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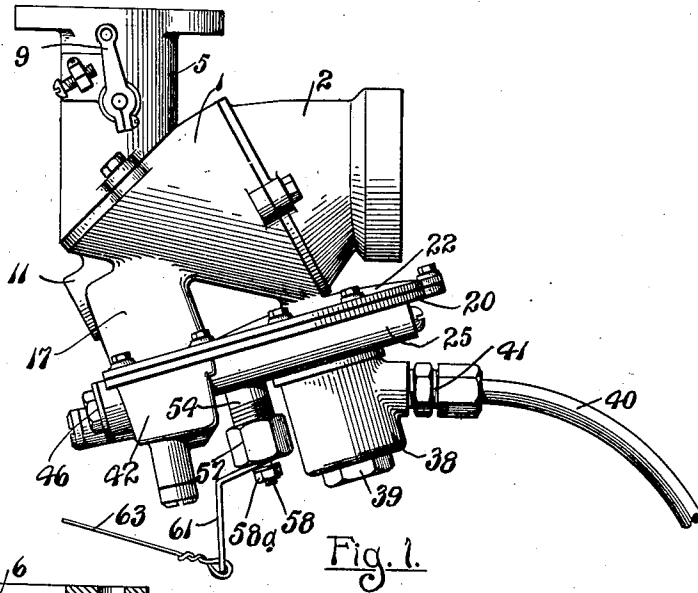
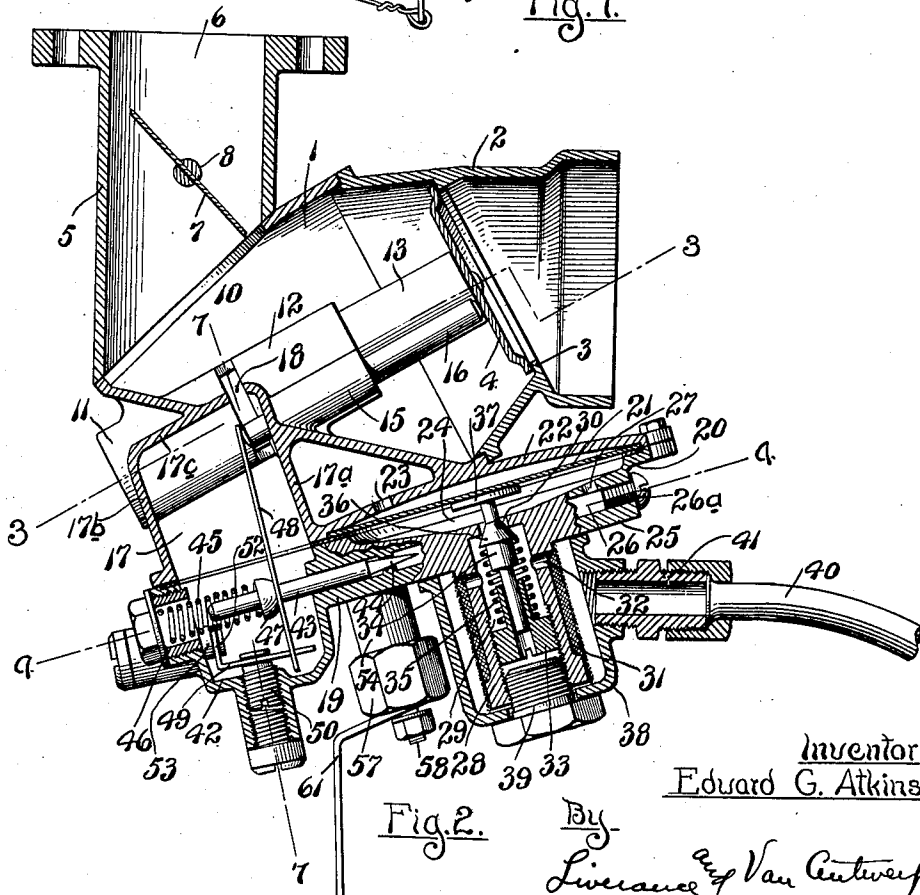
E. G. ATKINS

