

Dec. 21, 1937.

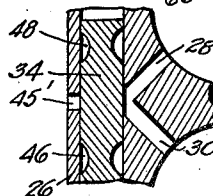
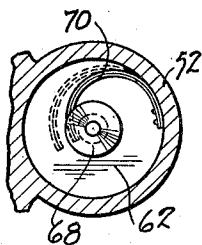
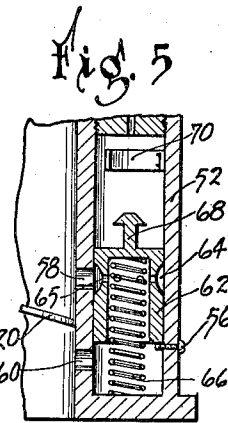
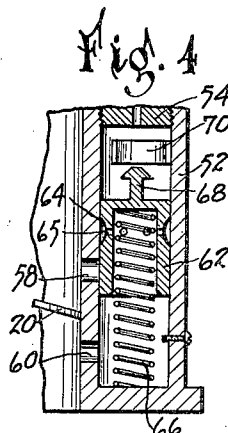
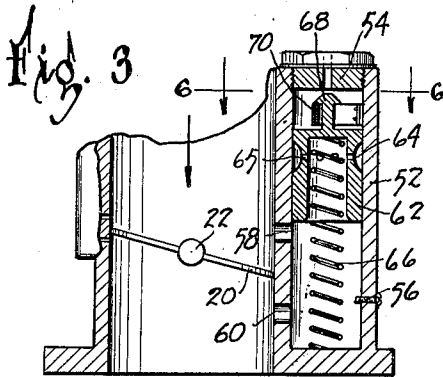
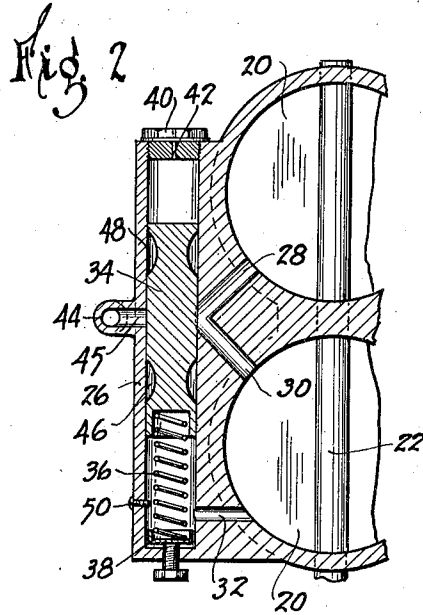
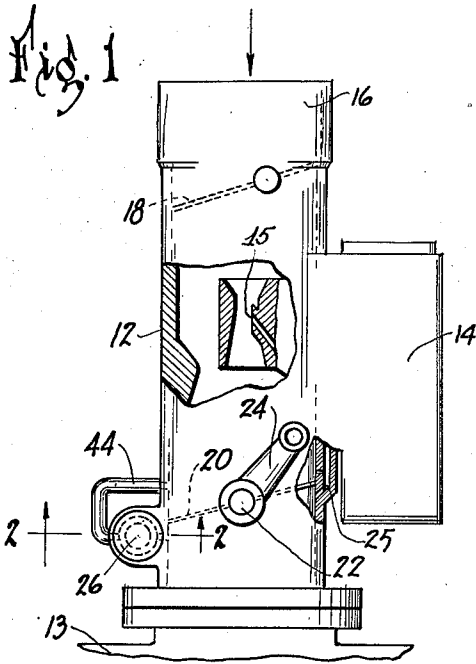
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2,102,846

