June 27, 1939. A. H. WINKLER 2,163,904

CARBURETOR

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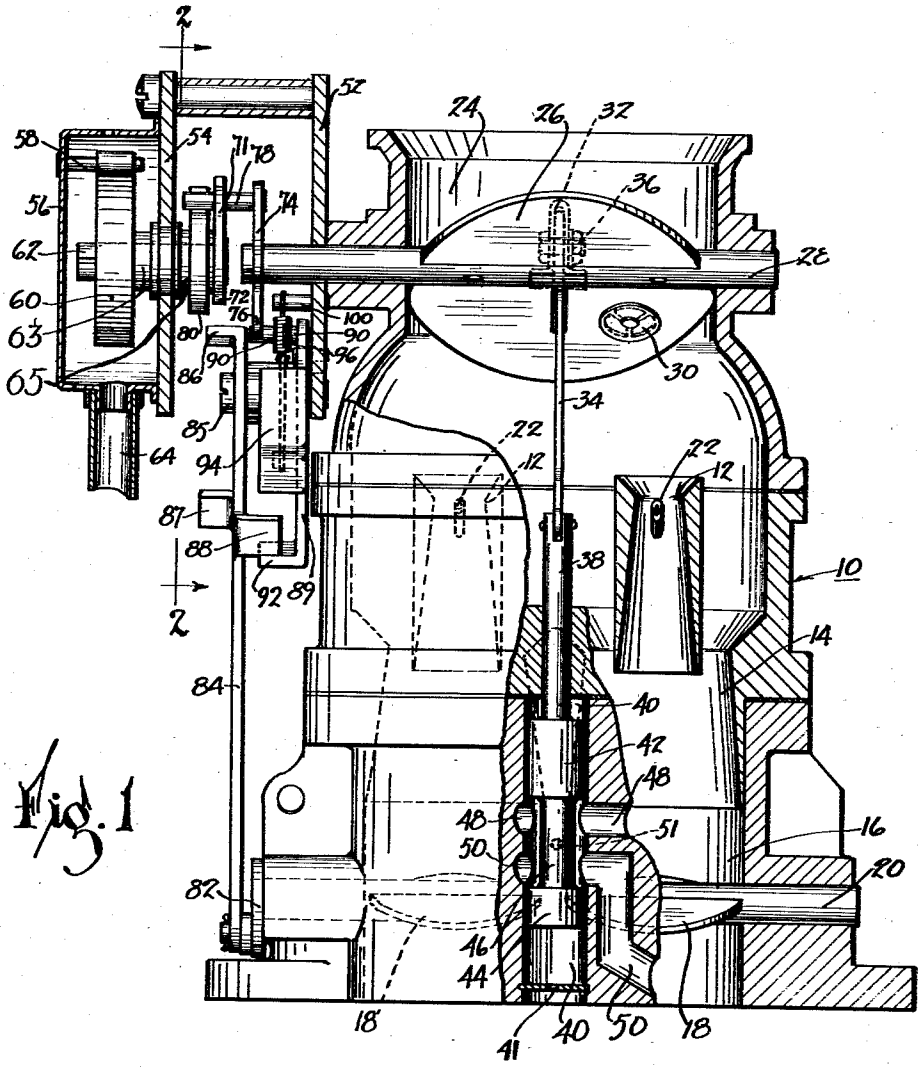


