June 9, 1931. S. E. MELKMAN 1,809,387

CARBURETOR

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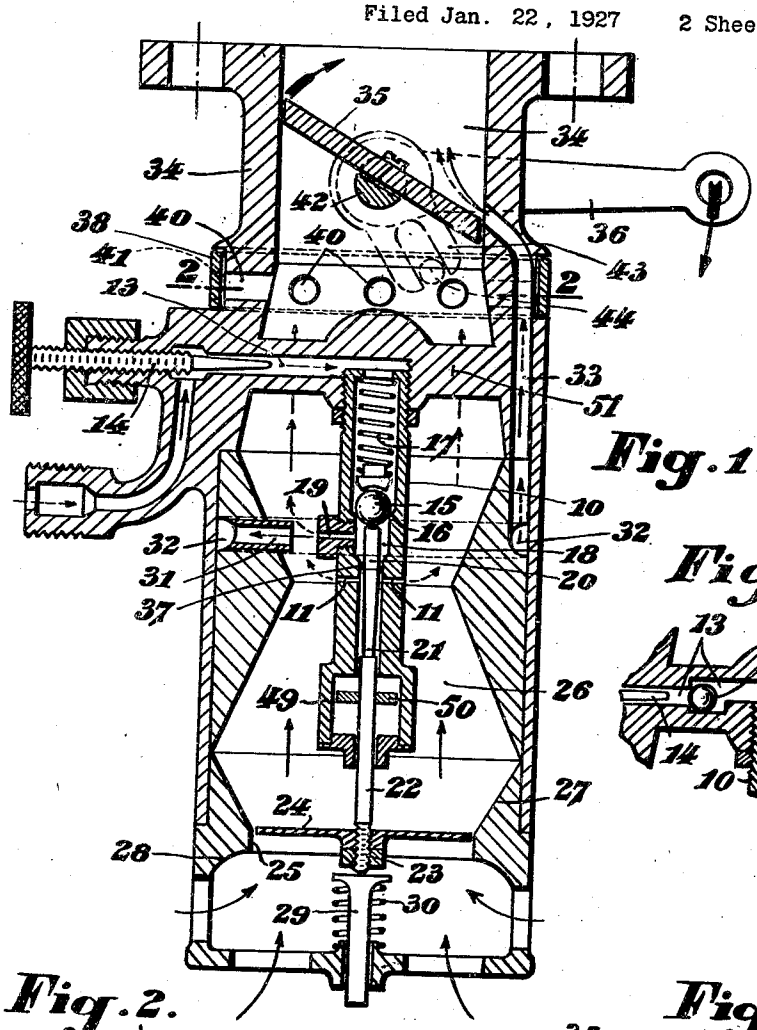


Fig. 1.

Fig. 10.

Fig. 2.

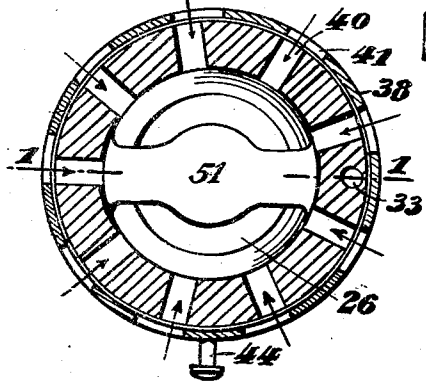
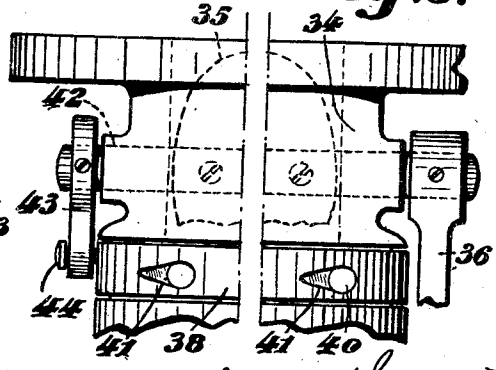


Fig. 3.



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Fig. 4.