1,787,230

CARBURETOR

Filed Oct. 24, 1927

2 Sheets-Sheet 1



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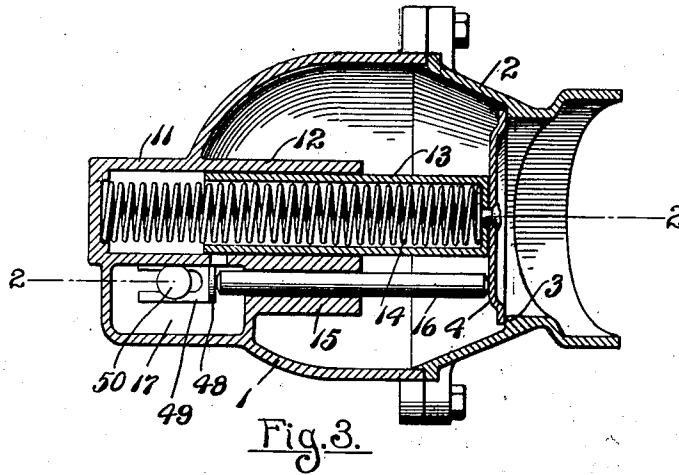
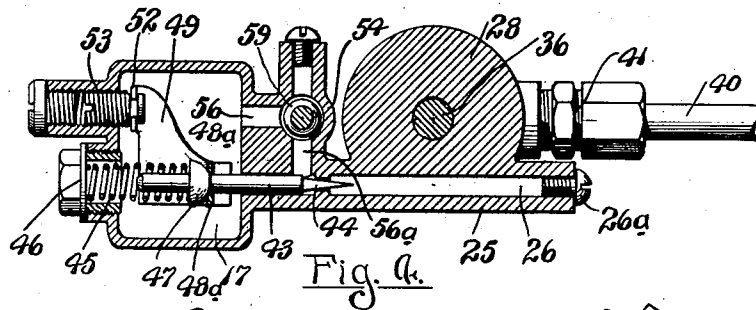
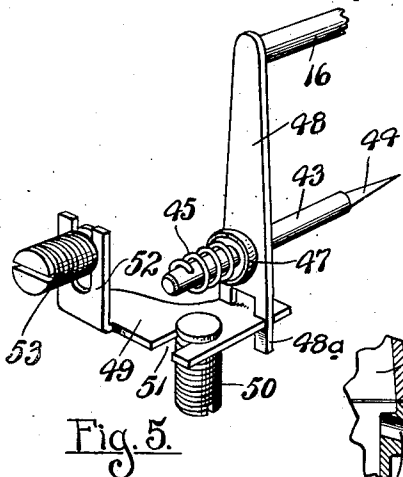
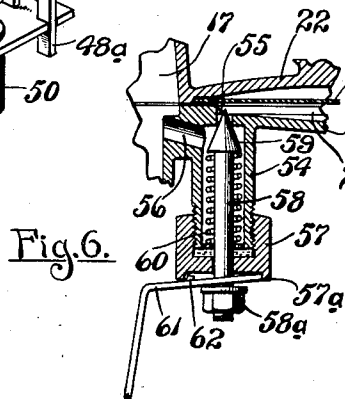
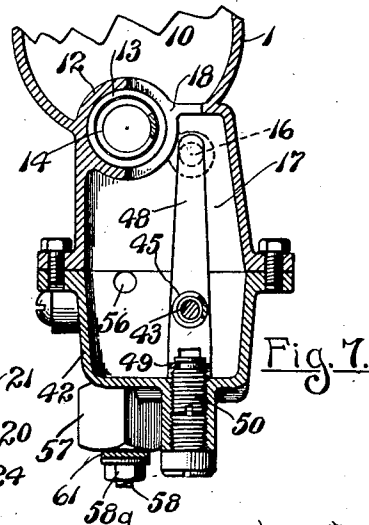
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UNITED STATES PATENT OFFICE

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CARBURETOR

Application filed October 24, 1927. Serial No. 228,152.

