

May 2, 1939.

O. HENNING

2,156,390

CARBURETOR FOR INTERNAL COMBUSTION ENGINES

Filed May 12, 1932

5 Sheets-Sheet 1

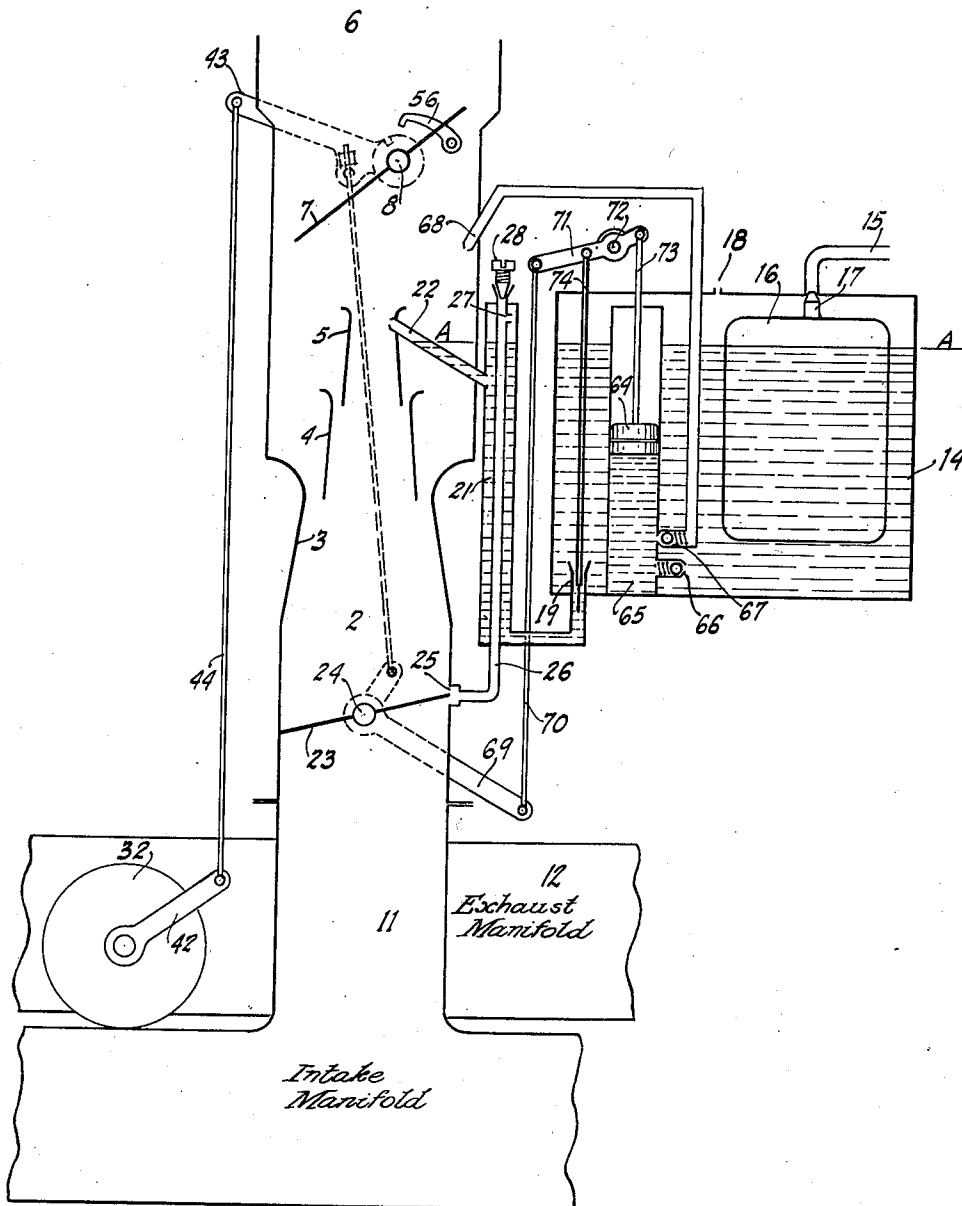