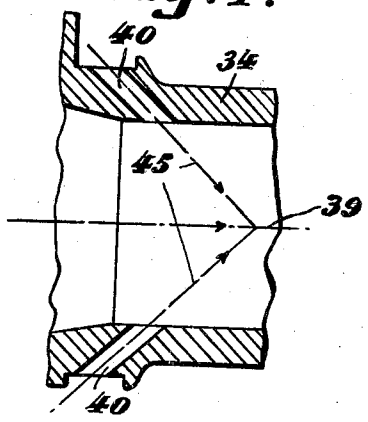


Fig. 5.

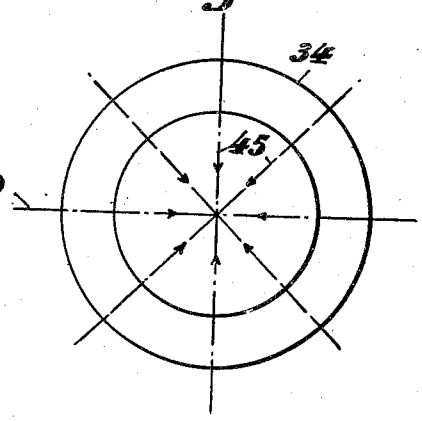


Fig. 6.

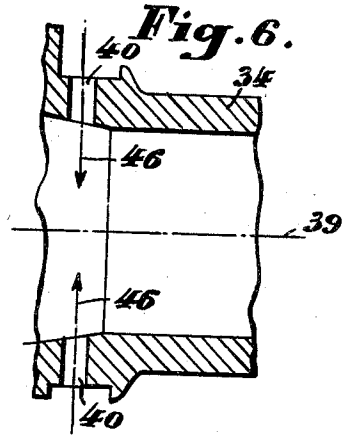


Fig. 7.

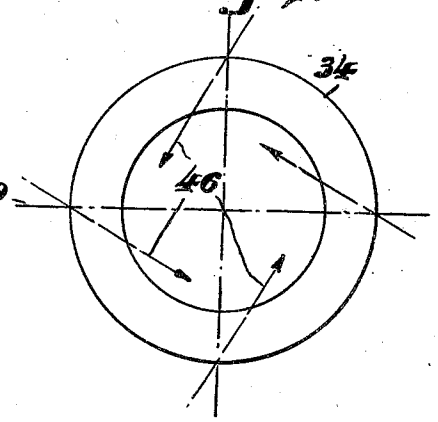


Fig. 8.

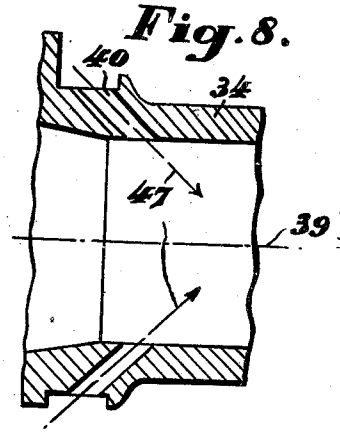
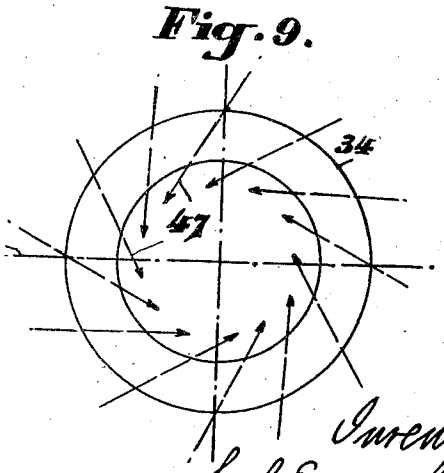


Fig. 9.



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UNITED STATES PATENT OFFICE

SAÜL EMMANUEL MELKMAN, OF MONTREAL, QUEBEC, CANADA, ASSIGNOR TO THELMA CARBURATOR COMPANY, SOCIETE ANONYME, OF BRUSSELS, BELGIUM, A CORPORATION OF BELGIUM

CARBURETOR

Application filed January 22, 1927, Serial No. 162,803, and in Belgium August 18, 1926.

