Jan. 31, 1939. S. M. UDALE 2,145,672

CARBURETOR

Filed May 25, 1936 3 Sheets-Sheet 1

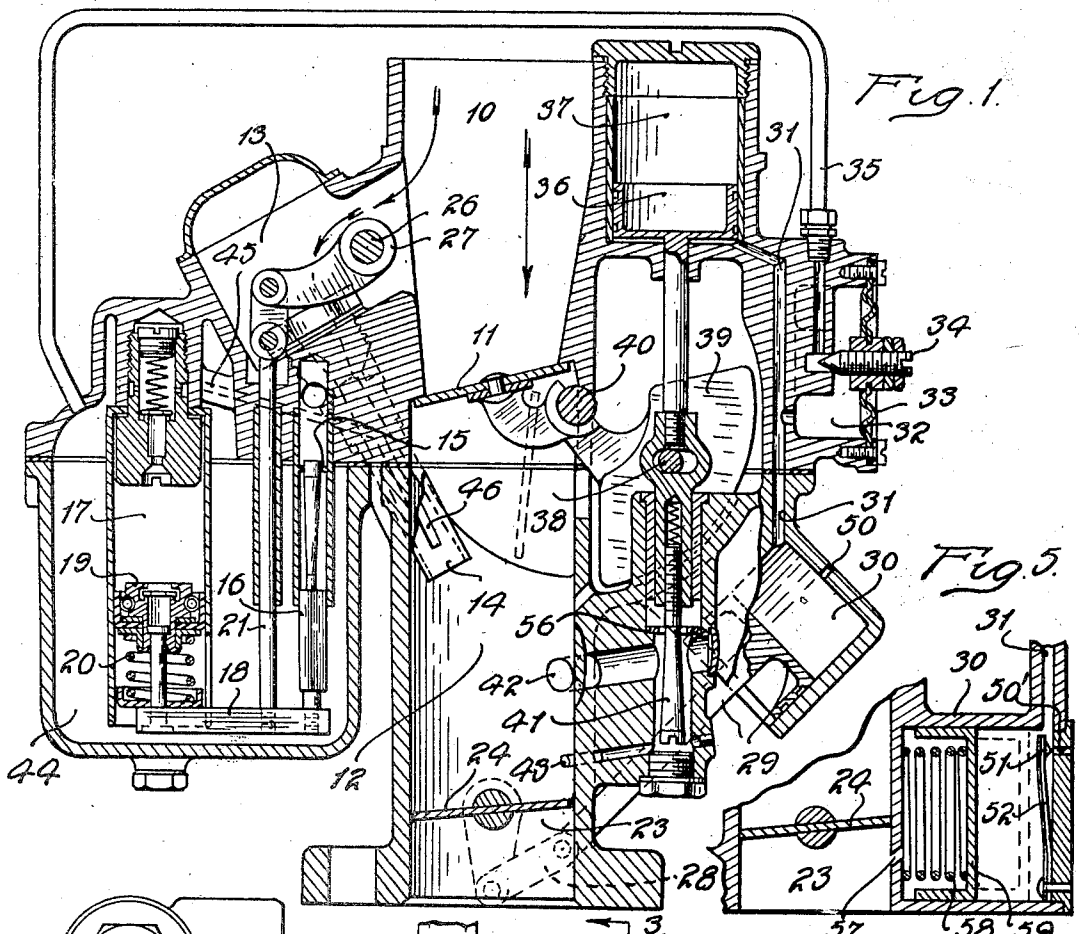


Fig. 1.

Fig. 5.