Fig. 1

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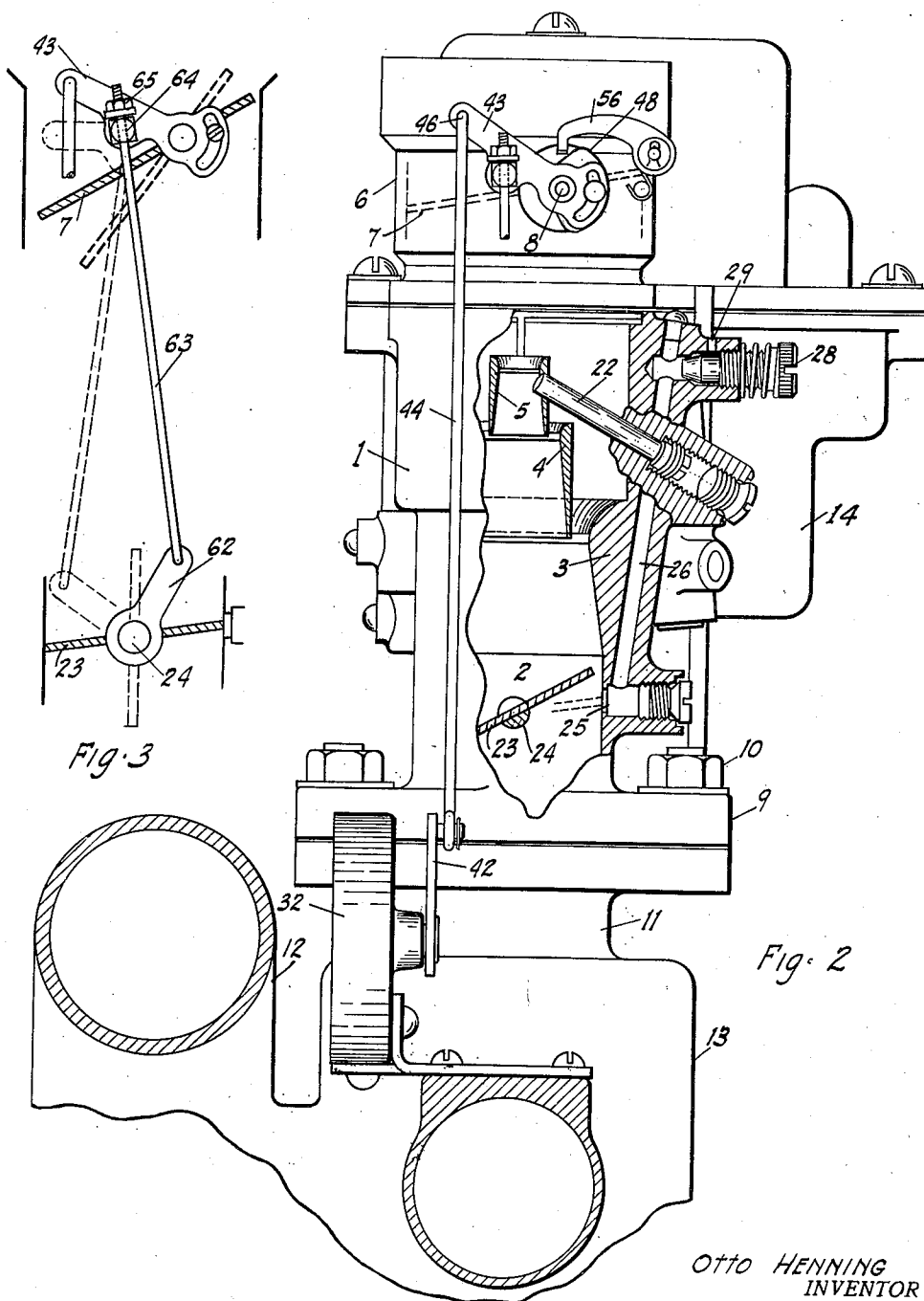
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

