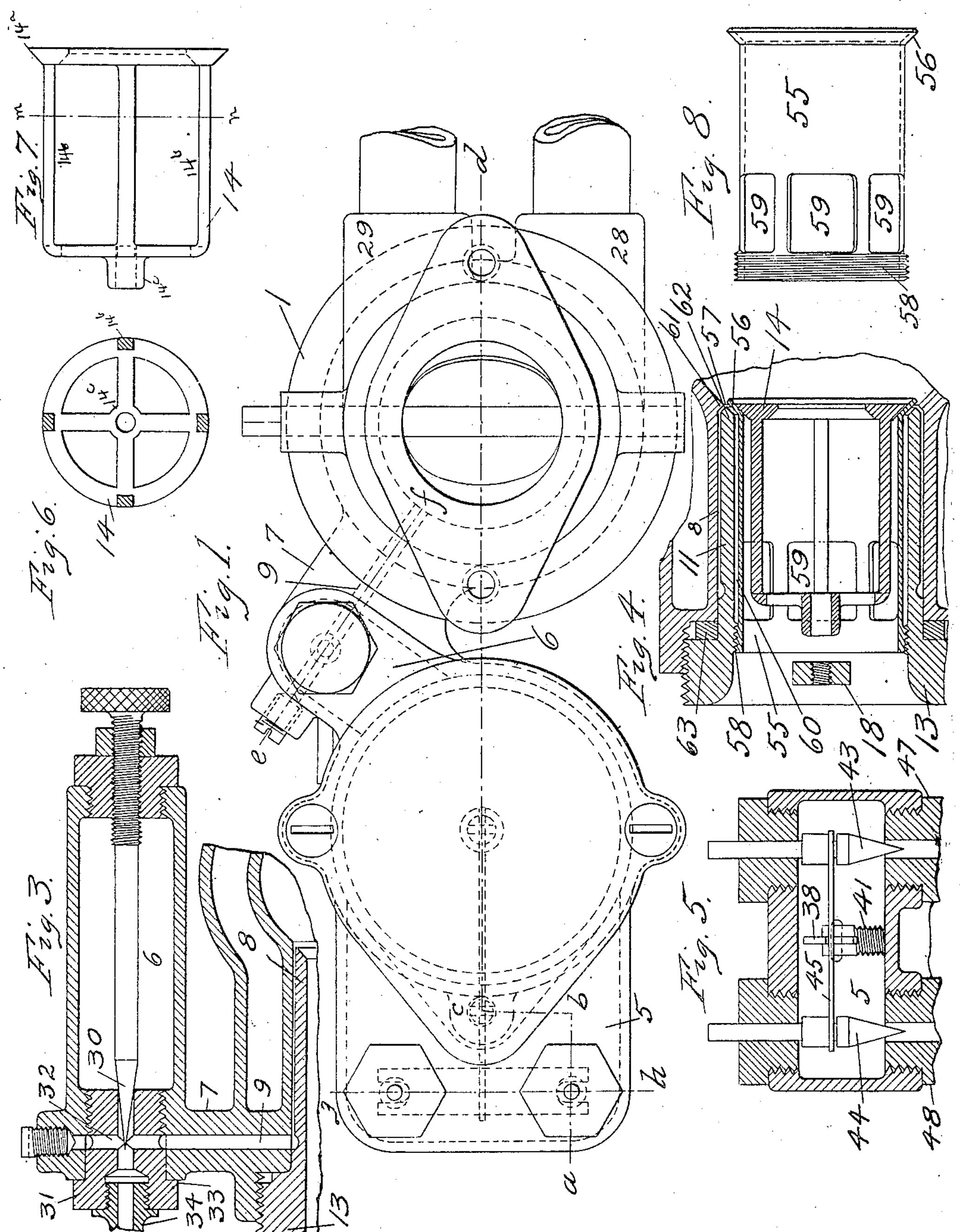
F. L. SESSIONS.

CARBURETER.

APPLICATION FILED JAN. 17, 1914.