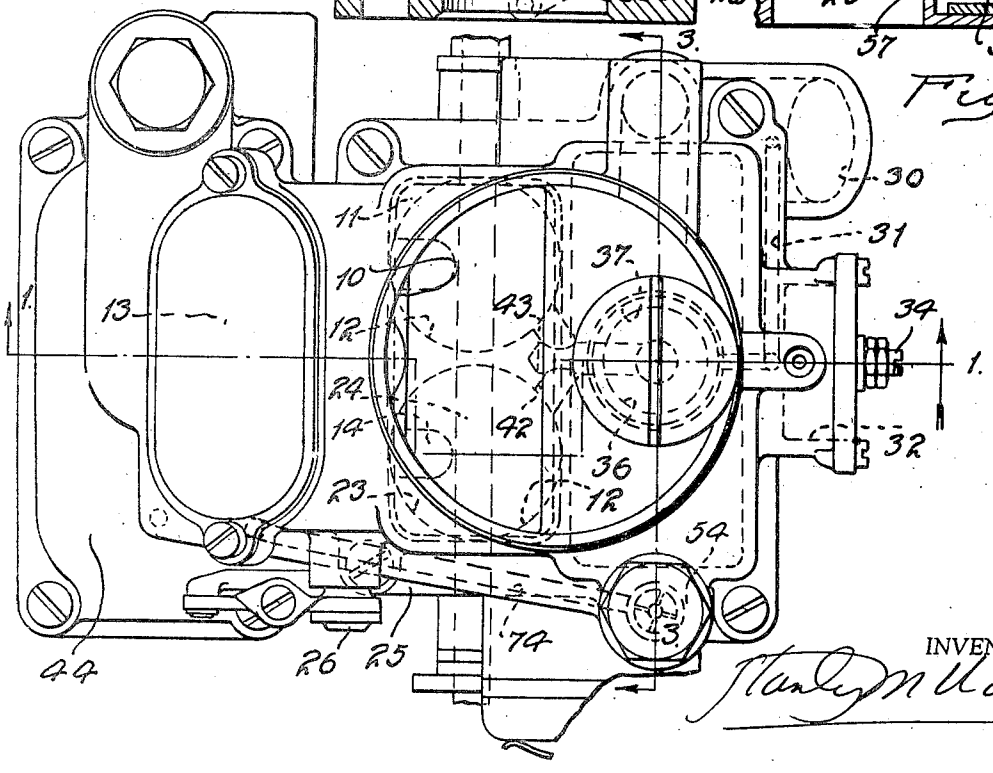


Fig. 2.

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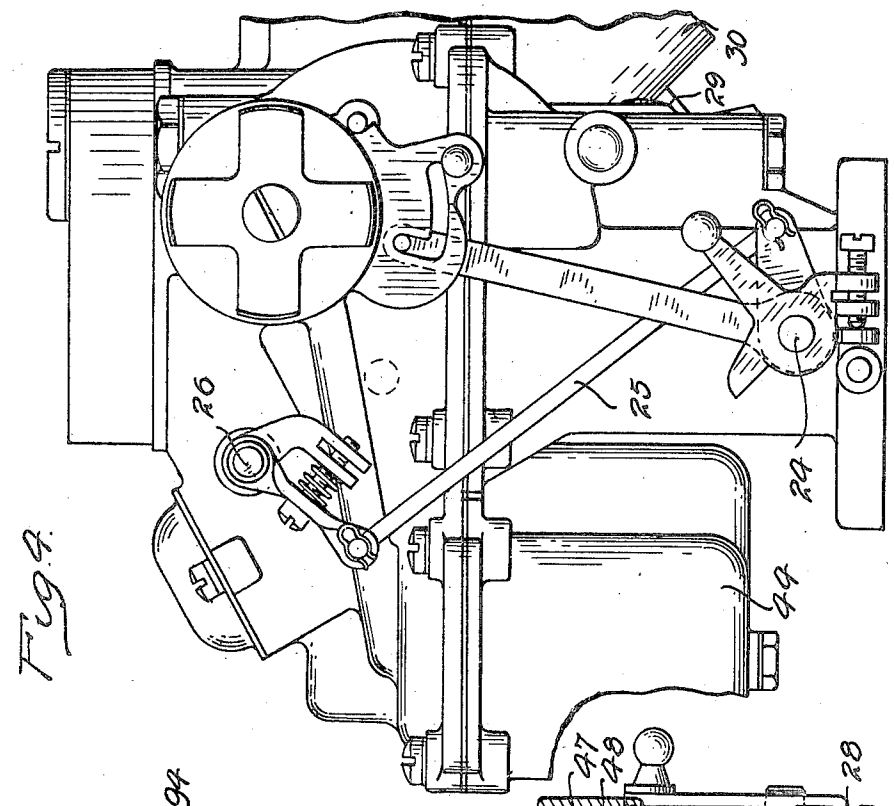


Fig. 2.

