

March 23, 1937.

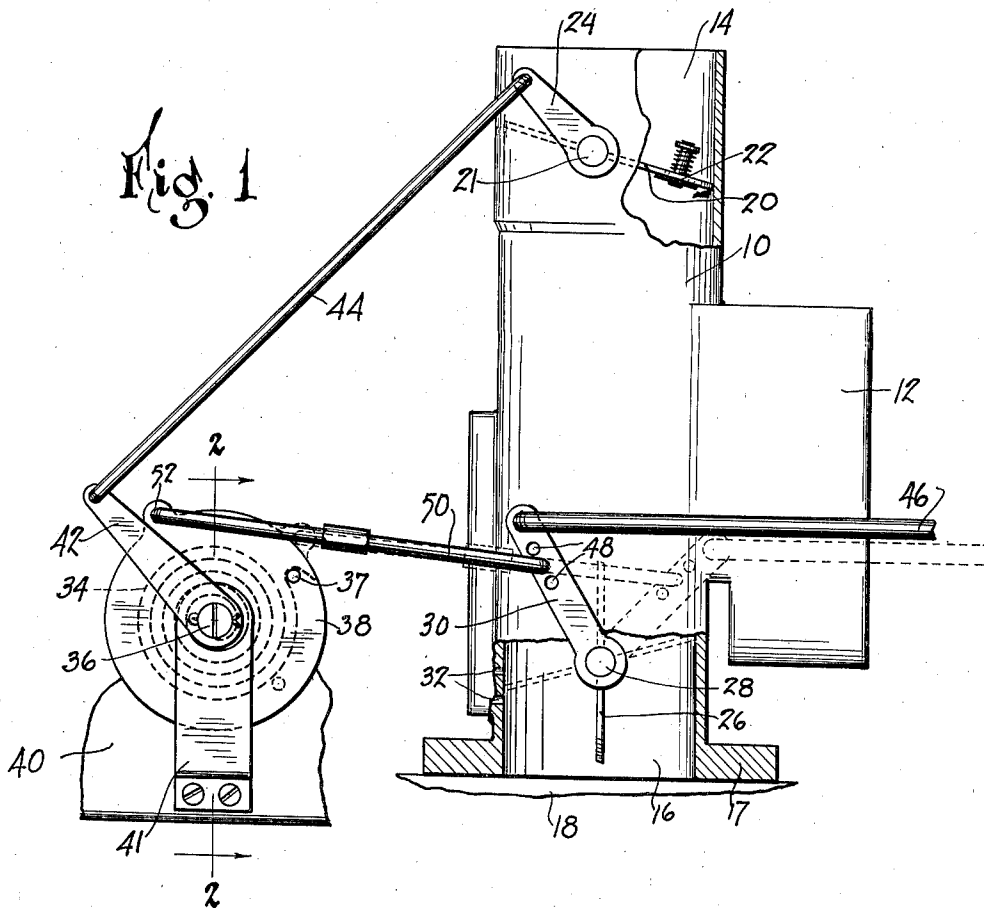
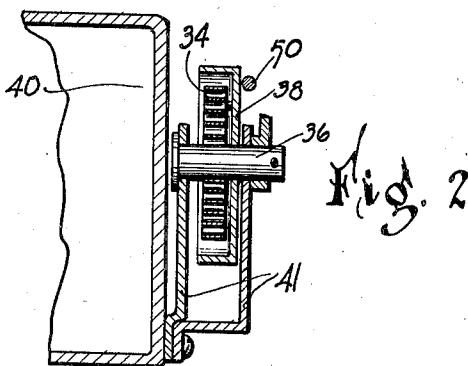
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2,074,728