This invention relates to a carburetor designed for application to an internal combustion engine. It is an object and purpose of the present invention to provide a carburetor in which the proper proportions of air and fuel are maintained automatically under all of the running conditions which an engine has to undergo when used in an automobile, it being apparent that there are continual changes in level where an automobile is going up and down grades, that there are jolts and vibrations and many other severe conditions which do not have to be taken into account with carburetors for stationary engines. And, the carburetor which I have designed has as one of its primary objects and purposes the proper automatic maintenance of the right proportion of air and fuel under all of these conditions and throughout the many different speeds of the engine to which the carburetor is attached. It is a further object and purpose of the invention to provide a carburetor in which the fuel is automatically drawn through the carburetor from the main tank therefor without regard to the location of the tank, whether it is above or below the carburetor and this without the necessity of using a vacuum tank, pump or similar means such as are now in common use.

A still further object of my invention is to provide a carburetor capable of obtaining the results stated, yet which is comparatively simple in its structure and in the parts used and which is not liable to get out of order when in service.

A still further object of the invention is to provide a carburetor having a passage through which fuel may be drawn to deliver the same to a mixing chamber in the carburetor, and to so design and construct said passage as to eliminate the possibility of air pockets therein. The passage at certain points has various enlargements necessitated for the reception of certain operative mechanisms of the carburetor, and the outlet of every enlargement in the passage is from a high point of the enlargement so that the carburetor, when located in either of the two positions that it is applied to an engine as

commonly used, empties from the high point of every enlargement in the passage with a total elimination of any possibility of air pockets forming in said passage for fuel.

A still further object of the invention is to provide a carburetor wherein the drop below atmospheric pressure in the mixing chamber will be higher than is customary at low speeds of the engine and will be lower than customary at high speeds. This is made possible by the design which permits the use of an exceptionally long coiled compression spring which is compressed when the air valve is opened and is of a tension such that the air valve will not open at low speeds as easily as in ordinary carburetors, but when opened, the tension of the spring is not greatly increased because of its extra long length, so that there is not a marked decrease in the pressure below atmospheric pressure in the mixing chamber and as high a vacuum at high speeds of the engine as has heretofore been customary.

These and many other objects and purposes, not at this time specifically stated, will appear fully as understanding of the invention is had from the following description taken in connection with the accompanying drawings illustrating the structure embodying my invention, in which drawings:—

Fig. 1 is a side elevation of the carburetor of my invention.

Fig. 2 is a vertical section taken substantially on the plane of line 2—2 of Fig. 3.

Figs. 3 and 4 are transverse sections taken substantially on the planes of lines 3—3 and 4—4, respectively, of Fig. 2.

Fig. 5 is a perspective view illustrating a detail of the structure used in operating and adjusting the degree of operation of the needle valve.

Fig. 6 is a fragmentary vertical section illustrating the choke mechanism of the carburetor which may be used to obtain a richer fuel mixture in starting the engine when cold, and

Fig. 7 is a fragmentary transverse section substantially on the plane of line 7—7 of Fig. 2.

Like reference characters refer to like

parts in the different figures of the drawings.

In the construction of the carburetor an intermediate hollow body 1 is provided to which an air intake coupling 2 is secured, formed with an inwardly facing valve seat 3 against which a valve 4 normally seats.

A member 5 having a passage 6 there-through is connected at the opposite side of the body 1, this member being adapted to be secured to the engine manifold. In the passage 6 a throttle valve 7 is mounted on a stem 8 which, at one end, carries an arm 9 through which the throttle valve is operated by the usual suitable operating means. The two members 1 and 5 within the same and below the throttle 7 provide a mixing chamber 10 where the fuel and air are mixed before the same pass to the engine manifold.

Integral with the body member 1 is a sleeve 11 having a closed outer end, which sleeve extends upwardly and inwardly into the chamber 10 as indicated at 12. A second sleeve 13 has a closed end which is permanently secured to the valve 4. Sleeve 13 is telescopically received within the sleeve 12 and between the closed ends of the two telescoping sleeves a coiled compression spring 14 is located being completely housed and acting normally to press the valve 4 against the seat 3.