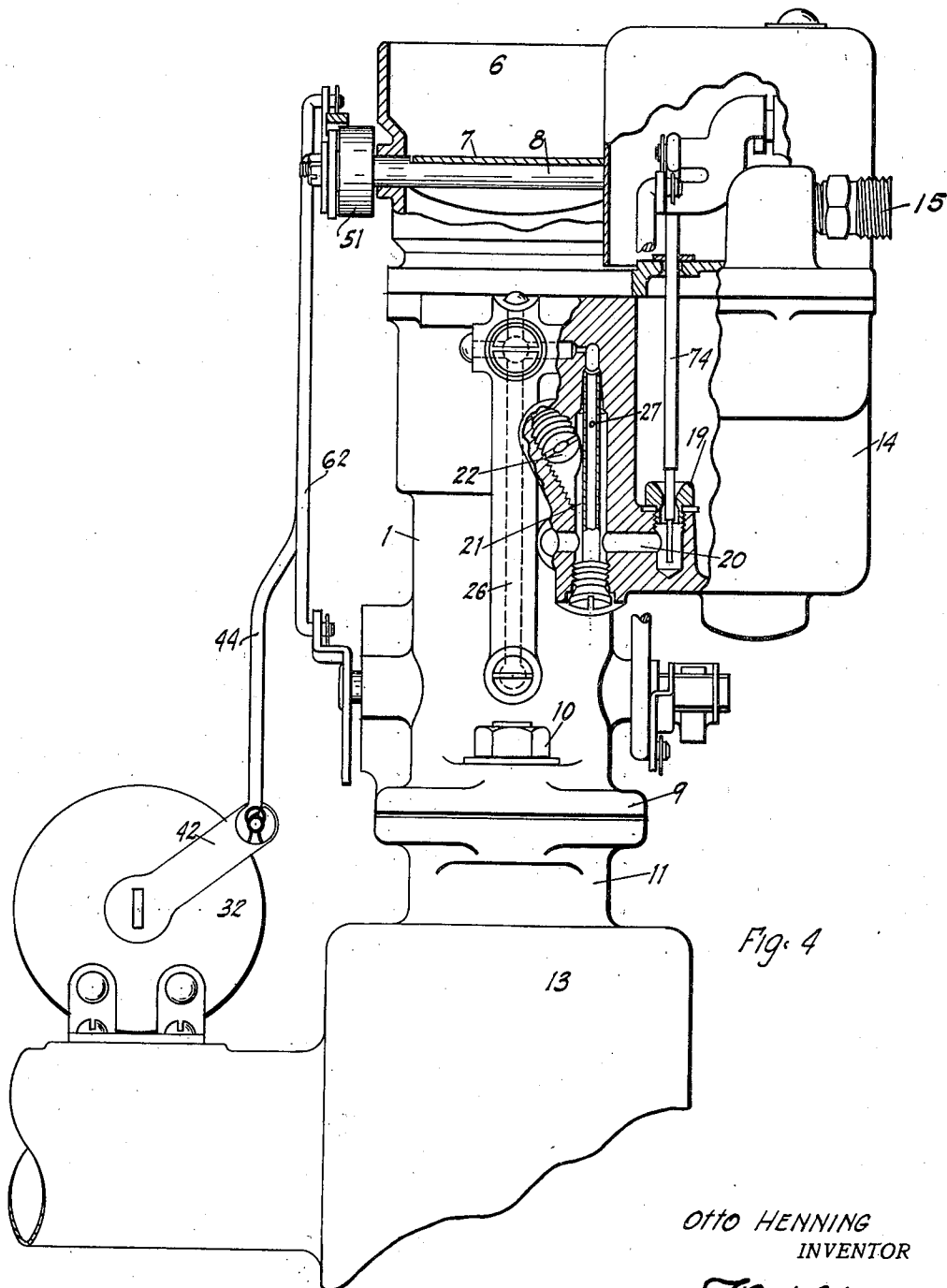


Fig. 4

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5 Sheets-Sheet 4

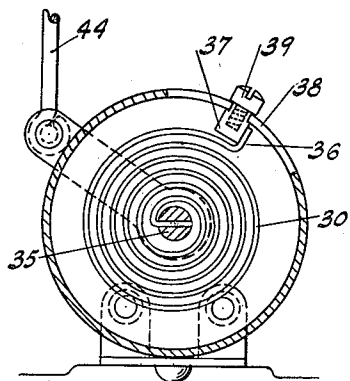


Fig. 5

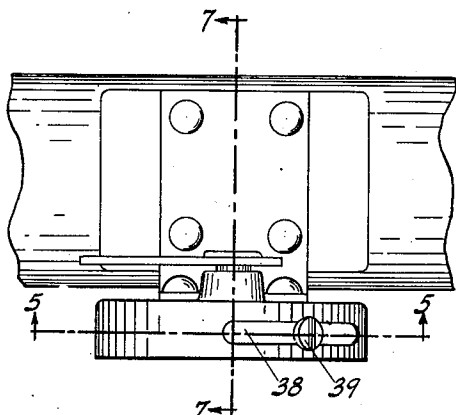


Fig. 6

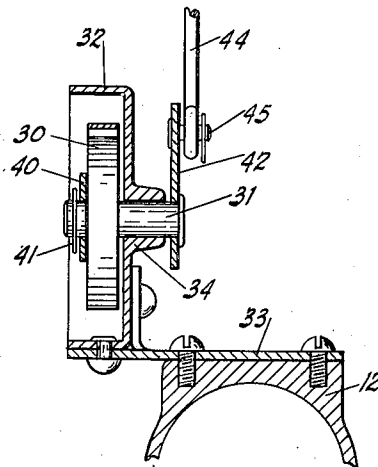


Fig. 7

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CARBURETOR FOR INTERNAL COMBUSTION ENGINES

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5 Sheets-Sheet 5

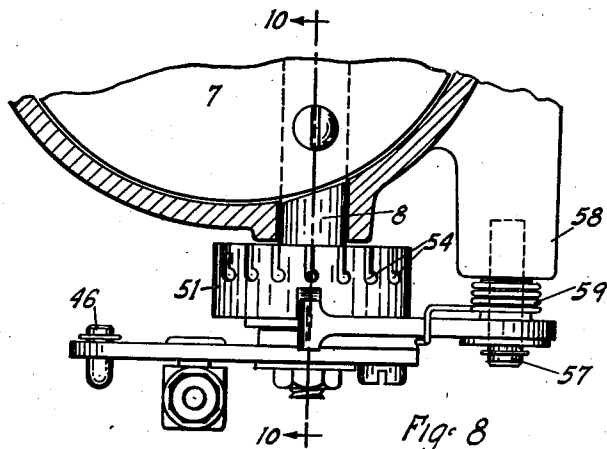