1,235,164. Patented July 31, 1917.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

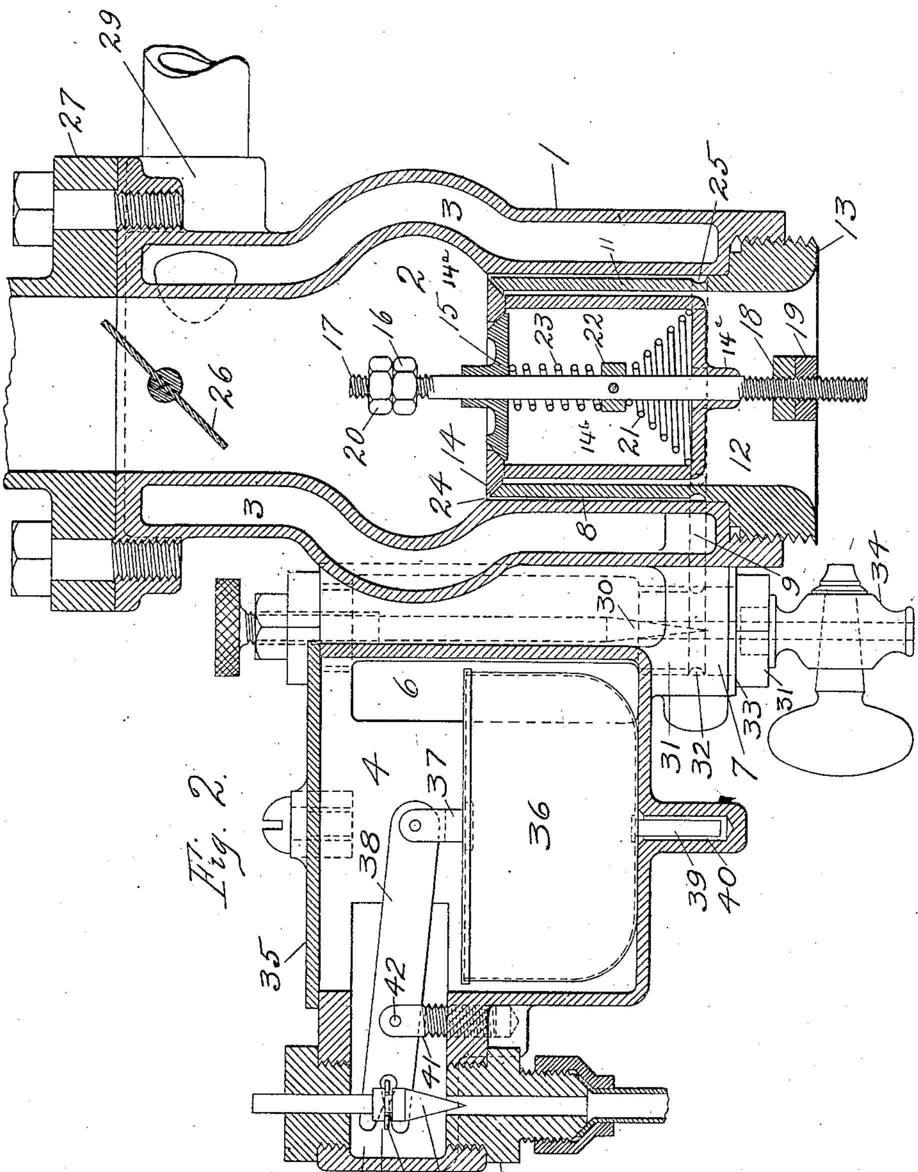

Fig. 2.

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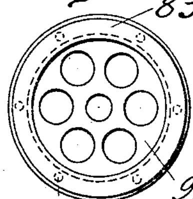
4 SHEETS—SHEET 3.

Fig. 9.



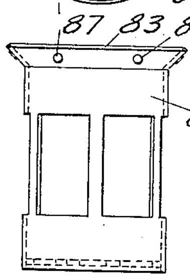


Fig. 10.

Fig. 11.

