

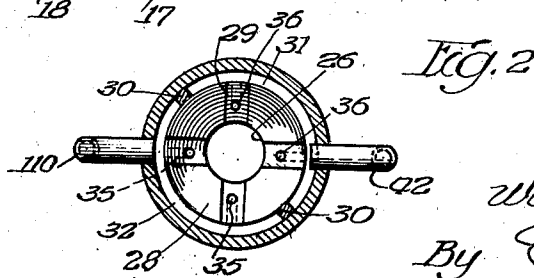
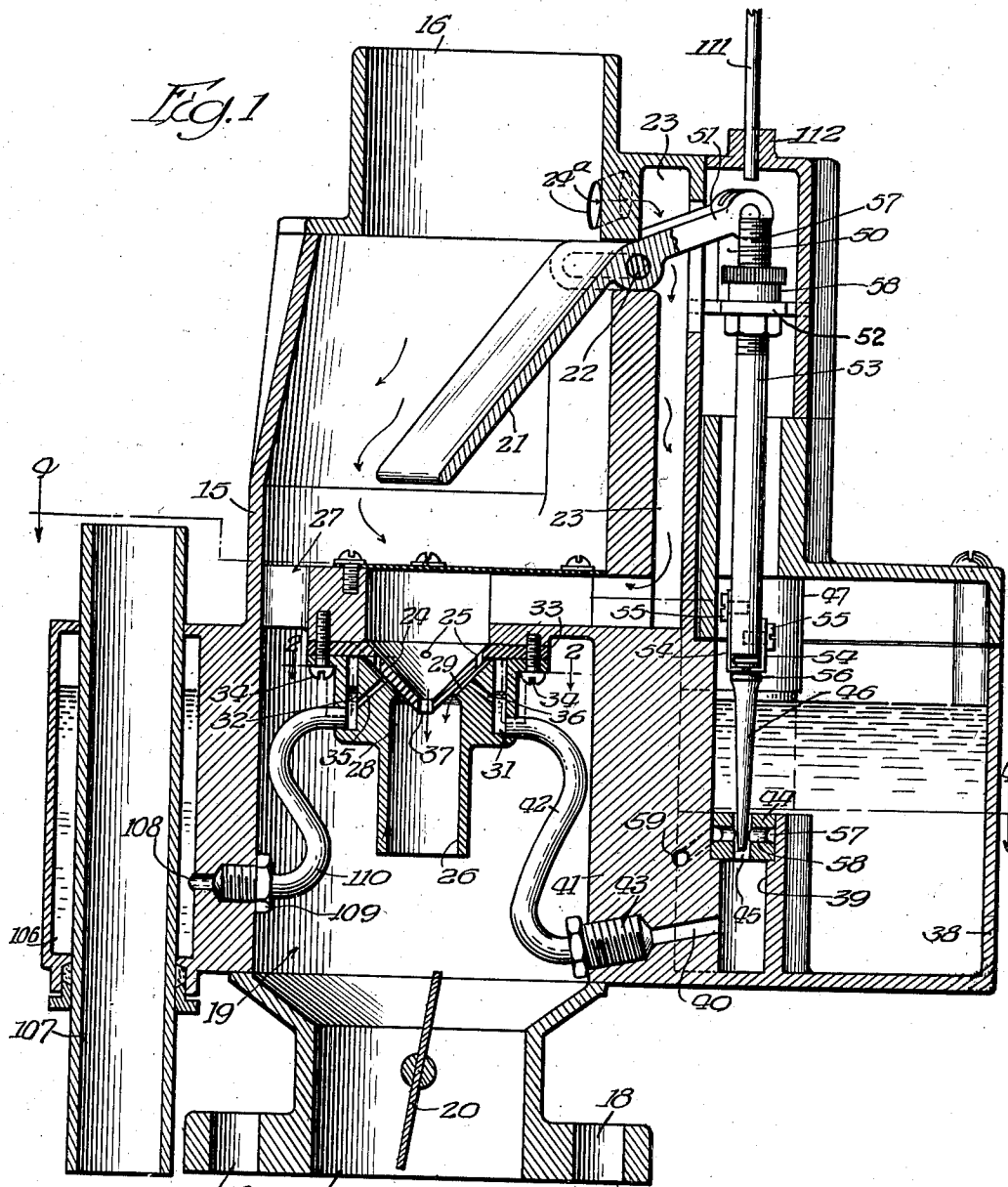
May 6, 1941.

