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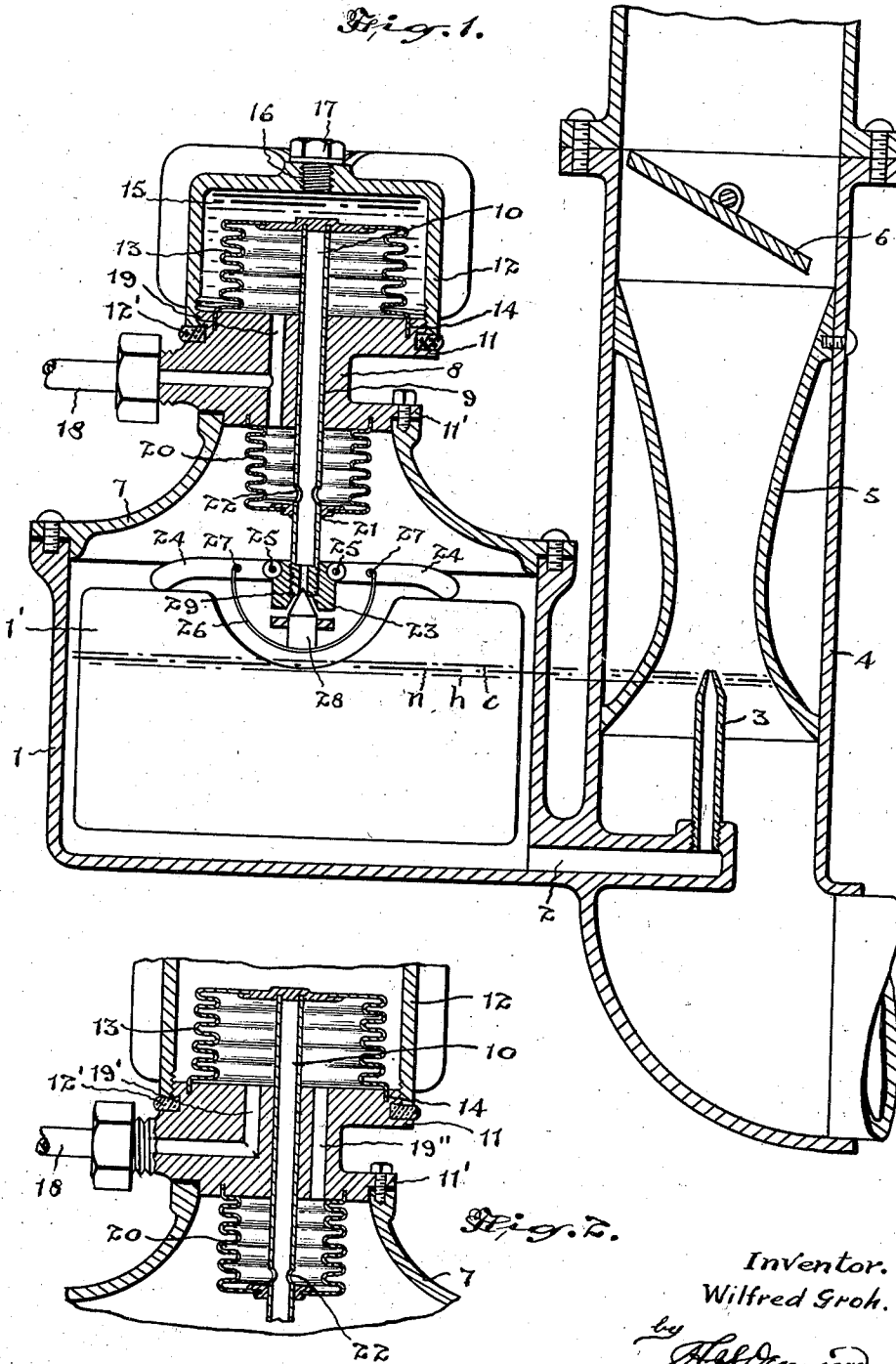
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AUTOMATIC CONTROL FOR FUEL MIXING DEVICES

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Fig. 1.



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AUTOMATIC CONTROL FOR FUEL MIXING
DEVICES

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12 Claims. (Cl. 137—104)

This invention relates to improvements in carburetors or fuel mixing devices and more particularly to means for thermostatically controlling the ratio of fuel and air in accordance with prevailing atmospheric temperatures.

