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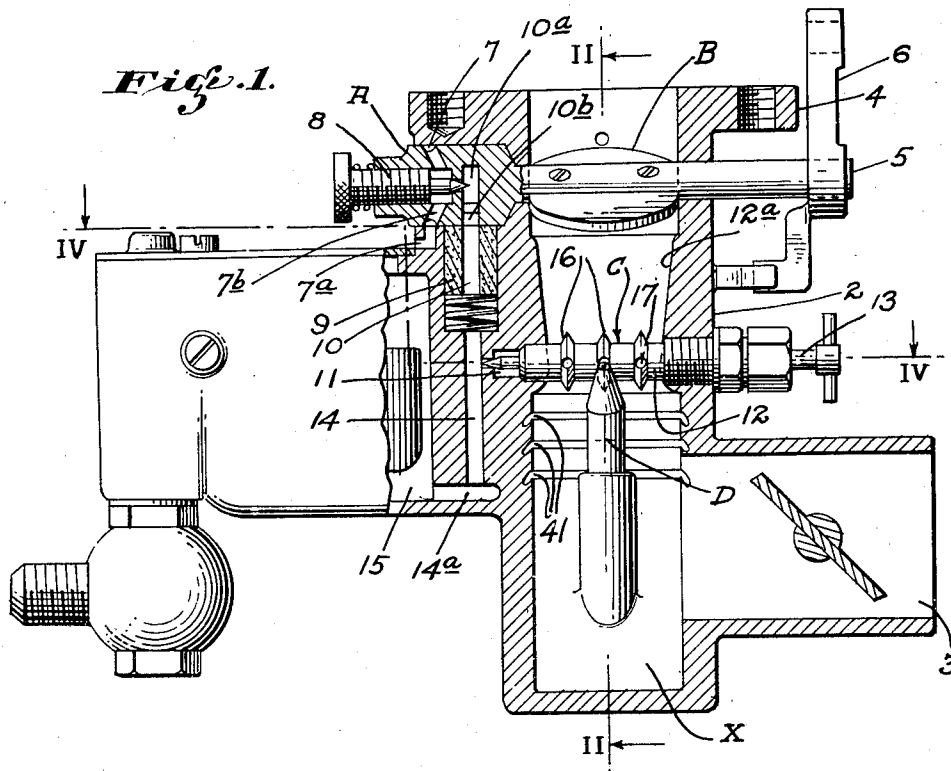
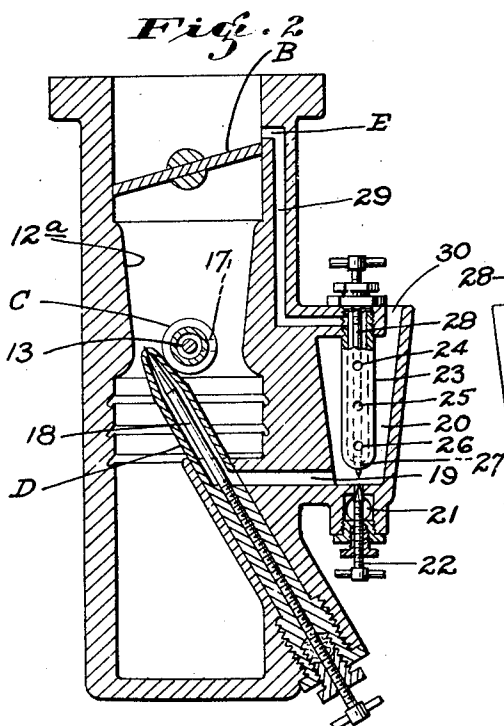
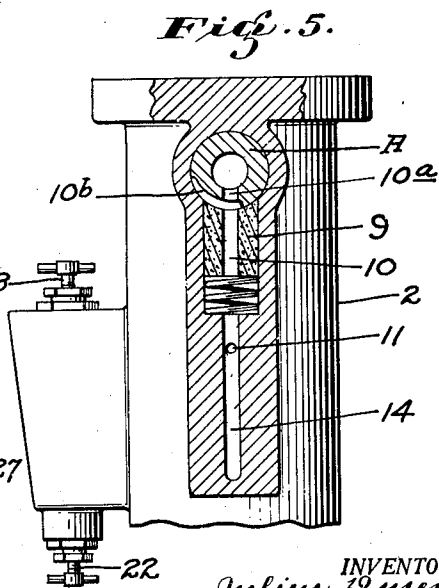
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CARBURETOR

Filed June 24, 1929

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3.