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2,240,497

CARBURETOR

Original Filed July 6, 1937 5 Sheets-Sheet 1



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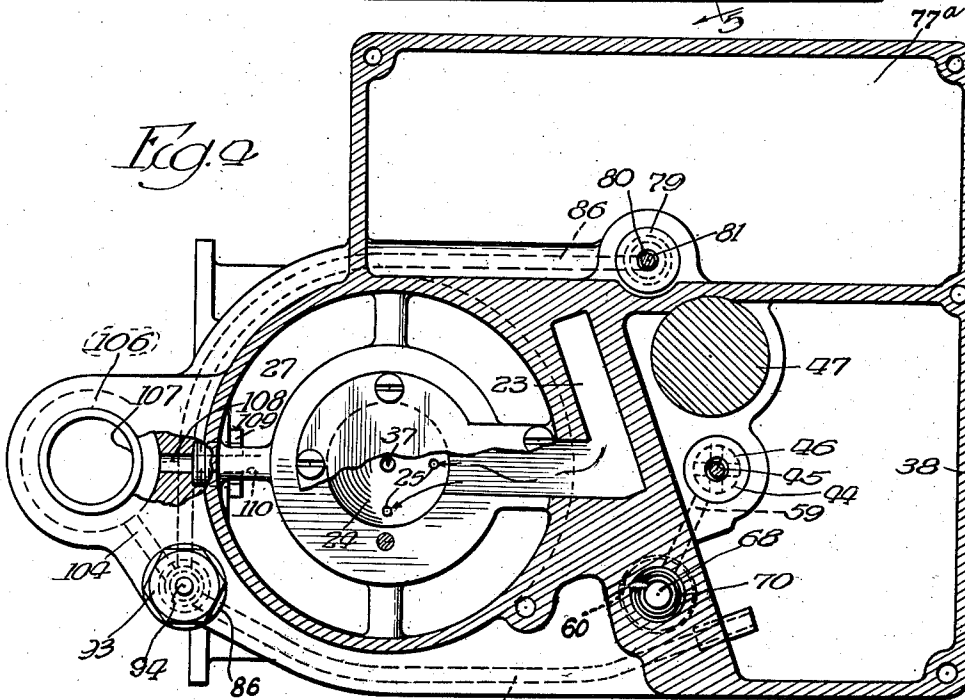
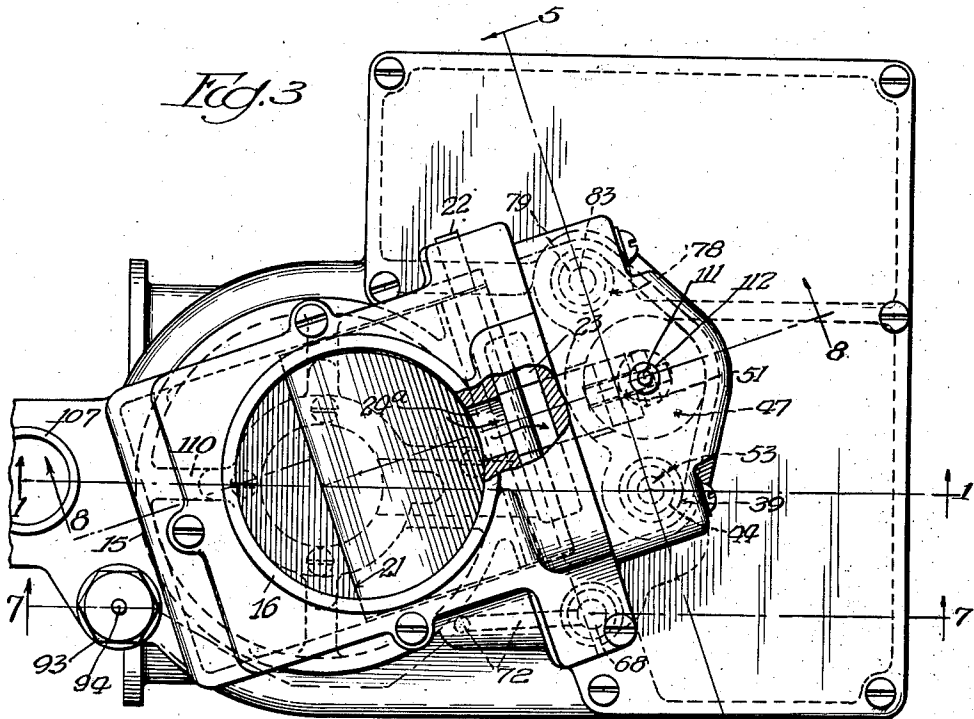
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CARBURETOR

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5 Sheets-Sheet 2



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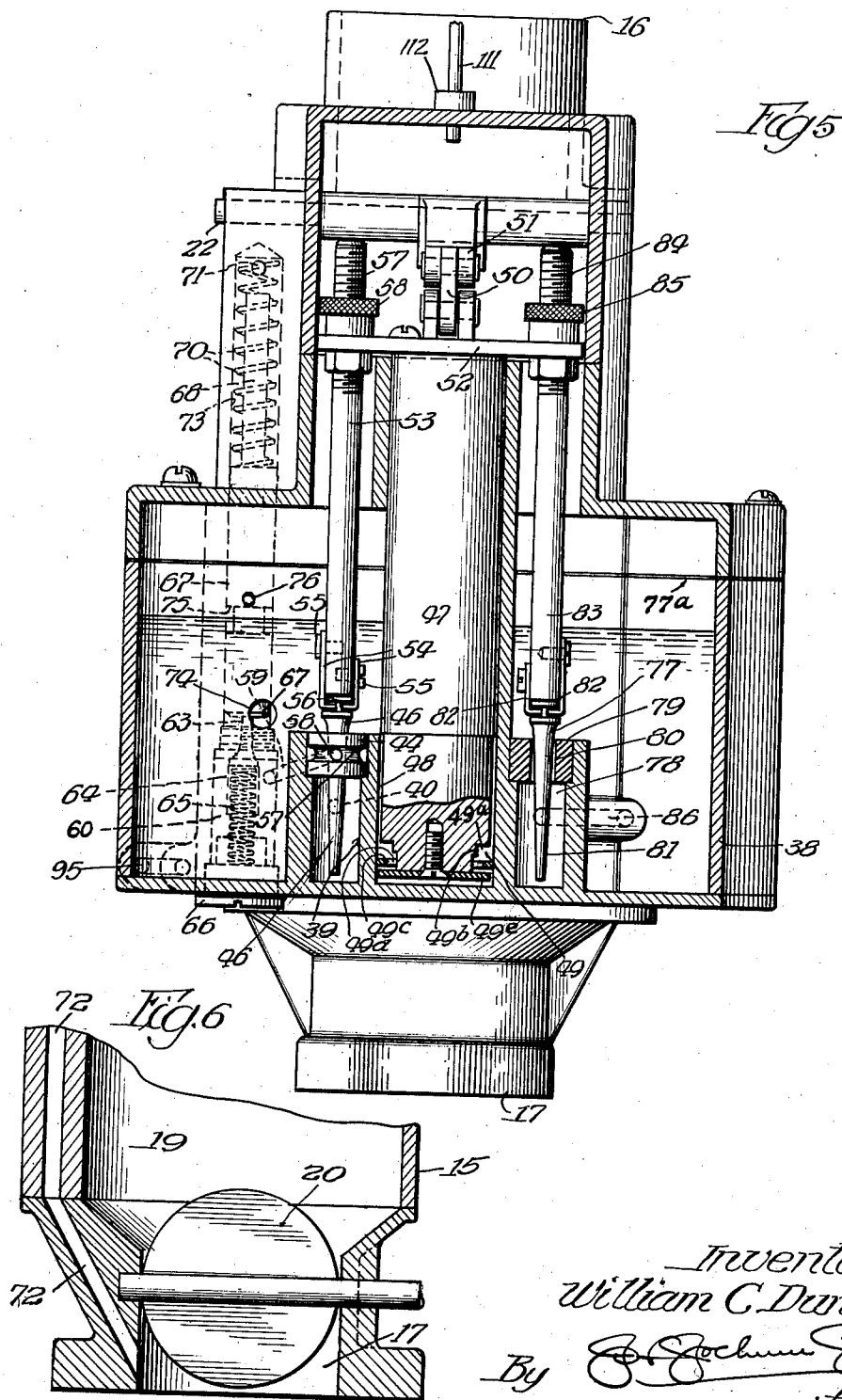
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CARBURETOR