The principal object of this invention is to provide an improved form of mechanism which will automatically control the level of the fuel in the float chamber in relation to the fuel jet or jets in response to changes in atmospheric temperatures and to provide a form of device for this purpose which will function in a dependable manner and will not be subjected to detrimental hammering or vibratory actions when associated with a fuel feed supply of the widely used pulsating pump type.

The principal feature of the invention resides in the novel construction and arrangement of parts whereby the valve means supplying fuel to the float bowl or chamber is thermostatically shifted in relation to the controlling float to regulate the height at which the float will close the supply valve.

Figure 1 is a mid-sectional elevational view of a control mechanism constructed in accordance with the present invention and incorporated in a carburetor structure.

Figure 2 is a fragmentary sectional view showing a modified arrangement of fuel circulating passages.

It is extremely desirable, particularly in the operation of combustion engines of motor cars, to ensure a constant ratio of fuel and air being fed to the engine irrespective of the wide variations encountered in atmospheric temperatures.

This problem has been recognized for some time and various means have been proposed in order to overcome the difficulty with varying degrees of success.

It has been previously proposed to provide thermostatic means for automatically adjusting the "choke" to regulate the volume of air entering the engine and it has also been proposed to thermostatically regulate the actual volume of fuel entering the jet of the carburetor, but so far as I am aware I am the first to propose a means whereby the actual level of the fuel in the carburetor bowl or chamber is automatically regulated in accordance with prevailing temperatures as a means of increasing or diminishing the amount of fuel drawn from the jet or jets in the operation of the engine.

While my invention is capable of wide structural variation and adaptation, I have shown for purposes of illustration a simple form of appara-

tus constructed in accordance with the present invention and referring to this illustrated construction, the float chamber 1 is shown provided with the usual fuel outlet 2 for conducting fuel to the jet or jets 3, which jet is shown disposed in the suction conduit 4 of the carburetor and encircled by a Venturi tube 5, the usual throttle 6 being shown for controlling the volume of the mixture passing to the engine.

A cover member 7 is fitted to the upper end of the float chamber 1 and has a central opening in which a guide block 8 is seated and suitably secured in place, a vertical guide bore 9 being provided therein for slidably receiving and guiding a displaceable tube member 10.

The upper end of the block 8 is provided with a circular threaded flange 11 to which an inverted cup-shaped housing 12 is threadedly secured, thereby forming a chamber above the block 8 into which the upper end of the tube 10 extends.

A bellows member 13 here shown of deeply corrugated form has the upper end closed and operatively secured to the upper extremity of the tube 10 and the lower end of the bellows is suitably sealed to the flange 11 preferably by being soldered into a groove therein as shown at 14.

The space between the element 13 and the casing 12 forms a chamber 15, which, according to the present invention, I propose to fill with mercury, alcohol or any other suitable fluid medium having the desired characteristics of expansion and contraction in response to temperature changes and this fluid medium may be introduced through the opening 16 in the top which will then be sealed by a suitable screw plug 17.

I preferably completely fill the chamber 15 to the exclusion of all air so that any expansion of the fluid medium will effect a positive and non-yielding downward displacement of the tube 10 and such filling preferably is accomplished with the fluid medium at a temperature substantially corresponding to the temperature of the surrounding atmosphere and that of the structure.

The housing 12 is here shown provided with heat exchange fins adapted to contact extensively with the atmosphere as a means of encouraging the conduction of heat to and from the atmosphere and the fluid medium in the chamber 15, and as a means of changing the actual volumetric capacity of the chamber 15, I have shown a rubber or other resilient sealing ring 12' interposed between the flange 11 and bottom of the cylindrical housing 12 which will retain an effective seal at this point, while permitting threaded adjusting the casing 12 to thereby effect changes

in the volume of the chamber 15 as a means of effecting an adjustment of the vertical positioning of the tube 10.

A fuel supply tube 18 directs fuel into a vertical passage 19 in the block 8, which passage leads upwardly into the interior of the bellows 13 and downwardly into the interior of a second and smaller bellows 20, which is here shown sealed at its upper end to the lower flange 11' of the block, while the lower end of the bellows 20 has the tube 10 extending therethrough and sealed thereto as indicated at 21.