Fig. 8

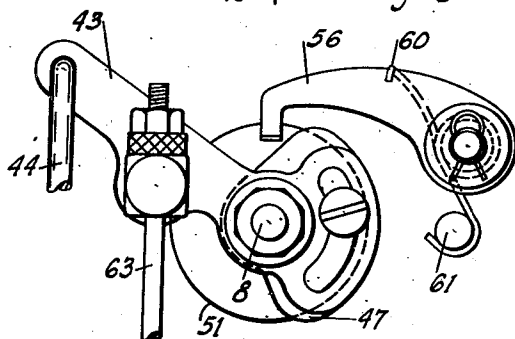


Fig. 9

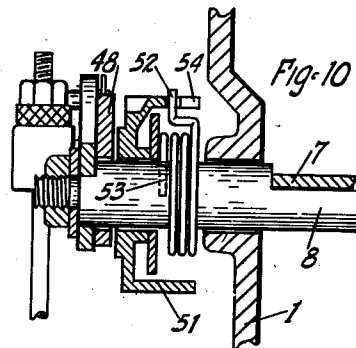


Fig. 10

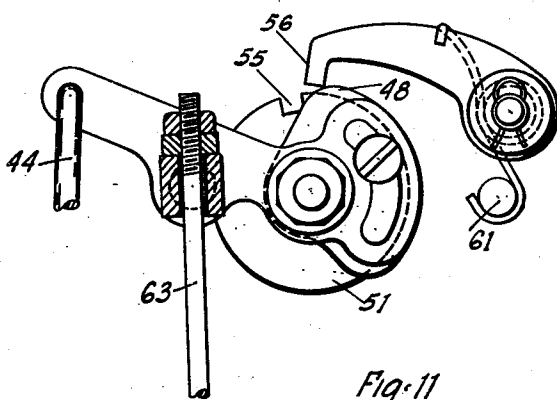


Fig. 11

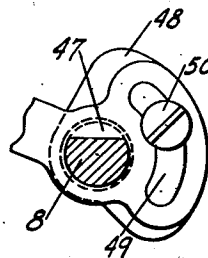


Fig. 12

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UNITED STATES PATENT OFFICE

2,156,390

CARBURETOR FOR INTERNAL COMBUSTION ENGINES

Otto Henning, St. Louis, Mo., assignor to Carter Carburetor Corporation, St. Louis, Mo., a corporation of Delaware

