April 28, 1942. S. C. SMITH 2,281,176

CARBURETOR

Filed May 5, 1932 3 Sheets-Sheet 1

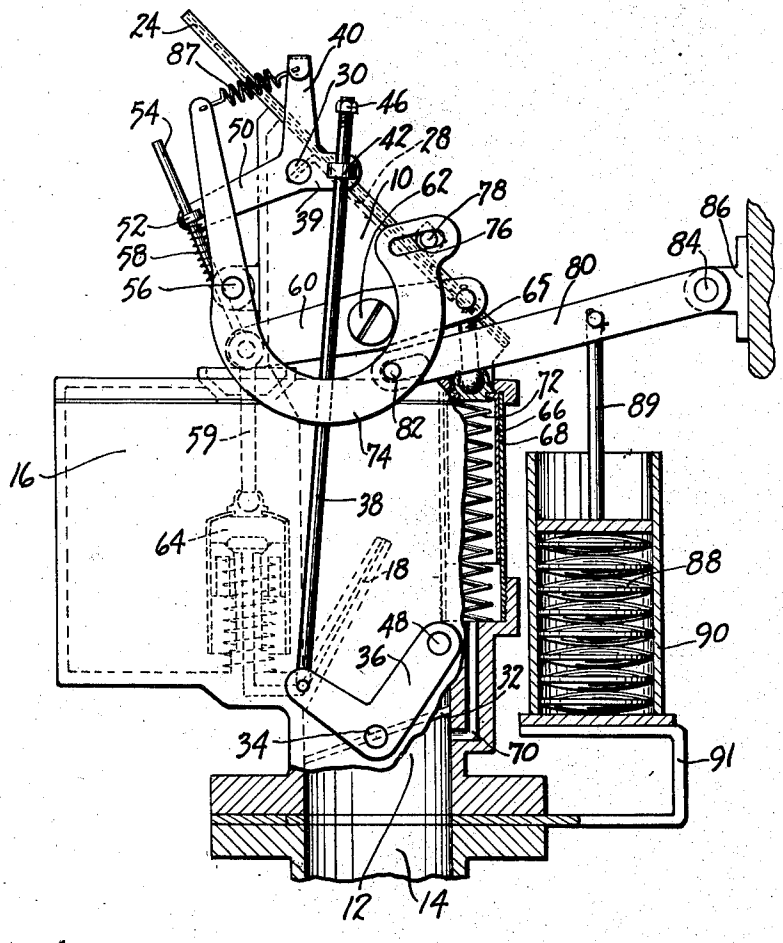


Fig. 1

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Fig. 2

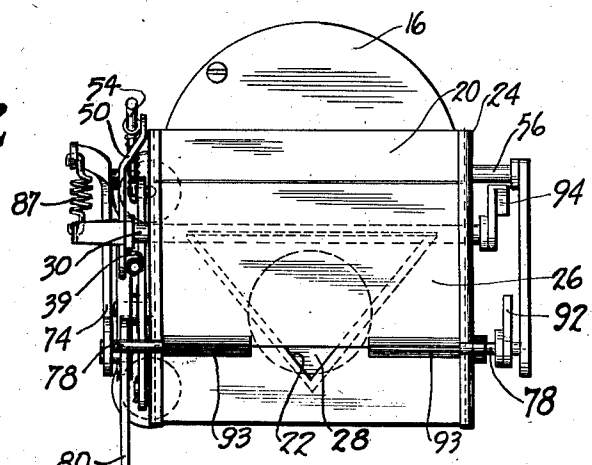
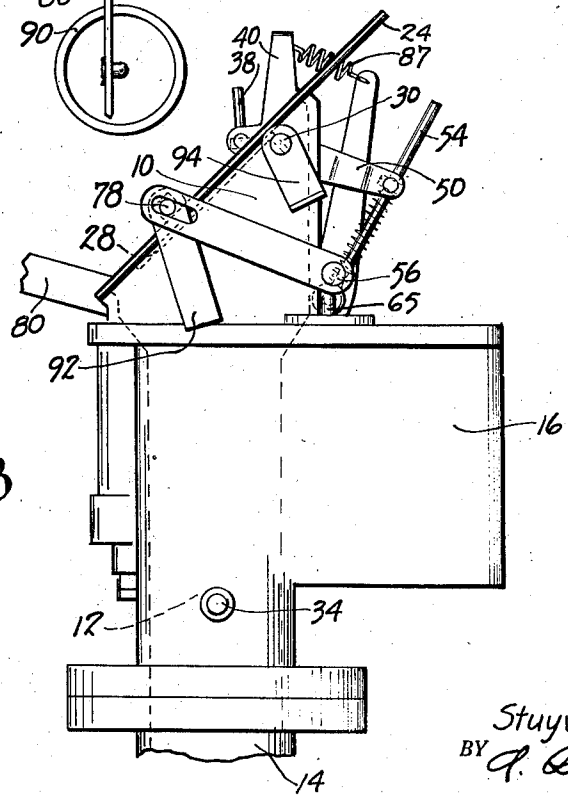