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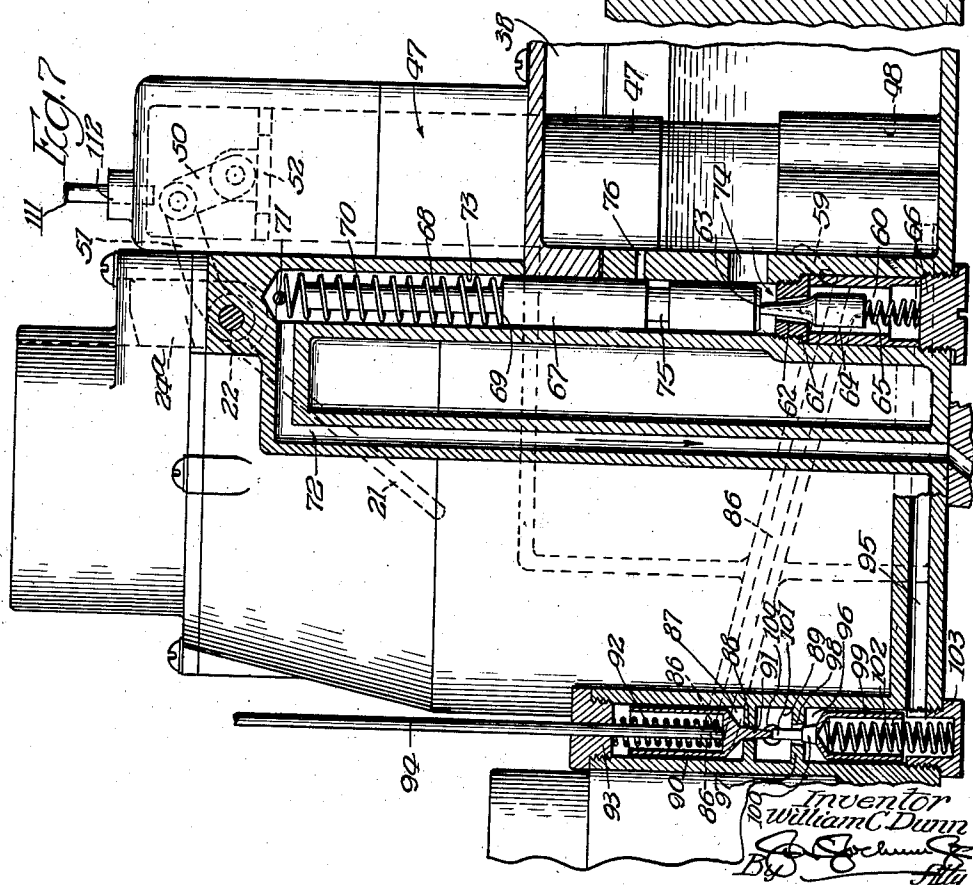
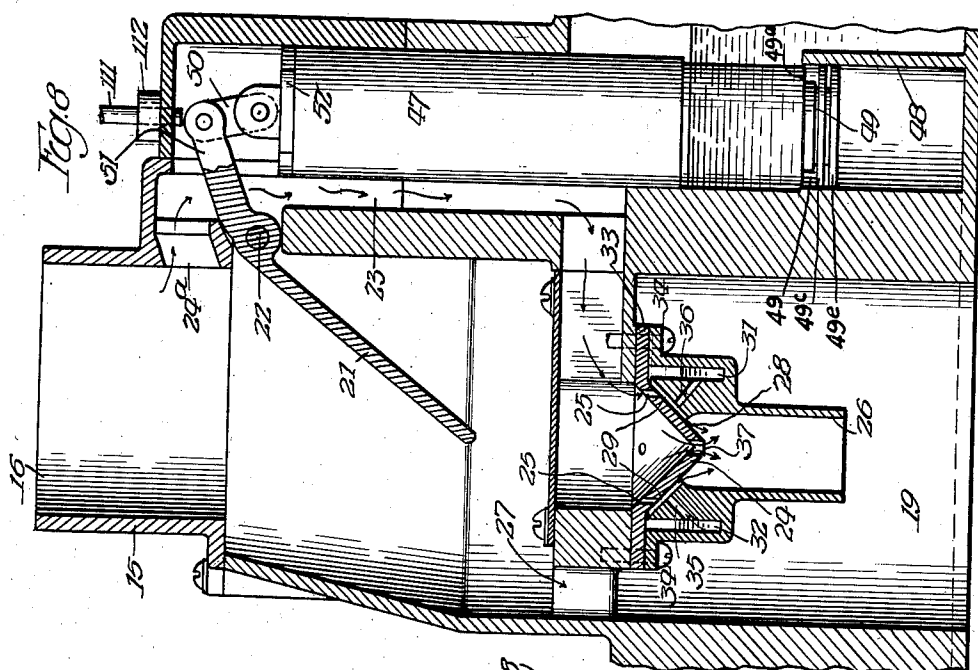
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CARBURETOR

