

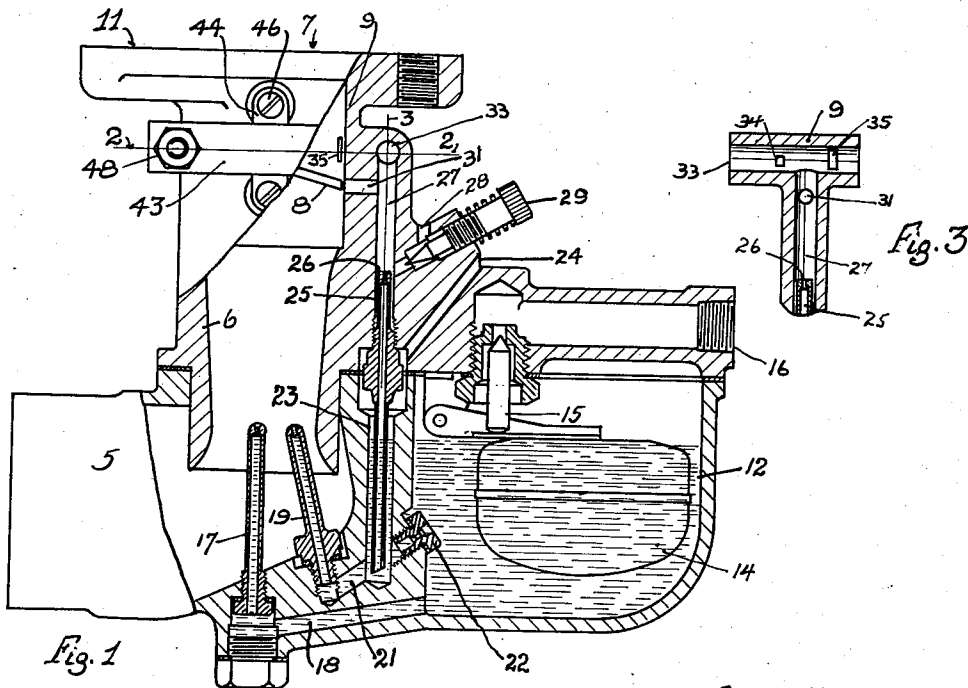
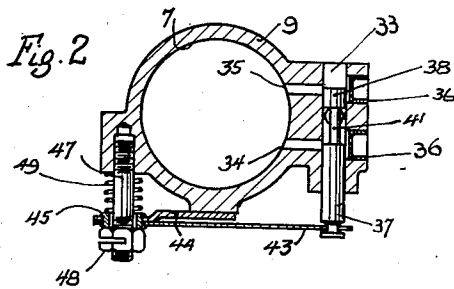
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CARBURETOR

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CARBURETOR

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The invention relates to carburetors for internal combustion engines and in particular to a construction of a carburetor which at closed or nearly closed throttle will furnish a fuel mixture regulated in amount and richness, or both, according to the temperature of the engine.

The conventional form of carburetor is constructed with an idling well, which, through the medium of an idling mixture outlet placed opposite the throttle, supplies substantially all of the explosive mixture when the throttle is closed, that is, when the engine is idling. The richness and amount of explosive mixture obtained through such idle mixture outlet is adjusted to obtain the optimum idling of the engine when operating at its normal temperature. It is well known in the art that difficulty will be experienced in attempting to start, or, when started, in attempting to idle a cold engine supplied with a mixture which has been adjusted for idling an engine warmed up to operating temperature.

It is, accordingly, the object of this invention to overcome this difficulty of starting and operating a cold engine by providing a carburetor which, responsive to the temperature of the engine, will supply the same while starting and idling, with a fuel mixture the richness and amount of which is best suited to the operation of the engine at that temperature. Another object is to provide a carburetor which will supply an additionally rich fuel mixture to an engine while it is operating below normal temperature. Another object is to provide a carburetor which will supply at closed throttle a greater amount of fuel mixture while the engine remains below operating temperature. Another object is to provide a device which will accomplish the aforementioned objects without changing the characteristics of the carburetor when operating with an engine at normal temperature. These, and other objects which will appear as the invention is disclosed, are accomplished by providing above the throttle of the carburetor an additional idling mixture outlet and an additional air supply, and regulating both simultaneously by a temperature controlled valve.

