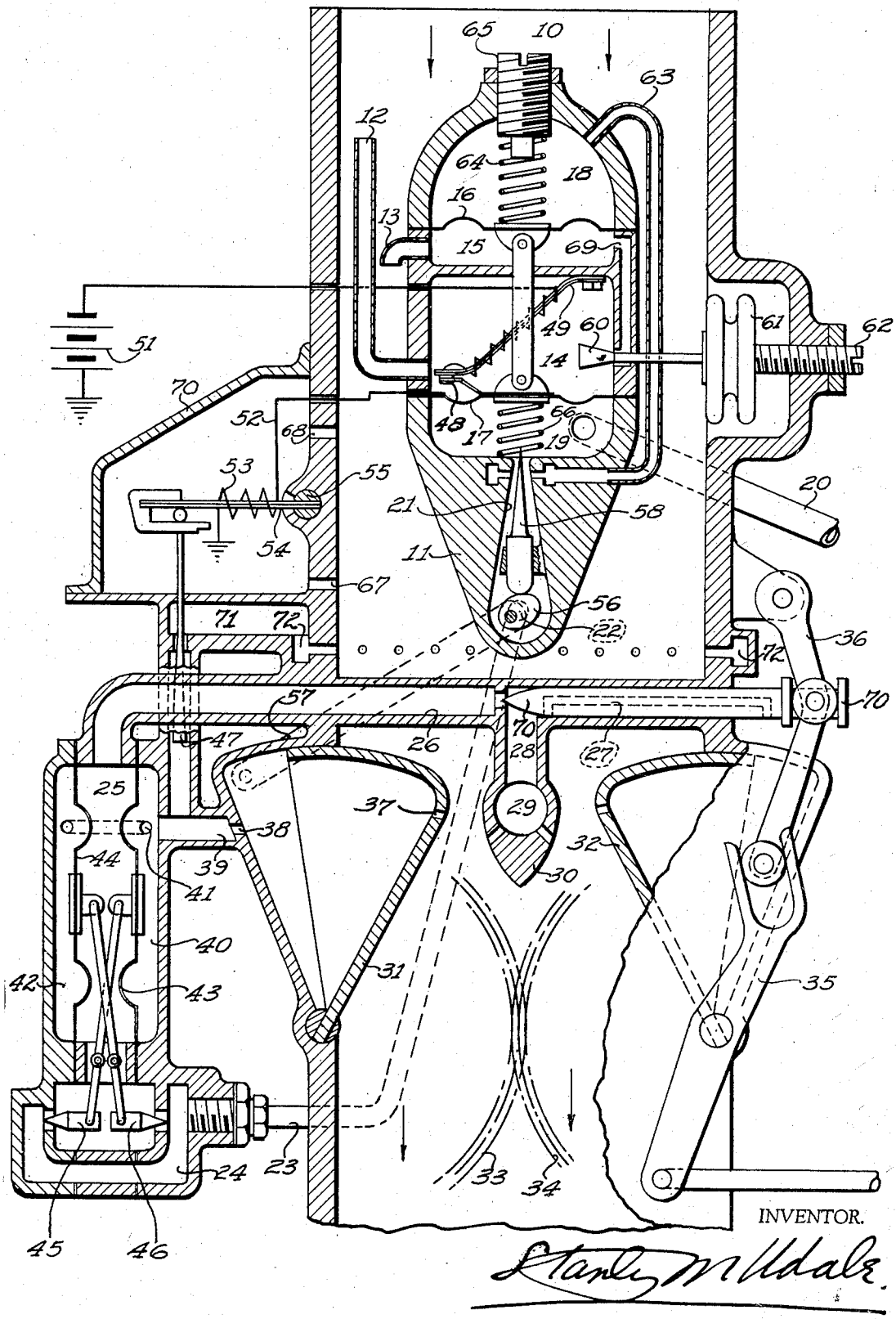
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FUEL REGULATOR FOR AIRCRAFT CARBURETORS

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FUEL REGULATOR FOR AIRCRAFT CARBURETORS

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2 Claims. (Cl. 261—39)

This application is in part a substitution for application filed July 23, 1940, Serial No. 346,973.

The object of this invention is to semi-automatically control the mixture ratio at any desired figure, so that if the pilot manually selects any given mixture ratio, the device will automatically change to and hold the mixture ratio at that desired figure.

In said drawing:

The figure shows diagrammatically the application of the device to a well known airplane carburetor.

In the figure 10 is the air entrance; 11 is a streamlined bridge in the air entrance forming an annular Venturi passage. The pilot tubes 12 and 13 are arranged so that they transmit pressures, the difference between which will vary with the velocity squared times the density of the air. The pilot tube 12 facing upstream communicates with the chamber 14. The pilot tube 13 facing downstream communicates with the chamber 15. A diaphragm 16 forms the upper wall of the air chamber 15. The diaphragm 17 forms the lower wall of the air chamber 14. A fuel chamber 18 is located above the diaphragm 16. A fuel chamber 19 is located below the diaphragm 17. A rod 71 connects the two diaphragms 16, and 17 together.