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5 Sheets-Sheet 4



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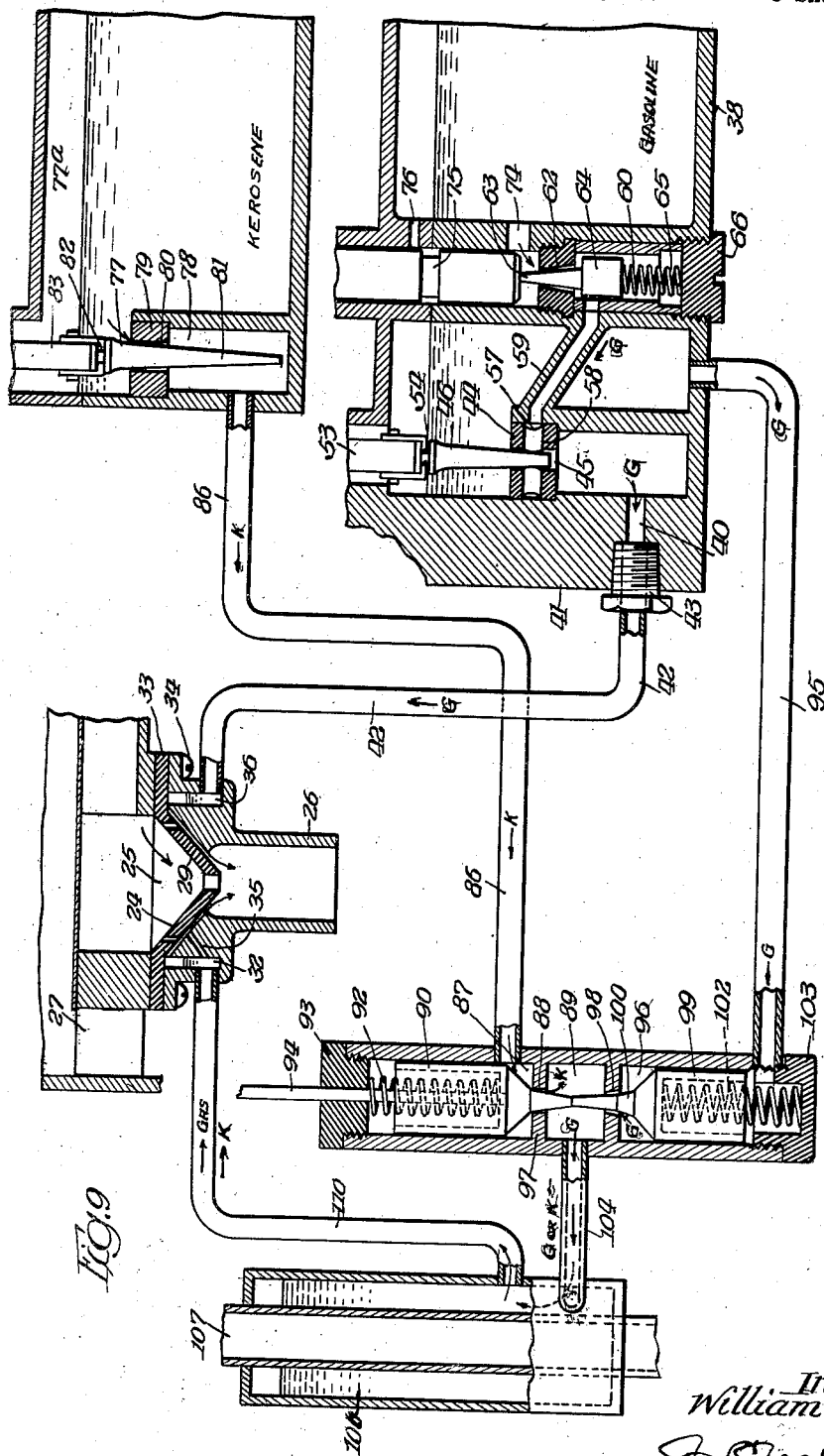
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CARBURETOR

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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CARBURETOR

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Continuation of application Serial No. 153,119,
July 6, 1937. This application May 9, 1939,
Serial No. 272,731

4 Claims. (Cl. 261—18)

This application is a continuation of application Serial #153,119, filed July 6, 1937.