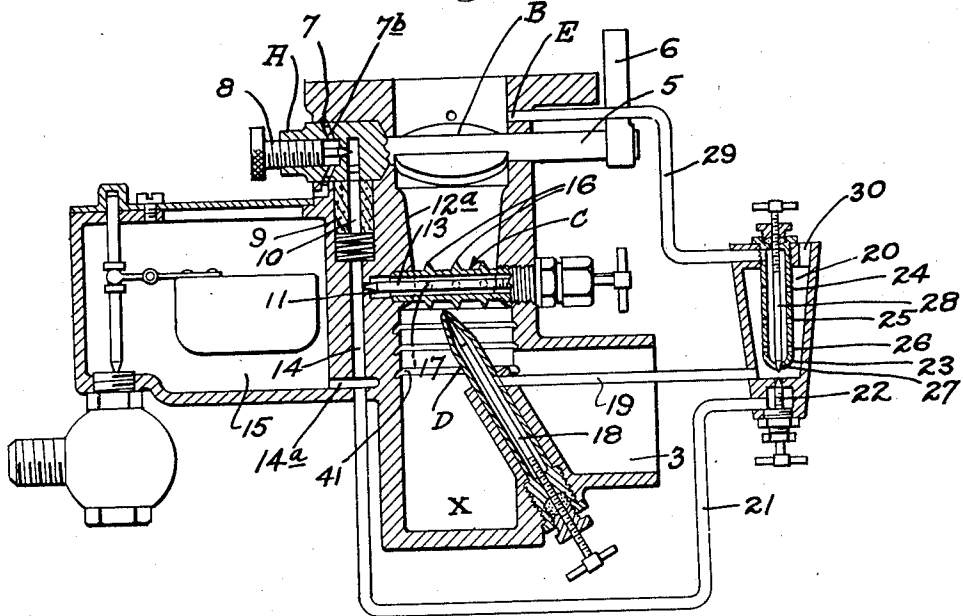


Fig. 4.

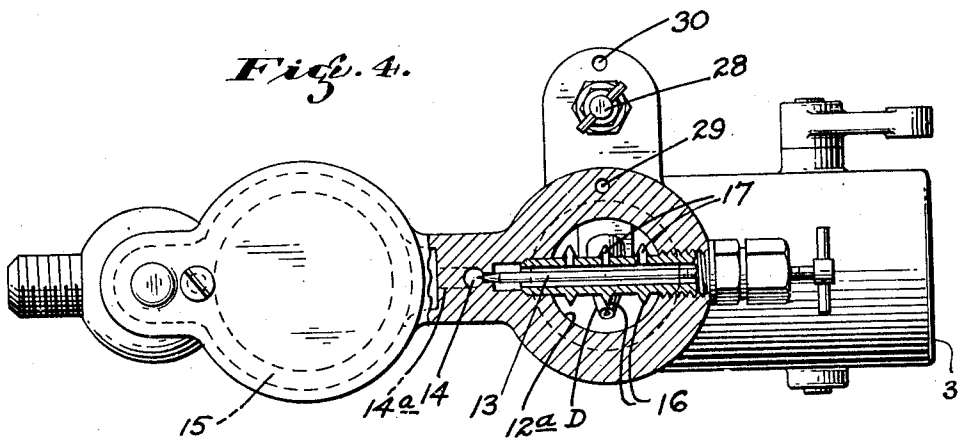
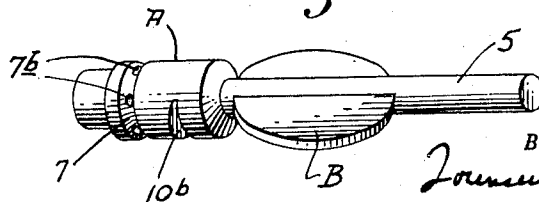


Fig. 6.



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CARBURETOR

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This invention relates to carburetors, and specially to that type which is used in connection with internal combustion engines, or instance on automobiles, airplanes etc. The requirements of a good carburetor are that it shall:

1. Provide an exceedingly rich mixture or starting when the engine is cold.
2. Provide a fairly rich mixture for idling.
3. Provide a comparatively lean mixture or average running roads, regardless of the speed of the engine.
4. Provide a fairly rich mixture for heavy loads, regardless of the speed of the engine.
5. Provide quick acceleration.
6. A carburetor should be provided with means for atomizing or vaporizing the fuel as finely as possible under all conditions of speed and load.

