Sept. 21, 1937. G. R. ERICSON 2,093,961

AUTOMATIC CARBURETOR

Filed Jan. 2, 1934 2 Sheets-Sheet 1

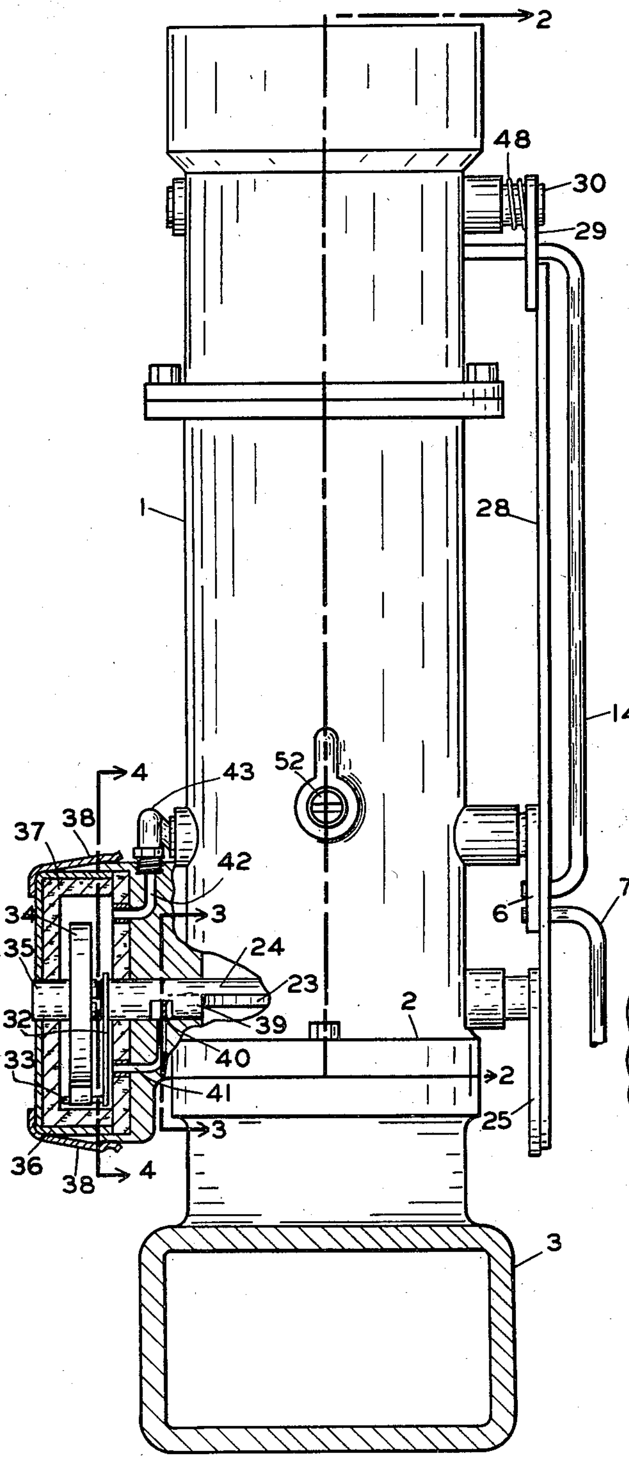

FIG. 1

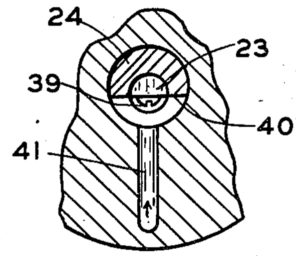

FIG. 3

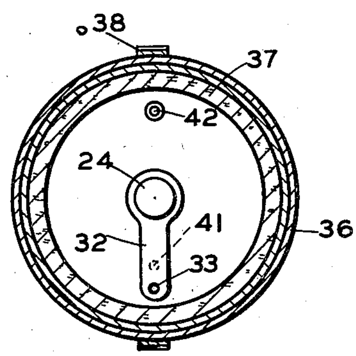

FIG. 4

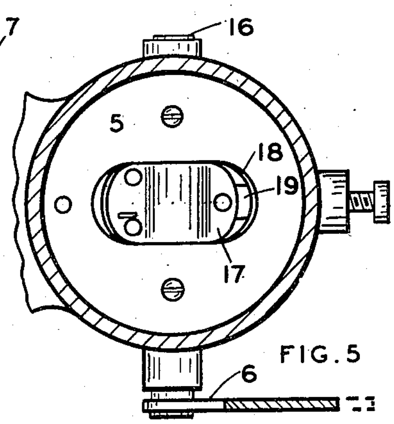

FIG. 5