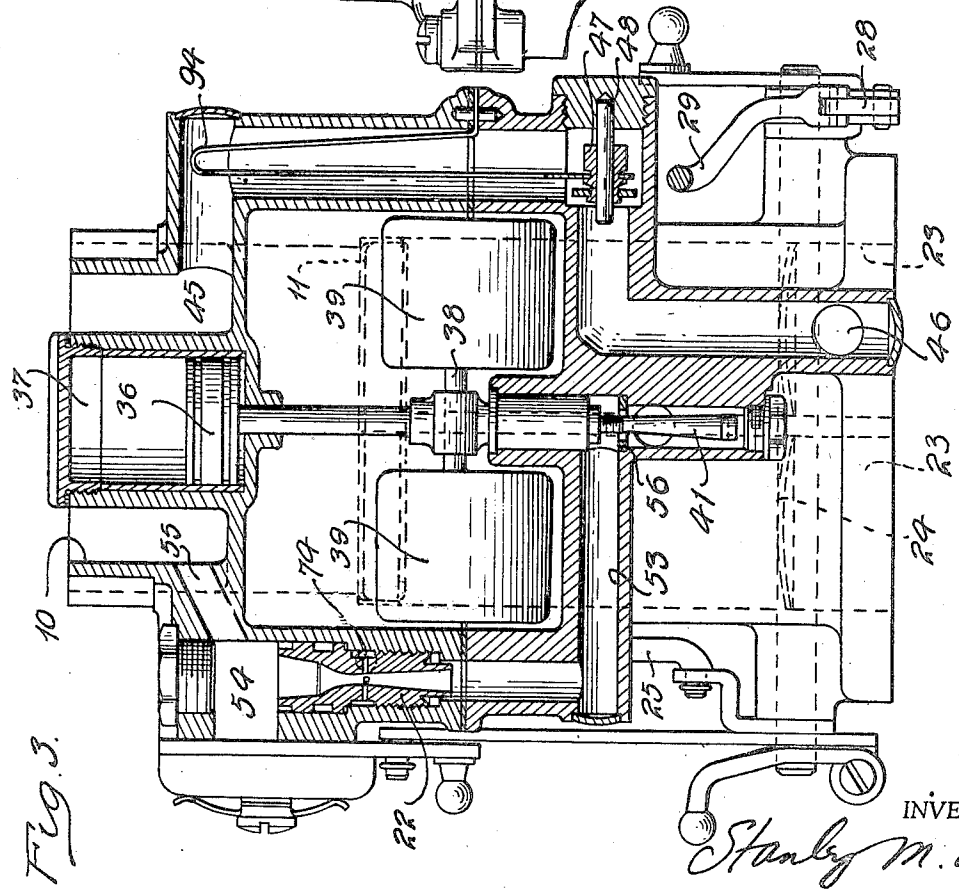


Fig. 3.

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Fig. 8.