CARBURETOR

Filed Dec. 22, 1932

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

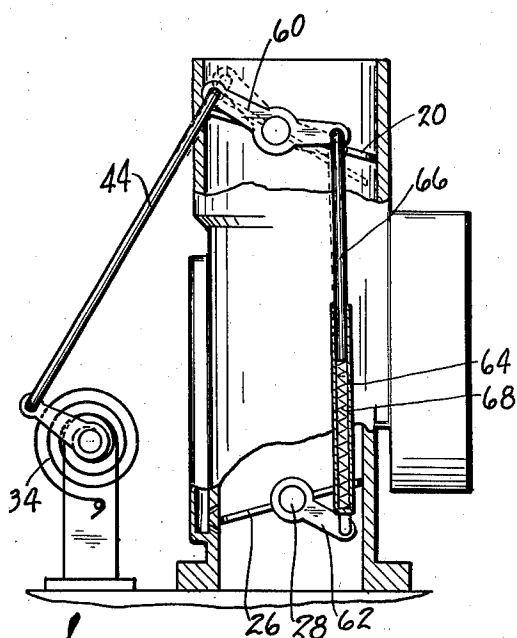


Fig. 3

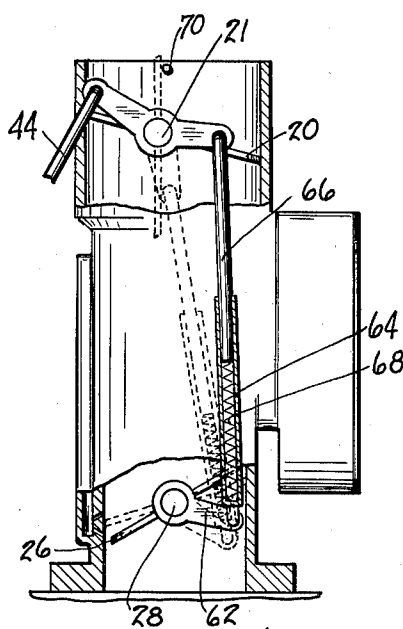


Fig. 4

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UNITED STATES PATENT OFFICE

2,074,728

CARBURETOR

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Application December 22, 1932, Serial No. 648,496

9 Claims. (Cl. 123—119)

This invention relates to carburetors, and has for its principal object the provision of an improved fuel control mechanism therefor.

Internal combustion engines using liquid fuel are usually provided with carburetors for mixing the fuel with air preparatory to burning in the engine. The carburetor usually has a control or choke valve which is operable to regulate the richness of the mixture, and a throttle for controlling the admission of the mixture to the engine. Certain prior art devices, of which the disclosure of the copending application of Hunt and Olson, Serial No. 575,025, filed November 14, 1931, is an example, provide a control mechanism for automatically regulating the richness of the mixture as a function of the temperature of the engine. In these devices there is usually a thermostat connected to the choke valve to bias it towards closed position under a tension which decreases as the temperature of the engine increases since the engine requires a richer mixture when it is cold than when it is hot. An internal combustion engine, particularly when it is working below its normal operating temperature, requires a richer mixture when it is operating under a heavy load, or is accelerating rapidly. Under both of these conditions the throttle is opened rather widely.

The present invention provides for increasing the richness of the mixture, as the throttle is opened, by connecting the throttle either to the thermostat so as to increase the tension thereof as the throttle is moved towards its open position, or to the choke valve in such a manner as to increase the tension of the thermostat as the throttle is opened, and the choke valve is partially closed by this increase in tension to restrict the air flow and increase the suction posterior to the choke valve and permit more fuel to be drawn into the mixture.

My invention will be best understood by reference to the accompanying drawings in which a preferred embodiment of it is shown by way of example and in which:

Figure 1 is an elevational view of a carburetor, partly in section and showing the control mechanism of my invention applied thereto;

Figure 2 is a cross sectional view taken through the thermostat along the line 2—2, looking in the direction of the arrows.

Figure 3 is an elevational view, partly in section, showing a modified form of the invention with the throttle in closed position; and

Figure 4 is a view similar to Figure 3 but showing the throttle in starting position.

The carburetor shown in Figure 1 is a plain tube down draft carburetor having a main tube 10, a fuel chamber 12, an air inlet horn 14, and a mixture outlet horn 16 which is flanged at 17 to facilitate attachment to an intake manifold 18. An unbalanced choke valve 20 is located in the inlet horn, being pivotally mounted for rotation therein on the shaft 21. The valve 20 is provided with a poppet valve 22, of known construction, through which a small quantity of air enters the mixing chamber when the valve is closed. An arm 24 is fixed on the shaft 21 to facilitate operating the valve.