This invention relates to improvements in carburetors for internal combustion engines, and has for one of its objects to provide improved means for creating and maintaining the most desirable mixture proportions for the varying demands of the engine to which the device is connected.

A further object is to provide in a carburetor of this character improved means whereby two different kinds of fuel may be employed and supplied so that the engine may be started and operated on one of the fuels, after which it may be run on a combination of the two fuels fed in predetermined proportions, thereby resulting in an economical operation of the engine.

Means are also provided whereby the engine may be run entirely on one of the fuels alone, if desired.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts, hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention, and in which

Figure 1 is a vertical longitudinal sectional view of a carburetor of this character constructed in accordance with the principles of this invention and as taken on line 1—1, Figure 3, Figure 1 being on an enlarged scale.

Figure 2 is a detail horizontal sectional view taken on line 2—2, Figure 1.

Figure 3 is a top plan view of the carburetor, with parts broken away.

Figure 4 is a horizontal sectional view taken on line 4—4, Figure 1.

Figure 5 is a vertical sectional view taken on line 5—5, Figure 3, on an enlarged scale.

Figure 6 is a detail sectional view of a portion of the casing of the carburetor.

Figure 7 is a vertical sectional view taken on line 7—7 Figure 3.

Figure 8 is a vertical sectional view taken on line 8—8 Figure 3.

Figure 9 is a diagrammatic view of the system embodied in this invention.

Referring more particularly to the drawings, the numeral 15 designates a casing of any size and configuration and is provided with an air inlet opening 16 and a discharge outlet 17. The casing is adapted to be supported above the intake manifold and may be secured in position in the usual manner by means of fastening devices passing

through suitable openings 18 in the base of the casing.

Within the casing is arranged a mixing chamber 19 which has communication with the outlet 17, and a throttle valve 20 controls the outlet.

The inlet 16 is controlled by means of a valve 21 pivotally mounted as at 22 and the valve is adapted to be moved about its pivot to open and close the inlet, automatically in a manner to be later described.

Arranged within the wall of the casing 15 is a passage 23 which has communication with the inlet opening 16, on the upper side of the valve 21 by means of a suitable opening 24—a, any number of which may be provided. The passage 23 leads around or to the other side of the valve 21 and is closed at its lower end. The passage 23 at its lower end is provided with a bottom wall of inverted conical formation 24, the bottom being provided with outlet passages 25, any number of which may be employed.

The conical bottom 24 of the passage 23 is arranged in alinement with the inlet opening 16 and also arranged beneath and in alinement with the conical bottom 24 is a throat or tube 26 which terminates considerably short of the throttle valve 20, and the inlet 16 has communication with the mixing chamber 19 through a suitable opening 27 which extends around the nozzle formed by the conical bottom 24 of the passage 23 and the tubular throat or passage 26.

This throat or tube 26 may be of any desired configuration and diameter and of any suitable length, and is provided with an opening 28 in the top thereof, the wall of the opening tapering from the periphery of the tube toward the diametric center of the opening to form a tapering or inclined surface of a substantial area about the opening. The apex of the conical bottom 24 of the passage 23 projects into the opening in the end of the throat or tube and abuts the surface surrounding the top wall of the throat or tube. Within the surface of the conical portion of the opening there are arranged a plurality of channels 29 extending from the periphery of the surface toward and communicating with the opening 28 in the upper end of the tube 26. These channels 29, any number of which may be provided, are spaced about the conical bottom 24 and the openings 25 are respectively arranged above the channels to form communications therewith so as to direct air which may enter the passage 23 from the inlet 16 through the opening 24—a, into the channels 29 to be discharged into the throat or tube 26.

In the upper portion of the throat or tube 26 is arranged a circumferential channel which is divided by upright partitions 30, into two sections 31—32 which are out of communication with each other, and a closure plate or cap 33 is provided for the channels, the tube and the cap plate being preferably removably secured in position by means of suitable fastening devices 34.

Extending through the body of the throat or tube are passages 35—36 which are arranged on opposite sides of the partitions 30 and form connections between the channels 29 and the respective portions 31—32 of the channels so that when fuel is supplied to these channels, in a manner to be hereinafter described, the fuel therein, by reason of the air currents flowing through the openings 25 in the bottom 24 of the passage 23, will be directed across the passages 35—36 into the throat or tube 26. This will entrain or atomize the fuel from the respective channels 31—32 into the channels 29 to be discharged into the throat or tube 26 and thence into the mixing chamber 19 where it will commingle with the air being drawn into the inlet opening 16.

If desired, the conical bottom 24 of the passage 23 may also be provided with an opening 37 in its apex to direct air into the throat or tube 26 between the incoming streams of fuel for better atomization thereof.

The external diameter of the throat or tube 26 is considerably smaller than the internal diameter of the mixing chamber 19 and also terminates a considerable distance short of the bottom of the chamber.

Supported by the casing 15 is a fuel containing tank or reservoir 38 which may be of any desired size and configuration and leading therefrom and disposed preferably on the interior of the chamber is a passage 39 having a discharge outlet 40 that extends through the wall 41 that is disposed intermediate the tank 38 and the mixing chamber 19. A pipe 42 is connected by one end to the channel 31 and on its other end is a plug 43 for securing or anchoring the other end of the pipe or tube in communication with the passage 40. This pipe or tube 42 may be of any desired diameter and length and serves as a means whereby a liquid fuel, such for instance as gasoline, will be supplied from the tank 38 into the channel 31 to be atomized or entrained into the throat or tube 26.