The fuel enters through the pipe 20 into the chamber 19, flows through the venturi 21 to the fuel outlet 22, whence it flows through the pipe 23 to the fuel entrance 24 to the diaphragm chamber 25. It flows through the outlet 26 past the needle 27 down the passage 28 through the nozzle 29 whence it discharges into the variable venturi formed between the streamlined central portion 30 and the streamlined throttles 31 and 32 which are connected together by the gears 33 and 34 in a well known manner.

A lever 35 is mounted on the throttle 32 and is also connected to the lever 36 which is in its turn connected to the needle 27 so that as the throttles 31, 32 are opened, the needle 27 is also opened. The throttle 31 has an opening 37 located in the throat of the variable venturi. The vacuum is thus transmitted through the restriction 38 to the passage 39 which communicates with the chamber 40 which is connected through the passage 41 with the chamber 42. The chamber 40 is bounded on its left hand side by the diaphragm 43. The chamber 42 is bounded on its right hand side by the diaphragm 44. The fuel chamber 25 is therefore located between the diaphragms 43 and 44. These diaphragms are connected through the usual mechanism with the fuel inlet valves 45 and 46. A metering valve 47 controls the admission of air from a passage 71 connected to an annular chamber 72 (vented to the air entrance) to the passage 39. Hence, the movement of the valve 47 will regulate the flow of fuel directly, indirectly therefore, it controls the mixture ratio. The diaphragm 17 carries a movable contact 48 which engages with the end of a bi-metallic strip 49 which is designed to deflect upwardly when heated. This bi-metallic strip 49 is surrounded by a heating coil connected through the conductor 50 with the storage battery 51. The contact 48 is connected through the conductor 52 with the heating coil 53 which surrounds the bi-metallic strip 54 which is designed to deflect upwardly when heated and is mounted in the pin 55 which is rigidly mounted in the wall of the intake passage 10. To correct for altitude well known means are used namely, a pressure responsive element 61, a valve 60, an adjustable element 62 and a bypass 69. The bypass 69 if unrestricted would cause the chambers 14 and 15 to be in equilibrium.

In order to vary the mixture ratio, a cam 56 is provided operated by lever 57. This cam engages with a needle 58 which varies the size of the throat of the venturi 21.

Operation

The thermostatic element 54 is designed so as to move clockwise that is to say, upwardly under the influence of the heating current in the coil 53. The valve 47 therefore descends and opens up the passage when heating current ceases to flow around the coil 53. This occurs when the contact is open between 48 and the end of the thermostatic bi-metallic element 49. This causes an increase in flow of fuel and the mixture ratio becomes richer. This increase in fuel flow through the venturi 21 causes an increase in the depression in the chamber 18. This causes the diaphragm 16 to rise. This causes the contact 48 to engage, therefore the current once more flows around heating coil 53. The thermostatic element 54 thereupon heats up and the valve 47 rises and the flow of fuel is thus reduced. Equilibrium is therefore reached determined by the size of the venturi 21 relative to the size of the annular air venturi into which the pilot tubes 12 and 13 project. When this mixture ratio is to be varied, the lever 57 is moved. When it is moved downwardly, the needle 58 rises and restricts the throat of the venturi 21. When this happens, a smaller flow of fuel will balance a given airflow; in other words, the valve 47 will be

an equilibrium when the mixture ratio is lean and of course, the reverse happens, when the needle valve 58 moves in the reverse direction.

What I claim is:

1. A carburetor having an air metering venturi of fixed throat area, a chamber located out of the airstream and connected to the throat of said venturi, a second chamber also located out of the airstream and connected to a portion of the airstream having a relatively low air flow velocity, a fuel venturi of fixed size, a chamber located out of the fuel stream and connected to the throat of said fuel venturi, a second chamber also located out of the fuel stream and connected to a portion of the fuel stream having a relatively low rate of fuel flow, means including two diaphragms connected together and responsive to the pressure differences in said four chambers and adapted to balance the pressure drop in the throat of the fuel venturi against the pressure drop created in the throat of the air venturi, an electric circuit, an electrical contact carried by one of the diaphragms and located in said circuit, a heating coil in said circuit, a heat responsive element associated with said heating coil, an electric contact mounted on said element and adapted to engage with the contact on the diaphragm, a second electrical heating coil, a second heat responsive element associated with the second heating coil, a fuel flow control valve connected to the second heat responsive element, the second electrical heating coil being in circuit with the first electrical heating coil and with the two contacts whereby when the ratio of fuel flow to air flow increases as measured by the unbalanced fuel and air pressure acting upon the said diaphragms, the second heat responsive element is heated and deformed so as to move the fuel flow control valve in the direction which will cause a reduction in fuel flow.

2. A carburetor as set forth in claim 1 in which there are means for varying the area of the throat of the fuel venturi for the purpose described.

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