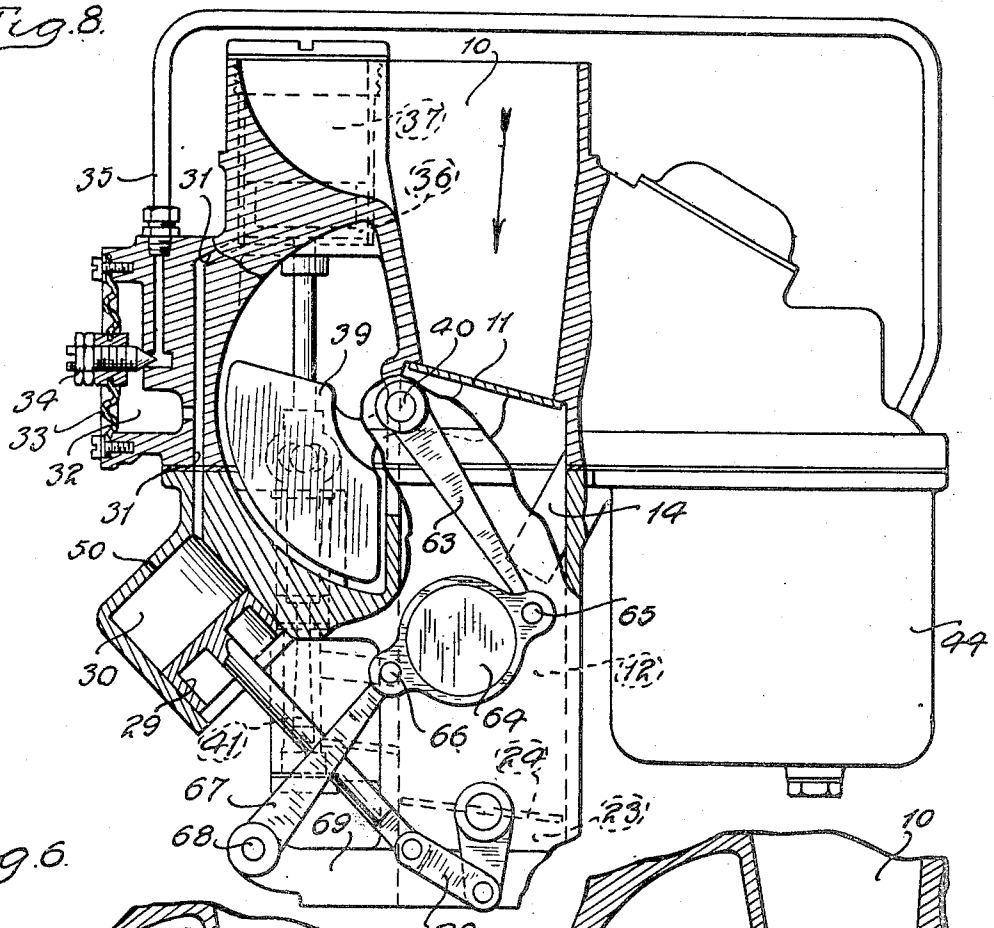
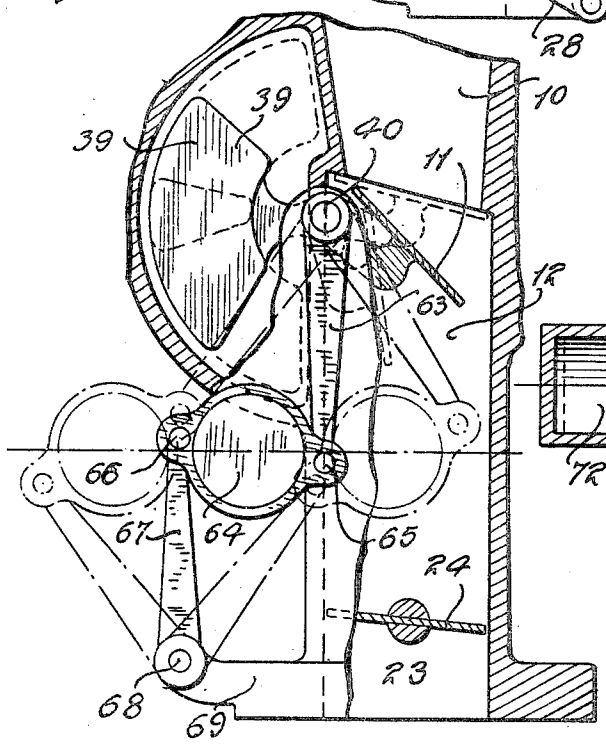


Fig. 6.



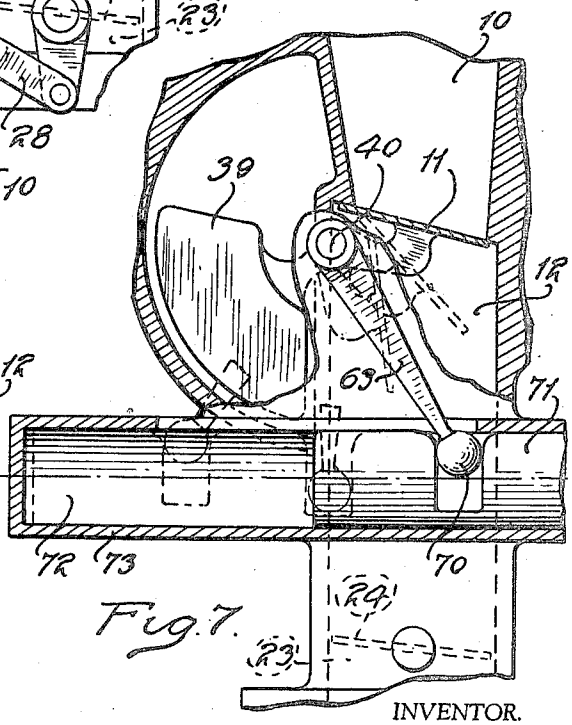


Fig. 7.