The passage 39 is preferably in the form of a chamber and seated at the upper end thereof is a member 44 having an opening 45 therethrough to form communication between the reservoir 38 and the chamber 39 and through which opening 45 fuel will flow into the chamber to be delivered through the outlet 40 and thence through the pipe 42 to the nozzle.

A metering valve 46 of a tapered construction projects into the opening 45 and is movable longitudinally so as to vary the size of the opening 45 and thereby meter the fuel which is delivered to the chamber 39.

The valve 46 is operable, or moved longitudinally, under the influence of a weight 47 which moves in a chamber 48 in the casing.

In the end of the weighted member 47 is provided a circumferential recess 49 shaped to form a shoulder 49—*a* and a shoulder 49—*b*. The circumferential groove 49 is of a substantial width and encompassing the member 47, and seated within the groove or recess 49 is an annular member 49—*c* of an external diameter only slightly less than the internal diameter of the chamber

or cylinder 48 within which the end of the member 47 operates.

A disc 49*e* is secured to the end of the member 47, preferably by means of a screw and co-operates with the shoulder 49*a* to prevent displacement of the annular member 49*c*.

Any number of apertures or openings 49—*d* are provided in the member 49—*c* and these openings are so placed that when the member 47 is moving in one direction the openings 49—*d* will be closed by means of the shoulder 49—*a*, thereby preventing fluid from flowing through the openings.

When, however, the member 47 is moving in the opposite direction, the member 49—*c* will assume a position that a portion thereof will abut the shoulder 49—*b* and the openings 49—*d* will be so positioned that fluid may flow therethrough.

The object of this dash-pot is that upon acceleration of the engine, the member 47 will be pulling against a partial vacuum below the dash or plunger. This creates a greater pull across the jet openings of the nozzle and gives a richer mixture.

This result is accomplished because if the valve 21 is permitted to drop back without the use of the dash pot then there would be no excess vacuum or suction to pull the gas across the jet into the venturi and into the engine. The object of the dash pot or the partial vacuum below the dash pot is that the valve 21 will be retarded in its dropping movement and in that retarding movement the vacuum is increased across the jet, which results in a richer mixture.

On the down stroke of the member 48, when de-accelerating, the fluid below the plunger will be by-passed through the openings 49—*d*, thereby providing for a quick return movement.

The weight 47 is connected by means of a link 50 to the end 51 of the valve 21 and tends normally to close the valve. Connected to the member 47 preferably at the upper end thereof, is a cross bar or rod 52 that extends beyond the side of the member, and passing through the member 52 is a bar or rod 53 to one end of which is detachably connected the valve 46. This connection may be formed in any suitable manner such as by means of L-shaped clip members 54 secured to the rod 53 by means of screws 55, the horizontal portions of the members 54 projecting beneath and being spaced from the end of the rod 53 and bifurcated so as to enter a slot 56 in the end of the valve 46. The upper end of the rod 53 is preferably threaded as at 57, and a nut or collar 58 is threaded thereupon for adjustably connecting the rod 53 with the cross bar or member 52.

The normal tendency of the weight 47 is to close the valve 21 but when suction is created in the engine manifold through the outlet openings 17 the valve 21 will be opened against the stress of the weight and to a distance proportionate to the amount of suction created, that is, whether the engine is idling or running at full speed. The opening of the valve 21 will correspondingly adjust the valve 46 and any movement of the valve 21 will control the opening and closing movement of the valve 46.

The member 44 is provided with an open peripheral groove 57 having openings 58 in the bottom thereof that form communication between the opening 45 and the groove so that any fuel flowing through the pipe or tube 59 will enter the groove 57 through the openings 58 to be delivered into the chamber 39.

A plug or screw 61 forms a closure for the

chamber 60 and is provided with a conical opening 62 into which a conical extremity 63 of a valve member 64 projects. A spring 65, one end of which is housed within the valve member 64 and the other end of which abuts a screw plug 66, tends normally to move the valve 64 and the conical extremity 63 in a direction to close the opening or passage 62. The pipe 59 discharges into the chamber 60 beneath the closure member 61.

A member 67 sliding in a suitable guide or casing is adapted at its lower end to abut the extremity of the conical portion 63 of the valve member 64. The other end of the member 67 is reduced as at 68 to form a shoulder 69 and a coil spring 70 encompasses the reduced portion 68 with one end abutting the shoulder 69. The other end of the spring abuts a pin or member 71 and the stress of the spring 70 tends normally to move the member 67 in a direction to unseat the valve 64—63 to permit fuel to flow through the opening 62.

When, however, suction is created in the engine manifold it will be manifested upon the member 67 which serves as a piston, to raise the latter against the stress of the spring 70 and thereby permit the valve 64—63 to be seated by the spring 65. This suction is manifested upon the member 67 through a passageway 72 which has communication with a chamber 73 in which the member 67 operates and also with the outlet opening 17 on the suction side of the throttle valve 20.

Therefore, it will be manifest that when the throttle valve 20 is wide open the suction through the passage 72 will be less than the suction in the said passage when the valve 20 is closed or in a partially closed position.

When the engine is idling or running at a low speed, an additional supply of fuel through the valve opening 62 is not necessary and such supply will be prevented by reason of the fact that the suction in the passage 72 will raise the member 67 against the stress of the spring 70 and the valve 64—63 will close.