Alongside the inwardly projecting sleeve portion 12 a guide 15 is located through which an actuating rod 16 is mounted for free slidable movement. One end bears against the valve 4 while the opposite end extends into an enlargement 17 of the fuel passage through the carburetor which is formed on the body member 1 below the mixing chamber 10, said part 17 having sides 17a and 17b and a top 17c as shown in Fig. 2. A passage 18, shown in Figs. 2 and 7, is made between the chamber 10 and the enlargement 17 in such a way as to cut through the wall of the sleeve 11.

On the under side of the body member 1 is another member indicated as a whole at 19 and formed, at what may be termed its forward portion, with a disk-like part 20 to receive a flexible diaphragm 21 which is clamped between the part 20 and an overhanging somewhat concaved disk 22 cast integral with the body member 1. The diaphragm is securely clamped in place and below it an air-tight enlarged passage 24 is made, while the space above the diaphragm 21 has communication with the outside atmosphere through the vent opening 23.

At one side of and slightly below the passage 24 is a part 25 bored longitudinally to provide a passage 26, the outer end of which is closed by a screw 26a. An opening 27 is made between the passage 24 and the passage 26. Projecting downwardly from the member 19 directly underneath the passage 24 is a sleeve 28 interiorly bored to make a chamber 29 and

interiorly threaded from its lower end for a distance upward. The chamber 29 communicates with the passage 24 by means of an opening 30 between them. The sleeve 28 is surrounded by a screen 31 and openings 32 are made through the sleeve 28 near the upper end thereof which communicate with the chamber 29.

A plug 33 is screwed into the lower end of the sleeve 28 and has an opening there-through serving as a guide passage for the lower end of a valve stem 34 which, adjacent its upper end, is provided with a conical valve 36 to partly enter and close the opening 30 previously described. Normally the valve is moved upwardly by a coiled spring 35 located between it and the plug 33. The tension of the spring is adjusted by adjusting the plug 33 as is evident. The stem 34 above the valve 36 extends into the passage 24 and at its upper end is equipped with a flat disk-like head 37 lying against the underside of the diaphragm 21 at the central portion thereof.

A cup shaped housing 38 is located over and around the sleeve 29 and is permanently secured thereto by a locking screw 39 threaded into the lower end of the sleeve, the upper edges of the housing 38 bearing tightly against the under side of the member 19. A pipe 40 for fuel is connected by means of a suitable coupling 41 to the housing 38, it being understood that the pipe leads to the fuel supply tank. It is evident that fuel passing from the fuel tank to the pipe 40 and into the housing 38, passes through the screen 31 and through the openings 32 to the chamber 29, and under suitable conditions, later to be described, which will cause the downward movement of the diaphragm 21 with a consequent downward movement of the valve 36, the opening 30 is opened to permit the passage of fuel to the passage 24 from which it may pass through the opening 27 into the passage 26.

The rear portion of the member 19 is formed to close the lower end of the passage enlargement 17, being formed into a cup shaped housing 42 open at its upper side. A needle valve rod 43 extends into the rear end of the passage 26, the needle point 44 thereof entering a restriction in said passage, as best shown in Figs. 2 and 4. The needle valve is normally pressed by the spring 45 so as to move the point 44 in a direction to close the restricted portion of the passage. The spring 45 is located between a nut 46 threaded through the rear side of the part 42 and a shoulder member 47 of substantially semi-spherical form located on the rod 43 between its ends.

A lever 48, in the form of a flat bar, has an opening between its ends through which the rod 43 of the needle valve freely passes. The upper end of the lever 48 comes against the