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2,145,672

UNITED STATES PATENT OFFICE

2,145,672

CARBURETOR

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Application May 25, 1936, Serial No. 81,551

14 Claims. (Cl. 261—72)

The object of this invention is to improve the acceleration obtained with air valve carburetion and specifically with self-feeding carburetors. The self-feeding carburetors for which this invention was made are those in which the air valve is located in the main air entrance and this air valve creates a depression in a small venturi leading to the mixing chamber and also in a second small venturi, the throat of which is connected to the float chamber at a point above the level therein. The throat of the first venturi is connected to the fuel in the float chamber below the level therein, a differential pressure is thereby created so that fuel is drawn into the float chamber and fuel is drawn out of the float chamber into the mixing chamber because of the higher depression in the throat of the first venturi. On opening the throttle in the mixture outlet suddenly, the air valve opens slowly because of the dash pot which is connected to it to prevent fluttering.

This invention provides means whereby opening the throttle automatically increases the rate of opening the air valve by operating an air compressor by the action of the throttle valve and using the compressed air to open the air valve. At the same time the vacuum in the float chamber is temporarily released by means of the compressed air. The engine is thus enabled to draw more than its usual supply of air and as the pressure in the float chamber rises or rather as the depression in the float chamber is temporarily reduced the flow of fuel is increased proportionately to the flow of air, which is also increased by the increased opening of the air valve. An additional object is to improve the hill climbing ability of the car.

Figure 1 shows a cross-sectional elevation taken in plane 1—1 of Figure 2.

Figure 2 shows a plane view of the carburetor shown in Fig. 1.

Figure 3 shows a cross-sectional elevation taken on plane 3—3 of Figure 2.

Figure 4 shows a side view in elevation looking in the same direction as Figure 1.

Figure 5 shows an alternative construction.

Figures 6, 7 and 8 show an alternative construction in which an additional weight is moved by the air valve to increase the lift on a hill without increasing the resistance to open the valve when running on the level.

Figure 8 corresponds to Figure 1 with the additional weight added.

Figure 6 corresponds to Figure 4 with the additional weight added.

In the figures, 10 is the air entrance, 11 is the air valve therein, 12 is one of the two similar mixing chambers which derive their air supply from the air entrance 10. 13 is an air bypass leading to the two small venturis 14, which discharge a rich mixture into each of the two mixing chambers 12 below the air valve 11. The fuel is derived from a float chamber 44 through a restriction 15 controlled by a needle valve 16. 17 is an accelerating fuel pump which also obtains its fuel supply from the float chamber 14, but this particular fuel pump forms no part of this invention. A horizontal bar 18 operates a piston 19, the spring 20 being interposed between the piston 19 and the bar 18. A rod 21 is connected to the bar 18, which bar also connects to the needle valve 16 so that when the rod 21 is moved up the piston 19 pushes fuel out of the pump 17 into the mixing chamber and the needle valve 16 admits fuel past the restriction 15 into the small venturi 14. The depression or suction in the float chamber 44 is created by the second small venturi 22 shown in Figure 3.