The amount of suction created in the passage 72 is controlled by the position of the throttle valve as when the throttle valve is wide open less suction will be manifested in the chamber 73 upon the member 67 than would be exerted upon the member when the throttle valve 20 is closed. As the suction in the passage 72 decreases the spring 70 moves the member 67 to open the valve 63—64 and an extra amount of fuel will then be supplied from the reservoir 38 through a passage 74 (see particularly Figure 7), through the valve opening 62 into the chamber 60 and will flow through the passage 59 (see also Figure 1) into the passage 57 in the member 44, to be delivered through the openings 58 and thence through the opening 45 into the passage 39.

In order to prevent the fuel from being drawn up by suction in the passage 72 and chamber 73, between the member 67 and the wall of the chamber, there may be provided a cut away portion 75 in the periphery of the member 57, which, when the member 67 is raised under the influence of suction will be in register with a vent opening 76, thereby breaking the suction.

A second and different kind of fuel, such for instance as kerosene or other low grade fuel, may also be supplied to the nozzle from a tank 77—A, and to that end there is provided a valve 77 and a supplemental chamber 78 which latter is provided with a closure member 79 having an opening 80 therethrough forming a communication

between the reservoir and the chamber. A valve 81, preferably tapered to co-operate with the opening 80 in the member 79, is provided for controlling such opening. This valve 81 is connected by means of connecting members 82, preferably similar to the members 54, to a rod or member 83. The upper extremity of this member 83 is preferably provided with screw threads 84 to receive a nut or collar 85. The end of the bar 83 passes through the member 52 and is connected thereto in a manner similar to the manner in which the bar 53 is connected.

With this construction it will be manifest that as the valve 21 swings about its pivot 22 and the member 52 is raised and lowered, the valve 81 will be moved through the opening 80, to vary the size of the latter and thereby meter or control the supply of fuel from the reservoir 77a into the supplemental chamber 78 through the opening 80.

Leading from the supplemental chamber 78 is a pipe or passage 86 which discharges into a valve chamber 87. The bottom of the valve chamber is provided with an opening 88 (see particularly Figure 7) which has communication with a chamber 89. A valve 90 is arranged in the valve chamber 87 and is provided with a tapered or conical extremity 91 projecting into and operating through the opening 88 to control the latter.

A spring 92 tends normally to seat the valve 91 to close the opening 88, the valve preferably being hollow, one end of the spring resting against a shoulder or abutment in the valve and the other end of the spring resting against a nut or collar 93 which forms a closure for the valve chamber 87. Obviously by adjusting the nut or collar 93 the stress of the spring 92 may be varied.

Connected with the valve 90—91 is a rod 94 by means of which the position of the valve may be varied and controlled by the operator. Any suitable means (not shown) arranged in a convenient position for the operator may be provided for actuating the rod 94 to control the valve 90—91.

Leading from the tank or reservoir 38 is a pipe or passage 95 (see particularly Figures 4, 5 and 7) which discharges into a valve chamber 96 that is arranged below the valve chamber 87 and is separated from the valve chamber 87 by means of the chamber 89. The wall 97 of the valve chamber 96 is provided with a conical opening 98 forming communication between chambers 96 and 89. A valve 99 having a tapered extremity 100 is provided to control the opening 98. An extension 101 is arranged on the end of the conical portion 100 and is in alignment with and adapted to abut the extremity of the tapered portion 91 of the valve 90. A spring 102 tends normally to seat the valve 99 to close the opening 98 and this valve normally closes said opening 98. The valve 99 is preferably hollow and one end of the spring is seated in the valve and abuts a shoulder. The other end of the spring is preferably seated in a cap 103.

The valve 99—100 is adapted to be unseated against the stress of the spring 102 by pressure exerted against the extremity of the extension 101 by the tapered portion 91 of the valve 90 when the latter is moved into a closing position by the actuation of the rod 94. This will shut off the supply of fuel through the pipe or passage 86 and will permit the supply of fuel from the pipe or passage 95 into the valve chamber 96 to flow through the opening 98 into the chamber 89.

It is of course to be understood that the con-

struction of the valves 99—91 and 99—100 is such that while they will control the respective discharge outlets, they will not interfere with the flowing of the respective fuels through such outlets when the respective valves are open.

The chamber 99 is provided with a discharge outlet opening 104 to which is connected a passage 105 that discharges into a heating chamber 106, (see particularly Figures 1 and 4). This chamber 106 may be of any desired size but is preferably comparatively small so as not to contain any great amount of fuel at any one time. The size of the chamber, however, may be varied as desired.

Passing through the chamber 106 is a pipe 107 of an external diameter preferably only slightly less than the internal diameter of the chamber 106. This pipe may be connected to the exhaust manifold of an engine or to any other suitable or convenient source of supply of heat and through which pipe the heated air flows in order to heat the contents of the chamber 106.

Leading from this chamber 106 is a discharge outlet 108 to which outlet and by means of a suitable connection 109, one end of a pipe 110 is connected. The pipe 110 is preferably located within the mixing chamber 19 and the other end thereof discharges into the channel 32 in the mixing nozzle so that fuel supplied through the pipe 110 to the nozzle will be delivered into the channel 32 of the nozzle while fuel supplied through the pipe 42 will be delivered into the channel 31 of the nozzle.

Both of the fuels are entrained through the nozzle by suction and the supply of fuel from the tank 71a is metered by the valve 81 while a portion only of the fuel from the tank 38 is metered by the valve 46.