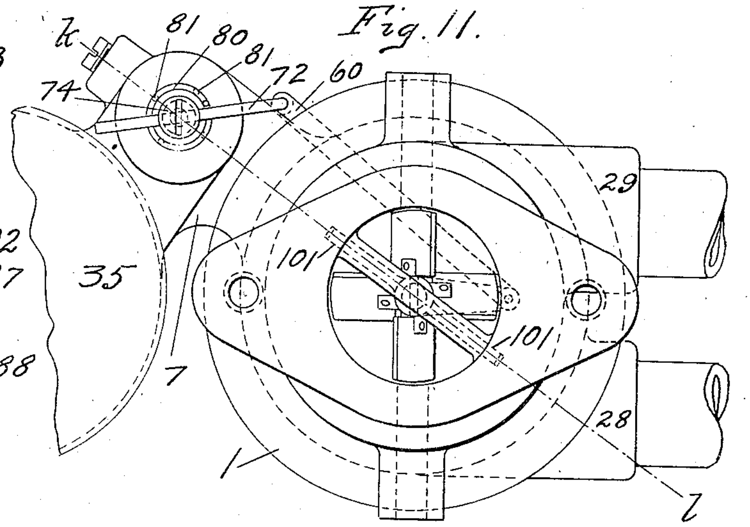
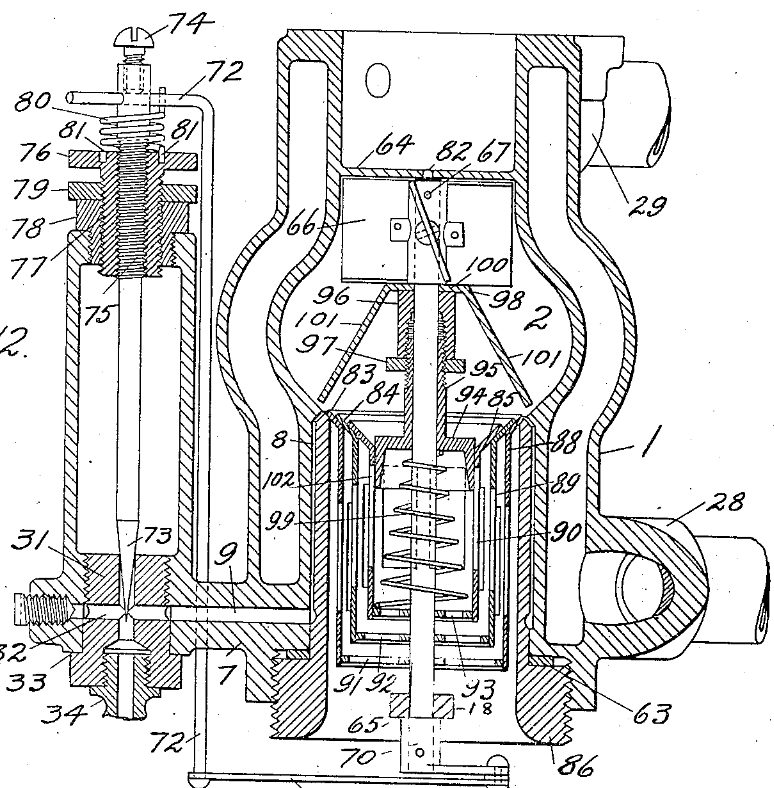


Fig. 12.



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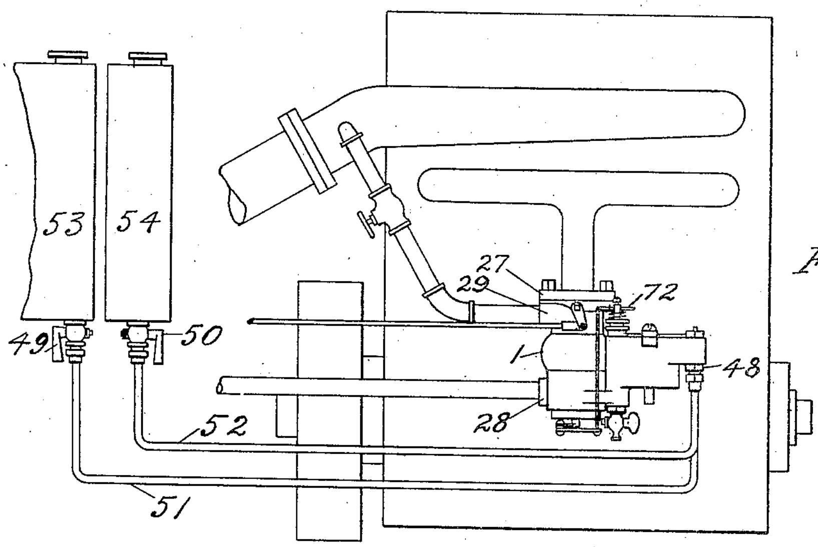


Fig. 13.

Fig. 15.