This invention relates to automatic carburetors and more particularly to that general type of carburetors set forth, described and claimed broadly in the copending application of George Loutz, Serial No. 104,783, filed April 26, 1926, which matured into Pat. No. 1,778,904, issued Oct. 21, 1930, wherein the suction action of the engine in connection with which the carburetor is employed actuates a valve for controlling the supply of atomizing air and also a fuel supply control valve by which the fuel is supplied into a mixing chamber where the air and fuel are mixed together to form the explosive charge for supply to the engine.

The object of the present invention is to provide a carburetor structure of the general nature referred to wherein an idling fuel delivery orifice is provided for supplying temporarily an excessive amount of fuel to produce an over-rich explosive mixture in starting up the engine from rest.

A further object of the invention is to provide main fuel supply orifices for use in supplying the fuel to the mixing chamber during the ordinary running of the engine after it is started, and, of means for varying the supply of fuel through the main orifices gradually and proportionately with respect to the speed of the engine and maintaining such fuel supply constant and the proper relative proportion to the supply of air for any particular given speed of the engine.

A further object of the invention is to provide a carburetor having a fuel-storage chamber from which fuel is supplied into the mixing chamber through one path for slow running of the engine with the throttle closed, or, more or less closed, and from which storage chamber fuel is supplied through other paths for ordinary running of the engine and in accordance with the running speeds of the engine.

A further object of the invention is to provide means whereby in case of a back-fire occurring within the carburetor a ready outlet is permitted to the gases of the resulting explosion, and, also, at the same time, the supply of fuel into the carburetor is automatically arrested, thus eliminating the risk of injury through fire, or the explosion resulting from a back-fire.

A further object of the invention is to provide means of simple structure for supplying additional diluting air into the explosive mixture delivered into the engine, such additional diluting air supply being controlled automatically by the actuation of the ordinary throttle member.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the structure, combination, location and relative arrangement of parts all as will be more fully hereinafter set forth as shown in the accompanying drawings and finally pointed out in the appended claims.

Referring to the drawings

Figure 1 is a view in central longitudinal section of a carburetor structure embodying my invention.

Fig. 2 is a cross-section of the same on line 2—2 of Fig. 1.

Fig. 3 is a view in elevation of the engine end of the carburetor.

Figs. 4, 6 and 8 are broken detail views in section.

Figs. 5, 7 and 9 are views in diagram respectively illustrating various arrangements of auxiliary air supply orifices forming a part in accordance with my invention, and

Fig. 10 is a broken detail view in section showing a valve arrangement to prevent a reverse flow of the fuel from the carburetor into the fuel supply connection thereto.

The carburetor structure shown, as a practical embodiment of the principles of my invention, comprises a casing within which is mounted a tubular member 10 one end of which is secured into a cross-bridge 51 and connects with a fuel supply passage 13, the flow of the supply of the fuel into said passage being controlled and regulated by a needle valve 14. The tubular member 10 is provided through the wall thereof with what I would call an idling orifice 19 and main fuel supply orifices 11 and also a chamber 18 and a valve seat 16. The valve seat 16 is disposed between the fuel supply passage 13 and the chamber 18 and the idling orifice 19 in

the arrangement shown is disposed between the valve seat 16 and the main fuel supply orifices 11. A valve, shown in this instance as a ball valve 15, is disposed in the end of the tubular member 10 and is adapted to coact with the valve 16 within said tubular member. Normally when the engine is at rest the valve 15 is urged to its seating position by means of a spring 17. The chamber 18 constitutes what I call a fuel-storage chamber, or receiver. The idling orifice 19 connects directly with the storage or receiver chamber 18. The main fuel supply orifices 11 are separated from the storage chamber or receiver 18 by a cylindrical portion 37 of the bore of tubular member 10. Operating longitudinally in the tubular member 10 is a control valve 20, 21 and 22. The portion 20 of this valve is cylindrical and normally with the engine at rest this cylindrical portion 20 works through the cylindrical portion 37 of the tubular member thereby shutting off the supply of fuel from the storage chamber or receiver 18 to the running or main supply orifices 11. The portion 21 of the valve is tapered so as to gradually open the communication between the storage chamber or receiver 18 through the portion 37 of the bore of tubular member 10, to the main fuel supply orifices 11. The portion 22 of the valve member constitutes a guide or stem which works through a cap on the end of the tubular member 10 and has mounted upon the threaded extremity thereof the valve member 24. This valve member 24 is in the form of a disc and its position on the threaded end of the portion 22 may be adjusted and the position of adjustment maintained by means of a lock-nut as clearly shown. The valve 24 operates within a cylindrical portion 25 of an annular ring shaped member mounted in the end of the carburetor casing.

