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CARBURETOR

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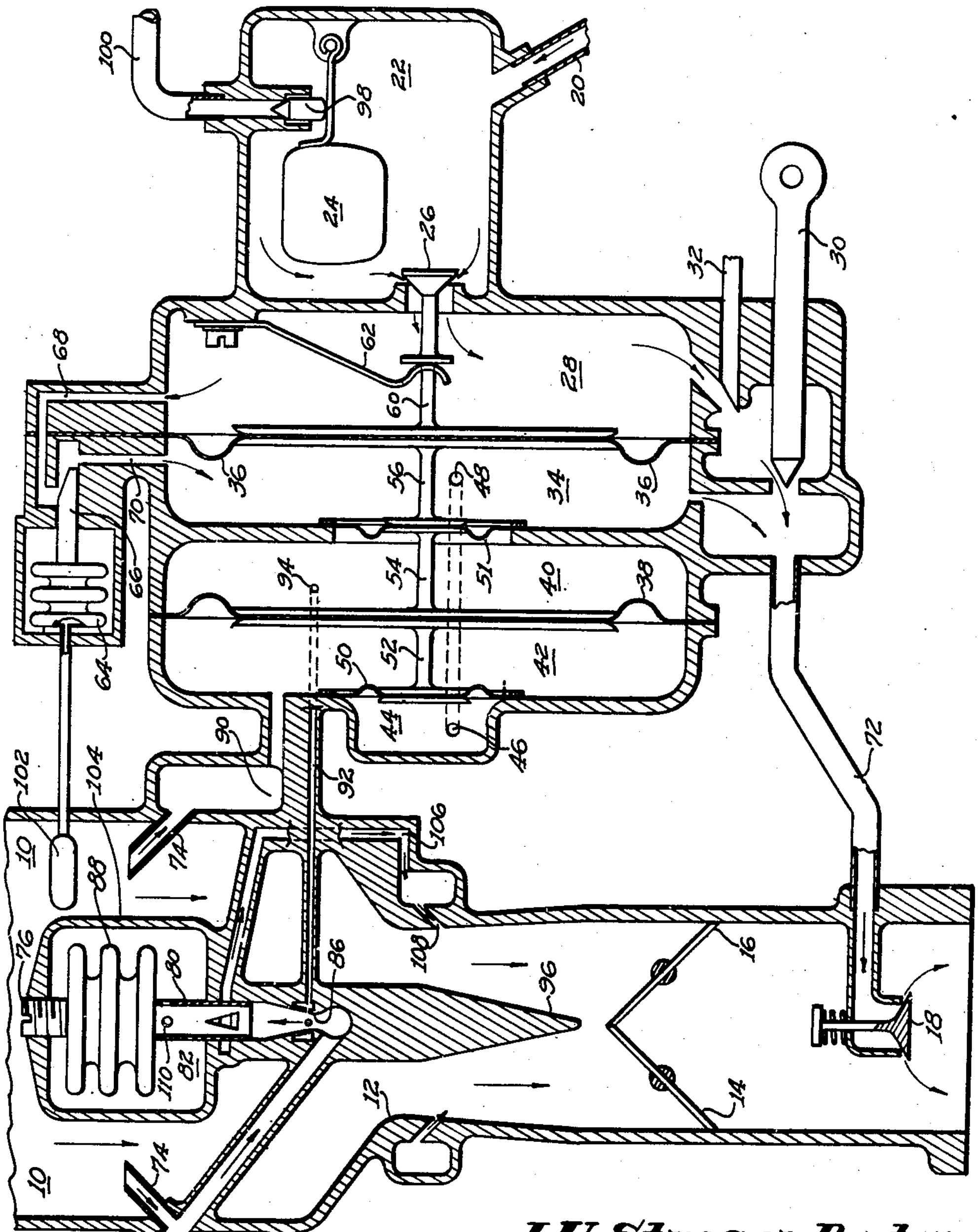

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CARBURETOR

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The object of this invention is to improve the performance of the carburetor at high air flow and at high altitudes.

Heretofore there has been a tendency at high air flow-high altitude for the carburetor to lean out when the ordinary altitude correction means are used. A slight increase in richness at high air flow at extremely high altitudes is preferable to leaning out at high altitudes-high air flows.

I have discovered that if I control the altitude responsive device by the pressure downstream from the smaller of the two venturis, which are usually used, and throttle the flow through this venturi by the altitude responsive means, then the drop in pressure in the throat of the smaller of the two venturis will approximately very closely to the correct value of Venturi suction required to maintain a constant fuel/air ratio when the drop in the throat in the smaller of the two venturis is balanced against the pressure drop through the fuel metering orifice.

The figure shows diagrammatically the preferred form of my invention.

In the figure, 10 is the air entrance, 102 is the temperature responsive element located in the air entrance. 104 is the casing containing the pressure responsive element 88 located in the air entrance 10. 12 is the main venturi. 14—16 are the throttles. 18 is the fuel nozzle discharging on the engine side of the throttles 14—16. 20 is the fuel entrance into the vapor separating chamber 22 containing the float 24, float needle 98 and the vapor outlet 100.

26 is the conventional fuel entrance valve. 28 is the fuel chamber which delivers fuel past the metering needle 30. For emergency use (idling) a valve 32 is provided. The chamber 34 communicates with the downstream side of the valve 30. Chamber 34 is located at the left hand side of the diaphragm 36, which diaphragm is the left hand wall of chamber 28. Corresponding diaphragm 38 is located between the two air chambers 40 and 42. A small fuel chamber 44 is connected through the passage 46 and the opening 48 to the chamber 34. A small diaphragm 50 separates the fuel chamber 44 from the air chamber 42. A rod 52 connects the diaphragm 50 with the diaphragm 38. Rod 54 connects the diaphragm 38 with a small diaphragm 51 identical with diaphragm 50. This diaphragm 51 separates the air chamber 40 from the fuel chamber 34. Rod 56 connects the diaphragm 51 with the diaphragm 36. Rod 60 connects the diaphragm 36 with the valve 26. A spring 62 maintains the valve 26 slightly off its seat so that the valve 32 can control

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the idle in spite of the fact that the air flow is so low that there is no pressure differences acting on the diaphragm 38.