Fig. 1

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Fig. 2

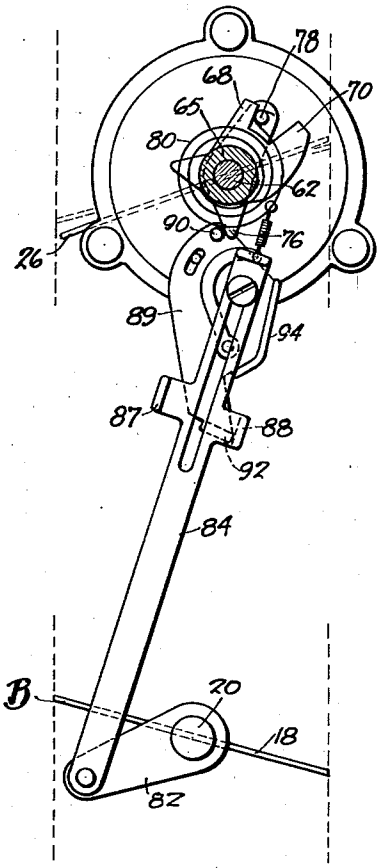
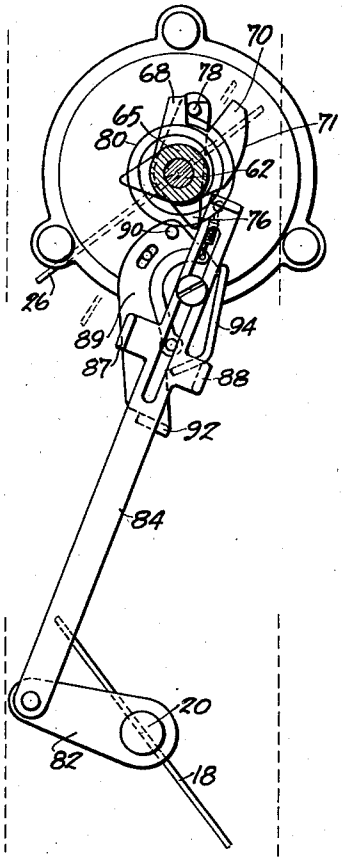


Fig. 4



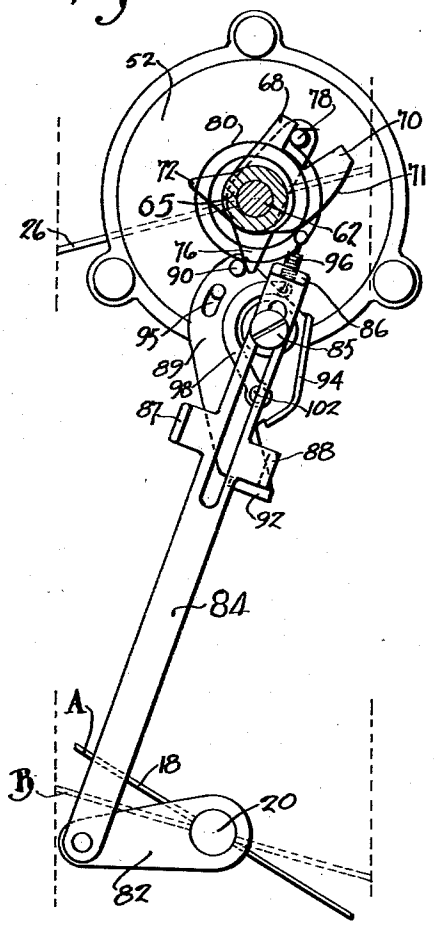
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Fig. 3