The invention will be better understood by the following description with reference to the illustrative embodiments of the invention shown in the accompanying drawing which form part of the specification, in which:

Fig. 1 is an elevational view largely in cross-section showing the relative positions of the various elements and passageways in a carburetor embodying the invention.

Fig. 2 is a horizontal cross-sectional view of the same carburetor, taken along the line 2—2 of Fig. 1, showing the additional fuel outlet, the additional air supply passage, and the valve mechanism regulating both of these.

Fig. 3 is a vertical, transverse cross-sectional

view of a portion of the carburetor shown in Fig. 1 (with the valve mechanism removed) taken along the line 3 thereof.

In Fig. 1 is shown a carburetor having an air entrance 5 leading to a venturi 6 and to a mixture outlet 7. The passage of air from the venturi 6 to the mixture outlet 7 is regulated by a throttle 8 in the form of a butterfly valve. The sidewall 9 of the mixture outlet 7 is provided with a flange 11 for securing the carburetor to the manifold of a combustion engine.

The carburetor contains a fuel chamber 12 supplied with liquid fuel to a predetermined level in the usual manner by means of a float 14 and the needle valve 15 regulating the entrance of liquid fuel from the fuel supply conduit 16. The jet 17, projecting into the throat of the venturi 6, is supplied with fuel from the chamber 12 by means of the conduit 18. The jet 19, similarly projecting into the throat of the venturi 6, is supplied with fuel from the fuel chamber 12 by conduit 21, the entrance of which is regulated by the metering orifice 22. The conduit 21 is intersected by the fuel well 23 which it supplies with fuel. The upper end of the fuel well 23 is maintained at atmospheric pressure by the air passage 24. A tube 25, having at its upper end a calibrated orifice 26, is inserted in a vertical idling conduit 27 from which is depends into the fuel well 23. The conduit 27 is open to the atmosphere through the air passage 28 which is regulated by the manually adjusted valve 29.

Conduit 27 is connected to the mixing chamber 7 by a passage 31 in the sidewall 9 of the mixing chamber and disposed to be opposite the lower edge of the throttle 8 when the same is in closed position, as shown in Fig. 1. The structure thus far described is well known in the art as a compensated carburetor with idling jet, and, of and by itself, is not the present invention, which relates to the provision of an auxiliary idling supply by means of a structure which will be immediately described.

As is shown in Fig. 1 and in Fig. 3, the idling conduit 27 extends upward beyond the passage 31 and intersects a valve chamber in the form of a horizontal, transverse, circular, cylindrical hole 33 in the sidewall 9 of the mixing chamber 7. The cylindrical hole 33 connects with the mixing chamber 7 through two parallel horizontal holes 34 and 35 respectively designated as a fuel port 34 and an air port 35, one on each side and above the conduit 27.

As shown in Fig. 3, the ports 34 and 35 are preferably of rectangular cross section and have equal horizontal widths. The vertical height of air port 35 may be, as shown in Fig. 3, greater than the corresponding dimension of the fuel port 34. The purpose of this will be subsequently explained. In the construction shown in the

drawing, ports 34 and 35 are perforated from the outside completely through the sidewall 9 at points selected so as to intersect the cylindrical hole 33. The portions of the holes which lie between the hole 35 and the outside surface of the sidewall 9 may be thereafter filled with suitable plugs 36.