lower rear end of the rod 16 previously described. The lower end of lever 48 is divided to make two spaced apart depending legs 48a which set in slots in opposite sides of a bracket 49 supported at the upper end of a stud 50 threaded through the lower side of the part 42 of the member 19, stud 50 having a groove around it near its upper end and the bracket 49 having a slot 51 which receives the grooved portion of the stud 50 (see Fig. 5). The bracket 49 also at its rear edge has an upturned finger 52 vertically slotted or divided between its edges, and a second screw threaded stud 53 engages with the finger 52 in the same way that the stud 50 engages with the bracket, the stud 53 being threaded through the rear side of the part 42. It is evident that, by adjusting the screw studs 50 and 53 the proper positioning of the needle valve may be accomplished. It will be noted that the axis of the stud 50 is parallel to the length of the lever 48 and that the axis of the stud 53 is perpendicular to the length of said lever. Also that the upturned finger 52 is parallel to the lever 48 and is perpendicular to the base of the lever 49 from which it is turned. This permits independent adjustment of either of the studs without in any manner disturbing or altering the adjustment of the other. It is also evident that when, due to the suction of the engine, the valve 4 is moved inwardly thereby moving the rod 16 longitudinally, lever 48 will be turned about its point of engagement with the bracket 49 and in this manner move the needle valve to partly open the restricted portion of the passage 26. It is also evident that by adjusting the screw stud 50 up and down the extent of movement of the needle valve with respect to the movement of the valve 4 may be controlled, as the fulcrum about which the lever 48 turns is changed by a vertical adjustment of the screw 50.

Depending from the member 19 at one side of the passage 26 is a sleeve 54 the interior of which communicates with the passage 24 through an opening 55 between them as shown in Fig. 6. The lower end of the sleeve 54 is tightly closed by a nut 57 recessed at its lower side so that a continuous annular rib 57a is made around the lower end of the nut. A valve stem 58 passes through the nut and into the sleeve 54 and at its upper end carries a conical valve 59 which normally projects into the opening 55 to close the same, being forced in an upward direction by a spring 60. The passage 56 connects the chamber 17 with the interior of the sleeve 54 and a similar passage 56a (Fig. 4) connects the interior chamber of the sleeve 54 with the passage 26 back of where the needle point 44 is located, as shown in Fig. 4. A nut 58a is threaded on to the lower end of the valve stem 58 above which the stem 58 passes through a lever 61 bearing against the

lower end of the nut 57 and seating at its end in the recess in said nut within the rib 57a. A short tongue 62 is struck upwardly from the lever 61 and lies in the recess at the lower end of nut 57 diametrically opposite the point where the end of the lever 61 seats in said recess. From the lower end of the bent lever 61 a wire or any other suitable connection 63 extends to any desired position where it may be reached by the driver of an automobile, who, by pulling on the wire can move the valve 59 downwardly against spring 60 and open the opening 55 as is evident.

The normal position of the parts is that illustrated in Fig. 2. When the carburetor is applied to an engine and when the suction or degree of vacuum in the mixing chamber 10 is such that spring 14 is compressed and the valve 4 opened, it is evident that a vacuum is produced in the chamber 24 and the pressure of air on the upper side of the diaphragm 21 will cause valve 36 to be moved downwardly opening the opening 30, whereupon fuel will be drawn through the pipe 40 and the various intervening connections into said passage enlargement 24, thence pass into the passage 26 and to the point 44 of the needle valve. The opening of the air valve 4 moves the rod 16 longitudinally, operates the lever 48 and thus moves the needle valve back so as to partly open the restricted portion of the passage 26, whereupon the fuel is carried through the passages 56a and 56 to the enlarged passage 17, thence through the passage 18 into the mixing chamber 10 to mix with the air coming into the chamber through an air inlet 2 and past the valve 4. The movement of the needle valve corresponds to the opening movement of the air valve 4. The tension of the spring 35 is adjusted so that all flow of fuel is cut off until the pressure drops or the degree of vacuum between the valves 36 and the needle point 44 is sufficient to raise a column of fuel equal to the maximum lift any time required in the operation of the engine.

The tension of the spring 13 is such as to keep the valve 4 seated until a degree of vacuum within the mixing chamber 10 is produced equal to or greater than that required for raising the fuel under any conditions of operation. The spring 13 is longer than is customarily used to hold an air inlet valve closed and its tension, when the air inlet is closed, is greater than the customary tension of springs for such purpose. Accordingly, the air valve will not open at low speeds of the engine until the pressure drop within the mixing chamber is greater than is customary in carburetors commonly used, insuring a degree of vacuum within the mixing chamber sufficient that the required amount of fuel will be raised under any conditions of engine operation. The length of

the spring further insures that its tension will not be greatly increased when the air valve is opened, inasmuch as its decrease in length will be only a small proportion or
 5 fraction of its total length. If the spring 13 was a short spring and its initial tension was strong, its tension at high speeds of the engine when the air inlet valve was opened to a large extent would be very high, but on
 10 account of the design which permits the use of the long spring the tension is not greatly increased so that the degree of vacuum within the mixing chamber at high speeds of the engine is less than what is customary with
 15 carburetors as now used. The telescoping sleeve dash-pot construction used in mounting the spring and its angular setting is also of value in controlling and dampening the spring action whereby the air inlet valve
 20 does not flutter and strike against its seat with consequent undesirable noise.