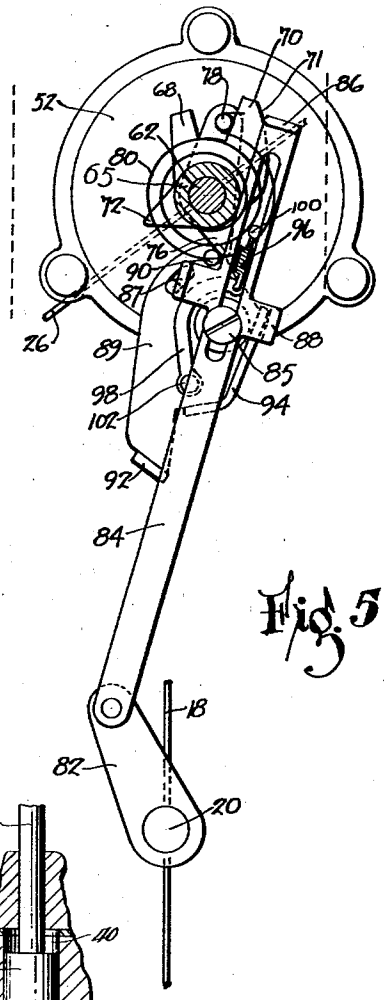


Fig. 5

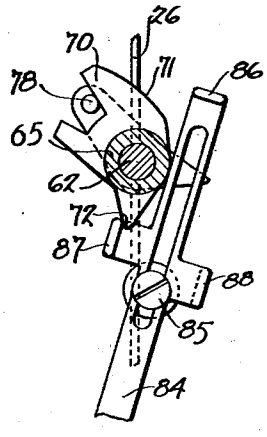


Fig. 6

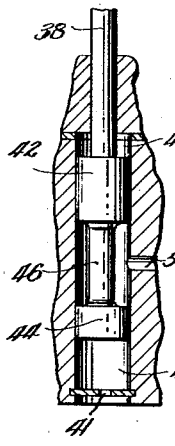


Fig. 7

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Patented June 27, 1939 2,163,904

UNITED STATES PATENT OFFICE

2,163,904

CARBURETOR

Albert H. Winkler, South Bend, Ind., assignor to Bendix Products Corporation, South Bend, Ind., a corporation of Indiana

Application September 18, 1935, Serial No. 41,033

1 Claim. (Cl. 261—39)

This invention relates to carburetors, and more particularly to devices for automatically controlling the richness and quantity of the mixture produced by internal combustion engine carburetors, as in starting and warming up a cold engine.

Such devices are commonly referred to as automatic chokes, and operate the control the position of the choke valve in accordance with temperature, engine speed, and/or other factors.

In the present invention, the richness of the mixture is controlled by an unbalanced choke valve the position of which is varied in accordance with temperature, rate of air flow and other factors, while the minimum engine speed is controlled by the position of a throttle valve which is moved to a partly open position for starting, and to its normal closed position when the engine is operating under its own power, while a bypass around the throttle provides for the flow of an abnormal quantity of fuel mixture to give a fast idle while the engine is warming up.

A thermostat is provided which opposes opening movement of the choke valve while the engine is being cranked, but which is, by suitable mechanism, limited in its action after the engine has been started, the operation of the choke valve being then chiefly controlled by a spring the stiffness of which does not vary with temperature, and which is connected in series with the thermostat. These results are accomplished by means of the improved mechanism now to be described, and shown in the appended drawings, in which:

Figure 1 is a vertical view, partly in section, of a carburetor and automatic choke embodying the invention;

Figure 2 is a detail view of the automatic choke mechanism, taken on the line 2—2 of Figure 1, but showing the parts in the positions they occupy before the cold engine has been started.

Figure 3 is a view similar to Figure 2, but showing the mechanism in starting position;

Figure 4 is a similar view, showing the parts in the positions they occupy during the warming-up period;

Figure 5 is a similar view, showing the mechanism in position for deflooding the engine;

Figure 6 is a fragmentary view, similar to Figures 2–5, but showing the mechanism in position to hold the choke valve fully open; and

Figure 7 is a segmental longitudinal section of the carburetor taken on a plane perpendicular to that of Figure 1.

Referring more specifically to the drawings, the carburetor shown is of the downdraft, double-barrel type having a single air-horn and two primary venturis 12 discharging into secondary venturis 14, which in turn discharge into parallel mixing chambers 16 controlled by twin throttles 18 preferably mounted upon a common shaft 20. Fuel is supplied to the carburetor through main nozzles 22 which discharge within the venturis 12, and through any suitable idling system, not shown. All of the elements thus far described may be of any suitable construction since they form, per se, no part of the present invention.

The air inlet 24 of the carburetor is controlled by a choke valve 26 which is mounted on its shaft 28 in off-center relation, so that suction within the carburetor, produced by the pumping action of the engine cylinders, tends to move the choke valve to open position. A pressure responsive poppet valve 30, of known construction, may if desired be provided to control an opening in the choke valve.