The cylindrical hole 33 functions as a valve chamber for the fuel piston 37 and the air piston 38 which are slidable axially therein. The diameter of both pistons is slightly less than that of hole 33 so as to form a nice fit therein. As shown in Fig. 2 the fuel piston 37 in its intermediate position extends into the hole 33 from the end thereof nearest the fuel port 34 so that the inner end of the piston half covers the fuel port 34. In this same position, the air piston lies in the hole 33 between the fuel conduit 27 and the air port 35, half covering the latter. A shank 41, extending between the two pistons 37 and 38, retains the same in spaced relationship so that as the fuel piston 37 is moved across the fuel port 34 the air piston 38 is likewise moved across the air port 35 closing the same in like degree. In the illustrated embodiment the air piston 38, fuel piston 37, and shank 41 are made in one piece.

Means are provided to actuate the pistons 37 and 38 according to the temperature of the engine and comprise a bimetallic strip 43 one end of which engages the outer end of the fuel piston 37 and the other end of which is clamped to a bar 44 by the hollow rivet 45. The bar 44 is secured to the sidewall 9 of the carburetor by means of the screws 46.

Means are provided for manually adjusting the position of the bimetallic strip 43 and comprise a stud bolt 47 secured in the sidewall 9 and projecting through the hollow rivet 45. A slotted nut 48 threaded on the end of the stud bolt 47 fixes the position of the bimetallic strip 43 which is urged against the nut 48 by the cylindric-spiral spring 49 encircling the bolt 47 between the bimetallic strip 43 and the sidewall 9.

The parts hereinbefore described are selected, proportioned and adjusted so that as the temperature increases up to normal the bimetallic strip 43 curves toward the mixture outlet 7 and thereby forces the pistons 37 and 38 to a position where both ports 34 and 35 are closed, and as the temperature decreases from normal the strip 43 curves in the opposite direction, thus drawing the pistons 37 and 38 with it, and opening both ports 34 and 35 to an amount controlled by the drop from normal temperature.

The operation of the device is as follows. When the throttle is closed with the engine turning over, considerable suction arises above the throttle 8. This suction is transmitted through passage 31 which is not completely closed by the throttle 8, to the vertical conduit 27. This suction draws fuel up the tube 25 and air through the manual valve 29, creating in the conduit 27 a fuel emulsion which flows through the passage 31 to the mixture outlet 7 and thence to the engine.

So long as the throttle 8 is closed, or almost closed, there is not enough suction in the venturi 6 to draw any fuel from the jets 17 and 19. As the throttle 8 is opened the suction in the venturi 8 increases and the jets 17 and 19 begin to furnish fuel in the well-known manner. At the same time the suction in the mixture outlet 7 decreases and the fuel furnished through the passage 31 diminishes. By properly shaping and

positioning the passage 31 a blending of these two phases of carburetion may be obtained.

When the engine is started or idling, the throttle 8 is closed and it is the fuel emulsion drawn through the passage 31 together with air which escapes around the throttle 8 which furnishes the explosive mixture to drive the engine. Generally the carburetor will be adjusted so that the mixture so obtained will be suitable for idling a warm engine. However, such a mixture is not suitable for a cold engine. The manner in which the invention operates to furnish the engine when cold with a mixture different in amount, or richness, or both, as desired, will now be explained.

When the engine is cold the pistons 37 and 38 as explained in the structural description, are drawn by the bimetallic strip 43 to a position where both ports 34 and 35 are uncovered. The air port 35 is therefore open to the atmosphere through the far end of the hole 33 and the fuel port 34 communicates with the vertical conduit 27. Because of the position of the air piston 38, which is always intermediate the air port 35 and the conduit 27, the latter is never open to the atmosphere through the movement of this valve mechanism, which affords a temperature controlled communication between the conduit 27 and the mixture outlet 7 only.

This additional communication between the mixture outlet 7 and the conduit 27 increases the suction in the latter, aids in the generation of an emulsion therein, and conveys additional emulsion so generated to the mixture outlet 7. In this way the engine when cold is supplied with additional fuel. Although the port 34 through which this additional fuel passes has been called a fuel port, it is understood that strictly speaking it is a fuel emulsion which passes there-through.