The fuel, therefore, is drawn through the pipe 40 as fast as permitted by the opening of the needle valve, which in turn, being actuated by the suction operated air valve 4,
 25 the fuel and air are admitted in proper proportions, the taper of the needle valve 44 and the fuel admission valve 36 are combined in an operative manner to insure that
 30 the fuel and air in proper proportions will be delivered to the engine by the carburetor and that the fuel will be properly carried to the air irrespective of the level of the main fuel supply with respect to the level of the
 35 carburetor. It makes no difference whether the fuel level in the supply tank is above or below or in the same plane with the carburetor mixing chamber or the needle valve thereof and it is a matter of no consequence how an
 40 automobile, having an engine equipped with this carburetor is inclined to the horizontal, whether it is going up or down grade and what the percent of the grade is.

There is produced a proper proportioning
 45 of the air and fuel during the variations of the speed of the engine and irrespective of the different amounts of mixed air and fuel required to drive the engine at its various speeds. It eliminates all vacuum tanks, fuel
 50 pumps or other auxiliary means required for the delivery of fuel and the operation is in no wise affected by variation of fuel level in the supply tank. The construction is also fully satisfactory for use where the fuel is
 55 fed to the carburetor by gravity. In fact the carburetor is one of universal application.

The mechanism for adjusting the carburetor for rich or lean mixtures is shown in Fig. 5. The degree that the needle valve is opened
 60 in proportion to the opening of the air inlet valve 4 is governed by the position of the bracket 49 with respect to the ends of the legs 48a of lever 48. This may be readily adjusted for rich or lean mixtures.

65 An extra supply of fuel for starting the

engine when cold is available through the mechanism shown in Fig. 6 wherein by opening the valve 59 on pulling on the wire 63 fuel may pass from the passage 24 in greater
 70 amounts than it can pass by the needle point 44 with a resultant richness of mixture. The passage remains filled up to the point 18 at all times after the carburetor has been in use.

While the position of the carburetor normally is that shown in Fig. 1 that is with the
 75 outlet at 6 vertical the carburetor may be located at right angles to this position with the outlet horizontal. This does not make any change in the action of the carburetor and it will be noticed that in both cases either
 80 in the position shown in Fig. 2 or in the position at right angles thereto the dash pot chamber at 17 is always filled with fuel and there is no possibility of air getting into the fuel line of the carburetor.

The construction shown and described is a practical working embodiment of my invention. Many variations in the specific detail of the structure may be resorted to without in
 90 any way departing from the invention. The invention is defined in the claims appended hereto and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In a carburetor, the combination of a
 95 mixing chamber having an air inlet and an outlet thereto, a spring pressed valve normally closing the air inlet and actuated to open the air inlet by the excess of atmospheric pressure over the pressure within said
 100 mixing chamber, a fuel conduit adapted to lead from a source of fuel supply to said mixing chamber, two fuel valves in said fuel conduit, the first being located nearest to the mixing
 105 chamber and the second nearest to the source of fuel supply, interposed means between the air valve and the first of said fuel valves for moving said first fuel valve when the air valve is opened to thereby withdraw
 110 the first valve partly from said fuel conduit, a spring normally holding the second fuel valve in a position to close said fuel conduit, a diaphragm bearing against the second fuel valve and flexing under atmospheric pressure
 115 when the pressure within said fuel conduit between the fuel valves has decreased sufficient that the excess of atmospheric pressure acting on said diaphragm will overcome the spring, whereupon the second fuel valve is
 120 moved to open the fuel conduit, said spring acting on the second fuel valve being of such strength that before the fuel conduit is opened by movement of the second fuel valve a difference in pressure is made between atmospheric pressure and that within the fuel
 125 conduit between the fuel valve sufficient to raise a column of liquid fuel equal to the maximum lift ever required in operation.