Application May 12, 1932, Serial No. 610,865

17 Claims. (Cl. 261—39)

This invention relates to carburetors for internal combustion engines, and particularly to automatic devices for controlling the mixture ratio delivered by the carburetor under varying conditions of temperature, speed, load, and starting.

It is an object of the invention to produce a carburetor of the plain tube type having an automatic temperature and suction operated valve for controlling the admission of air so as to vary the mixture ratio.

It is a further object of this invention to produce a generally new and improved automatic choke control of the above character.

Further objects of the invention will appear from the following description and accompanying drawings, referring to which:

Figure 1 is a diagrammatic view showing the general layout of the carburetor according to my invention.

Figure 2 is an end elevation of a carburetor according to my invention showing its relation to the intake and exhaust manifolds, parts being broken away and others shown in section.

Figure 3 is a diagram showing the connection of the throttle and choke valves.

Figure 4 is a side elevation of the carburetor shown in Figure 2, parts being broken away and others shown in section.

Figure 5 is a detail view showing the side operation of the thermostat used in conjunction with my invention.

Figure 6 is a plan view of the thermostat shown in Figure 4.

Figure 7 is a vertical sectional view taken along the line 7—7 of Figure 6.

Figure 8 is a detail plan view showing a part of the choke valve latching device and associated parts.

Figure 9 is an end view of the parts shown in Figure 8.

Figure 10 is a sectional view taken along line 10—10 of Figure 8.

Figure 11 is an end view of the parts shown in Figure 9, with the parts in a different operating position.

Figure 12 is a detail view showing the latching disengaging cam and adjustment therefor.

The reference numeral 1 indicates the body member of a carburetor which, in this particular embodiment, is of the downdraft type. The body member 1 is provided with a downwardly extending mixing conduit therein generally indicated by the reference numeral 2. This mixing conduit is restricted by means of the main venturi 3, secondary venturi 4, and primary venturi 5 at the

upper end of the main body member. An air inlet member or air horn 6 is provided, and the admission of air to the mixing conduit through the air horn is controlled by a valve 7 which is eccentrically mounted on the transverse shaft 8, the amount of eccentricity of the valve 7 may vary with different installations.

The lower end of the main body member is provided with a flange 9 which is attached by means of bolts 10 to the intake manifold 11 of an internal combustion engine. The exhaust manifold of the engine is indicated at 12, and it will be understood that a portion of the exhaust surrounds or otherwise comes in contact with the intake manifold and forms a hot spot 13. These elements are of conventional construction and need not be further described. The carburetor is provided with a fuel bowl 14 to which fuel may be supplied in any suitable manner, as for instance, by the conduit 15. Fuel is preferably maintained in the bowl at a constant level A—A by the float 16 and float valve 17. A suitable vent 18 for admitting air to the bowl at a point above the fuel level is provided.

The fuel is supplied from the bowl to the primary venturi by means of the main jet 19 which delivers fuel through cross passage 20 and chamber 21 to the fuel nozzle 22. This nozzle discharges at the most restricted point in the smallest venturi, as indicated in Figure 1, but it should be understood that the invention is capable of use with a single venturi or even with a mere passageway, if desired.

