlet opening from the automatic valve 41 to cut off the air both through the outer end of the tube and the automatic valve, for starting purposes.

The globular formation 33ª at the outer portion of the air metering tube provides a receptacle for catching any fuel which may be discharged back through the metering tube. This may happen on backward movement of the engine pistons.

Idling.—In idling, at which time the throttle valve is nearly closed, the mixture may be made lean by introducing air through the metering tube by retracting the metering pin 35. Any suitable connection may extend from the metering pin to the operator's position, such as the wire or rod 38. This air enters the fuel conduit and passes through the ejector fuel tube and thus reduces the amount of fuel delivered by the ejector. This air added to that passing through the air tube of the ejector from the atmosphere, and that which passes the throttle valve, will make the mixture of proper proportions of air and fuel for idling purposes.

Starting.—For starting the throttle valve is nearly closed and the metering pin substantially closes the air metering tube, thus substantially cutting off all inlet of air to the fuel conduit through the metering tube and thus a mixture rich in fuel will enter the mixing chamber, the only air being that

passing through the air tube of the ejector.

As soon as the engine is started, if idling is desired, the throttle valve being nearly closed, remains so and the metering valve is opened to let the air flow into the fuel conduit to lean the mixture therein.

For driving at wide open throttle the metering pin may be left in the same open position as for idling, because at this time the air passing through the throttle and around and along the outside of the ejector air tube, as well as through the open air tube, will produce a faster flow of mixture from the ejector, than when idling, to meet the requirements of the engine under driving load.

If the requirements of the particular make of engine to which the carburetor is to be applied are such as to require a rich mixture for idling, I provide an automatic valve mounted on the metering tube, the casing 39 of which is screwed onto a nipple 40 having a seat within it for the valve member 41 which is normally held open by a pull spring 42 when the vacuum in the mixing chamber is light, as when driving with wide open throttle, so that then the air may enter the metering tube through the port 43 of the automatic valve, so that a lean mixture will be produced.

When idling, at which time the throttle is nearly closed and the vacuum in the mixing chamber is high, the pull of the vacuum will close the automatic valve and the air thus being cut off from entering the metering tube and fuel conduit, the mixture will be enriched, the adjustment of the metering pin not being changed.

In starting the tendency of this automatic supplemental valve will be to close, but as the vacuum in the carburetor is light when the engine is first turned over, this valve will not close entirely. When, however, the engine has been started but is idling, with throttle nearly closed, the vacuum in the carburetor will be high and this valve will close and enrich the idling mixture by reducing the choking air supply.

If it is desired to meet requirements of certain engines by having a leaner idling mixture than would be afforded by the apparatus involving the use of the metering valve alone, I would use the supplemental valve (Fig. 4) on nipple 40, which will open during idling against its spring pressure and lean the mixture and close automatically at wide open throttle and enrich the mixture.

If, through any cause, air should get into the fuel chamber and commingle with the fuel and pass up through the vacuum passage, carrying with it some of the fuel, a separation of the air from the fuel will be effected in the passage 11 and space surrounding the mixing tube. The mixing tube itself, where it crosses the vacuum passage 11, will act as a baffle against which the air and fuel will strike to induce this separating action and any fuel which is separated out will drain back into the fuel chamber.

The float is built up of two portions which have an airtight seam. This seam as shown in Fig. 6 is solderless. This is particularly important in combination with the fuel chamber having its upper part connected with the engine intake through the passage 11 because in case of back firing the float will not be destroyed by the melting of a soldered joint.

I show in Fig. 10 a modification of means for controlling the inlet of fuel through the fuel pipe by means of air acting as a choke thereon. This means acts in a manner somewhat similar to the air metering tube, before described, but it is modified in construction in that the air passes through the inlet port 44 controlled by a valve 44^a, the air from said port passing into a chamber 44^b in the ring forming the seat for the throttle valve, said ring being shown at 9^a. From the chamber 44^b a tube, or plurality of tubes, 44^c extend upwardly along the outside of the air tube of the ejector and at their upper ends these tubes are directed inwardly at a point above the upper end of the fuel tube and in a direction across the bore of the air tube. The upper tapered end of the air tube of the ejector is cut across to receive these air jet tubes. The effect of the air passing across the depression space within the air tube above the fuel tube will be to choke the discharge of the fuel in some measure, and thus metering of the fuel supply may be effected by regulating the valve 45. This air modifies the action of the air passing the restriction around the end of the fuel pipe and between it and the wall of the air tube.