CARBURETOR

Filed Jan. 25, 1933

2 Sheets-Sheet 1



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2,102,846

CARBURETOR

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2 Sheets-Sheet 2

Fig. 7

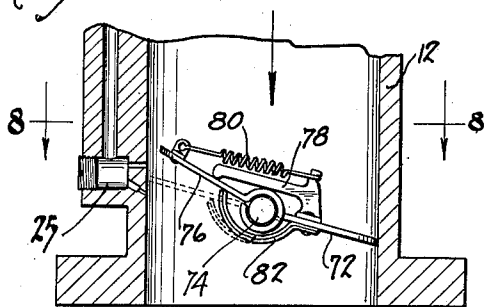


Fig. 8

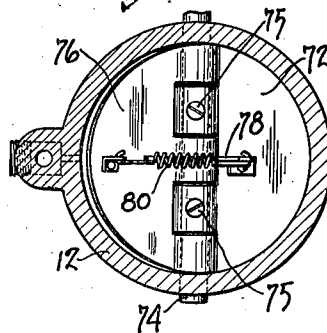


Fig. 9

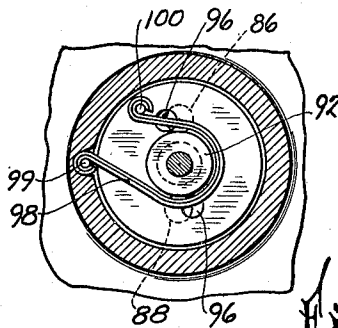
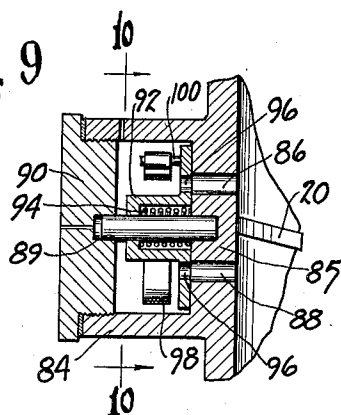


Fig. 10

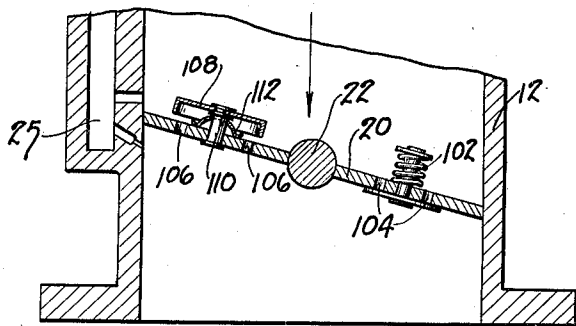


Fig. 11

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2,102,846

CARBURETOR

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14 Claims. (Cl. 261—39)

This invention relates to carburetors, and more particularly to devices associated with the throttle mechanism for admitting to the intake manifold a quantity of air over and above that which would normally be admitted by the throttle.

In most carburetors, the throttle valve does not seat with such a nice fit as to be even approximately air-tight when closed, but instead permits a sufficient amount of air to pass the closed throttle to mix with the fuel supplied by the idling system and form a combustible mixture. This is desirable under ordinary operating conditions. It is nevertheless desirable, under certain conditions, to augment the normal amount of air passing the closed throttle so as to reduce the richness of the mixture passing to the intake manifold. In starting a cold engine, for example, it is necessary that the throttle be slightly opened, but since the operator often fails to open the throttle, or opens it too much or too little, it is desirable that means be provided for permitting the throttle to pass more than the usual amount of air until the engine has started and has warmed sufficiently to enable it to idle at the usual rate without stalling.

Another situation wherein it is desirable to admit additional air occurs when the momentum of the car is driving the engine, as when the engine is used as a brake on a down grade or when the throttle is suddenly closed while the engine is rotating at high speed. Under such conditions the engine acts as a pump which develops a very high suction in the manifold and draws an excessive amount of fuel through the idling system, forming an excessively rich mixture which tends to cause the engine to stall and also causes the formation of carbon deposits in the cylinders. These difficulties can be avoided by temporarily admitting sufficient additional air to form a mixture of normal or less than normal richness.

The present invention aims to eliminate the difficulties previously stated by admitting a sufficient amount of auxiliary air to form a fuel mixture of the desired proportions at all times.

A further object of the invention is to provide means responsive to varying operating conditions for admitting auxiliary air to the carburetion system.

Further objects and advantages of the invention will be apparent from the following description, taken in connection with the appended drawings, in which:

Figure 1 is a view in elevation of a carburetor embodying the invention;

Figure 2 is an enlarged sectional view taken on the line 2—2 of Figure 1;

Figures 3, 4 and 5 are sectional views showing a modified form of the invention;

Figure 6 is an enlarged sectional view taken on the line 6—6 of Figure 3;

Figure 7 is a sectional view showing a further modification;

Figure 8 is a view taken on the line 8—8 of Figure 7;

Figure 9 is a sectional view showing a further modification;

Figure 10 is a view taken on the line 10—10 of Figure 9;

Figure 11 is a sectional view showing a further modification; and

Figure 12 is a detail sectional view showing a modification of the embodiment shown in Figures 1 and 2.