In addition to furnishing the engine when cold with additional fuel, it may be desirable to furnish it with additional air in order to increase the idling speed and thus cut down the danger of stalling should one or more explosions be missed. This function is performed by the air piston 38 controlling the air port 35. Due to the spaced relation of the pistons 37 and 38 and the fact that the air port 35 and the fuel port 34 have equal widths in the direction of travel of the pistons 37 and 38, both ports 35 and 34 close and open simultaneously. In this manner the amount of additional air supplied by the air port 35 is proportional to the amount of additional fuel supplied by the fuel port 34, and both of these amounts are controlled by the drop in engine temperature.

Because of the extreme richness of the emulsion furnished by the fuel port 34, it is possible to admit considerable air through the air port 35 and still obtain a resulting mixture richer than that obtained by the passage 31 alone. This is explained by the fact that the mixture obtained through the fuel port 34 is richer than that furnished by the passage 31 and the leakage around the throttle. By varying the relative heights of the ports 34 and 35 the amount of leaning of fuel port 34 by the air port 35 may be fixed in any predetermined manner.

In the construction shown in the drawing, the valves are balanced, that is, the position of the pistons 37 and 38 is not affected by the suction in the mixture outlet 7. This is considered important where it is desired that the pistons be responsive solely to temperature.

The fuel which is delivered by the passage 31 and the fuel port 34 is drawn from the fuel well 23 which, because it functions as an air bleeder for the jet 19, draws its fuel through the metering hole 22 and is open to atmospheric pressure through the air passage 24. In the usual carburetor the metering hole 22 will be large enough to supply the well 23 with fuel faster than it is drawn up into the conduit 27, so that the level of fuel in the well at closed throttle will be above the lower end of tube 25.

As the engine warms up, the heat therefrom affects the bimetallic strip 43 causing the same to bend toward the mixing chamber and drive the pistons 37 and 38 to a position where both ports 34 and 35 are somewhat closed, as illustrated in Fig. 2. The amount of additional air and additional fuel supplied through the ports is correspondingly cut down so that the resulting fuel mixture is suitable for the idling of an engine at that somewhat warmer temperature. It is understood that the positions of the strip 43 has been adjusted by the nut 48 so that when the temperature of the engine reaches normal both ports are completely covered by the pistons and the auxiliary fuel supply rendered inoperative.

By reason of the graduated action of the bimetallic strip 43 the regulation of additional fuel and air is gradual and continuous according to the temperature. Thus, by properly selecting the sizes of the air and fuel ports 35 and 34, the invention can be constructed so that any desired amount and richness of mixture can be furnished at any temperature. It is contemplated that the bimetallic strip 43 will be sensibly affected by the temperature of the engine by reason of the proximity of one to the other, but, if desired, more direct means of communicating the temperature may be furnished.

Formal changes may be made in the specific embodiment of the invention described without departing from the spirit and substance of the broad invention, the scope of which is commensurate with the appended claims.

I claim:

1. In a carburetor having a mixture outlet, a fuel conduit, means for supplying fuel to said conduit, a fuel port in the sidewall of said outlet, an air port in the sidewall of said outlet, a valve connecting said fuel conduit with said fuel port and regulating the communication therebetween, and, valve means regulating said air port and allowing air to enter therein in fixed proportion to the amount of fuel entering said fuel port.

2. In a carburetor having a mixture outlet, a fuel conduit, means for supplying fuel to said conduit, a fuel port in the sidewall of said outlet, an air port in the sidewall of said outlet, a valve connecting said conduit with said fuel port and regulating the communication therebetween, valve means regulating said air port and allowing air to enter therein in fixed proportion to the amount of fuel entering said fuel port, and means responsive to the temperature for controlling said valve and said valve means.

3. In a carburetor having a mixture outlet, a throttle in said outlet, a fuel conduit, means for supplying fuel to said conduit, a fuel port in the sidewall of said outlet and above said throttle, an air port in the sidewall of said outlet and above said throttle, a valve connecting said fuel conduit with said fuel port and regulating the communication therebetween, and, valve means regulating said air port and allowing air to enter there-

in in fixed proportion to the amount of fuel entering said fuel port.