The discharge of fuel mixture from the carburetor is controlled by throttle valve 23 mounted on shaft 24 in the lower part of the main body member, and the fuel for low speed operation is supplied through a port or ports 25 having openings both above and below the edge of the throttle valve when it is in closed position, as indicated in Figure 1. This port is supplied with fuel through conduit 26 which communicates with the upper part of the chamber 21 by means of restricted port 27. Means for admitting air in regulated quantities to the tube 26 is also provided in the form of a manually adjustable screw 28. This screw controls an air admission port 29 in a conventional manner. From the above description, it will be seen that the means for supplying fuel from the float chamber to the mixing conduit comprises a branched conduit having an inlet 19 and branches 22 and 26 connected by a calibrated restriction 27 for supplying fuel for high and low speed operation respectively. For controlling the choke valve, the thermostat 30 of

the usual bimetallic coil construction is mounted on a shaft 31 carried by a housing 32 which is mounted on exhaust manifold 12 by means of the bracket 33. The shaft 31 is mounted to freely rotate in bearing 34, and the inner end of the coil is connected to the shaft by the usual slot arrangement, as indicated at 35. The outer end of the thermostat coil is turned outwardly at 36 to engage an adjustable abutment 37 carried in the slot 38 and held in adjusted position by a screw 39. The outwardly turned end 36 of the coil is not connected to the bottom in any way, except by contact, and after the thermostat has been heated to such an extent as to open the choke valve, the portion 36 may continue to move in a clockwise direction with respect to Figure 5 without interference of any kind. In this operation, the hot thermostat moves out of contact with the abutment 37 and does not again come into contact until the temperature has fallen a predetermined degree.

The coil 30 is prevented from coming off the shaft 31 by a washer 40 which, in turn, is held in place by a hair pin or cotter 41. The outward end of the shaft 31 is provided with a lever 42. The lever 42 is connected to a lever 43 mounted on the choke valve shaft 8 by means of a link 44. This link is connected in any suitable manner, as by a pin 45, to the lever 42, and the upper end is simply hooked to the lever 43, as indicated at 46.

The shaft 8 is connected directly to the choke valve 7, and lever 43 is rigidly connected to the shaft 8 by reason of a non-circular formation indicated at 47 in Figure 12. A cam 48 rotatably mounted on the shaft 8 is rigidly, but adjustably, connected to the lever 43 by means of the slot 49 and adjusting screw 50 for a purpose hereinafter to be described.

A drum 51 is rotatably mounted on the shaft 8 between the cam 48 and the outside wall of the carburetor housing. This drum is freely rotatable on the shaft, except for a spring 52 which has one end connected to the shaft 8, as indicated at 53, and the other end engaged with one of a plurality of slots 54 formed in the periphery of the drum, as shown in Figures 8 and 10. The drum is provided with a slot 55 adapted to be engaged by a latch 56 which is pivotally mounted on a pin 57 carried by projection 58 on the air horn. A very light and flexible spring 59 has one end hooked around the latch 56, as indicated at 60, and the other wrapped around a stud 61, as indicated in Figure 9. The central part of the spring is formed into a coil wrapped around the stud 57, so that the spring slightly urges the latch 56 into engagement with the drum 51.

In order to prevent the choke valve remaining in fully closed position when the throttle is wide open or substantially fully closed, the throttle shaft 24 is provided with a lever 62 which is connected by means of link 63 and a lost motion connection of the lever 43. The lost motion connection comprises a block 64 carried by lever 43, which block has an opening to loosely receive the link 63. A nut, or the like, 65 is fixed to the end of the link 63 and adapted to contact the block 64. By this arrangement the choke valve 7 may open freely without interference, due to throttle position, but when the throttle is fully closed, as indicated in the solid lines in Figure 3, the choke valve is forced to a slightly open position, as indicated by the solid lines in the same figure. When the throttle valve is moved to open position, the lever 62 occupies the position indicated by the dotted lines in Figure 3, and the choke

valve is forced to a further open position, as indicated by the dotted lines in the same figure. When the throttle valve is moved to a partially open position, as customary for cold starting, the link 63 is moved to its uppermost position, and the choke valve 7 may be closed by the thermostat.

The carburetor is provided with a throttle operated accelerating pump comprising a cylinder 65 having a piston 64 therein. The cylinder is provided with an inlet valve 66 and an outlet check valve 67, as indicated in Figure 1. These valves are preferably of the spring pressed check valve type and need no further description. The discharge passageway of the pump terminates in a nozzle 68 suitably located in the mixing conduit, as indicated.