Fig. 3



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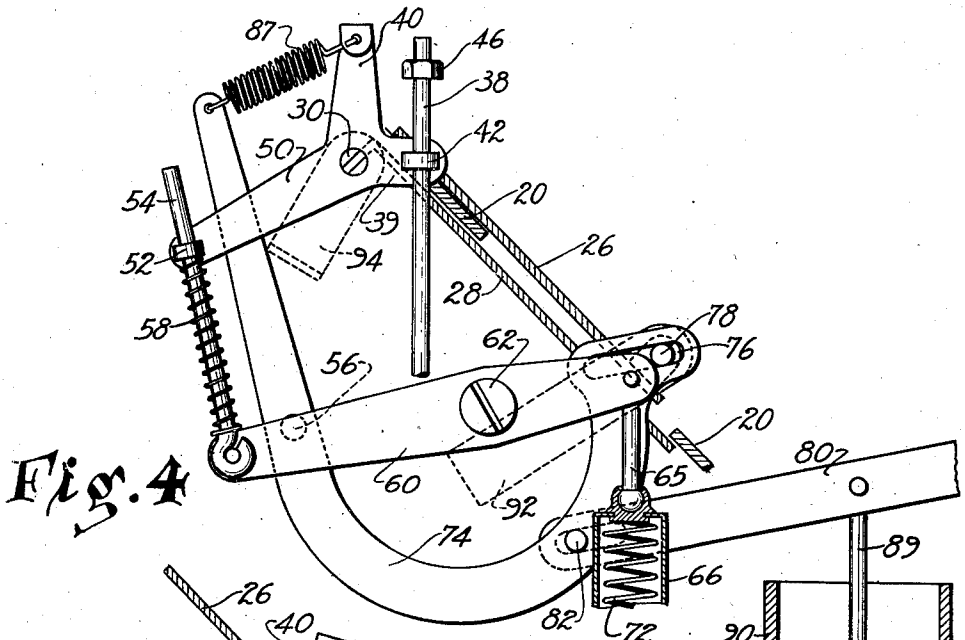


Fig. 4

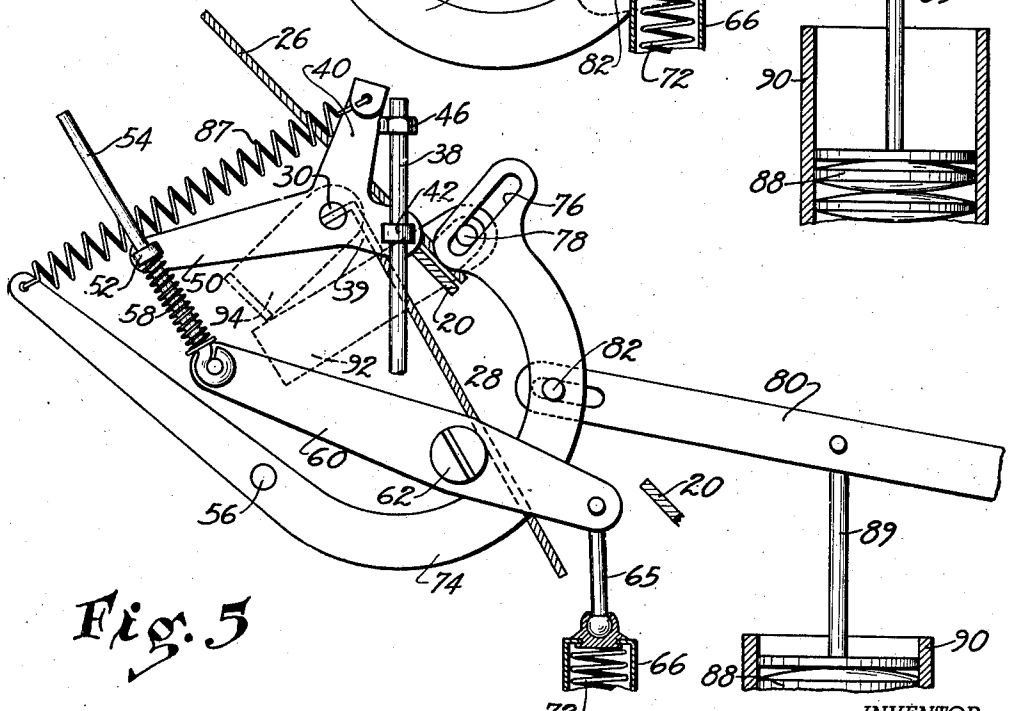


Fig. 5

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CARBURETOR

Stuyvesant C. Smith, South Bend, Ind., assignor to Bendix Aviation Corporation, South Bend, Ind., a corporation of Delaware