The object of the present invention is to generally improve and simplify the construction and operation of carburetors; to provide a carburetor which is capable of performing the conditions above specified; and further to provide a carburetor which is capable of automatically leaning or enriching the combustible mixture as the motor is subjected to varying running or load conditions. The carburetor is shown by way of illustration in the accompanying drawings, in which:

Fig. 1 is a central, vertical section of the carburetor,

Fig. 2 is a vertical section taken at right angles to Fig. 1 on line II—II,

Fig. 3 is a diagrammatic view of the carburetor,

Fig. 4 is a cross section taken on line I—I of Fig. 1,

Fig. 5 is a sectional detailed view of the air bleeder indicated at A,

Fig. 6 is a perspective view of the valve portion of the air bleeder.

The carburetor as a whole consists of a main housing, indicated at 2, the lower end of which is provided with the usual air inlet passage 3, the opposite end of the carburetor being provided with a flange 4

whereby it is bolted to the intake manifold of an engine in the usual manner.

The main throttle valve, indicated at B, is secured on a shaft 5, and it is positioned near the outlet or upper end of the carburetor in the conventional manner.

The shaft of the throttle valve is provided with a crank arm 6, and this is connected with a remote or dashboard control, not here illustrated.

By referring to Figs. 1, 5 and 6 it will be noted that the shaft 5 of the throttle valve is extended, as indicated at A. It is provided with an annular passage 7, which remains in constant communication with an opening 7a in the side of the housing. The member A, or the valve end of the shaft 5 is also provided with a central passage for the reception of a needle valve 8, and it is provided with two radial passages, such as shown at 7b and 10a, the radial passage 7b being in communication with a central passage in the valve, and also with the annular passage 7 and the radial passage 10a, while the radial passage 10a may be moved into communication with a passage 10, hereinafter to be described.

Disposed below the valve A is a graphite plug, such as indicated at 9. This is held against the valve by spring tension, so as to maintain a tight fit and prevent leakage of air. The passage 10 extends downwardly from the valve A, as shown in Fig. 1, and it connects with the intake end 11 of a multiple jet spray nozzle, generally indicated at C. The valve indicated at A will hereinafter be referred to as an automatic air bleeder, and its function will later be described.

The multiple jet spray nozzle consists of a tube 12 extending crosswise of a Venturi passage, indicated at 12a.

A needle valve 13 extends through the tube, and as one end of the tube is in communication with the passage 10, and with a fuel passage indicated at 14, the flow of fuel from the passage 14 and the flow of bleeding air from the valve A into the multiple jet spray nozzle will be regulated by the needle valve 13.

The fuel passage 14 is directly connected

with the float chamber 15 of the carburetor, through a passage 14a.

By again referring to Fig. 1 of the drawings it will be noted that a series of collars or flanges 16 are formed on the exterior surface of the spray nozzle. These flanges are drilled horizontally, as indicated at 17, so as to communicate with the interior passages of the nozzle. When the carburetor is in operation the gasoline is sucked out of the openings 17 and as the collars terminate in knife-like edges 16, the gasoline is readily drawn off by the air stream. Experimental work has shown that this is important. For instance, a multiple jet spray nozzle, such as here shown, without the knife edge flanges was placed in a carburetor connected with an engine. The highest revolution obtained by the engine was 1700 R. P. M. When a multiple jet spray nozzle with knife like flanges, such as shown at 16, was applied, the revolutions were stepped up to 1800, proving that the gasoline would escape more readily from the knife-like flanges than from straight tubular orifices.

The carburetor is provided with an auxiliary jet, such as generally indicated at D. This jet is best shown in Fig. 2. The auxiliary jet is provided with a needle valve 18, so that the flow of gasoline from the discharge end of the jet may be regulated.

The discharge end of the jet terminates on the same level as the multiple jets from the spray nozzle C, and at one side thereof. The auxiliary jet is supplied with fuel through a passage 19, and this passage in turn connects with a starting and accelerating well, generally indicated at 20, this well being supplied with fuel through a passage 21 which is connected with the passage 14 which in turn supplies the main multiple jet spray nozzle C. The flow of fuel through the passage 21 into the well 20 is regulated by a needle valve 22.

The starting and accelerating well, which is best illustrated in Figs. 2 and 3, tapers from end to end so that it presents its largest area at the top. The function of a well of gradually reducing area will hereinafter be described.