A throttle valve 26 is pivotally mounted in the mixture outlet horn 16 by the shaft 28, and an arm 30 is fixed upon the shaft to facilitate rotating the valve. When closed, the throttle quite completely blocks the outlet horn 16 and mixture for idling the motor is drawn through the idling nozzle 32 which by-passes the throttle.

The control mechanism comprises a thermostat 34, one end of which is fixed to a rotatable shaft 36, and the other end is fixed by a pin 37 to the casing 38 in which the thermostat is enclosed. The casing 38 has an open face disposed adjacent to the exhaust manifold 40 of the engine. As shown the thermostat and casing are mounted directly upon the manifold by a suitable bracket 41, this arrangement being shown by way of example only as the thermostat will usually form a part of a control unit mounted adjacent to or incorporated in the carburetor.

Shaft 36 carries an arm 42, fixed thereto, and a rod 44 is pivotally connected to the free end of the arm 42 and to the free end of the choke valve arm 24. When the manifold is cold, thermostat 34 is tensioned to rotate the shaft 36 in a counterclockwise direction and move the arms 42 and 24 to close the valve 20. As the manifold heats up the tension of thermostat 34 decreases and valve 20 is opened further by the pressure difference on its faces.

The usual throttle control rod 46 is connected to the free end of arm 30 to enable the operator to move the throttle from its closed position, in which it is shown in dotted lines in Figure 1, towards its open position, shown in full lines. Arm 30 is provided with a plurality of holes 48 into one of which is secured a rod 50, the free end of which is fixed at 52 to the thermostat casing 38. As the throttle is moved from its closed to its open position, rod 50 moves casing 38 in a counterclockwise direction about the axis of shaft 36, and the tension of thermostat is increased by this movement. Consequently, at a

given temperature, the valve 20 will be biased more strongly toward its closed position when the throttle 26 is open than when it is closed. Should the throttle be suddenly opened, to rapidly accelerate the engine from low speed, the inflow of air at such low speed will be insufficient to open the valve 20 against the force of the thermostat, thereby causing the control to function as an accelerating pump and increase momentarily the richness of the mixture. As the engine speeds up, however, the increasing air flow will gradually open the choke valve wider.

The amount of increase in the tension of thermostat 34 by a unit angular movement of the throttle may be adjusted by moving the arm 50 from one hole 48 to another. It is apparent that casing 38 will be rotated through the greatest angle, and the greatest increase in tension given to the thermostat, when the rod 50 is engaged with the outermost one of the holes 48. The rod is secured in the hole by suitable means such as a cotter pin, not shown, and when once set is not often moved from one hole to another.

As thermostat 34 warms up, the end of it which is hooked over pin 37 tends to move in a counterclockwise direction around the shaft 36. When the normal operating temperature of the engine is reached, preferably, the thermostat will have zero tension. Since the thermostat is associated with the exhaust manifold of the engine, it may be subjected to temperatures in excess of the critical temperature at which it is designed to impose zero tension on the pin 37. Since the end of the element is merely hooked over the pin 37, it is free to move in a counterclockwise direction away from the pin, that is to say, to unhook itself from the pin. When the element is unhooked, movement of the casing occasioned by opening and closing the throttle may have no effect upon the choke valve 20. The engine will then be warm enough to deliver its full power with the mixture prepared by the carburetor with the choke valve fully opened and further choking is not necessary. By setting rod 50 so as to move the casing 38 through a relatively wide angle as the throttle is opened, pin 37 may be moved into engagement with the hooked end of the temperature responsive element, and the thermostat tensioned to partially close the valve even though the engine is at normal operating temperature. Such an arrangement functions to increase the richness of the fuel mixture when the throttle is opened, such increase being but momentary because of the further heating of the thermostat by the increase in exhaust manifold temperature occasioned by the operation of the engine at wide open throttle.

In the modification of the invention shown in Figures 3 and 4, the shaft 21 of choke valve 20 carries a lever 60 to one end of which rod 44 is pivotally attached. The rod connects the thermostat 34 to the valve as before. Throttle shaft 23 carries a lever 62 and a tube 64 is pivotally connected to the free end of this lever. A rod 66 is fitted in the tube and pivotally connected to the other end of lever 60 on the choke valve shaft. Spring 68 fits within the tube 64 and is tensioned to bear against the end of rod 66 as will presently appear. By this arrangement spring 68 is connected in parallel with the thermostat.