In Figure 1, 23 is the mixture outlet, the flow through which is controlled by the two throttle valves 24. The throttle valves 24—24 are connected through a link 25 (Fig. 4) to the shaft 26 which is firmly connected to the lever 27 which is connected to the rod 21 so that on opening the throttles 24—24, the rod 21 (Fig. 1) is raised and fuel is discharged through the pump 17 through a passage 45 and nozzle 46 and fuel is also admitted through the opening 15 to the venturi 14 and so into the mixing chamber 12. A second link 28 is connected to the throttle 24 and this link connects to a piston 29 which reciprocates in an inclined cylinder 30. These elements constitute one of the principal features of my invention. Any air compressed in 30 when the throttle 24 is opened suddenly discharges through a passage 31 into a chamber 32 provided with a diaphragm 33 which carries an adjustable needle valve 34 which admits air to an air passage 35 which discharges air into the upper part of a float chamber 44 and thereby reduces the vacuum in the float chamber. As a convenient method of modifying the action, a small air bleed 50 may be provided in 30. Connected to the air valve 11 is a dash pot 36 which slides in a cylinder 37. This dash pot is connected through the pin 38 to the weight 39 which constitutes the load for the air valve 11, both the air valve 11 and the weight 39 being mounted on the shaft 40. This shaft 40 also controls the movement of the lift needle 41 which is connected to the piston 36 which controls the flow through the small second venturi 22 (Fig. 3).

In Figure 3, a passage 55 leads on from the air entrance 10 to a chamber 54 which is the air entrance to the small venturi 22, a longitudinal passage 53 leads this air to the restriction 56 controlled by the needle 41, the air flowing to the mixture chambers 12—12 through the passages 42 and 43 (Fig. 2). The passage 31 continues on past the chamber 32 and discharges air into the lower part of the cylinder 37 on the underside of the piston 36 (Fig. 1).

In Figure 5, an air passage 57 connects the left hand side of the piston 59 with the mixture outlet 23. A spring 58 operates the piston 59 in the cylinder 30. A restricted opening 50' is provided in the end of the cylinder 30 and this is controlled by a valve 51 mounted on a spring 52 (which may be made of bimetallic material) riveted to the end of the cylinder 30.

In Figures 6 and 8, the same parts are numbered with the same numbers as Figures 1, 2 and 3. An additional weight 64 is shown suspended from the shaft 40 and thereby connected to the air valve 11 by means of the arm 63 which is pivoted to the weight 64 at the pivot 65. An additional pivot 66 in the weight 64 is connected to a link 67 which is hinged to a bracket 69, which projects from the body of the carburetor. In Figure 6, the linkage 63, 64, 65, 66, 67 and 68 is shown in the various positions corresponding to the various positions of the air valve 11, namely closed, half open, wide open. This is the well-known James Watt straight line motion and is the equivalent of the horizontal piston 71 shown in Figure 7, which is moved by the spherical end 70 located on the end of the lever 63. The piston 71 moves in the cylinder 72, the walls 73 of which are integral with the carburetor body. Obviously, the cylinder 72 can be arranged to function as a dash pot in the same manner as the dash pot 37 cooperates with the air pump 30 and the weight 39, but this would be merely a repetition of the disclosure already made.

Operation

As this invention relates only to the parts 29, 30, 31, 32, 33, 34, 35, 36, 37, 50, 51, 52, 57, 58, 59, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, it is not necessary to discuss the well-known operation of the other parts of the carburetor.

During acceleration when the throttle 24 is opened suddenly, the piston 29 compresses air in the cylinder 30, air flows up the passage 31 into the chamber 32, pushes the diaphragm 33 over to the right in Figure 1 and to the left in Figure 8, unseats the valve 34, and a minute portion of air flows through the passage 35 into the float chamber 44. The amount of air which flows is then determined by the taper on the needle 34, the adjustment of the needle 34 and the stiffness of the diaphragm 33 and the size of the relief opening 50. At the same time, air is admitted to the underside of the piston 36. The effect of the weight 39 is thereby counteracted by the upward pressure of the air under the piston 36. Obviously, the air valve 11 opens more quickly than would otherwise be the case. It is equally obvious that the flow of gasoline through the restriction 15 is greater by reason of the air flowing through the pipe 35 than otherwise would be the case.

In order to start the engine during hot weather, a thermostat 94 (see Figure 3) is provided located in the bypass 45 which communicates with one of the mixture outlets 23 through the opening 46. A valve 47 is provided mounted on the pin 48 for controlling the flow of air from 45 past the valve 47 to the outlet 46. The valve 47 is seated by two forces, namely, by the effect of heat on the thermostat 94 and also by the effect of air flow past the valve 47. This particular detail is not part of this invention and will, therefore, not be discussed exhaustively.