When the engine is at rest the valve member 20, 21, 22 occupies such a position that the extremity of the portion 20 permits the valve 15 to seat against its seat 16 and the other extremity of the portion 22 of the valve rests upon a back stop member which is supported by a spring 30. The admission of carburetting air, as well as the carburetting air which is required when the engine is running at slow speed, is controlled by the valve member 24 operating within the annular cylindrical wall portion 25 referred to. Of course, it will be understood that the amount of carburetting air, the admission of which into the carburetor is controlled by valve member 24, will depend upon the relative position of valve member 24 with reference to the opening 25. To effectively control this amount or volume of carburetting air the cylindrical bore or portion 25 of the annular plug member terminates inwardly in a conically widening portion 27 which extends towards the interior of the carburetor casing, and the same passage or bore 25 terminates outwardly in a flaring extension 28 at a somewhat wider angle or flare than that of the surface 27.

Assuming the engine to be at rest, the valve member 24 occupies a closed position or relation with respect to the annular bore 25 while the outer extremity of the member 22 rests upon the back stop or buffer 29 which is sustained yieldingly by the spring 30. While in this position the cylindrical portion 20 of the fuel supply control valve occupies a position within the annular cylindrical portion 37 of the bore of the tubular member 10 thereby shutting off communication between the storage chamber 18 and the main fuel supply orifices 11. Also the valve 15 is seated upon its seat 16 thereby shutting off the supply of fuel from the supply source to the receiver or chamber 18. With the parts in this relation the engine is to be started up. The first result of the operation of the engine is to exert a suction action through the carburetor chamber. This suction action causes the valve 24 to be displaced with reference to the annular bore surface 25 and outer air to be drawn through openings in the direction of the arrows in Fig. 1 and through the mixing chamber 26 which surrounds the tubular member 10, past the orifice 19, and in case the throttle 35 is closed then the suction action will draw the fuel on with the air through the by-pass opening 31 and channel 32, 33 and passage 34 into the engine. The same movement of the valve member 24 will cause the valve 22, 21, 20 to be displaced slightly thereby unseating valve 15 but not substantially or materially opening the communication between storage chamber or receiver 18 and the main orifices 11. The result of these operations is that an over-rich explosive mixture is drawn into the engine for the purpose of starting it into operation, such over-rich mixture being produced by the fuel supply from the receiver or storage chamber 18 through orifice 19 and oppositely exposed passage 31 into channel 32 and thence through channel 33 and into the engine cylinders or manifold. The same action takes place to a greater or less extent if the choke member 35 is more or less open, only in such case the explosive mixture will, for the most part, pass directly from the mixing chamber 26 around the bridge 51 thence on through the passage 34 into the engine cylinders or manifold. Ordinarily, however, in starting up the engine the throttle 35 remains closed so as to insure an over-rich mixture supply initially to the engine in starting it up.

If desired and in order to secure a smooth, easy operation of the valve 20, 21, 22 and to prevent too rapid an operation thereof, the end or extremity of the tubular member 10 is formed into a chamber as indicated at 49. Mounted upon the portion 22 of said valve

and disposed within the chamber 49 is a plunger or piston 50. The outer extremity of the chamber 49 is closed by a cap centrally through which the member 22 operates, the fit, as clearly shown in Fig. 1, of the member 22 within said cap being sufficiently loose to permit air to be drawn into the chamber 49 or expelled from said chamber according as the piston 50 moves in said chamber in one direction or the other. Thus a controlling dash-pot is provided to regulate and control the speed of movement of the valve 20, 21 and 22.