The throttle valve is provided with a lever 69 connected to the link 70, which operates rock shaft 71. The rock shaft is pivoted on shaft 72 and operates the piston 64 by means of link 73. A metering rod 74 for controlling the inlet passageway 19 may also be provided. The operation of these parts will be fully understood by those skilled in the art, and since they form no part of this invention, no further description is necessary.

In operation, the position of the choke valve is, at all times, regulated by the thermostat, but when the engine is at low temperatures and the choke valve is moved to closed position by the thermostat, the latch 56 engages the groove 55 in the drum 51 and thereby applies an additional resistance against the opening by suction of the valve 7. This, of course, assumes the throttle valve to be in a partly open position as desired for starting and as indicated in Figure 2. The resistance of the spring 52 to the opening of the choke valve is substantially constant within its range of operation and is additional to the resistance of the thermostat which, in itself, acts as a spring displaceable by suction to permit the opening of the choke valve.

When the engine starts to run under its own power, there is a sudden impulse of suction which forcibly opens the choke valve against the resistance of the thermostat and the spring 52 to such a point as to bring the cam 48 under the end of the latch 56, forcibly lifting it to the position shown in Figure 11. This lifting of the cam permits the drum 51 to freely rotate, due to the influence of spring 52, and removes any resistance to the opening of the choke valve, except the thermostat itself. The practical result of this operation is that, as soon as the engine starts to run under its own power, the choke valve makes a sudden opening movement and is therefore much more freely responsive to suction. When the engine stops, however, if the thermostat is still cold, the choke valve may be freely returned to the closed position, and the drum will then be engaged by the latch 56 falling into the slot 55, so that the starting action may be repeated.

By this arrangement, a thermostat of much more sensitive nature can be used to advantage and much less strength is required in the thermostat itself. Numerous other objects are also attained by the above construction, and the claims should be given a broad construction accordingly.

When the engine is operated with the throttle substantially closed, the pressure in the intake manifold is greatly reduced, and the boiling point of the raw fuel therein is correspondingly lowered. This means that the quantity of fuel sup-

plied must be substantially reduced. For this purpose the link 44 forcibly opens the choke valve 7 to a predetermined extent regardless of the temperature. If the engine ceases to run, the throttle is again opened, thereby permitting the choke valve to close, and the engine is restarted in the usual manner.

It sometimes happens that the cylinders will become flooded before the engine starts, and the engine will then refuse to start until a substantial quantity of air or of a leaner mixture is passed through the cylinders. To provide for this, the link 63, when the throttle is fully opened, pulls the choke valve 7 open to a substantial extent. By cranking the engine with the throttle and choke open, the cylinders may then be relieved of the surplus fuel, and the engine may then be started without difficulty.

I claim:

1. In a carburetor, a choke valve, said choke valve being constructed and arranged to be operated by suction, a heat responsive device for moving said choke valve to closed position, spring means for resisting the initial opening movement of said choke valve, and a latch for controlling said spring means.

2. In a carburetor, a choke valve, a thermostat controlling said choke valve, spring means connected to said choke valve, latch means for engaging said spring means to provide a resistance to the initial opening movement of said choke valve, and a cam carried by said choke valve for disengaging said latch.

3. In a carburetor, a mixing conduit, a choke shaft at the inlet end of said mixing conduit, a choke valve carried by said shaft, a drum rotatably mounted on said shaft, spring means for yieldably holding said drum in position with respect to said shaft, latch means for engaging said drum, and means for disengaging said latch.

4. In a carburetor, a mixing conduit, a choke shaft at the inlet end of said mixing conduit, a choke valve carried by said shaft, a drum rotatably mounted on said shaft, spring means for yieldably holding said drum in position with respect to said shaft, latch means for engaging said drum, means for disengaging said latch, and a heat responsive member connected to said choke shaft.

5. In a carburetor, a mixing conduit, a choke shaft at the inlet end of said mixing conduit, a choke valve carried by said shaft, a drum rotatably mounted on said shaft, spring means for yieldably holding said drum in position with respect to said shaft, latch means for engaging said drum, means for disengaging said latch, and a heat responsive member connected to said choke shaft, said latch disengaging means comprising a cam member controlled by said heat responsive means.