In Figure 5, the vacuum in the mixture outlet 23 draws the piston 59 over to the left compressing the spring 58. On opening the throttle suddenly, the spring 58 moves the piston 59 over to the right. Compressed air then flows up 31. In Figure 5, a check valve 51 is added to control the air entrance through the restricted opening 50' and to check the air exit through the same opening 50'. This check valve is mounted on the flexible flat spring 52 which may be of bimetallic material. Hence, during acceleration the opening 50' is closed by the valve 51, but during deceleration air is drawn back into 30 through 50'. Hence, closing the throttle will not unduly disturb the air valve 11. In very hot weather if the spring 52 is made of bimetallic material, this fact will render this accelerating means less effective and thus more effective in very cold weather.

In the operation corresponding to carburetor illustrated in Figure 7, on accelerating the engine, the weight 71 tends to hold the valve 11 closed, but as described above, the air compressor 30 corrects this tendency.

On the other hand, when climbing a hill, the weight 71 tends to hold the air valve closed. The tendency of the pivoted weight 39 to increase the lift on the hill, as described in the Patent No. 2,080,570, issued May 18, 1937, to George M. Holley, is increased. The lift on a hill is thus increased not only when the engine is idling, but also when the air valve is wide open. It is quite obvious that with the construction shown in Figures 6 and 8, the air valve resistance of the weight 39 to the opening of the air valve is actually less on a hill when the air valve is wide open than it is when running on the level. This defect is corrected by the addition of the weight 64, which moves parallel to and in the direction of motion of the automobile. The combination of a weight moving from an angle of say 30° idle to say 85° wide open with a weight which moves forward in a straight line gives an improved result when climbing a hill.

The invention consists of modifying the action of a weighted air valve by means of a weight moving in a straight line and also by means of an air compressor operated by the throttle.

The larger weights 39 oscillate in a chamber located on the engine side of the air valve 11. This chamber is in free communication with the mixing chamber. The weights 39 are thus completely enclosed. In the case of Figure 7, the horizontal sliding weight 71 is also enclosed. Wherever a weight, such as 64 in Figures 6 and 8 is permitted to oscillate in the open air, objections are raised on many grounds.

What I claim is:

1. A fuel lift carburetor for motor vehicles having an air entrance, an automatic air valve therein responsive to air flow therethrough, a mixing chamber, a mixture outlet therefor, a throttle valve therein, a Venturi passage through which air is bypassed into said mixing chamber around said air valve, a fuel supply chamber, a fuel passage leading therefrom discharging into the throat of said Venturi passage, a second Venturi passage through which air is also bypassed around said air valve into said mixing chamber,

a passage connecting the throat of said second venturi with the upper part of said fuel supply chamber so as to create a vacuum therein, means for increasing this vacuum when a vehicle is ascending a hill, comprising a weight attached to said air valve and adapted to be moved by said air valve in a straight line in a plane parallel to and in the direction of the motion of the vehicle.

2. A fuel lift carburetor for motor vehicles having an air entrance, an automatic valve therein responsive to air flow therethrough, a mixing chamber, a mixture outlet therefrom, a throttle valve therein, a Venturi passage through which air is bypassed into said mixing chamber around said air valve, a fuel supply chamber, a fuel passage leading therefrom discharging into the throat of said Venturi passage, a second Venturi passage through which air is also bypassed around said air valve into said mixing chamber, a passage connecting the throat of said venturi with the upper part of said fuel supply chamber so as to create a vacuum therein, means for increasing this vacuum when a vehicle is ascending a hill, comprising a weight attached to said air valve and adapted to move in a straight line parallel to the motion of the vehicle and in the direction of motion of the vehicle, means for opposing the increased vacuum produced by the inertia effect of said weight during acceleration comprising an air compressor adapted to be operated by the throttle, a passage leading from said air compressor to the upper part of said fuel supply chamber and a pressure responsive valve in said passage.

3. A fuel lift carburetor as set forth in claim 2 including an air dash pot connected to said weight, means for admitting compressed air from said air compressor to said dash pot for the purpose described.

4. A fuel lift carburetor as set forth in claim 1 including means for opposing the inertia effect of said weight during acceleration comprising an air compressor adapted to be operated by the throttle, an air dash pot connected to said weight, means for admitting compressed air from said air compressor to said dash pot for the purpose described.