Application May 5, 1932, Serial No. 609,479

4 Claims. (Cl. 261—39)

This invention relates to carburetors, and has for its principal object the provision of mechanism for automatically controlling the carburetor choke valve in accordance with temperatures and pressures developed by the engine in its operation.

An object of the present invention is to provide a carburetor choke valve control which is completely automatic and which is actuated by the temperatures existing adjacent the carburetor and by the relative pressures between the choke valve and the throttle and posterior to the throttle.

An important feature of the invention consists in the actuation of the choke valve by the differential of pressures anterior and posterior to the throttle, the actuation being modified by the temperature.

Further objects and advantages of the invention will be apparent from the following description, taken in connection with the appended drawings, in which:

Figure 1 is a vertical section through a carburetor embodying the invention;

Figure 2 is a plan view of the same;

Figure 3 is a side elevation of the same; and

Figures 4 and 5 are partial, enlarged diagrammatic views of the device showing the choke valves in closed and open positions respectively.

The carburetor shown in the drawings is of the down draft type and comprises an air horn 10, mixing chamber 12, designed to be connected to an intake manifold 14, a fuel nozzle 18, and a float chamber 16. The carburetor also comprises a Venturi float mechanism, and other elements, but these are not shown in detail since they may be of any suitable construction.

The mouth of the air horn 10 is preferably formed with an inclined surface upon which is mounted a flat plate 20 having a triangular opening 22 therein and having its edges turned over as indicated at 24 to receive and retain a slide 26 forming a closure for the opening 22. A triangular flap valve 28 is hingedly mounted in the air horn, being fixed to a shaft 30, and is designed to form a yielding closure for the opening 22 as will be more fully described hereinafter.

A throttle 32 of any suitable design is mounted at the lower end of the mixing chamber on a shaft 34 to which is fixed a bell crank lever 36 one arm of which is connected by a link 38 to an arm 39 of a triangular lever 40 which is fixed to the shaft 30. Link 38 has a sliding fit in an ear 42 on the lever, and at its upper end is provided with a stop 46 to provide an overruning connection between shafts 34 and 30. The throttle is manually controlled by a suitable rod (not shown) connected to lever 36 at 48 in the usual manner.

An arm 50 of lever 40 is provided with an ear 52 in which slides a rod 54 pivoted at its lower end to a lever 60 which is pivoted at 62 to the air horn 10 and has one of its ends connected to the rod 59 of an acceleration pump 64 designed to supply additional fuel to the main nozzle 18. Arm 50 is urged upwardly by a coil spring 58 surrounding rod 54. The other end of lever 60 is connected by a link 65 to a piston 66 mounted in a cylinder 68 adjacent the mixing chamber and having a port 70 opening into the mixing chamber just below the throttle 32. Piston 66 is normally held in its lowermost position by suction acting against the force of a compression spring 72, but upon rapid opening of the throttle is drawn upwardly by the spring 72. This mechanism, together with that of the acceleration pump, is known in the art and no novelty is claimed for the construction per se.

A curved lever 74 is pivoted on a shaft 56 and at one end is provided with a slot 76 in which rides a shaft 78 fixed to slide 26, so that upon rotation of the lever 74 about shaft 56 as a pivot the slide is moved correspondingly to open and close the opening 22. Lever 74 is rotated by means of a lever 80 which has one of its ends pivoted at 84 to a stationary member 86 and its other end pivoted to lever 74 by a pin 82. A thermal control of lever 80 is provided by a thermostat 88, which may be of the either disk type as shown, mounted in a cylinder 90 positioned adjacent the exhaust manifold (not shown) of the automobile and connected to the lever 80 by a rod 89. Cylinder 90 is supported by a bracket 91. As the temperature of the thermostat 88 rises it will be seen that lever 80 is rotated about its pivot 84, thereby raising slot 76 of lever 74 and causing slide 26 to uncover opening 22 and admit additional air to the carburetor. A tension spring 87 connects the upper arm of bracket 49 to the upper end of lever 74.