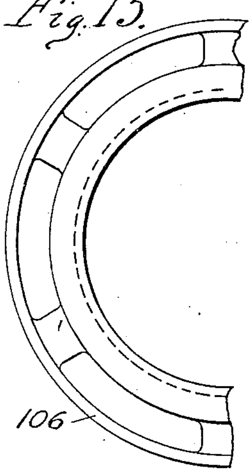
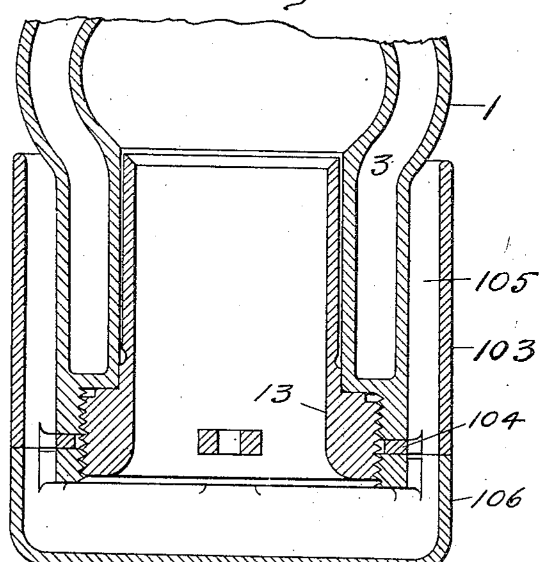


Fig. 14.



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FRANK L. SESSIONS, OF LAKEWOOD, OHIO.

CARBURETER.

1,235,164. Specification of Letters Patent. Patented July 31, 1917.

Application filed January 17, 1914. Serial No. 812,702.

To all whom it may concern:

Be it known that I, FRANK L. SESSIONS, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Carbureters, of which the following is a specification.

Some of the objects of my invention are the use of fuels which are not readily vaporized or gasified at atmospheric temperatures and the economical use of fuels which are more readily vaporized or gasified at higher temperatures.

To attain these objects, I employ controllable means and new and improved devices for heating the fuel prior to its mixture with air, for heating the air in the air inlet passage before it meets the fuel and for the further heating of the mixture as it passes through the mixing chamber.

I also employ controllable means and new and improved devices for mixing with the less volatile fuels, highly volatile fuels or other liquids, which mixtures are readily vaporized at ordinary atmospheric temperatures and can be utilized for starting the engine or for continuous operation if desired. Some of the fuels which may be used in this manner are kerosene and gasolene in various proportions. With my carbureter, gasolene only may be used for starting, or any effective mixture of gasolene and kerosene. After starting and securing sufficient heat in the heating jacket, kerosene only may be used, or any desired proportion of gasolene may be admitted.

Other fuels which may be employed are kerosene and sulfuric ether, a small amount of the latter being sufficient to make the mixture volatile at ordinary temperatures.

I make further provision for efficient carburetion in improved forms and arrangements of fuel nozzle and air inlet, and in control of the admission of both air and fuel.

While my invention provides means for attaining the objects mentioned, it is to be noted that the parts are so designed and arranged that the carbureting of the air with fuels such as gasolene and other highly volatile liquids may be carried on in my improved carbureter without the use of the heating devices, more efficiently than in the existing types of carbureters not employing heating means. This is accomplished by the shapes and arrangements of fuel nozzle and air inlet valves in the control of the admission of air and fuel, and the shape of the mixing chamber.

In the drawings:

Figure 1 is a plan view of one form of my carbureter.

Fig. 2 is a section on vertical planes on lines *a b c d* of Fig. 1.

Fig. 3 is a part section on line *e f* of Fig. 1.

Fig. 4 is a section through a modified form of air inlet and fuel nozzle.

Fig. 5 is a section on line *g h* of Fig. 1.

Fig. 6 is a detail cross section of valve 14 on line *m n* of Fig. 7; Fig. 7 is a side elevation of valve 14; Fig. 8 is a side elevation of tube 55; Fig. 9 is a plan and Fig. 10 is a side elevation of valve 83.

Fig. 11 is a plan view of a portion of my carbureter showing the fuel valve controlling mechanism.

Fig. 12 is a vertical section on line *k l* of Fig. 11.

Fig. 13 is an elevation of one of my improved carbureters connected to an engine and fuel supply tanks.

Fig. 14 is a sectional view showing an air intake sleeve.

Fig. 15 is a partial plan view of cap 106 shown in Fig. 14.