4. In a carburetor having a mixture outlet, a throttle in said outlet, a fuel conduit, means for supplying fuel to said conduit, a fuel port in the sidewall of said outlet and above said throttle, an air port in the sidewall of said outlet and above said throttle, a valve connecting said fuel conduit with said fuel port and regulating the communication therebetween, valve means regulating said air port and allowing air to enter therein in fixed proportion to the amount of fuel entering said fuel port, and means responsive to the temperature for controlling said valve and said valve means.

5. In a carburetor having a mixture outlet, a valve chamber, a fuel passage extending from said mixture outlet to a fuel port in the side wall of said valve chamber, an air passage extending from said mixture outlet to an air port in the side wall of said valve chamber, a fuel conduit communicating with said valve chamber, means for supplying fuel to said conduit, and a member in said valve chamber movable across both of said ports from a position where communication is established between said air port and the atmosphere and a separate communication is established between said fuel port and said conduit to a position where said member covers both of said ports.

6. In a carburetor having a mixture outlet, a valve chamber, a fuel passage extending from said mixture outlet to a fuel port in the side wall of said valve chamber, an air passage extending from said mixture outlet to an air port in the side wall of said valve chamber, a fuel conduit communicating with said valve chamber, means for supplying fuel to said conduit, a member in said valve chamber movable across both of said ports from a position where communication is established between said air port and the atmosphere and a separate communication is established between said fuel port and said conduit to a position where said member covers both of said ports, and means responsive to the temperature actuating said member.

7. In a carburetor having a mixture outlet, a throttle in said outlet, a valve chamber, a fuel passage extending from said mixture outlet above said throttle to a fuel port in the side wall of said valve chamber, an air passage extending from said mixture outlet above said throttle to an air port in the side wall of said valve chamber, a fuel conduit communicating with said valve chamber, means for supplying fuel to said conduit, a member in said valve chamber movable across both of said ports from a position where communication is established between said air port and the atmosphere and a separate communication is established between said fuel port and said conduit to a position where said member covers both of said ports, and means responsive to the temperature actuating said member.

8. The structure described in claim 5 in which said ports have unequal cross-sectional area and have equal widths in the direction of movement of said member.

9. The structure described in claim 6 in which said ports have unequal cross-sectional area and have equal widths in the direction of movement of said member.

10. The structure described in claim 7 in which said ports have unequal cross-sectional area and

have equal widths in the direction of movement of said member.

11. In a carburetor having a mixture outlet, a throttle in said outlet, an idle mixture passage opening into the sidewall of said mixture outlet adjacent said throttle, a mixture conduit communicating with said idle mixture passage, means for supplying fuel to said idle mixture passage, a mixture port in the sidewall of said outlet above said throttle, and a valve connecting said mixture conduit with said mixture port and regulating the communication therebetween.

12. In a carburetor having a mixture outlet, a throttle in said outlet, an idle mixture passage opening into the sidewall of said mixture outlet adjacent said throttle, a mixture conduit communicating with said idle mixture passage, means for supplying fuel to said idle mixture passage, a mixture port in the sidewall of said outlet above said throttle, a valve connecting said mixture conduit with said mixture port and regulating the communication therebetween, and means responsive to the temperature for actuating said valve.

13. In a carburetor having a mixture outlet, a throttle in said outlet, an idle mixture passage opening into the sidewall of said mixture outlet adjacent said throttle, a mixture conduit communicating with said idle mixture passage, means for supplying fuel to said idle mixture passage, a mixture port in the sidewall of said outlet above said throttle, an air port in the sidewall of said outlet above said throttle, a valve connecting said mixture conduit with said mixture port and regulating the communication therebetween, and means for simultaneously and in like manner regulating the communication between said air port and the atmosphere.