64 is a temperature responsive bellows connected to the temperature responsive element 102. Valve 66 is connected to the temperature responsive bellows 64 and moves to the right when the temperature in the air entrance 10 rises.

Bypass 68 delivers fuel under pressure from the chamber 28 to the valve 66. Passage 70 connects the fuel flowing by the valve 66 with the chamber 34. Fuel pipe 72 conveys the fuel flowing by the metering valve 30 to the fuel discharge valve 18. The impact tubes 74 transmit air under pressure to the annular chamber 90 surrounding the air entrance 10. This air pressure is transmitted to the chamber 42, to the left of the diaphragm 38.

The air flows from the annular chamber 90, down the inclined passage, through the small venturi 86, through the valve 80, down the passage 106, through the opening 108 into the point of maximum suction of the venturi 12. The streamlined obstruction 96 completes the venturi 12.

The pressure responsive element 88 in the chamber 82 is adjusted by the adjustable screw 76 and is responsive to the pressure at the upstream side of the valve 80 through openings 110.

Operation

In the operation assume the carburetor is running with throttles 14—16 substantially open and with the idle control valve 32 out of the way as shown in the drawings. Then as the air flow increases there is a pressure difference established on the diaphragm 38 in a well known manner. In a similar way there is a pressure difference created on the diaphragm 36. By a well known means, namely by the valve 26, the fuel/air ratio is maintained substantially constant over a wide range of air flows. When the temperature becomes abnormally low (as it does at high altitudes) the valve 66 is drawn to the left and the fuel pressure in the chamber 28 is bled through the passage 68—70, past the valve 66 so that it takes a greater fuel flow to balance the pressure responsive to air flow. Thus the fuel/air ratio is substantially constant despite the drop in temperature at high altitudes.

The temperature responsive means shown, namely 102—64—66, may be dispensed with and the flow through the passage 68—70 completely stopped. In that event a slight quantity of nitrogen is admitted to the evacuated bellows 88 and a partial correction for temperature is obtained.

At high altitudes the depression transmitted through the passage 92 is diminished because the valve 80 throttles the flow through the passage 106 as the pressure transmitted through the opening 110 to the chamber 82 falls. Therefore the pressure drop through the small venturi 86 is added to the pressure drop due to altitude.

I have discovered that by making the bellows 88 responsive to the drop downstream from the small venturi 86 I get nearer perfect compensation for load and altitude than I do if the bellows respond to the pressure in the venturi 12 or alternatively to the pressure in the air entrance 10. If the bellows respond to pressure in the air entrance 10 the mixture becomes rich at high altitude-high air flow. If the bellows respond to the pressure in the venturi 12 the tendency would be for the mixture ratio at high altitudes-high air flow to become slightly lean.

What I claim is:

1. Air metering means for an aircraft pressure type carburetor adapted to maintain a combustible mixture at all air flows and at all altitudes comprising an air entrance, a first venturi therein, a second venturi discharging into the throat of the first venturi, a throttle valve in the outlet of said second venturi, barometric bellows adapted to move said throttle toward the closed position at high altitudes, a chamber enclosing said barometric bellows, a passage connecting said chamber to the outlet from said second venturi on the upstream side of said throttle valve.

2. A device as set forth in claim 1 in which the chamber enclosing said barometric means is located so as to respond to the temperature of the air in the air entrance and the barometric bellows are partially filled with a gas so as to respond to temperature in the air entrance.

3. A device as set forth in claim 1 which is combined with a temperature responsive element located in the air entrance, a temperature responsive valve connected to said element, a main fuel supply passage, a restriction therein, a moving wall responsive to the drop of fuel pressure at said restriction, a fuel valve controlling the flow of the fuel supply connected to said moving wall so that the fuel valve is moved towards its closed position by said moving wall as the fuel flow increases, a second moving wall responsive to the pressure difference between the air entrance pressure and the pressure in the throat of said second venturi also connected to said fuel valve so as to move said fuel valve towards its open position as the air flow increases, a relatively small bypass around said fuel restriction, said temperature responsive valve being located in said bypass and being adapted to be moved to its closed position as the temperature in the air entrance increases.

4. Fuel and air metering means for an aircraft pressure type carburetor adapted to maintain a combustible mixture at all air flows and at all altitudes comprising an air entrance, a first venturi therein, a second venturi discharging into the throat of the first venturi, a throttle valve in the outlet from the second venturi, pressure responsive bellows adapted to move said throttle toward the closed position at low pressures, a chamber enclosing said bellows, a passage connecting said chamber to the outlet from said second venturi, a temperature responsive element located in the air entrance, a temperature responsive valve connected to said element, a main fuel supply passage, a restriction therein, a moving wall responsive to the drop of fuel pressure at said restriction, a fuel valve controlling the flow of the fuel supply connected to said moving wall so that the fuel valve is moved towards its closed position by said moving wall as the fuel flow increases, a second moving wall responsive to the pressure difference between the air entrance pressure and the pressure in the throat of said second venturi also connected to said fuel valve so as to move said fuel valve towards its open position as the air flow increases, a relatively small bypass around said fuel restriction, said temperature responsive valve being adapted to be moved to its closed position as the temperature in the air entrance increases.

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