Extending downwardly into the well, is a tube 23, which is perforated throughout its length, as indicated at 24, 25 and 26. A fuel inlet opening 27 is formed in the bottom of the tube, and a needle valve 28 controls the amount of fuel admitted through the lower end. The fuel entering the tube 23 passes upwardly through a passage 29, and this terminates in a starting or idling jet, which is disposed above the throttle valve at the point indicated at E.

In actual operation, when starting a motor, particularly when it is cold, it is essential that an over rich mixture be supplied by the carburetor. This mixture is, in the pres-

ent instance, supplied by the starting or idling jet indicated at E (see Fig. 3). When starting the throttle valve is placed in a substantially closed position, and as the opening of the idling jet is above the throttle a high suction will be created and the fuel is sucked upwardly from the starting and accelerating well 20 through the passage 29, and as such is sprayed into the carburetor at a point above the throttle, thereby producing an exceedingly rich mixture. The well presents a large area at the top, and a free flow of a comparatively large quantity of fuel is accordingly available.

As the engine gains momentum the fuel level in the well 20 becomes lower and lower, and the openings 24, 25 and 26 are gradually opened. The mixture still remains rich, but it becomes leaner and leaner, first because the area of the well diminishes as the liquid level drops, and secondly because air will be admitted through the openings indicated at 24, 25 and 26, and by the time the well is empty the motor will become sufficiently heated to continue running. Hence there is supplied an over rich mixture for starting and this mixture is gradually leaned as the motor increases in speed, due to the tapered formation of the well, and due to the air admitted through the bleeding openings 24, 25 and 26 which are successively uncovered as the fuel level drops, the bleeding air being admitted through an opening 30.

It will now be assumed that the motor is started and is running. If it is desired to keep the motor running at idling speed, fuel will be admitted to the tube 23 through the lower needle valve control opening 27. A fairly rich mixture will still be supplied as the only air admitted is that which enters through the bleeding opening 30. On the other hand if it is desired to speed up the motor the throttle valve B is slightly opened. The moment this is opened the vacuum or depression at the starting jet E is lowered to such an extent that it ceases to function. Hence the main multiple jet spray nozzle C and the auxiliary jet D will now have to be depended upon to supply fuel to the incoming air.

The main multiple jet nozzle is supplied directly from the float chamber 15 by the passage 14, and the valve controlled opening 11. The air rushing by the knife-like flanges 16 of the multiple jet nozzle produces a depression in the Venturi throat, and at the ends of the discharge openings 17, thereby causing sufficient suction to withdraw the fuel from the nozzle so that it will mix with the incoming air to produce a combustible mixture.

The multiple jet nozzle is designed to give a rich mixture which is used only under certain conditions, to wit, under heavy loads but it must give a comparatively lean mixture during other conditions. It is for this reason that the air bleeding valve, indicated at A, is

rovided. This air bleeder admits air downwardly through the passage 10, and the air entering with the gasoline through the opening 11 produces a comparatively lean mixture of air and gasoline are discharging from the multiple jet nozzle, except under heavy loads, at which time the bleeder is automatically cut off by opening the throttle to full open position.

From the foregoing it is apparent that the carburetor is provided with a starting jet E which provides an over rich mixture for starting; secondly, the starting jet is also utilized for idling conditions; third, a main multiple jet nozzle C is provided for delivering a lean mixture under most running conditions. This is due to the fact that a graduated amount of air is admitted with gasoline delivered to the nozzles, and means are also provided for cutting off the air supply when a richer mixture is required, as when operating under full load conditions.

The auxiliary nozzle D is designed to provide a comparatively rich mixture when rapid speed changes are encountered. That is, to permit quick acceleration. At other times it practically ceases to function. This will be more fully explained.

By referring to Fig. 3 it will be noted that the fuel passage 14 is connected with a float chamber 15 by the passage 14a, this passage making an almost direct connection with the multiple jet spray nozzle, so as to permit a path of least resistance thereto. Passage 14 also supplies the passage 21, which in turn supplies the well 20. Under actual operating conditions the path of least resistance is through the passage 14, to the multiple jet spray nozzle, as more resistance is encountered when the fuel is flowing through the passage 21.

