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FUEL CONTROL MEANS

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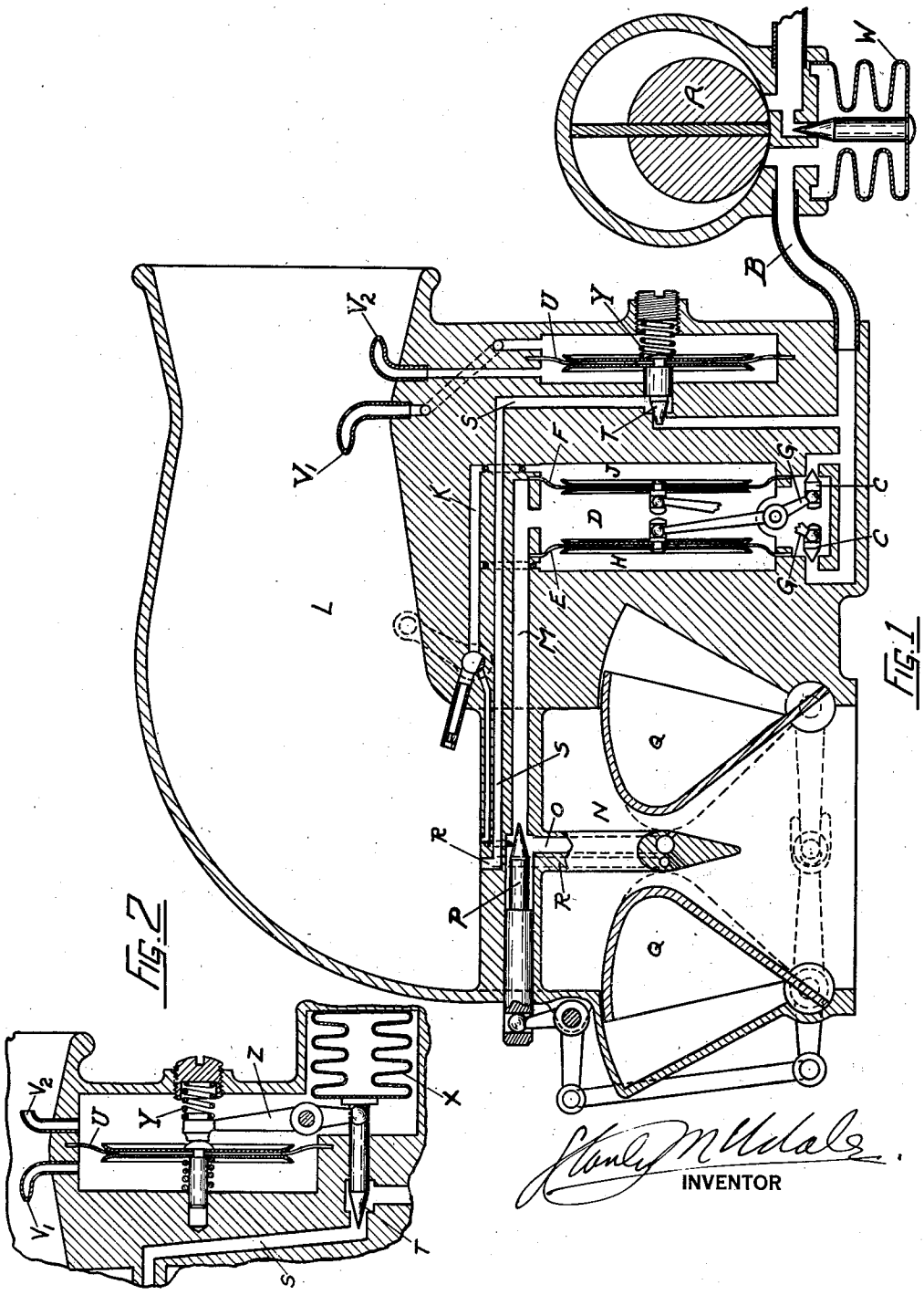


FIG. 1

FIG. 2

INVENTOR

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FUEL CONTROL MEANS

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2 Claims. (Cl. 261—41)

This invention is an improvement on the carburetor shown in the Milton J. Kittler application, Serial No. 107,386. In a carburetor of this type it is desirable that the mixture ratio be richer at maximum power than it is under throttle, because the engines to which these carburetors are applied are built so closely to their safety limit that unless excess fuel is used, the engines fail because under excessive heat the strength of the parts subjected to the heat is reduced below the safe limit.