Instead of the check valve between the fuel chamber and the air inlet from the air metering tube, I may employ other means for taking care of air which may pass down the fuel tube from the outlet of the metering tube.

This is shown in Fig. 12 wherein the lower end of the fuel pipe extends into a chamber 47 which is located in the fuel chamber with its open upper end just above the fuel level.

The bottom of this chamber is closed. It has a port 48 at its lower end admitting fuel from the fuel chamber, and the lower end of the fuel tube gets its supply from the bottom of this chamber. Any air which comes down the fuel pipe will displace the liquid in this chamber and keep it substantially free from fuel at points above the lower end of the fuel tube, so that the air may escape up through the free space of the

chamber and will strike a baffle surface at 49 on the casing above the level of the fuel, where any fuel which may be carried up will be separated from the air to fall into the body of the fuel, and thus no fuel will be carried off through the vacuum passage to the engine manifold, the main purpose being to prevent the air from passing up through the body of fuel and carrying with it some of the fuel directly to the engine intake.

Cooperating with the elements of the carburetor above described, including the vacuum passage from the manifold to the fuel chamber and the float controlled inlet valve, I employ means for introducing air into the fuel supply pipe whereby the lifting of the fuel directly to the fuel chamber from a tank at a lower level is facilitated. The structure involving the mixing tube acting as a baffle across the mouth of the vacuum passage leading from the fuel chamber contributes to the use of air with a directly connected fuel chamber and supply tank, because this construction will take care of any fuel which passes off with the air from the fuel supply in the fuel chamber through the vacuum passage. This fuel will be separated from the air by striking the baffle and will run back into the body of fuel in the fuel chamber, to be drawn out through the ejector.

In carrying out this part of my invention, I provide an opening as at 55 or openings in the fuel pipe which extends down into the fuel tank so that as the fuel is drawn through this pipe air will also be drawn in and lighten the fuel column so that it can be lifted to the required height. This air will, of course, not be drawn in until the level of the fuel is below the opening or openings referred to.

This air, of course, gets into the fuel chamber, passes through the body of fuel therein, and should any fuel be carried up with the air, it will be separated therefrom, particularly as it will strike against the side of the mixing tube or chamber acting as a baffle and this separated fuel will drain back into the fuel chamber through the said vacuum passage and will be available to be drawn through the ejector, and therefore will not alter the proportion of fuel to air by going directly to the engine.

It will be observed that an aspirating action takes place at the discharge side of the annular passage 12 surrounding the mixing tube by the velocity of the mixture passing from the discharge end of the mixing tube into the engine manifold, and this creates the higher depression in the fuel chamber.

With my arrangement of mixing chamber without bends and with the ejector directed coaxially thereof and the annular valve, providing, when open, an annular air admission space about the base of the ejector, and uniform at all points, the flow of the air will be uniform at all points around the ejector and the axis of the mixing tube, and there will be no variations in friction, and the engine intake or manifold will receive its supply uniformly to be distributed to the engine cylinders alike.

Not only does my carburetor present material advantages from the standpoint of operation, but it has advantages from a manufacturing standpoint, by reason of its simplicity. The mixing chamber is simply a tube. The frame is provided with two openings in alignment with each other, in one of which the tube is seated, and projects therefrom, affording a guide and support for the throttle valve. The other end of the tube simply projects into the other opening, leaving an annular space 12 around it and it thus provides in a simple way an aspirating means for producing higher depression in the fuel chamber than in the engine manifold. The valve seat and ejector support is provided in a simple way by the ring shaped member, and this is carried by a bracket arm, forming a support or carrier also for the fuel pipe or conduit. This bracket with the ejector and valve seat and fuel conduit is removable as one unit, so that the fuel conduit may be replaced with one of larger or smaller diameter and with an ejector to correspond, as may be necessary to suit different engines. This bracket also carries the air metering device as a part of said removable unit.

The outlet from the fuel chamber to the fuel conduit leading to the ejector is such as will prevent the collection of any vapor given off from the liquid fuel. For this purpose the wall of the fuel chamber at 50 is inclined downwardly at such an angle that at no time in traversing steep grades will there be formed a pocket at this point in which vapor given off from the fuel will collect, and by its expansion and contraction interfere with the feed of the fuel.