The various modifications disclosed in the several figures are shown as applied to a downdraft carburetor, the air flow being in the direction of the arrows in Figures 1, 3, 7 and 11, but in all cases the invention is equally applicable to other types of carburetors.

Referring to the embodiment of the invention disclosed in Figures 1 and 2 the reference numeral 12 designates a carburetor which is designed to supply fuel mixture to the intake manifold 13 of an internal combustion engine. The carburetor comprises any suitable float chamber 14, air inlet 16, and choke valve 18. In the illustrated embodiment, the carburetor is of the duplex type and comprises two throttle valves 20 of the usual butterfly construction fixed to a shaft 22 which is manually rotated through a lever 24 in the usual manner. An idling jet 25 of known construction is disposed adjacent each of the throttles. A horizontal cylinder 26 is formed in the wall of the carburetor adjacent the throttles and is connected to the two induction passages of the carburetor posterior to the throttles through air inlet ducts 28 and 30. A control duct 32 connects one end of the cylinder 26 to one of the induction passages beyond the throttle, for a purpose to be described.

A piston 34 is slidable in cylinder 26 and is constantly urged toward one end of the cylinder by a compression spring 36, the stationary end of which seats on an adjustable bracket 38. The other end of the cylinder is closed by a threaded plug 40 which is provided with a restricted orifice 42 of such size as to permit inflow and escape of air during movements of piston 34, while still exerting some damping effect on the movements

of the piston. A tube 44 leads from a port 45 near the midsection of the cylinder 26 and communicates with the interior of the mixing chamber anterior to the throttles, although it may instead communicate directly with atmosphere. The illustrated arrangement is preferred because with such an arrangement no air is admitted except through the air cleaner which is customarily attached to the air inlet of the carburetor.

The operation of the device illustrated in Figures 1 and 2 is as follows. When the engine is stopped piston 34 is moved into contact with plug 40 by the force of spring 36. In this position, an annular groove 46 in the piston is in registry with port 45 and with the ducts 28 and 30. If the engine is now cranked while the throttles are closed or nearly closed, the manifold suction developed by cranking is not sufficient to change the position of the piston materially, and air will bypass the throttles through tube 44, groove 46, and ducts 28 and 30, mingling with the overrich fuel mixture supplied by the idling jets to provide a fuel mixture of proper proportions. When the engine begins to fire the (absolute) pressure in the intake manifold drops sharply, and the suction acting through port 32 draws the piston 34 to the position shown in Figure 2, closing off port 45. Now if the pressure in the intake manifold drops further, the piston 34 is moved further against the force of spring 36, bringing a second annular groove 48 into registry with port 45 and ducts 28 and 30, thus thinning the mixture to the proper proportions. This action will occur when the engine is being used as a brake or when the throttle is suddenly closed while the engine is operating at high speed. The movement of the piston in this direction is limited by a stop screw 50 threaded in the wall of the cylinder.

The embodiment of the invention disclosed in Figures 3 to 6 is similar to that above described except as noted hereinafter. A cylinder 52 extends longitudinally of the carburetor and is provided with an apertured plug 54 and stop screw 56 similar to those described in connection with Figures 1 and 2. Ports 58 and 60 connect the cylinder to the induction passage of the carburetor respectively anterior and posterior to the throttle 20. A hollow piston 62 is reciprocally mounted in the cylinder and is provided with an external groove 64 which communicates with the interior of the piston through ports 65. A spring 66 urges the piston toward its uppermost position, as shown in Figure 3, against the manifold suction through port 60 tending to draw it to its lowermost position, defined by stop 56, as shown in Figure 5. A detent 68 is fixed to the top of the piston and has a tapered head designed to engage a bimetallic spring member or thermostat 70 which has one of its ends fixed to the inner wall of the cylinder 52 and its free end disposed in coacting relation to the detent 68.

In the embodiment just described, the piston will move to its uppermost position when the engine is stopped and, if the engine is cold when it is next started, the piston will be retained in its uppermost position by thermostat 70 until the heat of the engine causes the thermostat to move from the position shown in full lines in Figure 6 to the position shown in dotted lines in the same figure. The position of the piston after being released will vary with the vacuum posterior to the throttle. Thus, at low vacuums it will be in the position shown in Figure 3, allowing a free flow of air past the throttle. At in-

termediate vacuums it will move to the position shown in Figure 4, completely shutting off the flow of air through the cylinder, and at extremely high vacuums it will move to the position shown in Figure 5, wherein it permits a limited flow of air through ports 65.