2. In a carburetor, the combination of a 127

mixing chamber having an air inlet normally closed by a spring actuated valve and opened by suction of an engine to which the carburetor is adapted to be attached, said carburetor having a discharge outlet through which mixed air and fuel may pass to said engine, a fuel feed passage including a diaphragm chamber covered by a diaphragm exposed to atmospheric pressure, a needle fuel feed valve projecting into said feed passage, means disposed between the air valve and said needle fuel feed valve for actuating the needle valve to open the fuel feed passage in proportion to the movement of the air valve, a second fuel valve located in said fuel feed passage, means interposed between the second valve and the diaphragm for moving said valve to open the passage on flexing the diaphragm under the influence of atmospheric pressure, and yielding means normally holding the second fuel valve in closed position, said yielding means being overcome by atmospheric pressure on the diaphragm when the second valve is opened.

3. In a carburetor, the combination of a mixing chamber having an air inlet normally closed by a spring actuated valve, and having a discharge outlet, a fuel feed passage adapted to lead from a source of fuel supply to said mixing chamber closed at one side by a flexible diaphragm exposed at its outer side to atmospheric pressure, two fuel valves in said fuel feed passage at spaced apart points, the first being located nearest the mixing chamber and the second nearer the source of fuel supply, means for automatically moving the first valve interposed between it and the air inlet valve when said air inlet valve is opened and in proportion to the amount that said air inlet valve is opened, yielding means normally holding the second fuel valve in position to close the fuel inlet passage, a stem having a head extending from said second valve, said head contacting against the inner side of said diaphragm for the purposes described.

4. In a carburetor, the combination of a mixing chamber having an air inlet opening and an outlet opening, a spring actuated valve normally closing said air inlet opening, a fuel conduit for conducting fuel from a source of supply to said mixing chamber, a needle fuel valve projecting into said fuel passage to control the amount of fuel that passes to the mixing chamber, a pivotally mounted lever connected with the needle valve, a rod bearing against the air inlet valve at one end and against the lever at its other end moved by said air inlet valve when the same is opened to automatically and simultaneously withdraw the needle valve to permit the passage of fuel, said fuel passing being in proportion to the air passed by the inlet valve irrespective of the extent that the air inlet valve is opened, a second valve

located in said fuel conduit closing the same, yielding means holding the second valve in closed position, and means operated by atmospheric pressure for moving said second valve to open position when said atmospheric pressure exceeds the pressure within said fuel passage by an amount sufficient to overcome said yielding means.

5. In a carburetor, the combination of a mixing chamber having an air inlet closed by a spring actuated valve and an outlet provided with a throttle, an air tight fuel passage to said chamber, two fuel valves arranged in series in said fuel passage the first nearer to the mixing chamber than the second, means for actuating said fuel valve nearest the mixing chamber by movement of said air valve when the same is open, means whereby the second of said fuel valves is automatically opened on drop of pressure in the fuel passage between said two valves caused by drop of pressure in the mixing chamber, and means for externally adjusting the first of said valves in the fuel passage to set the valve in said passage whereby in its normal position the passage will be partially opened and the extent to which it is open governed by said external adjustment therefor.

6. In a carburetor, the combination of a mixing chamber having an air inlet closed by a spring actuated valve, and a mixture outlet thereto, a fuel valve passage to said chamber, a fuel valve, having a shoulder thereon, arranged in said fuel passage, a lever having an opening adapted to receive the stem of the fuel valve whereby said shoulder abuts thereagainst, spring means for forcing the fuel valve to a closed position and adjustable means for varying the position of the lever.

7. A carburetor of the character described in claim 4, but further characterized by the fact that the adjustable means has additional means cooperably associated therewith whereby the position of the lever is controlled by the spring actuated air valve.

In testimony whereof I affix my signature.
EDWARD G. ATKINS.