It will be clear from the foregoing description that when the depression throughout the carburetor and manifold is at its minimum, i. e., at wide open throttle, I maintain a high degree of vacuum in the fuel chamber to draw fuel thereinto from a low level tank. During idling the depression in the manifold and fuel chamber is high, and ample to perform this function, although the same ratio of difference in the depression between the manifold and fuel chamber does not, and need not, exist at this time, as compared with that which must exist during wide open throttle.

By my construction the natural minimum depression in the engine manifold and carburetor fuel chamber, for example, at open

throttle at low revolutions, is wholly retained and in addition I employ means that will create a still greater depression than the natural minimum, by creating an ejector force at the vacuum connection above the ejector.

The float, the inlet valve, the housing for the valve, the support and pivotal mounting for the float and the inlet nipple, are combined as a unit capable of removal or replacement as such, and capable of being assembled and tested before mounting it on the frame of the carburetor. The opening through the wall of the carburetor is large enough to take in this float.

The globular formation 33 at the outer portion of the air metering tube provides a receptacle for catching any oil which may be discharged back through the metering tube. This may happen on backward movement of the engine pistons.

Having thus described my invention, what I claim is:—

1. A fuel supply system for internal combustion engines, comprising a fuel chamber to receive fuel from a lower level tank, a float valve controlling said supply, a mixing chamber in communication at one end with the engine intake, a fuel ejector extending into the other end of the mixing chamber and connected with the fuel chamber, said fuel chamber having communication above its fuel level with the engine intake to be subjected to the vacuum depression of the engine intake, a valve seat arranged opposite and spaced apart from the the end of the mixing chamber where the ejector is located to leave an annular air inlet space, and a sleeve valve movable in relation to said mixing chamber from its closed position against said seat, said ejector, mixing chamber, engine intake, and valve being axially in line, and the air tube of said ejector having an outwardly flaring upper end to make a restricted space between itself and the mixing chamber wall, in order to give greater velocity to the secondary air, thus intensifying the degree of vacuum induced by same over the fuel tube, substantially as described.

2. In combination in a vacuum feed carburetor, an air-tight fuel chamber connected with a low level tank and having a suction passage leading from above its fuel level to the engine intake and whose axis is substantially perpendicular to that of the intake at their juncture to subject the fuel chamber to the suction of the engine to draw fuel into the fuel chamber, a float valve in the fuel chamber, a mixing chamber directed to the engine intake and extending beyond the substantially horizontal opening of the suction passage so that the effect of pulsations existing in the suction passage on the stream of mixture moving through the mixing chamber to the intake will be balanced as regards said stream of mixture, and an ejector directed axially of the mixing chamber and having its upper end below said suction passage.

3. In combination in a carburetor, a mixing chamber, a fuel ejector comprising an air tube flared at its upper end, open at its lower end to atmosphere, and extending axially of the mixing chamber, said air tube having a flared tip and together with the wall of the mixing chamber defining a restriction in the mixing chamber adjacent said flared tip, and a fuel pipe within and below the upper end of the air tube having a flared upper end forming between itself and the wall of the air tube a restriction, said restrictions inducing higher velocity of air at the points where they are located and consequently a greater degree of vacuum over the end of the fuel pipe, and a valve for controlling the air to the space between the mixing chamber wall and the air tube, and a fuel chamber subject to the depression in the manifold.

4. In combination in a carburetor, a mixing chamber, an air tube extending into the same, a member arranged opposite and spaced apart from the intake of the mixing chamber, said member constituting a seat for an annular valve which controls the admission of air into the mixing chamber between said member and the end of the mixing chamber, said air tube opening to an air supply through said member, a fuel pipe extending into the air tube terminating below the top of the same and flared outwardly to provide a restriction of the passage of air between itself and the wall of the air tube, the said air tube at its outer side being flared outwardly to form a restriction to the passage of air between itself and the wall of the mixing chamber, substantially as described.