When the engine is operating with the throttle valve 20 wide open, as shown in Figure 1, engine suction will swing the valve 21 to the position shown in Figure 1, and will raise the weighted member 47 as well as the bars or rods 53—83 connected to the valves 46—81 and position the valves to supply the fuel in the proportions commensurate with the supply of air drawn through the carburetor. When the throttle valve 20 is wide open the valve 64—63 will also be open for the reason that the spring 70 will overcome the suction created in the chamber 73 upon the member 67 and cause the member to engage the extremity 63 of the valve 64 and unseat it against the stress of the spring 65, thereby admitting a larger amount of fuel.

When, however, the throttle valve 20 is closed or partially closed, the suction in the passage 72 will be increased and this will be manifested upon the member 67 to raise the latter and overcome the stress of the spring 70 so as to permit the valve 64—63 to be seated, thereby closing the opening 62 or reduce the size of the opening according to the position of the member 67.

With this construction it will be manifest that the amount of fuel supplied will be controlled by engine suction.

Should the valves 99—91 be positioned as shown in Figure 7, the valve 99—100 will be open and fuel from the reservoir 38 will be supplied through the passage 95 into the valve chamber 96 to be discharged into the pipe or passage 104 to be delivered into the chamber 106 and from thence through the pipe 110 into channel 32 of the nozzle.

With the valve 99—100 thus open, a single fuel will be supplied to the nozzle.

This condition may exist upon starting of the engine. After the engine has been started and it is desired to shift to another kind of fuel and to shut off a portion of supply of the first fuel to the nozzle and from the channel 32, the rod or member 94 is actuated so as to move the valve 99—91 in a position to open the passage 93 to permit another kind of fuel to flow into the chamber 106 from where it will be delivered from the pipe 110 to the channel 32, at the same time permit the valve 99—100 to close under the influence of the spring 102 and thereby shut off the supply of fuel from the tank or reservoir 38 to the channel 32.

At the same time, however, fuel from the tank or reservoir 38 will be delivered through the pipe 42 to the channel 31.

Under these conditions it will be manifest that there will be two different kinds of fuel being supplied to the chambers in the nozzle, one on one side and the other on the other side, but as these two different fuels will be entrained into the mixing tube 26 through the passages 29 by atomization they will commingle and will be delivered into the mixing chamber 19 with the air being discharged into the nozzle.

It will therefore be manifest that with the present construction it is possible to operate the engine with either one kind of fuel alone or a mixture of two different kinds of fuel.

This will reduce the expense of operating the engine as the engine may be started to operate on one of the fuels and then a portion of the supply of such fuel cut off, and a less expensive fuel supplied in lieu of the cut off portion and the two fuels will commingle.

If desired, and for the purpose of operating as a choke to start the engine, any suitable means may be provided, under the control of the operator, and located in a suitable or convenient position for maintaining the valve 21 against opening under the suction of the engine, while the engine is starting. Any suitable means for accomplishing this result may be provided.

A simple and effective means, however, embodies a member 111 (see particularly Figure 1) which is mounted in a suitable bearing 112 to contact with the extension 51 on the valve 21 so as to prevent the valve 21 from swinging about its pivot 22. This member 111 may be operated in any suitable manner (not shown) and when desired may be withdrawn so that it will not interfere with the swinging of the valve 21 about its pivot 22 under the influence of engine suction thereupon.

While the preferred form of the invention has been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:

1. In a carburetor a fuel nozzle, two sources of supply of different fuels, metering valves individual to the supplies for metering the fuels to the nozzle, a counter-balanced air supply control valve common to and connected with said metering valves for operating them, two different connections between one of the sources of fuel supply and the said nozzle, valves individual to said connections for controlling the passage of fuel there-through, and a connection between the other of the sources of fuel supply and the said nozzle, a portion of the last said connection embodying a

portion of one of the first said connections, whereby the valve in the latter will operate to control a supply of fuel to the nozzle from both of said sources of fuel supply.

2. In a carburetor a fuel nozzle, two sources of supply of different fuels, metering valves individual to the supplies for metering the fuels to the nozzle, automatically operating means common to and connected with both of said metering valves for simultaneously operating them, two different connections between one of the sources of fuel supply and the said nozzle, valves individual to said connections for controlling the passage of fuel therethrough, and a connection between the other of said sources of fuel supply and said nozzle, a portion of the last said connection embodying a portion of one of the first said connections, whereby the valve in the latter will operate to control a supply of fuel to the nozzle from both of said sources of fuel supply.

3. In a carburetor a fuel nozzle, two sources of supply of different fuels, metering valves individual to the supplies for metering the fuels to the nozzle, a counter-balanced air supply control valve common to and connected with said metering valves for operating them, two different connections between one of the sources of fuel supply and the said nozzle, valves individual to said connections for controlling the passage of fuel therethrough, a connection between the other of the

sources of fuel supply and the said nozzle, a portion of the last said connection embodying a portion of one of the first said connections, whereby the valve in the latter will operate to control a supply of fuel to the nozzle from both of said sources of fuel supply, means whereby an additional amount of fuel may be supplied to the nozzle from one of said sources of supply, and additional means influenced by engine suction for controlling the last said means.

4. In a carburetor a fuel nozzle, two sources of supply of different fuels, metering valves individual to the supplies for metering the fuels to the nozzle, means connected to both of said metering valves for operating them, two different connections between one of the sources of fuel supply and the said nozzle, valves individual to said connections for controlling the passage of fuel therethrough, a connection between the other of the sources of fuel supply and the said nozzle, a portion of the last said connection embodying a portion of one of the first said connections, whereby the valve in the latter will operate to control a supply of fuel to the nozzle from both of said sources of fuel supply, and a heater constituting a portion of one of the said connections between the nozzle and one of said sources of supply.

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