The applicant has discovered that the required additional fuel can be obtained by admitting fuel to the mixing chamber through a valve controlled by the air flow in the air entrance, the valve being so loaded that until a certain minimum air flow is reached, no additional fuel is added. By utilizing the Pitot tube effect and a diaphragm responsive to this effect, a convenient method is available with the fewest number of parts for operating such a valve. I have also discovered that if the pressure available in the fuel supply is maintained at a definite number of pounds above the atmosphere, then the added fuel will be constant, depending only on the depression created by the air flow. A definite number of pounds per hour at altitude, however, will correspond to a higher velocity of air flow. The Pitot tube effect is proportional to the velocity squared times the density. Therefore, if the density is one-half, the velocity squared would be four times and the relative Pitot tube effect would be doubled as the product of four times one-half equals two. Therefore, the additional fuel received would be excessive unless means were provided to correct this excess fuel. Hence I oppose to the Pitot tube effect the effect of increased altitude, that is, the effect of reduced atmospheric pressure by employing a suitable sylphon bellows containing air at atmospheric pressure.

In the figures:

Figure 1 shows diagrammatically the fuel control means.

Figure 2 shows diagrammatically the altitude control.

In the figures, A is the fuel pump; B is the fuel outlet leading to a pair of needle valves C, C, which admit fuel to a diaphragm chamber D bounded on one side by the diaphragm E and on the other side by the diaphragm F. Levers G, G engage with the center portions of the diaphragms E and F and also with the needle valves C, C. Air chambers H, J enclose the diaphragm F, E and are connected together through the passage K, which passage communicates with the air entrance passage L. The fuel outlet M from the upper portion of the diaphragm chamber D communicates with the center of the variable venturi N through the nozzle passage O. The flow is controlled by a needle valve P. The venturi N is formed of two movable curved elements Q and Q linked together. One of the elements Q engages with the needle valve P so that the needle valve P opens at the same time that the venturi N opens. A fuel passage S discharges into an air passage R which has an unrestricted connection with the air entrance and which in its turn discharges into the center of the venturi N.

The fuel is supplied through the fuel outlet B from the fuel pump A. A valve T is provided in the passage S and is controlled by a diaphragm U. The diaphragm U responds to a differential pressure created by the air flowing into and through the entrance passage L which has a portion of Venturi-shape, the differential or Pitot tube effect being obtained by the use of the Pitot tubes V1 and V2, V1 facing downstream substantially in the throat of the venturi portion of the passage and V2 facing upstream to receive air at atmospheric pressure. An adjustable spring Y regulates the opening of the needle valve T. The pressure in the fuel outlet B from the fuel pump A is regulated by means of a Sylphon bellows W responsive to atmospheric pressure and arranged to by-pass the fuel from the fuel outlet B back to the fuel pump A when the pressure in W exceeds a predetermined amount. Thus the pressure in B is maintained a constant amount above that of the atmosphere.

In order to correct the mixture ratio for the variations in atmospheric pressure, the fuel control means is modified as shown in Figure 2. Another Sylphon bellows X is placed back of the needle valve T. In order to regulate the effect of this Sylphon bellows, the spring Y is arranged to engage with the diaphragm U through a lever Z. The lever Z also transmits the movement from the diaphragm U to the needle T. The tendency that would otherwise exist as described above for the mixture ratio to get rich at high altitudes is thus counteracted by the increase in pressure in the air enclosed in the Sylphon X at high altitudes. This increase in pressure is a relative increase, that is to say, an increase with relation to the pressure derived from the Pitot tube V2.

In the operation of the carburetor when the

throttle elements Q, Q are moved towards each other, the needle valve P restricts the flow from the fuel passage M to the fuel outlets O, O. As the throttle elements Q, Q are opened and the valve P is opened, the fuel flow increases through M. At the same time, the air flow increases through L. The pressure differential acting on the diaphragm U also increases. If the air flow exceeds, for example, 4000 pounds of air per hour, the valve T will open slightly and as the quantity of air increases to 6000, the valve T becomes more and more open. There is thus an increase in fuel flow through the passage S from the fuel pump A. When the plane is flown at high altitudes, the same volume of air produces a less pressure differential, but a less quantity of fuel is required to counteract the tendency of the engine to overheat. The means for maintaining the mixture ratio constant at altitude is controlled by the Sylphon bellows X which reduces the opening of the needle valve T when the atmospheric pressure falls.

What I claim is:

1. In a carburetor having a mixing chamber, an air entrance leading thereto, and a source of fuel supply under substantially constant pressure, a fuel supply chamber connected thereto, a pressure reducing valve for the fuel, said valve being adapted to maintain a relatively low pressure of substantially constant value in said chamber, a fuel outlet passage from said chamber adapted to discharge into said carburetor, a second fuel passage connecting the high pressure fuel supply directly to the carburetor, a valve in said second passage, and means directly responsive to the flow of air through said air entrance for operating said valve in said second passage for the purpose described.

2. A carburetor as described in claim 1 together with means responsive to variations in atmospheric pressure for opposing the action of the means responsive to air flow for the purpose described.

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