From the foregoing description it will be understood that the valve member 20, 21 and 22 and the valve 24 carried thereby are independent in their movement and operation of the valve 15. In other words, the valve 24 is capable of moving downwardly and hence withdrawing the portion 20 of the fuel feed control valve from contacting relation with respect to the valve 15. This is a valuable feature of my invention, because in case of a back-fire occurring within the mixing chamber 26 the resulting gas pressure produced within said mixing chamber acts upon the valve 24 in a direction forcing the same outwardly, the buffer 29 yielding to permit such upward movement, whereby such gases are permitted to escape through the passage 25 to the outer air. This eliminates the danger of injury to the carburetor due to the back-fire explosion within the same and also eliminates the possibility of fire risk.

The throttle 35, as is ordinarily the case, is located in the passage 34 between the carburetor and the intake connection to the manifold of the engine. This throttle member may be operated from the accelerator, or otherwise, in any suitable or convenient manner such, for example, as by means of a spindle 42 to which the throttle member 35 is connected. An arm 36 suitably connected to be operated as exigency may require and attached to the spindle 42 serves as a means for operating the throttle member. The passage 31, channel 32 and channel 33 constitute a by-pass around the throttle member 35 and hence affords a means for supplying an explosive mixture to the engine when the throttle member 35 is closed. This same by-pass is utilized also when the engine is throttled down to a very low constant speed of operation thereby securing great economy in fuel consumption while the engine is idling at low speed. In that case the fuel required is supplied through the small single orifice 19 and through the passage 31 and channels 32, 33. When, however, the engine is speeded up, as, for instance, by opening the throttle 35 the resulting increased suction action exerted upon the valve member 24 will displace the latter to a corresponding increased extent thereby moving the cylindrical portion 20 of the fuel feed supply valve out of contact with the cylindrical bore portion 37 and bringing the tapered portion 21 of said valve into position to open said passage 37. Thereupon the fuel supply delivers from the chamber or receiver 18 through passage 37 and through the main fuel supply orifices 11 into the mixing chamber 26. This increased displacement of the valve member 24 likewise increases the area of opening for the carburetting air, consequently increasing the volume of such carburetting air drawn into and through the mixing chamber, thereby properly diluting the explosive charge. The degree of such dilution is dependent upon the area of the opening omitted by the displacement of the valve member 24. Likewise the degree of opening of the passage 37 from the receiver or storage chamber 18 to the main fuel feed orifices 11 is regulated and controlled proportionately to the speed of the engine by reason of the tapering portion 21 of the valve which controls said opening 37. Thus it will be seen that for any desired constant speed of the engine the supply of fuel will be proportionately controlled, but the supply of fuel to the main operating orifices 11 is proportionate to the displacement of the tapered portion 21 of the fuel feed control valve and hence is proportionate to the speed of the engine.

It may sometime be necessary or desirable to introduce additional diluting air. To accomplish this result I provide a carburetting casing with a series of port openings 40 which are controlled by means of an angular ring member 38 which may be annularly shaped to open or close ports 40 correspondingly to the extent of operation of the throttle member 35. This result may be obtained in any suitable or convenient manner. A simple arrangement is shown wherein a forked member 43 actuated by the arm 36, or carried by the spindle 42, engages a pin 44 carried by the annular ring 38. This annular ring 38 in the particular form shown is provided with openings 41 which are of varying area as clearly shown in Fig. 3, that is, they are annularly tapered in width and in cooperation with the ports 40 they serve to permit the greater or lesser amount or volume of additional air to be drawn in to dilute the explosive mixture in the passage of such mixture through the carburetor to the engine.