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AUTOMATIC CARBURETOR

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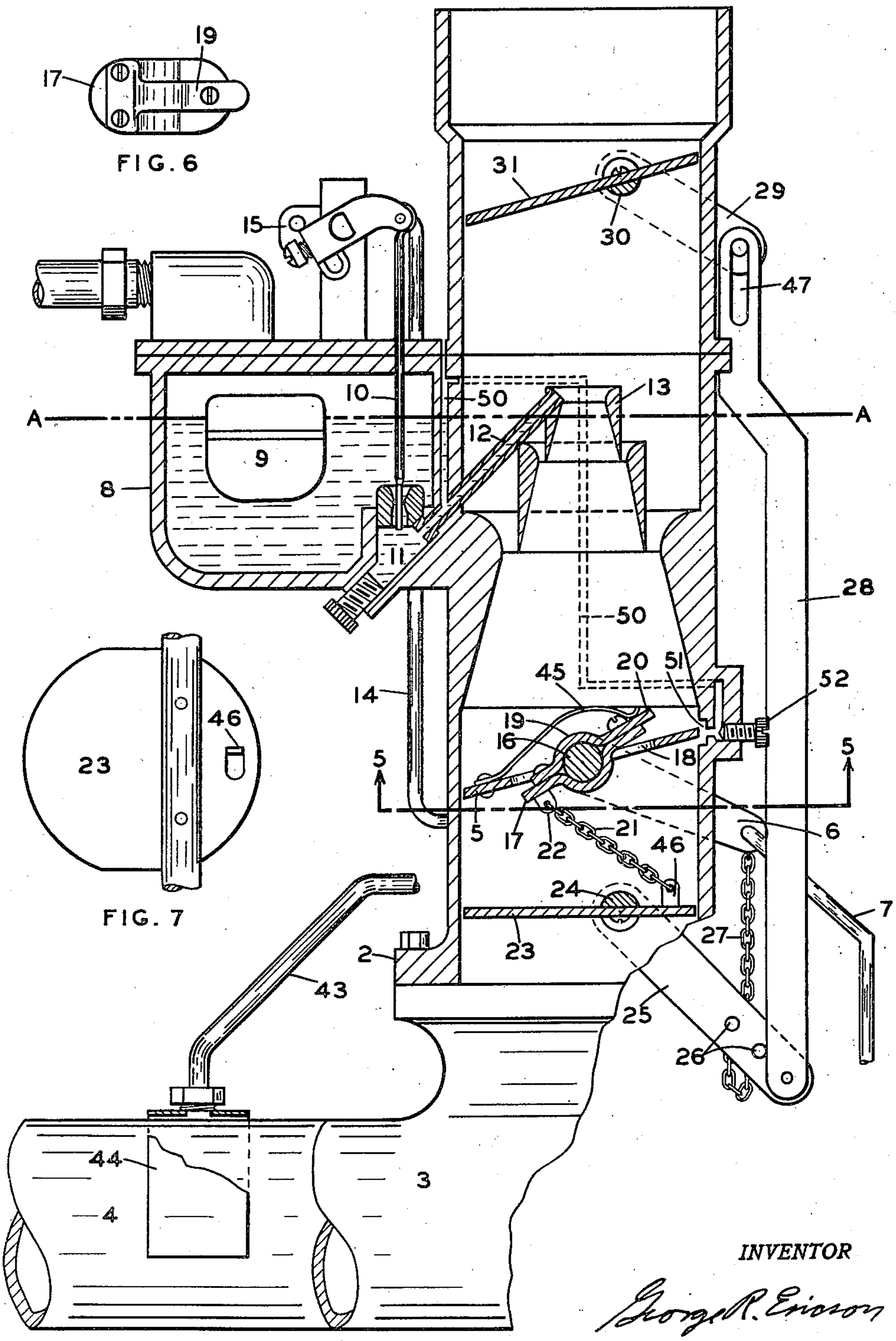

FIG. 6

FIG. 7

FIG. 2

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AUTOMATIC CARBURETOR

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Application January 2, 1934, Serial No. 704,940