A stamping or bracket 32 is fixed to the choke valve and a link 34 is pivoted thereto by a pin 36, and extends downwardly through a slot in the choke valve. At its lower end, link 34 is pivoted to the upper end of a rod 38, which is formed integral with a piston reciprocably mounted in a cylinder 40 cast in the carburetor body between the mixing chambers 16. The said piston comprises an upper cylindrical portion 42 and a lower cylindrical portion 44, connected by a reduced portion 46.

From each of the mixing chambers 16 anterior to the throttle leads a duct 48 to the cylinder 40, and a duct 50 leads from the cylinder 40 to each of the carburetor barrels posterior to the throttle. A fuel jet 51 discharges into these passages, as disclosed in Patent Number 2,031,709, issued February 25, 1936 to S. F. Hunt. It will be seen that when the piston 42, 44 is in the position shown in Figure 1 it will permit a substantial amount of fuel mixture to bypass the throttles, thus permitting the engine to idle at a faster rate when the choke valve is closed.

A plate 52 is attached to the outside of the carburetor and supports in spaced relation a second plate 54 which has mounted thereon a thermostat casing 56. Casing 56 carries a pin 58 to which is hooked the outer end of a coiled thermostatic spring 60, the inner end being fixed to a shaft 62 which is journaled in a fixed sleeve 63 mounted in plate 54. Casing 56 may be supplied through duct 64 with heated air from a stove on the exhaust manifold, as described in Stuyvesant C. Smith, Patent 2,030,331, or may

be heated electrically or in any other suitable manner.

The inner end of shaft 62 has fixed thereto an annular boss 65, and a member having upwardly extending spaced stops 68, 70, a cam portion 71, and a downwardly extending cam projection 72. The choke shaft 28 has fixed thereto a member 74 having a downwardly extending cam projection 76 and a pin 78 fixed to its upper portion and extending between the stops 68, 70, so that the stops yieldingly limit the opening and closing movements of the choke valve. A coiled spring 80 has its inner end fixed to boss 65 and its outer end fixed to pin 78 so as to constantly urge the latter in such direction as to tend to close the choke valve.

The control mechanism thus far described operates as follows. The thermostat when cold exerts a yielding force on stops 68, 70 in the clockwise direction as viewed in Figures 2 to 6. This causes stop 68 to contact pin 78 and exert a force tending to rotate the choke valve to the closed position, the force of spring 80 being of negligible effect on the operation. Opposing said force, during the operation of the engine, may be the pressure of air on the unbalanced choke valve tending to open the same.

Throttle shaft 20 is provided at one end with the usual manual control mechanism, not shown, and at its other end has fixed thereto an arm 82. A rod 84 has its lower end pivoted to the outer end of arm 82 and its upper end is slotted to receive in sliding relation a guide pin 85 which is mounted on plate 52. Rod 84 is provided with horizontally projecting studs 86, 87, and 88 for a purpose to be described. A member 89 is pivotally mounted on pin 85 and carries at its upper end a pin 90 designed to actuate projection 76 as described hereinafter. At its lower end member 89 is provided with a horizontally extending stop member 92 designed to cooperate with stud 88 in limiting the closing movement of the throttle, as described hereinafter. Member 89 is also provided with a cam member 94 which cooperates with stud 88 under certain conditions of operation. A pin-and-slot arrangement 95 (Figure 3) is provided to limit the movement of member 89. In order to insure that member 89 will remain in one or the other of its extreme positions, a dead-center mechanism is provided, comprising a spring 96 and a curved link 98 connecting pins 100 and 102 fixed respectively to plate 52 and member 89 on opposite sides of pin 85. A suitable friction mechanism may be substituted for the dead-center mechanism, if desired.