5. In combination in a carburetor, a mixing chamber, an ejector comprising an air tube extending into the same, a valve seat arranged opposite and spaced apart from the intake of the mixing chamber, an annular valve to admit air into the mixing chamber, said air tube opening to an air supply through said seat, a fuel pipe extending into the air tube terminating below the top of the same and flared outwardly to provide a restriction between itself and the wall of the air tube, the said air tube at its outer side being flared outwardly to form a restriction between itself and the wall of the mixing chamber, and producing a conical area of depression at the end of the ejector, the tip of said air tube being conical to extend into said depressed area, and a substantially horizontal ledge at the base of said conical extension.

6. In combination in a carburetor of the

kind described, an unrestricted passage from the discharge end of said carburetor to the constant level reservoir to subject the latter to the vacuum created by an engine in order to raise fuel to the reservoir, a mixing chamber, an ejector directed to the mixing chamber to deliver fuel thereto from the reservoir, and means to admit air to the fuel tube of the ejector consisting of two cooperating valves of the metering pin type, the one being manually controlled, the other automatic, to assist the ejector in properly proportioning the mixture of fuel and air by counterbalancing the effect of certain variations in the differential in pressures between the reservoir and ejector head.

7. In combination in a carburetor, an open passage from the discharge end of said carburetor to the constant level reservoir to subject the latter to the vacuum created by an engine in order to raise fuel to the reservoir, a mixing chamber, an ejector directed to the mixing chamber to deliver fuel thereto from the reservoior, and means consisting of two cooperating valves, one manually controlled, the other automatic, to admit air to assist the ejector in proportioning the mixture of fuel and air, substantially as described.

8. In combination in a carburetor, a fuel chamber, a mixing chamber, a fuel conduit leading from the lower part of the fuel chamber and terminating in a nozzle directed to the mixing chamber, a throttle valve, and metering means consisting of an air conduit connected with the fuel tube to supply air thereunto and a metering pin for regulating the opening through said metering tube, and an automatic air valve operated by the suction in the mixing chamber for controlling air to the fuel conduit, substantially as described.

9. In combination in a carburetor, a fuel chamber, a mixing chamber, a fuel conduit leading from the lower part of the fuel chamber and terminating in a nozzle directed to the mixing chamber, a throttle valve, and metering means consisting of an air conduit connected with the fuel supply tube to supply air thereunto and a metering pin for regulating the opening through said metering tube, a nipple through which air may pass to the fuel tube, and valves removably adapted to said nipple, said valves being controlled automatically by the suction of the engine, substantially as described.

10. In a carburetor, a fuel chamber, a mixing chamber having at its outlet end a coaxial passage communicating with the engine, a fuel ejector, and a vacuum passage communicating said coaxial passage with the fuel chamber, the wall of said mixing chamber acting as a baffle for said vacuum passage and to cause engine pulsations to take place parallel with the axis of the mixing chamber, substantially as described.

11. In combination, a carburetor having a fuel chamber, an ejector drawing fuel therefrom, a passage connecting the fuel chamber with the manifold of the engine whereby said fuel chamber is subjected to the depression at the manifold and also to the pull of the ejector, a fuel tank, a pipe extending therefrom to the fuel chamber, and baffle means extending across said vacuum passage and consisting of the mixing chamber wall, substantially as described.

12. In combination with a fuel chamber, a mixing chamber, a passage extending from the upper part of the fuel chamber and in communication with the engine intake through an annular passage surrounding the upper part of the mixing chamber, the lower wall of said passage fitting close about the mixing tube and forming a drain surface and conducting the fuel back into the fuel chamber, substantially as described.

13. In a carburetor of the kind described, a mixing chamber, a fuel chamber subject to the suction of the engine through a passage leading thence to the mixing chamber, the juncture of said passage with the mixing chamber being so arranged that the flow of mixture passing through the mixing chamber will, by aspiration, induce in the fuel chamber a higher degree of vacuum than exists in the mixing chamber to assure the supply of fuel to the fuel chamber, and means for delivering fuel into the mixing chamber.

14. In combination in a carburetor, a fuel chamber, a tubular connection extending therefrom, having aligning openings, a mixing tube seated in one opening and directed to the other opening with an annular space between to communicate said tubular connection and fuel chamber with the engine manifold, means to direct fuel into the mixing chamber, a member arranged opposite and spaced apart from the end of the mixing tube and an annular valve operating in connection with said member, substantially as described.

In testimony whereof, I affix my signature.

WARD T. SIMPSON.