14. In a carburetor having a mixture outlet, a throttle in said outlet, an idle mixture passage opening into the sidewall of said mixture outlet adjacent said throttle, a mixture conduit communicating with said idle mixture passage, means for supplying fuel to said idle mixture passage, a mixture port in the sidewall of said outlet above said throttle, an air port in the sidewall of said outlet above said throttle, a valve connecting said mixture conduit with said mixture port and regulating the communication therebetween, valve means for simultaneously and in like manner regulating the communication between said air port and the atmosphere, and means responsive to the temperature for actuating said valve and said valve means.

15. In a carburetor having a mixture outlet, a fuel conduit, a valve chamber, passages connecting said chamber with said mixture outlet, with said fuel conduit and with the atmosphere, a valve member within said chamber and movable from a position wherein separate paths of communication are established between the mixture outlet and the fuel conduit and between the mixture outlet and the atmosphere to another position wherein the above communications are intercepted.

16. In a carburetor having a mixture outlet, a fuel conduit, a valve chamber, passages connecting said chamber with said mixture outlet, with said fuel conduit and with the atmosphere, a valve member within said chamber and movable from a position wherein separate paths of communication are established between the mixture outlet and the fuel conduit and between the mixture outlet and the atmosphere to another position wherein the above communications

are intercepted, and temperature responsive means to actuate said valve.

17. In a carburetor having a mixture outlet, a throttle in said mixture outlet, a fuel conduit, an idling passage connecting said fuel conduit to said mixture outlet in the proximity of the edge of said throttle when closed, a valve chamber, passages connecting said chamber with said mixture outlet, with said fuel conduit and with the atmosphere, a valve member within said chamber and movable from a position wherein separate paths of communication are established between the mixture outlet and the fuel conduit and between the mixture outlet and the atmosphere to another position wherein the above communications are intercepted.

18. In a carburetor having a mixture outlet, a throttle in said mixture outlet, a fuel conduit, an idling passage connecting said fuel conduit to said mixture outlet in the proximity of the edge of said throttle when closed, a valve chamber, passages connecting said chamber with said mixture outlet, with said fuel conduit and with the atmosphere, a valve member within said chamber and movable from a position wherein separate paths of communication are established between the mixture outlet and the fuel conduit and between the mixture outlet and the atmosphere to another position wherein the above communications are intercepted, and temperature responsive means to actuate said valve.

19. A carburetor having a mixture outlet, a fuel conduit, a chamber, passages connecting said chamber with said mixture outlet, with said fuel conduit and with the atmosphere, movable valve means in said chamber to intercept gradually and proportionately the separate access into said mixture outlet of fuel from said fuel conduit and of air from the atmosphere.

20. A carburetor having a mixture outlet, a fuel conduit, a chamber, passages connecting said chamber with said mixture outlet, with said fuel conduit and with the atmosphere, movable valve means in said chamber to intercept gradually and proportionately the separate access into said mixture outlet of fuel from said fuel conduit and of air from the atmosphere, and temperature responsive means to actuate said valve.

21. A carburetor having a mixture outlet, a throttle in said mixture outlet, a fuel conduit, an idling passage connecting said fuel conduit to said mixture outlet in the proximity of the edge of said throttle when closed, a chamber, passages, connecting said chamber with said mixture outlet, with said fuel conduit and with the atmosphere, movable valve means in said chamber to intercept gradually and proportionately the separate access into said mixture outlet of fuel from said fuel conduit and of air from the atmosphere.

22. A carburetor having a mixture outlet, a throttle in said mixture outlet, a fuel conduit, an idling passage connecting said fuel conduit to said mixture outlet in the proximity of the edge of said throttle when closed, a chamber, passages, connecting said chamber with said mixture outlet, with said fuel conduit and with the atmosphere, movable valve means in said chamber to intercept gradually and proportionately the separate access into said mixture outlet of fuel from said fuel conduit and of air from the atmosphere, and temperature responsive means to actuate said valve.

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