10 Claims. (Cl. 261—39)

This invention relates to carburetors for internal combustion engines and particularly to devices for providing a substantially automatic mixture control. In previous devices of this character the mixture has been controlled by various devices most of which depend on the thermo-suction principle for their operation. Most of such devices have a suction operated choke valve at the air inlet of the carburetor and a thermostat to increase the tension to hold the choke valve in closed position when the temperature is low. Devices of this character are somewhat difficult to handle and are unreliable in action because of the fact that they are incapable of doing anything more than merely to increase the ratio of fuel to air in the mixture and also because the suction available in the air chamber is so low that the controlling means for the choke valve must be very delicate and sensitive in its operation with the result that small particles of dust or sand may seriously impede the operation of the mechanism. Devices of this character were also unsatisfactory because the mere control of the choke valve in response to variations in suction did not result in a proper fuel mixture ratio curve. It was necessary to have an extremely rich mixture prior to starting and then to change instantly to a slightly rich mixture as soon as the engine began to run, and there was some difficulty in getting the ratio to change quickly enough.

Another difficulty with previous constructions is that no satisfactory provision has been made for automatically insuring the admission of enough volume of mixture to operate the engine under low temperature conditions. Various throttle opening devices have been tried but great difficulty has been experienced in getting the throttle to shut down to the proper speeds at the proper times and finally to permit the throttle to close to a normal idle as soon as a normal operating temperature is reached.

It is the object of this invention to produce a carburetor in which the fuel mixture ratio is controlled not only in accordance with temperature and suction but also in accordance with velocity; that is in accordance with the volume of fuel being admitted to the engine.

It is a further object of this invention to produce a carburetor in which the amount of fuel admitted to the engine will be controlled in accordance with both temperature and the speed at which the engine is being operated.

Other objects of the invention will appear from the following description and accompanying drawings.

Figure 1 is an end elevation of a carburetor constructed according to my invention, parts being broken away and others shown in section.

Figure 2 is a sectional view taken along the lines 2—2 of Figure 1 looking in the direction of the arrows, parts being broken away and others shown in section.

Figure 3 is an enlarged sectional view taken along the line 3—3 of Figure 1 looking in the direction of the arrows.

Figure 4 is a sectional view taken along the line 4—4 of Figure 1 looking in the direction of the arrows.

Figure 5 is a sectional view taken along the line 5—5 of Figure 2 looking in the direction of the arrows.

Figure 6 is a detail view of the small valve which is a part of the throttle valve looking down.

Figure 7 is a detail view of the thermostatically controlled valve looking down.

The reference numeral 1 indicates the main body of a carburetor mounted by means of a flange 2 on the intake manifold 3 of an internal combustion engine. The exhaust manifold is shown at 4. The carburetor is provided with the throttle valve 5, controlled by a manually operated lever 6, and a connection 7 to the foot pedal.

Integrally formed with the main casting is a float bowl 8 containing the customary float 9, metering rod 10 and well 11. The gasoline is maintained at substantially the level A—A by the float 9 and is discharged through the main nozzle 12 at the throat of the venturi 13, which in this particular instance, discharges into other and larger venturis forming a multi-stage mixing chamber, an arrangement already well known in the art. The connection 14 between the throttle lever 6 and the rocker arm 15 serves to operate the metering rod 10 in accordance with the throttle position.

An idle passage 50 communicates with the float bowl 8 and the opening 51, which is so located that the throttle valve 5, when in closed position, divides the opening 51 into two sections. A manually adjustable screw valve 52 is provided as a means of adjusting the idle mixture.

Rotatably mounted on the throttle valve shaft 16 is a substantially eliptical valve 17 which fits into an opening 18 in the throttle valve 5. The throttle valve 5 is mounted rigidly on the shaft 16 by means of screws. Secured to valve 17 is a plate 19 protruding beyond the valve, as at 20, so as to form a stop for the valve 17 when in closed position.

Fixedly mounted on the throttle valve 5 is a flat spring 45 which contacts the plate 19 in such a manner as to tend to close the same against the throttle. A chain 21 is secured at one end to a lug 22 on valve 17 and at the other end is secured to the vaporizing valve 23 posterior to the throttle by means of a lug 46. Vaporizing valve 23 is mounted on a shaft 24 at one end of which is a lever 25 provided with holes 26 for attachment of a chain 27. The other end of the chain 27 is attached to throttle lever 6. Also attached to the lever 25 is the link 28 at the upper end of which is the slot 47 for attachment to choke lever 29.