Furthermore, the flow of fuel through this passage is limited by the needle valve 22. When the engine is standing the well and all of the passages will fill up with gasoline, hence providing an ample supply of gasoline in the well for supplying the over rich mixture to the starting jet E when starting the motor. However, after the motor has started and the well becomes sufficiently empty there is a comparatively small amount of fuel entering through the needle valve 22. The jet is supplied from the well, and as the amount of gasoline entering is comparatively small, jet D will normally supply a very lean mixture. On the other hand, if the throttle assumes $\frac{1}{8}$ th or $\frac{1}{4}$ th opening, and the engine running comparatively slowly, the fuel level in the well increases so that if the throttle valve is quickly opened, sufficient fuel is provided to permit quick acceleration. That is, at high speeds the well is comparatively empty and the fuel jet D supplies a lean mixture, at slow or almost idling speeds it supplies fuel or a comparatively rich mixture,

and when quick acceleration is desired under these conditions, ample fuel is available in the well to supply fuel or a rich mixture, thus permitting quick acceleration.

When the engine is running under any speed whatsoever, and it is necessary to subject it to full load conditions, throttle valve B is completely opened. In that instance the air supply through the passage 10 is completely cut off and as now no air enters the multiple jet nozzle C with the fuel, a rich mixture will be supplied for full load conditions, and if the speed of the engine is fairly low, the fairly rich mixture will also be supplied by the jet D.

On the other hand, if the engine is operating at high speed and full load, the jet D will be of comparatively little assistance as it would supply only a lean mixture as the well will be comparatively empty.

By referring to Figs. 1 and 6 it will be noted that the radial passage 10a terminates in a grooved passage 10b formed in the exterior face of valve A, and that this passage tapers, as shown in Fig. 6, so as to present less and less area. The groove 10b moves over the passage 10, and hence regulates the amount of bleeding air admitted. As the engine speed increases the fuel mixture should gradually become richer and richer, hence the reason for tapering the passage 10b so as to gradually reduce the amount of bleeding air before it is cut off altogether when operating under full load.

By referring to Figs. 1 and 2 it will be noted that the air inlet passage 3 is arranged at one side of the carburetor housing, and that a trap chamber such as indicated at X is formed below the Venturi passage. It should also be noted that the interior surface of the carburetor is corrugated or grooved, as indicated at 41.

The formation of the well, and the corrugations are important, as under certain speed or load conditions, a certain amount of unvaporized fuel has a tendency to drop downwardly away from the spray nozzles. Any fuel thus lost, or any leakage fuel will, in this instance, collect in the corrugations and in the well, and as such will not escape. On the other hand, it will be picked up by the incoming air which enters at high velocity and as such will be evaporated and removed from time to time.

This is particularly important when starting, as the overrich mixture of raw fuel entering through the jet E has a tendency to leak by the throttle valve and down into the lower part of the carburetor. Such leakage fuel is picked up, evaporated and mixed with the incoming air, thereby aiding starting.

By properly shaping the groove 10b on valve A, it is possible to bring about practically any condition desired. That is, car-

buretors are known to have what is termed flat spots. Such flat spots may be remedied by properly shaping the groove, whereby air is supplied to the multiple jet fuel nozzle.

5 While certain features of the present invention are more or less specifically described, I wish it understood that various changes may be resorted to within the scope of the appended claims, similarly, that the materials and finishes of the several parts employed
10 may be such as the manufacturer may decide, or varying conditions or uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

15 1. In a carburetor a main fuel supplying jet, a combination starting and idling jet, a well in the carburetor to supply fuel to the starting and idling jet, the latter having fuel
20 controlled communication with the well at different levels and said well having an air inlet at the top a common connection for supplying fuel to the main jet and the well, an accelerating jet having its discharge end located at the main jet, a connection between
25 the accelerating jet and the bottom of the well whereby fuel is supplied, and a throttle valve interposed between the main jet and the starting and idling jet.

30 2. In a carburetor a main fuel supplying jet, a combination starting and idling jet, a well in the carburetor to supply fuel to the starting and idling jet, the latter having fuel controlled communication with the well at
35 different levels and said well having an air inlet at the top, a common connection for supplying fuel to the main jet and the well, an accelerating jet having its discharge end located at the main jet, a connection between the
40 accelerating jet and the bottom of the well whereby fuel is supplied, a needle valve regulating the flow of fuel through the accelerating jet, and a throttle valve interposed between the main jet and the starting and idling
45 jet.

3. In a carburetor a main fuel supplying jet, a combination starting and idling jet, a tapering vertically disposed well in the carburetor having its largest diameter at the top,
50 a tube extending downwardly in the well, and terminating adjacent the bottom of the well, said tube having a plurality of interspaced perforations formed therein and one at the bottom of the tube, a connection between the
55 upper end of the tube and the starting and idling jet, an air inlet in communication with the upper end of the well, and a common connection supplying fuel to the main jet and the well.