In the drawings, 1 is the cast metal body of the carbureter shown in Fig. 1 and Fig. 2. This body casting comprises the mixing chamber 2, the heating jacket 3, the float chamber 4, the float valve chamber 5, and the fuel needle valve chamber 6. 5 and 6 are branch compartments of float chamber 4, being connected therewith by cored openings. 7 is a connecting and supporting arm between the needle valve chamber and the walls of the exhaust gas and mixing chambers. The fuel passes from the needle valve chamber to the fuel heating chamber 8 through the hole 9 in the arm 7. The fuel heating chamber 8 is a thin space between the interior wall 10 of the exhaust gas chamber 3 and the wall 11 of the air inlet 12. 13 is the air inlet valve seat and support which is secured to the body 1, and makes a gas tight joint therewith. 14 is the air inlet valve which consists of an annular plate 14^a having depending arms 14^b converging at the bottom to form a spider for carrying the lower hub bearing 14^c. 15 is a valve carried by the air inlet valve but arranged to open in the reverse direction to relieve pressure due to explosions in the intake passages or back firing in the engine cylinders. It has another function of admitting an increased supply of air when the suction caused by the pistons reaches the point where the inlet valve is lifted until the valve 15 contacts with and is unseated by adjusting nut 16 on rod 17.

Rod 17 is threaded into and supported by a cross bar 18 forming part of inlet valve support 13. 19 and 20 are jam nuts on rod 17. 21 is a spring acting between the collar 22 which is pinned to rod 17 and the air inlet valve 14 to hold the latter to its seat. 23 is a spring acting between the collar 22 and the valve 15 to hold the latter to its seat. 24 is the fuel nozzle of annular cross section. 25 is a groove in the wall of the fuel heating chamber to insure free admission of fuel. 26 is the customary throttle valve, controlling admission to the cylinders. 27 is the flange upon the intake manifold of the engine to which the carbureter is connected. 28 and 29 are pipe connection openings into the heating jacket, 3, through which a portion of the exhaust gases may be passed for the purpose of heating the fuel, the air, and the mixture of fuel and air. Other means than the exhaust gases may be used for these purposes, as for instance, water from the engine cooling system, or air heated by being drawn over hot surfaces of the exhaust pipe, or by sources of heat independent from the operation of the engine, without departing from the scope of my invention. 30 is an adjustable needle valve. 31 is a threaded plug drilled centrally to form a seat for the adjustable needle valve. 31 is drilled transversely as shown at 32 and grooved around its circumference to permit the fuel which passes the needle valve to enter hole 9 and thence the fuel heating chamber 25. 31 is provided with a shoulder 33 which is forced tightly against a corresponding surface upon the body casting 1 to prevent the leakage of fuel. 34 is a stop cock screwed into the bottom of plug 31, for draining the float and heating chambers. 35 is a float in the top of which is secured the post 37 which is hung to the lever 38. To the bottom of the float is fixed axially therewith the guide pin 39 which fits loosely in the guide hole 40 at the bottom of the float chamber. This guide pin steadies the float and prevents its rubbing upon the wall of the float chamber. 41 is a fulcrum post for the lever 38. 41 is screwed into the metal of the float valve chamber, so that the height of the fulcrum pin 42 may be varied as desired to raise or lower the level of the fuel in the float chamber. 43 and 44 are similar float valves each having a circumferential groove on its stem for the reception of one end of the equalizing lever 45. One end of the lever 38 is bifurcated so that the equalizing lever 45 may stand in the slot 46 so formed. The rising and falling of the float causes both valves to close and open. I make no claim in this application for the float-valve mechanism herein described and shown in the drawings as it forms the subject matter of my copending divisional application, Serial Number 166,356, filed May 4, 1917.

In Fig. 4, I show a modified form of air inlet in which I provide a fixed or constant opening for air across the orifice of the fuel nozzle. This is accomplished by adjustably mounting in the air inlet a thin metal tube, 55, having a cone shaped flange 56 at its upper end for deflecting the air over the fuel nozzle orifice 57. 55 is threaded at 58, the air inlet and valve support being correspondingly threaded to receive it. By means of this threaded connection, the opening between the flange 56 and the nozzle may be adjusted to regulate the amount of air that may enter through it.

In Fig. 4 I have shown the valve 14 in section but the rod 17, valve 15, collar 22, and springs 21 and 23 are not shown. These parts are employed in this modification in the same manner as they are shown in Fig. 1 with the exception that valve 14, as shown in Fig. 4, seats upon the flange 56 of tube 55.