The fuel thus entering the lower bellows 20 is allowed to pass into the tube 10 by way of the ports 22 therein and the fuel flows from the lower end of the tube 10 in a controlled manner as hereinafter defined.

The lower end of the tube 10 has mounted thereon a sleeve 23 having radially disposed toggle arms 24 pivotally connected therewith at 25.

A semi-circular stirrup 26 preferably of a resilient nature, is pivotally linked at its end to the toggle members 24 as indicated at 27 and this stirrup element extends down directly below the bottom extremity of the tube 10 and carries a needle valve 28 which cooperates directly with a valve seat 29 arranged in the lower extremity of the tube.

The outer ends of the toggle member 24 are adapted to rest directly on the float 1' so that as the fuel level rises in the float chamber the arms 24 will be swung upwardly on their pivots 25 so that the spring stirrup 26 will move the valve 28 to close the outlet from the tube 10 and with the parts in the position shown it is assumed that the fuel level is at a mean height indicated by the letter *n* and the prevailing temperature may be assumed to be say, 40° F.

Assuming now that a considerably lower temperature is encountered, then there will be a resultant contraction of the fluid medium in the chamber 15 causing an upward lift on the tube 10 unsealing the lower end thereof from the valve 28 and allowing fuel to flow into the float chamber until the float again raises sufficiently to close the valve 28, thereby raising the fuel level, for example, to the line *c*.

If, on the other hand, an increase in temperature in the atmosphere is encountered above normal, then there will be a resultant expansion of the fluid medium in the chamber 15, thereby forcing the tube 10 downwardly to cause the valve 28 to close with a lower float position, so that the fuel level will approximate that indicated by the letter *h*.

After careful experimentation I have found that by controlling the actual fuel level in the float chamber a proportionate increase or decrease in the amount of fuel drawn from the jet 3 results, so that the fuel air mixture passing to the engine may be accurately regulated.

Moreover it will be observed that the pressure of the fuel supply entering the port or passage 19 will be impressed with somewhat greater upward force on the tube 10 due to the greater end area presented by the upper bellows 13 relative to that presented by the lower bellows 20 and this effectively offsets the weight of the tube 10 and associated parts. When fuel is fed to the passage 19 in a pulsating manner it will be seen that this pressure will be distributed upwardly and downwardly into the respective bellows and this in conjunction with the weight of fuel resting in the lower bellows 20 will effect a substantially balanced condition and it is to be further

observed that with the chamber 15 completely filled with a liquid expansion medium, this will effectively offset any inclination for the tube 10 to be vibrated or pulsated axially, so that detrimental vibration will not be imparted to the parts suspended on the lower end thereof, which would tend to interfere with the positive positioning and heating of the cooperating elements, producing wear and strain on the parts.

It will also be observed that any air or vapor trapped in the upper end of the bellows 13 and tube 10 will act as a cushioning medium, effectively absorbing or damping out the pulsating surges of the fuel as it is fed to the carburetor.

The fuel entering the upper bellows 13 will have a heat exchange relation to the fluid medium in the chamber 15 through the metallic bellows 13 and will therefore have a controlling effect on the positioning of the tube 10 as will be readily appreciated and in Figure 2 I have provided for a positive circulation of the fuel through the upper bellows 13 by way of the passage 19' and a passage 19'' conducts the fuel from the upper bellows 13 to the lower bellows 20.

What I claim as my invention is:—

1. The combination with a fuel mixing device having a fuel supply chamber and a jet or jets supplied thereby and a fuel supply line through which fuel is adapted to be supplied under pressure, of means for automatically regulating the level of the fuel in said chamber supply relative to the jet or jets in accordance with changes in atmospheric temperatures, said means including an expansile chamber in pressure communication with the interior of said fuel line, and means for restricting displacement of said expansile chamber due to the fuel pressure thereon.

2. The combination with a fuel mixing device having a float chamber for supplying fuel thereto at a predetermined level and a fuel supply line through which fuel is adapted to be supplied under pressure, of means for automatically varying the effective fuel level in said float chamber in accordance with changes in atmospheric conditions, said means including a pair of pressure-responsive bellows arranged in opposition having their interiors connected together and to the interior of said fuel supply line.

3. Means as claimed in claim 2 in which said automatic means includes a float-controlled valve means for controlling entry of the fuel into said float chamber, said valve means having a common operative connection with said pressure-responsive bellows and adjustably supported thereby for positioning said valve means relative to the float.