6. In a carburetor, a choke valve, a shaft for said valve, a spring carried by said shaft, latch means for engaging said spring, a heat responsive member for operating said shaft, and cam means controlled by position of the shaft for disengaging said latch.

7. In a carburetor for internal combustion engines, walls forming a mixing conduit, a choke shaft extending through one of said walls, a choke valve eccentrically carried by said shaft, a heat responsive member connected to said shaft, spring means for supplying a resistance to the opening movement by suction of said valve in addition to the resistance of said heat responsive member, latch means for controlling the appli-

cation of the resistance of said spring to the opening of said valve, cam means carried by said shaft for disengaging said latch, said cam means coming into contact with the latch only after a slight opening movement of said valve has been accomplished, whereby a breathing action of said valve during cranking of the engine may be permitted without disengagement of said latch.

8. In a carburetor for internal combustion engines, a choke shaft, a choke valve carried by said shaft, a heat responsive member for operating said valve, said valve being eccentrically mounted on said shaft, whereby it may be operated by suction, a drum rotatably carried by said shaft, spring means yieldably resisting rotation of said drum with respect to said shaft, and latch means for controlling the movement of said drum.

9. In a carburetor for internal combustion engines, a choke shaft, a choke valve carried by said shaft, a heat responsive member for operating said valve, said valve being eccentrically mounted on said shaft, whereby it may be operated by suction, a drum rotatably carried by said shaft, spring means yieldably resisting rotation of said drum with respect to said shaft, latch means for controlling the movement of said drum, and latch disengaging means comprising a cam carried by said shaft.

10. In a carburetor for internal combustion engines, a choke shaft, a choke valve carried by said shaft, a heat responsive member for operating said valve, said valve being eccentrically mounted on said shaft, whereby it may be operated by suction, a drum rotatably carried by said shaft, spring means yieldably resisting rotation of said drum with respect to said shaft, latch means for controlling the movement of said drum, and latch disengaging means comprising a cam carried by said shaft, said latch disengaging means being constructed and arranged to engage said latch only after a substantial opening movement of said valve has been accomplished.

11. In a carburetor, a suction operated choke valve, a heat responsive member connected to said valve, spring means for yieldably resisting the opening movement of said valve, said spring means acting in conjunction with said heat responsive member to permit a restricted breathing action of said valve, and means for completely releasing said valve from the influence of said spring after a predetermined degree of opening movement.

12. In a carburetor for internal combustion engines, a choke valve, a throttle valve, a lost motion connection between said throttle valve and said choke valve for at least partially opening said choke valve when said throttle valve is either fully closed or fully opened, said lost motion connection permitting the closure of said choke valve when the throttle is in an intermediate position, and means independent of said lost motion connection for opening said choke valve.

13. In a carburetor for internal combustion engines, a choke valve, a throttle valve, a lost motion connection between said throttle valve and said choke valve for at least partially opening said choke valve when said throttle valve is either fully closed or fully opened, said lost motion connection permitting the closure of said choke valve when the throttle is in an intermediate position, said choke valve being openable by suction, and additional means for closing said choke valve.

14. In a carburetor for internal combustion en-

- gines, a choke valve, a throttle valve, a lost motion connection between said throttle valve and said choke valve for at least partially opening said choke valve when said throttle valve is either fully closed or fully opened, said lost motion connection permitting the closure of said choke valve when the throttle is in an intermediate position, and a heat responsive member for further controlling said choke valve.
- 15 15. In a control mechanism for a carburetor having a choke valve and a throttle, the combination of temperature responsive means for governing the degree of opening of the choke valve to regulate the richness of the fuel mixture produced by the carburetor, and means associated with the throttle for setting the valve to produce a leaner mixture than the temperature-respon-

sive means tends to produce when the throttle is closed.

16. In a control mechanism for a carburetor having a choke valve and a throttle, the combination of a thermostat for governing the degree of opening of the choke valve as a function of temperature, and means connecting the valve and throttle for partially opening the valve when the throttle is fully closed.

17. In a control mechanism for an integral combustion carburetor having a choke valve and a throttle, a thermostat tensioned to set the choke valve to produce a starting mixture for the engine, and means controlled by the throttle for resetting said choke valve against said tension to produce an idling mixture for the engine.

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