In the modification of the invention shown in Figures 7 and 8, the throttle valve is formed in two sections one of which, 72, is fixed to the throttle shaft 74 by screws 75, the other section 76 being rotatable relative to the shaft. A stop member 78 is fixed to section 72 and has a portion extending adjacent section 76 to limit its movement relative to section 72. A tension spring 80 connects member 78 to section 76 and urges the latter into contact with the stop member. A bimetallic member 82 is fixed to section 72 and has its free end extending into coacting relation to section 76 as shown. When the engine is cold, member 82 will be in the position indicated in full lines in Figure 7, in which position it will hold section 76 in contact with stop member 78 and permit the maximum quantity of air to pass the closed throttle. As the engine gradually warms up, thermostat 82 moves to the position indicated in dotted lines in Figure 7, thus permitting section 76 to move into alignment with section 72 under the influence of the differential of pressures on the opposite faces of the throttle. Then if section 72 is in its closed position the throttle will completely close the carburetor passage. In this embodiment, a maximum amount of air is permitted to pass the throttle at low temperatures, and the amount is gradually decreased as the engine warms up and thus requires a less rapid rate of idling to prevent stalling.

In the embodiment shown in Figures 9 and 10, a casing 84 is formed on the outer wall 85 of the carburetor adjacent the throttle valve 20 and is connected to the induction passage by ports 86 and 88 positioned respectively anterior and posterior to the throttle. A shaft 89 is rotatably mounted in journals formed in the wall 85 of the carburetor and in the cover 90 of the casing, and has a limited amount of end play in its journals. A movable valve member 92 is mounted on the shaft and is formed with a hollow hub which receives a compression spring 94 urging member 92 outwardly against the variable force of suction drawing it inwardly. Valve member 92 is provided with relatively small ports 96 designed to register with larger ports 86 and 88, as shown. A bimetallic member or thermostat 98 has one of its ends 99 fixed to a pin in the wall of casing 84, and its other end secured to a pin 100 in member 92 so that flexing of the thermostat will rotate member 92 and move ports 96 into and out of registry with ports 86 and 88.

When the engine is cold and not running, thermostat 98 maintains ports 96 in registry with ports 86 and 88, and spring 94 holds member 92 spaced from the carburetor wall 85. If the engine is then cranked, air will flow freely through ports 86 and 88, thus bypassing the throttle enough to give an air flow equivalent to that produced when the throttle is slightly opened. When the engine begins to fire, if the throttle is closed or nearly closed, the increased suction will draw member 92 to the right in Figure 9, thus limiting the amount of bypassed air to the quantity which can pass through ports 96. This will permit the engine to idle at a rapid rate when cold, which is desirable. As the engine warms up, thermostat 98 gradually moves ports 96 out

of registry with ports 86 and 88, preventing further bypassing of air except when the suction acting on member 92 is insufficient to hold it in contact with wall 85. This will occur (1) at wide open throttle and (2) when the engine falters and is about to stall at closed or partly closed throttle. In the former case very little air will pass through the ports 86 and 88 since the pressure is substantially the same at both ports. In the latter case, as the speed of the engine decreases, the suction acting on member 92 decreases until spring 94 is able to move it out of contact with wall 85, permitting a free flow of air from port 86 to port 88 and this, if the stall has been due to too rich a mixture, will correct the mixture proportions and enable the engine to continue to function.

In the embodiment of the invention shown in Figure 11, the throttle 20 is provided with a pressure-responsive poppet valve 102, of known construction, controlling ports 104 and designed to permit air to pass the closed throttle in proportion to the suction in the intake manifold. At the opposite side of the throttle are ports 106 controlled by a cap 108 mounted on a pin 110 reciprocable in a bore in the throttle. A spring 112, which may be formed of a temperature-responsive strip if desired, tends to hold cap 108 away from ports 106 against the variable force of suction tending to draw the cap down into contact with the throttle, in which position it obstructs the flow of air through ports 106. In this embodiment, no air will pass through the throttle when the suction beyond the throttle is very low. At a somewhat higher suction, valve 102 will be unseated and cap 108 will not be seated, and a maximum amount of air will pass. At very high suction, cap 108 will seat, reducing the amount of air passed to that passing through ports 104. As a result, if the engine is cranked while the throttle is closed, sufficient air will pass to permit the engine to fire. When the engine is warmed up and begins to stall at closed throttle due to overrichness of the mixture, the decreased suction will permit cap 108 to move away from the throttle and admit sufficient auxiliary air to prevent stalling.