47 and 48 are threaded plugs forming seats for fuel valves 43, 44, and they also serve as fuel supply connections to the float valve chamber 5. It will be understood that each of the float valves is served with one of these connections. Where two sorts of fuel are used, each connection will lead to a separate storage tank as shown in Fig. 13, and the proportion of each fuel that is admitted to the float chamber may be governed by adjustable valves 49, 50 in the pipe lines 51, 52 between the storage tanks 53, 54 and the float valves 43, 44. Thus, if kerosene be used as one fuel and it is desired to mix with it sulfuric ether, a small tank containing the latter may be connected to one float valve and a large tank of kerosene to the other. By adjusting the valves 49, 50 in the fuel connections between the float valves and the storage tanks, the smaller proportion of ether necessary to make the mixture sufficiently volatile to permit ready starting of the engine may be admitted through one float valve, while the larger proportion of kerosene may be admitted through the other. After the engine has been started and the heating jacket of the carbureter has become

warm enough to cause the heavier grade of fuel to properly mix with the air, the fuel connection to the storage tank containing the lighter fuel may be closed. Means for operating either or both of the valves between the float valves and storage tanks may be provided convenient for the driver to operate without leaving his seat. 59, 59 are perforations in 55 to admit air to the annular space 60, between the tube 55, and the wall 11 of the air inlet and valve support. In Fig. 4, is also shown means for varying the size of the orifice of the fuel nozzle. The exterior wall of the fuel heating chamber is provided with a conical shoulder 61 adjacent to the orifice 57 toward and from which the correspondingly cone shaped end, 62 of the interior wall is moved by screwing the air inlet and valve support in or out of the main body casting. 63 is a washer or shim whose thickness may be varied to suit the adjustment of the fuel nozzle orifice, 57, and serves also to prevent leakage of fuel from the fuel heating chamber.

In Figs. 11 and 12 are shown the means I prefer to employ for regulating the amount of air and fuel which enter the mixing chamber. In this arrangement, the main body casting, 1, is provided with a cross bar 64 for centering the top of rod 65. This rod is carried by cross bar 18, but is free to turn in a plain bearing therein and is not threaded like rod 17.

Upon rod 65 are mounted the deflecting blades 66 which are pinned to 65 by the pin 67. To the lower end of rod 65 is pinned the lever 70 which is connected to the offset lever 72 by the link 71. At its upper end, lever 72 is adjustably secured to the stem of the needle valve 73 by means of the set screw 74.

The needle valve stem is threaded at 75 into a nut 76 which in turn is externally threaded with a screw thread 77 of greater pitch than that of the needle valve stem. 78 is a plug screwed into the top of the needle valve chamber and threaded internally at 77 to receive the nut 76. 79 is a lock nut for 76. 80 is a coiled spring arranged to rotate the valve stem in a direction to close the needle valve 73. 76 is provided with a series of holes 81, 81, into any one of which the lower end of spring 80 may be placed to produce the desired spring tension. The upper end of spring 80 bears against lever 72.

In Fig. 12, I have shown an air valve differing from that shown in Fig. 2. In this construction, rod 65, corresponds to rod 17 of Fig. 2, but instead of being rigidly mounted in cross arm 18, it is free to revolve about its own axis. The upper end of rod 65 has a bearing 82 in cross bar 64. 83, 84, 85 are concentric conical valves. The largest of these, 83 bears upon the valve seat formed upon air inlet and valve seat 86, but may be separated therefrom slightly by raised points 87, 87 upon the contacting surfaces so that a limited amount of air may enter the mixing chamber without lifting the valve. The conical valves 83, 84, 85 have perforated tubular stems, 88, 89, 90, extending downwardly. They are held central by having perforated bottoms 91, 92, 93 which bear upon rod 65. Sliding upon rod 65 and within the tubular extension 90 of valve 85 is the piston valve 94. The length of the stem 95, of this valve is adjustable by means of the nut 96 and lock nut 97. The upper end of the valve stem nut 96 bears against the valve stop 98 which in turn bears against the hub of propeller fan 66 which is pinned to rod 65.

Spring 99 standing in tube 90, acts to force the nest of conical valves to their seats and to hold the piston valve 94 in its uppermost position.

Valve stop 98 is shown to consist of a circular hub portion 100, and two downwardly and laterally extending arms, 101, 101. As the suction caused by the engine pistons increases, the valves 83, 84 and 85 are drawn upward until 83 is stopped by the arms 101, 101. At this point the air inlet opening will remain constant until the suction increases to such an extent that it lifts valves 84 and 85 together or decreases and permits all of the valves to again fall. In case the suction increases sufficiently, the valve 84 strikes the valve stop arms 101, 101, and is prevented from rising farther, while with still further suction the valve 85 will be lifted away from 84 to permit air to enter between them. It is evident that as soon as any of the valves begin to open, the lifting pressures may thereby be reduced so that the combined suction and the friction of the air passing through the valves will hold them in balanced suspension between the points where they strike the valve stop arms.