The lever 29 and the choke valve 31 are mounted on the choke valve shaft 30. Also mounted on the shaft 30 is the spring 48 which tends to open the choke valve 31. At the end of the vaporizing valve shaft 24 opposite lever 25 is a lever 32 on which is a pin 33. A bi-metallic thermostatic coil 34 is attached at its outer or free end to the pin 33 and at the center to the pintle 35 which is fixedly mounted in the housing 36. The housing 36 is thermally insulated by means of cork lining 37. The housing is held in position by the spring clamps 38 and is so attached as to be rotatable in either direction for adjusting the thermostatic coil 34.

An eccentric passage 39 extends axially through the bearing portion of throttle shaft 24 adjacent lever 32 and opens radially through the shaft as at 40. A passage 41 connects the interior of the thermally insulated housing with opening 40 as described hereafter. Another passage 42 joins the interior of the housing with the conduit 43 connected to the hot air stove 44 which is mounted on the exhaust manifold 4.

In operation when the internal combustion engine, to which the carburetor is applied, is cold, the heat responsive bimetallic thermostat 34 will tend to close the vaporizing valve 23 and also the choke valve 31 as shown in Figure 2. If the throttle valve 5 is in closed position as indicated in the same figure, the chain 21 which is connected to vaporizing valve 23 will cause the opening of the small by-pass valve 17 against the tension of the flat spring member 45.

When the engine is cranked for starting purposes, suction is applied thru the intake manifold 3 to vaporizing valve 23 which may open slightly to permit the passage of air into the engine. The vaporizing valve 23 may have sufficient leakage so that if the temperature is extremely low there will be no opening of this valve during the cranking period, but in either case some air will be drawn down thru the carburetor, the choke valve 31 being closed or partially closed, a rich mixture of fuel and air will be supplied to the engine, the fuel being drawn by suction from the main nozzle 12 and from the idling discharge port 51. If the throttle is in the substantially closed position shown in Figure 2, the mixture will pass thru the opening 18.

As soon as the engine starts to run, a much higher suction will be applied to the vaporizing valve 23 which will have the effect of partially opening this valve and also the choke 31, admitting more air to lean out the fuel mixture. This will cause a slight but not complete closing of the valve 17, which is so designed with respect to the brackets 22 and 46 as to permit a fairly rapid operation of the engine during the warm up period. After the engine is fairly warm, the vaporizing valve 23 will be opened to a substantial extent, although perhaps not fully open and the by-pass valve 17 is then closed by the flat spring member 45. Opening of the throttle also permits valve 17 to close, but this will do no harm as sufficient mixture can flow to the engine thru the partially open throttle valve. When the engine has reached its normal operating temperature, the vaporizing valve 23 will be in its vertical or wide open position and the choke valve 31 will also be wide open. Choke valve 31 opens substantially before the vaporizing valve 23 due to the fact that the lever 29 is shorter than the lever 25 and also the valve 23 must travel 90 degrees to its full open position while the valve 31 must only travel about 75 degrees to its full open position. This will result in the elimination of the choking action of the valve 31 before the vaporizing action of the valve 23 is eliminated.

At all times, when the motor is below its normal operating temperature, the vaporizing valve 23 will be partially closed, thus giving a very substantial venturi effect or vaporizing action to the mixture which flows past it into the engine. It will be understood that the flexibility of the thermostat 34 permits the valve 23 to open and close under variations of suction applied thereto.

The heat supplied to the thermostat is controlled by the slotted opening 40 which acts as a valve. Air is heated under the stove 44 by the exhaust manifold on which it is mounted, and drawn up thru the passageway 43 into the thermostat housing where it flows over the coils of the thermostat into the passage 41, thru the opening 40 and thru the passage 39 into the lower end of the carburetor below the vaporizing valve 23. After the vaporizing valve 23 reaches its open position, the flow of heat to the thermostat housing is wholly or partially cut off due to the fact that the shaft opening 40 passes out of registration with the end of the passage 41. In this manner, over-heating of the thermostat 34 is prevented.