5. In a fuel lift carburetor having a main air entrance, an air valve mounted therein responsive to air flow therethrough, yieldable means for closing the air valve, a mixing chamber, a fuel supply chamber, a fuel passage leading therefrom and discharging into said mixing chamber, a passage connecting said mixing chamber to the upper portion of said fuel supply chamber to maintain a substantially uniform depression therein, a mixture outlet from said mixing chamber, a throttle valve therein, an air compressor connected to said throttle, a passage leading from said air compressor to said fuel supply chamber, an automatic pressure responsive valve therein for admitting a limited amount of air to said fuel supply chamber, a compressed air responsive means connected to said air valve, a passage from said air compressor to said means whereby said air valve is opened by the air in said air compressor.

6. In a fuel lift carburetor having a main air entrance, an air valve mounted therein responsive to air flow therethrough, yieldable means for closing the air valve, an air dash pot for controlling said air valve, a mixing chamber, a fuel supply chamber, a fuel passage leading therefrom and discharging into said mixing chamber, a mixture outlet from said mixing chamber, a throttle valve therein, an air compressor connected to said throttle, a passage from said air compressor to said air dash pot whereby said air valve is opened by the air from said air compressor, a second passage leading from said air compressor to said fuel supply chamber, and a valve in said passage adapted to be operated by air pressure.

7. A carburetor having a mixture outlet, a throttle valve therein, an air entrance, an automatic air valve therein, responsive to air flow therethrough, an air dash pot connected to said air valve, a mixing chamber, a fuel nozzle discharging therein, means responsive to a sudden opening of the throttle for injecting an additional shot of fuel into said mixing chamber, an air compressor, means for operating said air compressor responsive to the opening of said throttle, a passage leading from said compressor, to said air dash pot whereby opening the throttle, automatically opens the air valve.

8. The carburetor as set forth in claim 7 in which the air compressor consists of a cylinder, a piston therein, a passage connecting one end of the cylinder to the mixture outlet and a spring connected to said piston whereby the suction in the mixture outlet moves the piston in one direction and the spring moves the piston in the other, to compress air in the cylinder for the purpose described.

9. The carburetor as set forth in claim 7 in which the air compressor consists of a cylinder, a piston therein, adapted to compress air in one end of the cylinder, a restricted air vent in said end communicating with the atmosphere.

10. The carburetor as set forth in claim 7 in which the air compressor consists of a cylinder, a piston therein, adapted to compress air in one end of the cylinder, a restricted air passage in said end communicating with the atmosphere, a check valve in said passage restricting the escape of air through said passage, a bimetallic spring controlling said check valve for the purpose described.

11. The carburetor as set forth in claim 7 in which the air compressor consists of a cylinder, a piston therein, adapted to compress air in one end of the cylinder, a restricted air passage in said end communicating with the atmosphere, a check valve in said passage, bimetallic spring means for opening said valve when the carburetor is hot, said valve being yieldably closed when the carburetor is cold.

12. A fuel lift carburetor as set forth in claim 1 in which a swinging weight is attached to the air valve so as to swing forward in the direction of motion under the influence of the opening motion of said air valve.

13. A fuel lift carburetor for motor vehicles having an air entrance, an automatic valve therein responsive to air flow therethrough, a mixing chamber, a mixture outlet therefrom, a throttle valve therein, a fuel supply chamber, a fuel passage leading therefrom discharging into the throat of a Venturi passage through which air is bypassed into said mixing chamber around said air valve, a second Venturi passage through which air is also bypassed around said air valve into said mixing chamber, a passage connecting the throat of said second venturi with the upper part of said fuel supply chamber so as to create a vacuum therein, means for increasing this vacuum when a vehicle is ascending a hill, comprising a weight attached to said air valve and

adapted to swing as the air valve opens in the direction of motion of the vehicle; means for neutralizing the vacuum in said fuel supply chamber when the throttle is quickly opened comprising an air compressor operatively connected to said throttle, and a passage leading from said compressor to said fuel supply chamber.

14. In a fuel lift carburetor as described in claim 13 in which there is an air dash pot piston connected to said automatic air valve and a passage connecting said air compressor with said dash pot.

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