It will be seen that the main air inlet valve is made up of a plurality of concentric valves, each one being seated upon the next larger and forming a seat for the next smaller. It may be best designated as a laminated valve.

Piston valve 94 performs the same functions as valve 15 shown in Fig. 2, in providing a relief for back pressure within the carbureter and in unseating the valve to admit air after the main inlet valves have opened a predetermined amount. By varying the position of the perforations or ports 102 in tube 90 and the tension of spring 99, the opening of valve 94 may be regulated.

As the mixture of air and fuel passes the deflecting blades 66, it will produce a rotating effect upon these blades upon rod 65 which will be transmitted to the needle valve stem and will open the needle valve an amount depending upon the velocity of the mixture, the pitch of the screw 75, the tension of spring 80 and the relation of the levers 70 and 72. By means of the various adjustments, I have provided that the proper proportions and amounts of air and fuel allowed to enter the engine cylinders will be very accurately and automatically governed for all loads and speeds, once the adjustments are made.

The adjustment of the needle valve, 73 is accomplished by turning the nut 76 until the needle valve stands at the desired nearest closed position when the lever 72 rests against the arm 7 which acts as a stop to further rotation to open the valve. It will be understood that any other means to limit the action of the spring 80 to close the needle valve may be employed without departing from the scope of my invention.

The amount of exhaust gases allowed to pass through the heating jacket may be regulated by suitable valves in the pipe connections or by adjusting the size of these connections.

The preheating of the air may be regulated by the length of the air inlet adjacent the fuel heating chamber; or by extending the air inlet and valve support downward or by drawing the incoming air through a compartment surrounding the exhaust gas chamber as shown in Fig. 14.

The air inlet and valve support being surrounded by the fuel heating chamber and heating jacket, will become heated by them so that the incoming air will be preheated from contact with and radiation from the walls of the air passage. After passing the air inlet valve and fuel nozzle, the air and fuel will be directed against the walls of the mixing chamber.

By making the shape of the mixing chamber, 2, partially spherical, or oblate, the air and fuel are thoroughly mixed and are heated by being forced into contact with the hot walls common to the mixing chamber and heating jacket.

In Fig. 14 is shown one of several means which may be employed to effect a greater preheating of the air. 103 is a sleeve having an internal flange 104. This flange slips over the threaded projection of the air inlet and valve support 13, the sleeve 103 surrounding the main body casting 1, and forming the annular space 105 through which the incoming air is drawn in contact with the outer wall of the heating jacket. 106 is a threaded cap which holds the sleeve 103 in place. Both the sleeve 103 and cap 106 are perforated to permit the incoming air to enter the air inlet. 103 may be cut away where necessary for passing the arm 7 and other obstructions, or may be modified as found convenient or desirable to inclose more or less of the heating jacket and connections.

By my improved arrangement, heat is very quickly imparted to the fuel on account of the large surface of the fuel heating chamber. By heating the fuel after it passes the fuel needle valve, all the heat applied is put to useful work and the fuel is readily picked up by the incoming air. The cylindrical fuel heating chamber surrounding the air inlet passage, and the heating jacket, may be made of any required length to secure the proper heating of the fuel and incoming air prior to their entering the mixing chamber. The thin walls of the fuel heating chamber readily transmit heat from the heating jacket to the incoming air which they completely surround. As the air passes through the air inlet valve into the mixing chamber it is deflected sharply across the annular fuel nozzle. At the same time it expands into the mixing chamber, the cross section of which is considerably larger than that of the air inlet passage, and the fuel is completely vaporized and thoroughly mixed with the air. I have shown the walls of the mixing chamber inclined upward and outward so that any liquid fuel which may be drawn out of the nozzle by the suction created by the engine will be blown upon the walls in a thin film and quickly evaporated by the incoming air. This feature is particularly advantageous in starting a cold engine and I believe that it has not been heretofore proposed.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any one of the following claims or the equivalent of such stated means be employed.

I therefore, particularly point out and distinctly claim as my invention:

1. In a carbureter, a casing provided with a mixing chamber having an air inlet, a fuel inlet and a mixture outlet, the fuel inlet surrounding the air inlet, and a plurality of concentric valves controlling the admission of air through the air inlet to the mixing chamber.

2. In a carbureter, a casing provided with a mixing chamber having an air inlet, a fuel inlet and a mixture outlet, the fuel inlet surrounding the air inlet, a plurality of concentric valves controlling the admission of air through the air inlet to the mixing chamber, and means for closing said valves.