Referring to Figures 2 and 3, it will be seen that shaft 78 is fixed to slide 26 by means of blocks 93, and a stop member 92 is fixed to shaft 78 and arranged to actuate a lever 94 fixed to shaft 30 and having a flange projecting into the path of member 92, so that as member 92 approaches the limit of its upward movement it engages lever 94 and rotates shaft 30 in the counterclockwise direction as viewed in Figure 3 to positively move valve 28 to its open position.

Prior to such engagement shaft 30 is free to rotate under the differential of air pressures acting on opposite faces of valve 28, but is restrained by the tension of spring 87.

Operation.—The positions of the parts shown in the drawings are those assumed when the outside atmosphere and the engine are at the lowest temperatures ordinarily encountered. At such temperatures, the thermostat 88 will hold lever 74 up in such position as to expose a portion of the opening 22. When the operator closes the starter switch, slide 26 is then near its closed position and valve 28 is yieldingly held closed by the tension of the spring 87, so that relatively little air is admitted to the carburetor. As the engine is driven by the starter the nozzle 18 is subjected to high suction, and the carburetor delivers a very rich mixture to the engine. As soon as the engine begins to fire the suction acting through port 70 increases sharply, drawing piston 66 downwardly and causing spring 58 to exert on the lever 40 a clockwise torque as viewed in Figure 1, thereby permitting the air pressure against valve 28 to open it and admit more air. In this condition of the carburetor, the valve 28 is oscillated between its closed and partially open position by the differential of air pressures acting on it, opening 22 being partially uncovered by slide 26. In this connection, it should be noted that with slide 26 partially opened and due to the triangular shape of flap valve 28, the air does not have the leverage to open the flap valve that it has when the engine is warmer, but can only act on the tip of the flap valve which has a relatively small area.

It should also be noted that opening throttle 32 beyond a certain point causes stop 46 to engage ear 42 and positively open valve 28. This compensates for the fact that at wide open throttle the vacuum at port 70 drops so low that it fails to hold the piston 66 down, so that valve 28 would tend to close when the throttle is opened. The arrangement shown, however, positively holds the valve 28 open at wide open throttle. It also permits the operator to relieve a flooded condition of the engine, by positively opening both the throttle and the choke to permit air to be pumped through the engine to carry away the excess fuel. When stop 46 engages ear 42 to rotate lever 40 clockwise (Figure 1), force is thereby applied through spring 87 which tends to move valve 26 toward its closed position, but the resulting movement of valve 26 will be relatively slight since spring 87 will yield much more readily than will thermostat 88.

As the engine gradually warms up with continued operation, thermostat 88 expands and through the mechanism above described gradually opens slide 26 to admit more air, while at the same time the tension on spring 87 is increased so as to compensate for the greater area of valve 28 which is uncovered. When the engine is fully warmed up, member 92 engages lever 94 and positively moves the valve 28 to its fully opened position, so that there is no restriction whatever on the influx of air when once the engine is fully warmed up.

Although the invention has been described with particular reference to a specific embodiment thereof, it may be embodied in other forms within the spirit of the invention and within the terms of the following claims. Thus, the invention is equally applicable to up draft carburetors and to carburetors having different types of acceleration devices, nozzles, and actuating mechanism. The arrangement of parts may be considerably varied and other changes will be apparent to those skilled in this art.

I claim:

1. In a carburetor, a choke valve adapted to be actuated by a differential of pressures on opposite sides thereof, resilient means tending to close the valve, means tending to close the valve upon increase in temperature, means responsive to suction posterior to the throttle for modifying the effect of the temperature-responsive means, and a second choke valve positioned anterior to the first named valve and connected to the second mentioned means to be operated thereby.

2. In an automatic control for carburetor choke valves, a casing formed of heat conducting material and connected with an engine so as to be readily responsive to the heating action of said engine, a thermostat element mounted in said casing, lever and link means connecting said thermostat element with an unbalanced carburetor choke valve, said link means being yieldable to movement of said choke valve in opposition to the tendency of said thermostat element.

3. In a carburetor, a throttle valve, a choke valve, a heat responsive member for operating said choke valve, and means for yieldably resisting the effect on said choke valve of said heat responsive member in accordance with an opening movement of said throttle valve.

4. In a carburetor for an internal combustion engine, a choke valve actuated by a differential of pressures on opposite sides thereof, means tending to close the valve upon increase in temperature, means responsive to suction posterior to the throttle for modifying the effect of the temperature-responsive means, said temperature-responsive means being adapted to fully open the valve at normal operating temperature of the engine, and a second choke valve connected to the first mentioned means to be operated thereby.

STUYVESANT C. SMITH.

CERTIFICATE OF CORRECTION.

Patent No. 2,281,176. April 28, 1942.

STUYVESANT C. SMITH.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 34, for "either" read --ether--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of August, A. D. 1942.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)