4. In a fuel mixing device, a fuel supply chamber for feeding said device, a float in said chamber, a valve structure operatively associated with said float including a part displaceable to control the entry of fuel into said chamber, thermostatically responsive means for bodily shifting said part of the valve structure relative to a second part thereof and to said float to regulate the effective level of the fuel in said chamber, said thermostatically responsive means comprising a pressure responsive member separate from said float and operatively connected with said displaceable valve part, a fuel supply line through which fuel is adapted to be supplied, under pressure, and pressure responsive means directly connected with the fuel line for pressure actuation by the fuel and operatively associated with said displaceable valve part to influence the thermo-

static positioning thereof in accordance with the prevailing fuel pressure in said line.

5 5. Means as claimed in claim 4 in which said displaceable valve part includes a fuel supply tube communicating with said fuel line and axially displaceable toward and away from said float and having the displaceable valve part mounted thereon for co-operation with said second valve part, said second valve part being operatively connected with said float.

10 6. In a fuel mixing device for combustion engines, a fuel supply chamber having a float therein, a fuel supply tube axially slidable toward and from said float, means forming a pressure chamber into which said tube extends, a pressure responsive bellows in said chamber operatively connected with said tube, an expansile fluid surrounding said bellows and filling said pressure chamber, and fuel control means operatively interposed between the said tube and float for controlling the entry of fuel into said fuel supply chamber.

20 7. Means as claimed in claim 6 in which means is provided for adjusting the volumetric capacity of said pressure chamber to adjust the axial position of said tube.

25 8. Means as claimed in claim 6 in which the means forming said pressure chamber includes a cup-shaped housing having a threaded connection with a fixed part of the device, a compression seal being interposed between said housing and fixed part to maintain a seal therebetween while permitting threaded adjustment of the housing whereby adjustment of the said tube is provided for.

30 9. In a fuel mixing device, a float chamber, a float in said chamber, a tube axially slidable having a valve seat adjacent said float, means for directing a supply of fuel into said tube, a valve co-operating with said valve seat, toggle members mounted on said tube and operatively engaged by said float, means operatively connecting said toggle means with said valve member, and pressure responsive means operatively connected with said slidable tube for axially positioning the same, said tube being slidably mounted in a guide block and the means for conducting fuel to said tube including a bellows sealed at one end to the tube and at the other end to said guide block, said bellows forming a receptacle for the fuel supply and said tube having ports leading therefrom to the float chamber.

10. In a fuel mixing device, a float chamber, a float in said chamber, a tube axially slidable having a valve seat adjacent said float, means for directing a supply of fuel into said tube, a valve co-operating with said valve seat, toggle members mounted on said tube and operatively engaged by said float, means operatively connecting said toggle means with said valve member, and pressure responsive means operatively connected with said slidable tube for axially positioning the same, said pressure responsive means comprising a bellows operatively connected with said tube and having its interior open to the fuel supply.

15 11. In a fuel mixing device, a float chamber, a float in said chamber, a tube axially slidable having a valve seat adjacent said float, means for directing a supply of fuel into said tube, a valve co-operating with said valve seat, toggle members mounted on said tube and operatively engaged by said float, means operatively connecting said toggle means with said valve member, and pressure responsive means operatively connected with said slidable tube for axially positioning the same, the means for operatively connecting the toggle arms with the valve member comprising a spring stirrup member of bowed form having the ends pivotally linked to the respective toggle arms.

20 12. In a fuel mixing device, a float chamber, a float in said chamber, a tube axially slidable having a valve seat adjacent said float, means for directing a supply of fuel into said tube, a valve co-operating with said valve seat, toggle members mounted on said tube and operatively engaged by said float, means operatively connecting said toggle means with said valve member, and pressure responsive means operatively connected with said slidable tube for axially positioning the same, said tube being slidably mounted in a guide block and the means for conducting fuel to said tube including a bellows sealed at one end to the tube and at the other end to said guide block, said bellows forming a receptacle for the fuel supply and said tube having ports leading therefrom, said pressure responsive means including a second bellows, means directing the fuel supply first into said second bellows in heat exchange contact therewith, and means conducting the fuel from said second bellows to the interior of said first-mentioned bellows.

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