The ports 40 may be arranged in various ways. Thus in Fig. 2 these ports are shown as being readily disposed in the wall of the induction connection 34. This arrangement produces radial air jets, that is, air jets which are radial with respect to the passage through which the explosive mixture passes from the carburetor to the engine. It has been found that the axes 45 of the ports 40 (see Figs. 5, 7 and 9) may sometimes, with advantage, be inclined to the axis 39 of the intake pipe. In Figs. 4 and 5 the axes 45 of the ports 40 are

so inclined as to cause the air jets drawn through these ports to meet the axis 39 of the induction connection 34, so that the air jets form a cone, the apex of which points in the direction of flow of the explosive mixture. This arrangement serves to increase the aspirating action of the air blast.

In Figs. 6 and 7 is shown an arrangement in which the axes 46 of the ports 40 are inclined in a plane at right angles to the axis 39 of the induction pipe. With this arrangement the air jets supplied through the ports 40 are directed in the tangential direction with reference to to the path of flow of the explosive mixture.

In Figs. 8 and 9 the axes 47 extend substantially tangentially to the line of flow of the explosive mixture. The substantially tangential arrangements of Figs. 6–7 and 8–9 as well as the radial arrangements of Fig. 2 and the conical arrangement of Figs. 4–5 serve to exert a more or less gyratory motion to the explosive mixture particularly in the cases of the substantially tangential arrangement of the air jet ports, and also to simultaneously overcome the resistance to the flow of the mixture through the carburetor to the engine. In the case of the arrangement shown in Figs. 8 and 9 a helical motion is imparted to the explosive mixture. Obviously the arrangements of Figs. 6–7 and 8–9 produce the highest degree of turbulence. The various arrangements of the auxiliary air ports likewise, by reason of the agitation exerted thereby upon the explosive mixture, serve to prevent any accumulation of condensation upon the inner wall surface of the induction pipe.

It may sometimes be desirable to prevent any back flow of the fuel from the carburetor into the fuel supply connection thereto. This result may be accomplished by providing a check-valve, such as shown at 48 in Fig. 10, which seats outwardly within the passage 13 whereby in case of the application of any force upon the body of fuel contained in the storage chamber 18, or other portion of the tubular member 10, tending to force the fuel contained therein back into the supply pipe connection the valve 48 will close, thus preventing back flow of the fuel.

It will be obvious to persons skilled in the art that many of the changes in the details of construction and relative arrangement of parts may be made without departure from the spirit and scope of my invention. I do not, therefore, desire to be limited to the exact construction shown and described as illustrating the principles of my invention.

What I claim is:

1. In a carburetor, a throttle valve, said carburetor having a duct adapted to form a by-pass around said throttle valve, a fuel valve having an idling fuel outlet disposed opposite the inner end of the by-pass and adapted to discharge therein and also having a normal speed fuel outlet, and means controlling the said fuel valve to successively discharge the fuel through the idling outlet and the normal speed outlet.

2. In a carburetor a body member having a passage therethrough, a throttle valve for controlling the passage of air through the body member, a hollow member supported within said passage having a fuel chamber and a fuel supply connection thereto, a valve stem slidably supported in said member and extending beyond it, and a disc secured to the valve stem and cooperating with the body member at a restricted point to close off its passage under normal conditions, said hollow member having main and auxiliary fuel orifices controlled by said valve stem, and a check valve in said hollow member between the fuel chamber and auxiliary orifice which is opened upon initial movement of the valve stem and disc to supply fuel to the auxiliary orifice, said body member having a by-pass duct in the wall thereof around the throttle valve and having its inner end terminating adjacent the auxiliary orifice.

3. In a carburetor a body member having a passage therethrough, a throttle valve for controlling the passage of air through the body member, a hollow member supported within said passage having a fuel chamber and a fuel supply connection thereto, a valve stem slidably supported in said member and extending beyond it, and a disc secured to the valve stem and cooperating with the body member at a restricted point to close off its passage under normal conditions, said hollow member having main and auxiliary fuel orifices controlled by said valve stem, and a check valve in said hollow member between the fuel chamber and auxiliary orifice which is opened upon initial movement of the valve stem and disc to supply fuel to the auxiliary orifice, and means cooperating with the valve stem for permitting reverse movement thereof under back fire pressure on the disc.

In witness whereof I affix my signature.

SAÜL EMMANUEL MELKMAN.