In the operation of the modification, when the throttle is closed, to idle the engine, spring 68 should bear but lightly against the end of rod 66 so that the tension of thermostat 34 is prac-

tically all that is applied to the choke valve. Preferably the thermostat is adjusted so that the valve will be partially opened even when the engine is cold, so that the mixture will be sufficiently lean for idling. When the throttle is moved to starting position, in which it is shown in full lines in Figure 4, spring 68 bears against rod 66 with appreciable force to increase the tension holding the choke valve closed, and a rich mixture is produced for starting. As the throttle is opened to accelerate the engine while it is still below its normal operating temperature, the tension of spring 68 is added to the tension of the thermostat to increase the richness of the fuel mixture by partially closing the choke valve to compensate for the lowering of the vacuum in the carburetor. As soon as the temperature of the engine reaches normal the tension of the thermostat will be decreased sufficiently to permit the choke valve to be fully opened by the air pressure acting upon it, and brought into engagement with the stop 70. Under these conditions the axis of rod 66 is substantially aligned with the axis of choke shaft 21 and the tension of spring 68 cannot close the choke valve as the throttle is opened. Stop 70 may be positioned so that the line of thrust of the spring 68 is over center so that the valve 20 will be biased open by the spring.

My invention is not limited to the embodiments shown by way of example, and I am not to be limited except by the scope of the appended claims.

What is claimed is:

1. The combination with a plain tube internal combustion engine carburetor having a throttle and an air pressure actuated choke valve designed to become inoperative at normal operating temperatures, of temperature responsive means tensioned to bias the choke valve closed, and means associated with the throttle and temperature responsive means for increasing the force exerted on said valve by said temperature responsive means as the throttle is opened.

2. The combination with an internal combustion engine carburetor having an air pressure actuated air inlet valve and a throttle, of a thermostat tensioned to bias the valve closed when the engine is cold, and means associated with the throttle and thermostat for increasing the force exerted on said valve by said thermostat as the throttle is opened.

3. The combination with an internal combustion engine carburetor having an air pressure actuated choke valve and a throttle, of a thermostat tensioned to bias the valve closed when the engine is cold, and means operated by the throttle moving to open position and associated with the thermostat for increasing the force exerted on said valve by the thermostat.

4. A control mechanism for a carburetor having an air pressure actuated choke valve and a throttle, comprising means for controlling the degree of opening of the choke valve as a function of engine temperature, and means for modifying the degree of opening of the valve as an inverse function of throttle opening.

5. The combination with an internal combustion engine carburetor having an air pressure actuated choke valve and a throttle, of a casing, a thermostat element fixed to the casing and connected to the choke valve to bias the same closed when cold, and means operated by the throttle moving to open position when the engine is cold for moving said casing to increase the amount of said bias.

6. The combination with a carburetor having a choke valve and a throttle for regulating the richness and quantity of mixture delivered to an internal combustion engine, of a casing mounted adjacent to the exhaust manifold of the engine, a shaft journaled in said casing, a thermo-responsive element connected between said casing and said shaft and tensioned inversely as the temperature of the element, means connecting the shaft to the choke valve to apply said tension to bias the valve closed, and means connected to the casing and actuated by the throttle moving to open position to move the casing and increase the tension of the element.

7. A control mechanism for a carburetor having a rotatable choke valve and a rotatable throttle comprising, a thermostat connected to the valve and tensioned when cold to rotate the same, said thermostat being arranged to decrease said tension as the temperature of the same increases, and means connected to said throttle for moving the free end of the thermostat to increase the tension thereof as the throttle is opened.

8. In a control mechanism for an internal combustion engine carburetor having a choke valve and a throttle, means including a thermostat for governing the degree of opening of the choke valve as a function of the engine temperature, and means connected to the throttle for increasing the force tending to close the choke valve as a function of the opening of the throttle while the engine is cold.

9. In a control mechanism for an internal combustion engine carburetor having an air pressure operated choke valve and a throttle, a thermostat connected to the choke valve and tensioned to bias the valve closed, said tension decreasing to zero as the temperature of the engine rises to a critical temperature to permit the valve to be fully opened, and means connected to the throttle for increasing the tension of the thermostat to raise the effective critical temperature as the throttle is opened.

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