It will be understood that in any of the forms of the invention shown, the air may be drawn from the atmosphere rather than from the induction passage anterior to the throttle, as in Figure 12, and may be introduced at any point posterior to the throttle, including any point in the intake manifold.

Although the invention has been described with particular reference to the illustrated embodiments thereof, it is not limited thereto, but may be further varied within the scope of the following claims.

I claim:

1. In a plain tube carburetor system including an induction passage, a throttle in said passage, an inlet to said passage posterior to said throttle, and means responsive to the degree of suction in said passage to open said inlet at low suctions and at high suctions and to at least partially close said inlet at intermediate suctions.

2. In a carburetion system including an induction passage, a throttle in said passage, an inlet for gas to said passage posterior to said throttle, and means responsive to the degree of suction in said passage to open said inlet at suctions below a predetermined amount, to close said inlet at suctions above said predetermined amount, and

to open said inlet at suctions above a higher predetermined amount.

3. In a carburetion system including an induction passage and a throttle, an inlet for auxiliary air posterior to said throttle, and means responsive to the degree of suction in said passage posterior to said throttle to open said inlet at low suctions and at higher suctions, and to at least partially close said inlet at intermediate suctions.

4. In a carburetion system including an induction passage, a fuel nozzle therein, means for admitting auxiliary air to said passage posterior to said fuel nozzle, said means being inoperative within a predetermined range of suctions within the passage and operative above and below that range.

5. In a plain tube carburetor having a throttle, an air inlet posterior to the throttle, a valve member controlling said inlet and having two open positions and a closed position therebetween, yielding means urging the valve member toward one open position, and suction means urging the valve member toward the other open position.

6. In a carburetor having an induction passage and a throttle, a cylinder communicating with the induction passage anterior and posterior to the throttle, a piston in the cylinder operative in two positions to permit flow of air through the cylinder and operative in an intermediate position to obstruct such flow, said piston being subjected at its opposite ends to atmospheric pressure and to the pressure posterior to the throttle whereby it tends to move in one direction in response to a decrease in said latter pressure, and yielding means urging the piston in the opposite direction.

7. In a carburetor, an induction passage, and a throttle valve in said passage having apertures therein, and pressure responsive members oppositely acting to control said apertures.

8. In a carburetion system including an induction passage, a throttle valve controlling the same, and means for admitting air to said passage posterior to the throttle valve including an inlet and a valve member having two open positions and a closed position intermediate the open positions.

9. In a carburetion system including an induction passage, means for admitting auxiliary air to said passage including an inlet and a valve member having two open positions and a closed position intermediate the open positions, said valve member being movable in response to suctions existing in the induction passage.

10. In a carburetor having an induction passage and a throttle, a cylinder, a duct connecting two spaced points in the induction passage respectively anterior and posterior to the throttle, a piston in the cylinder controlling said duct and having one of its faces subjected to the suction posterior to the throttle, and temperature-responsive means to releasably hold the piston in its open position.

11. In a carburetor having an induction passage and a throttle, a cylinder, a duct connecting two spaced points in the induction passage respectively anterior and posterior to the throttle and comprising spaced ports in the wall of the cylinder, a piston in the cylinder controlling the flow through the duct and having one of its faces subjected to the suction posterior to the throttle, said piston being provided with an aperture designed to register with the posterior one of said spaced ports to permit a restricted flow of air around the throttle, and yielding means urging

the piston toward a position wherein said aperture will register with said posterior port.

12. In a carburetor having an induction passage and a throttle, a cylinder, a duct comprising spaced ports in the wall of the cylinder by-passing the throttle, a piston in the cylinder controlling the duct and having a port designed to register with one of said spaced ports to permit a restricted flow of air around the throttle, and temperature responsive means to hold the piston in its open position when the carburetor is cold.

13. In a plain tube carburetor including an induction passage, an air inlet to said passage, a throttle valve controlling the flow of air through said passage, and means responsive to differences

of fluid pressure on opposite sides of the throttle valve for establishing communication between opposite sides of said valve when said differences of pressure are negligible or are very great and to interrupt the flow of air at intermediate differences of fluid pressure.

14. In a carburetor, an induction passage, a throttle controlling the same, and means responsive to the degree of suction posterior to the throttle establishing communication between opposite sides of the throttle when said suction is either high or low, and inoperative at intermediate suctions.

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