The invention is not limited to the structure shown but may be modified in various respects as will occur to those skilled in the art, and the exclusive use of all such modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a carburetor, a throttle valve, a by-pass valve carried by said throttle valve, means comprising a spring carried by said throttle valve for normally holding said by-pass valve in closed position and means for temporarily opening said by-pass valve when the throttle valve is in closed position.

2. In a carburetor, a throttle valve, a by-pass valve carried by said throttle valve, means normally holding said by-pass valve in closed position and a heat responsive device for opening said by-pass valve.

3. In a carburetor, means forming a mixing conduit, said mixing conduit having an air inlet, a mixing chamber and a mixture outlet, a choke valve mounted in said air inlet, a fuel nozzle discharging into said mixing chamber, a throttle valve controlling said outlet, a vaporizing valve mounted posterior to said throttle, said vaporizing valve being eccentrically mounted on a shaft, a housing mounted at one end of said shaft, a heat responsive device mounted in said housing and adapted to control said shaft, a heating de-

vice for applying heat to said heat responsive device and means operated in accordance with the position of said shaft for controlling the operation of said heating device.

4. In a carburetor, a mixing conduit, a throttle valve in said mixing conduit, a by-pass for conveying a limited amount of fuel mixture around said throttle when it is closed, a valve controlling said by-pass, a liquid fuel nozzle discharging into said mixing conduit at a point anterior to said throttle, an unbalanced, suction controlled vaporizing valve in said mixing conduit posterior to said throttle, an operating connection between said vaporizing valve and said by-pass valve, and a heat responsive device for influencing said vaporizing valve.

5. In a carburetor, a mixing conduit, a throttle valve and a by-pass valve in said mixing conduit, a liquid fuel nozzle discharging into said mixing conduit at a point anterior to said throttle, a vaporizing valve in said mixing conduit, connections between said vaporizing valve and said by-pass valve, said vaporizing valve being eccentrically pivoted whereby it may be affected by suction, and a heat responsive device for controlling said vaporizing valve.

6. In a carburetor, a mixing conduit, a choke valve, a throttle valve in said mixing conduit, a liquid fuel nozzle discharging into said mixing conduit at a point anterior to the throttle, a by-pass valve for permitting the flow of fuel mixture through said mixing conduit under certain conditions when said throttle valve is closed, a vaporizing valve mounted in said mixing conduit, connections between said vaporizing valve and said by-pass valve, and connections between said vaporizing valve and said choke valve.

7. In a carburetor, a mixing conduit, a choke valve for controlling the admission of air to said mixing conduit, a throttle valve for controlling the flow of mixture through said mixing conduit, a by-pass valve for permitting the flow of fuel mixture under certain conditions when said throttle valve is closed, a vaporizing valve, connections between said vaporizing valve and said by-pass valve, and connections between said vaporizing valve and said choke valve, at least one of said choke and vaporizing valves being eccentrically mounted on a pivot in said mixing conduit in such a manner that an increase in suction will tend to move it toward open position.

8. In a carburetor, a mixing conduit, a throttle valve, a by-pass for conveying a limited amount of fuel mixture around said throttle when it is closed, a valve controlling said by-pass, a liquid fuel nozzle discharging into said mixing conduit at a point anterior to said throttle, a vaporizing valve, said vaporizing valve being mounted in said mixing conduit posterior to said throttle, and a connection between said vaporizing valve and said by-pass valve for influencing said by-pass valve.

9. In a carburetor, a mixing conduit, a throttle valve in said mixing conduit, a by-pass for said throttle valve, a valve controlling said by-pass, a liquid fuel nozzle discharging into said mixing conduit at a point anterior to said throttle, an unbalanced, suction controlled vaporizing valve in said conduit posterior to said nozzle, and an operating connection between said vaporizing valve and said by-pass valve.

10. In a carburetor, a mixing conduit, a choke valve for controlling the admission of air to said mixing conduit, and a throttle valve for controlling the flow of mixture through said mixing conduit, a by-pass valve for permitting the flow of fuel mixture through said conduit under certain conditions when said throttle valve is closed, a fuel vaporizing valve in said conduit, an operation connection between said vaporizing valve and said by-pass valve, a connection between said vaporizing valve and said choke valve, at least one of said choke and vaporizing valves being unbalanced whereby an increase in suction in said conduit will tend to move it toward open position, and a heat responsive device for closing at least one of said vaporizing and choke valves.

GEORGE R. ERICSON.