3. In a carbureter, a casing provided with a mixing chamber having an air inlet, a fuel inlet and a mixture outlet, the fuel inlet sur-

rounding the air inlet, a plurality of concentric valves controlling the admission of air through the air inlet to the mixing chamber, and means for limiting the opening of said valves.

4. In a carbureter, a casing provided with a mixing chamber having an air inlet, a fuel inlet and a mixture outlet, the fuel inlet surrounding the air inlet, and a plurality of concentric valves controlling the admission of air through the air inlet to the mixing chamber, the largest valve being seated upon the wall of the air inlet, and each of the remaining valves being seated upon the next preceding valve.

5. In a carbureter, a main air inlet valve opening inwardly and provided with an opening, a supplemental reverse-opening-valve seated over said opening to close the same, means for holding both valves normally closed, and means for automatically unseating said supplemental valve when the main valve has reached a predetermined point in its inward movement, said carbureter having a fuel inlet adjacent the main valve.

6. In a carbureter an air inlet valve opening inwardly, a reverse opening valve carried thereby, means for holding said reverse opening valve against inward movement during a portion of the inward opening movement of the air inlet valve, and to be positively unseated upon further opening of the air inlet valve to thus admit an additional supply of air past the reverse-opening-valve, said carbureter having a fuel inlet adjacent the main valve.

7. In a carbureter, a casing provided with a mixing chamber, an air inlet, a fuel inlet, and a mixture outlet, the fuel inlet surrounding the air inlet, an air inlet valve opening inwardly and having an opening therethrough, a reverse opening valve closing said opening, and a single means for closing said air inlet valve and said reverse opening valve.

8. In a carbureter, the combination of an inwardly-opening main valve provided with a central opening, a reverse-opening supplemental valve adapted to seat over said opening and thus close the same, a central rod passing through said valves, means for normally holding both valves closed, and stop means on the rod adapted to hold the supplemental valve when the main valve reaches a predetermined point in its inward movement and thus cause the supplemental valve to be unseated and admit an additional supply of air through the central opening in the main valve, said carbureter having a fuel inlet adjacent the main valve.

9. In a carbureter, a main air inlet valve opening inwardly and provided with a central opening, a supplemental reverse-opening-valve seated over said opening to close the same, means for holding both valves normally closed, and means for automatically unseating said supplemental valve when the main valve has reached a predetermined point in its inward movement, said means embodying devices whereby the point at which the unseating takes place may be varied, said carbureter having a fuel inlet adjacent the main valve.

10. In a carbureter, the combination of an inwardly-opening main valve, a supplemental valve adapted to admit an additional supply of air, and means whereby this supplemental valve is unseated to admit said additional supply of air at a predetermined point in the inward movement of the main valve, said carbureter having a fuel inlet adjacent the main valve.

11. In a carbureter, the combination of an inwardly-opening main valve, a supplemental valve adapted to admit an additional supply of air, and means whereby this supplemental valve is unseated to admit said additional supply of air at a predetermined point in the inward movement of the main valve, said means consisting of a rod extending into the intake and provided with a stop against which said supplemental valve abuts, said carbureter having a fuel inlet adjacent the main valve.

12. In a carbureter, the combination of an inwardly-opening main valve, a supplemental valve adapted to admit an additional supply of air, and means whereby this supplemental valve is unseated to admit said additional supply of air at a predetermined point in the inward movement of the main valve, said means consisting of a rod extending into the intake and slidably connected to the supplemental valve and provided with a stop on its inner end against which said supplemental valve abuts, said carbureter having a fuel inlet adjacent the main valve.

13. In a carbureter, the combination of an inwardly-opening main valve, a supplemental valve adapted to admit an additional supply of air, and means whereby this supplemental valve is unseated to admit said additional supply of air at a predetermined point in the inward movement of the main valve, said means consisting of a rod extending into the intake and slidably connected to the supplemental valve and provided with a stop on its inner end against which said supplemental valve abuts, said stop being adjustable on the rod to vary the point of unseating of the supplemental valve, said carbureter having a fuel inlet adjacent the main valve.

14. In a carbureter, a casing provided with a mixing chamber, an air inlet and a fuel inlet, a main valve controlling the flow

of air into the mixing chamber, a supplemental valve adapted to admit an additional supply of air to the mixing chamber, and means whereby this supplemental valve is unseated to admit said additional supply of air at a predetermined point in the inward movement of the main valve.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK L. SESSIONS.

Witnesses:
FLORENCE PALMER,
DAVID PERRIS.