60 4. In a carburetor a main fuel supplying jet, a combination starting and idling jet, a tapering vertically disposed well in the carburetor having its largest diameter at the top, a tube extending downwardly in the well
65 and terminating adjacent the bottom of the

well, said tube having a plurality of interspaced perforations formed therein and one at the bottom of the tube, a connection between the upper end of the tube and the starting and idling jet, an air inlet in communication with the upper end of the well, a common connection supplying fuel to the main jet and the well, an accelerating jet supplied with fuel from the well, and a needle valve regulating the supply of fuel to the well.

5. In a carburetor a main fuel supplying jet, a combination starting and idling jet, a tapering vertically disposed well in the carburetor having its largest diameter at the top, a tube extending downwardly in the well and terminating adjacent the bottom of the well, said tube having a plurality of interspaced perforations formed therein and one at the bottom of the tube, a connection between the upper end of the tube and the starting and idling jet, an air inlet in communication with the upper end of the well, a common connection supplying fuel to the main jet and the well, and a throttle valve interposed between the main jet and the combination starting and idling jet.

6. In a carburetor a main fuel supplying jet, a combination starting and idling jet, a well in the carburetor to supply fuel to the starting and idling jet the latter having fuel controlled communication with the well at different levels and said well having an air inlet at the top, a common connection supplying fuel to the main jet and the well, a throttle valve interposed between the main jet and the combination starting and idling jet, means actuated by movement of the throttle valve for admitting air to the main jet during a predetermined range of movement of the throttle valve, said means also adapted to shut off the supply of air to the main jet when the throttle reaches a substantially full open position and an accelerating jet connected with the well at the bottom thereof and having its discharge end located substantially in the plane of the main jet.

7. In a carburetor a rotatable throttle valve, a main fuel jet, means supplying fuel to the jet, means for admitting air to the jet, a valve directly connected to and carried by and rotatable with the throttle valve to open or close an air duct through which air is supplied to the jet, and a needle valve carried by said valve whereby the flow of air to the jet may be regulated.

8. In a carburetor a Venturi passage, a fuel nozzle mounted therein, said nozzle comprising a tube to which fuel is admitted, an annular knife-like flange formed on the exterior surface of the tube and extending in the direction of the current through the passage, said tube having an orifice formed at the outer edge of the annular knife-like flange, the outer end of the orifice terminating in the

peripheral edge of the knife-like flange and forming a fuel spray nozzle.

5 9. In a carburetor a Venturi passage, a multiple jet spray nozzle mounted therein, said nozzle comprising a tube to which fuel is admitted, a plurality of interspaced annular knife-like flanges formed on the exterior surface of the tube and extending in the direction of the current through the passage, said
10 tube having a plurality of orifices formed in the outer edges of the knife-like flanges, the outer ends of the orifices terminating in the peripheral edges of the knife-like flanges and forming a plurality of spray nozzles.

15 10. In a carburetor a Venturi passage, a multiple jet spray nozzle mounted therein, said nozzle comprising a tube to which fuel is admitted, a plurality of interspaced annular knife-like flanges formed on the exterior
20 surface of the tube and extending in the direction of the current through the passage, said tube having a plurality of orifices formed in the outer edges of the knife-like flanges, the outer ends of the orifices terminating in
25 the peripheral edges of the knife-like flanges and forming a plurality of spray nozzles, and a needle valve regulating the flow of fuel entering the tube and discharging through the spray nozzles.

30 11. In a carburetor a Venturi tube, a fuel spray nozzle in said tube, a trap chamber formed below the Venturi tube, the walls of said chamber presenting a corrugated surface forming liquid holding gutters to collect
35 unvaporized fuel escaping from the fuel nozzle, and an air inlet connection at one side of the trap chamber to direct air against the corrugated surface and upwardly into and through the Venturi tube.

40 12. In a carburetor a Venturi tube, a fuel spray nozzle cooperating therewith, a trap chamber formed below the Venturi tube and having liquid holding gutters in the walls of the trap chamber to collect unvaporized
45 fuel escaping from the nozzle and an air inlet connection at one side of the trap chamber to direct air into the chamber so as to vaporize the fuel collected therein, and so as to direct the air upwardly through the Venturi tube.

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