Operation.—When the motor has been shut off and the car allowed to stand at low atmospheric temperature, thermostat 60 will uncoil and, through shaft 62, stop 68, pin 78 and arm 74, will move the choke valve 26 toward its closed position, but member 89 will be held in its clockwise position by the contact of stop 92 with stud 88, as shown in Figure 2, and pin 90 will prevent member 76 moving in the clockwise direction sufficiently to permit the choke valve to close fully. If now the operator actuates the starter, the throttles will be partially opened, either manually or automatically by mechanism well known in the art, and this will move rod 84 to or beyond the position shown in Figure 3, the throttles being moved to or beyond the position indicated at A in that figure. As soon as stud 88 passes upwardly beyond stop 92, the thermostat, acting through shaft 62, stop 68, member 76 and pin 90, is free to move member 89 counterclockwise to the position shown in Figure 3, wherein the stop 92 moves into the path of stop 88 and prevents return of the throttle beyond position A. At the same time, the choke valve will be urged toward fully closed position by the thermostat, and the bypass 48, 50 will be open as described above. This condition will obtain (except for such opening movement of the choke valve as will be caused by the suction due to cranking) until the engine fires, whereupon its speed will gradually increase as the viscosity of the oil in the crankcase and elsewhere is decreased due to agitation, until an engine speed corresponding to a vehicle speed of, say, 20 M. P. H. is attained. At such speed, the danger of the engine stalling is largely past, and the operator, without the necessity for instructions, will open the throttle wider, which will cause stop 88 to strike cam 94 and move the latter clockwise until member 89 is moved past its dead-center position to the position shown in Figure 4. During such movement of member 89, pin 90 will move to the position shown in Figure 3, where it positively limits the closing movement of the choke valve. The parts will remain in approximately this position if the engine continues running, and there will be sufficient air flowing through the carburetor, and sufficient manifold vacuum acting on piston 42, 44, to cause the choke valve to oscillate between the positions shown respectively in full and dotted lines in Figure 4, against the constant force of spring 80 and the gradually decreasing force of thermostat 60. The throttle may then be returned to its fully closed position, indicated at B in Figure 3, although the bypass 48, 50, being open, will provide sufficient mixture to keep the engine running at a speed corresponding, say, to 10 M. P. H. If the engine stalls or if the ignition switch is opened while the throttle is thus closed, the choke valve is free to return to its original position, in which case member 76 contacts pin 90 and moves member 89 past dead-center in the counterclockwise direction, thus restoring the parts to their original positions, shown in Figure 3.

With the parts in their original positions, if the cylinders have been flooded with an excess of fuel, the operator opens the throttle wide open. This moves stop 86 into contact with cam surface 71, which positively rotates stops 68 and 70 in the counterclockwise direction so as to positively move the choke valve to a partially open position, as shown in Figure 5, and permit it to open further by merely overcoming the force of spring 80. If the engine is then cranked with the throttle fully open, the choke will be drawn open by the flow of air and the flooded condition will be relieved.

Even if the engine has warmed up in cold weather when climbing a long hill with the throttle wide open and insufficient flow through the exhaust manifold to keep the thermostat heated, the choke valve may tend to close, which would cause the mixture to become overrich. In order to prevent this, the arrangement shown in Figure 6 is provided, wherein it will be seen that if the throttle is moved to wide open position when the choke valve is fully opened, stud 87 will engage member 72 and positively hold the choke valve wide open.

It will be seen that with any throttle opening sufficient to bring stud 86 into contact with cam 71, the closing movement of the choke valve is positively limited at the point where pin 78

contacts stop 76, as seen in Figure 5. The choke, by merely overcoming the force of spring 80, may then open to the point where pin 78 contacts stop 68, whereupon, in order to open further, it must overcome the force of thermostat 60. Since, at low temperatures, the thermostat is considerably stiffer than spring 80, the result will be that the spring 80 alone will largely control the choke valve position during the warming-up period.

Although the invention has been described with particular reference to a specific embodiment thereof, it is not limited thereto or otherwise except in accordance with the language of the appended claim.

I claim:

In an internal combustion engine carburetor, a pressure responsive choke valve, temperature responsive means urging the choke valve closed, a lost motion connection between the temperature responsive means and the choke valve, yielding means connected in series with the temperature responsive means and mounted concentrically therewith urging the choke valve closed, and means controlled by throttle position for rendering said last mentioned means inoperative to close the choke valve beyond a predetermined point.

ALBERT H. WINKLER.