Dec. 6, 1938. I. E. COFFEY 2,139,355

CARBURETOR DEVICE

Filed March 17, 1936 4 Sheets-Sheet 1

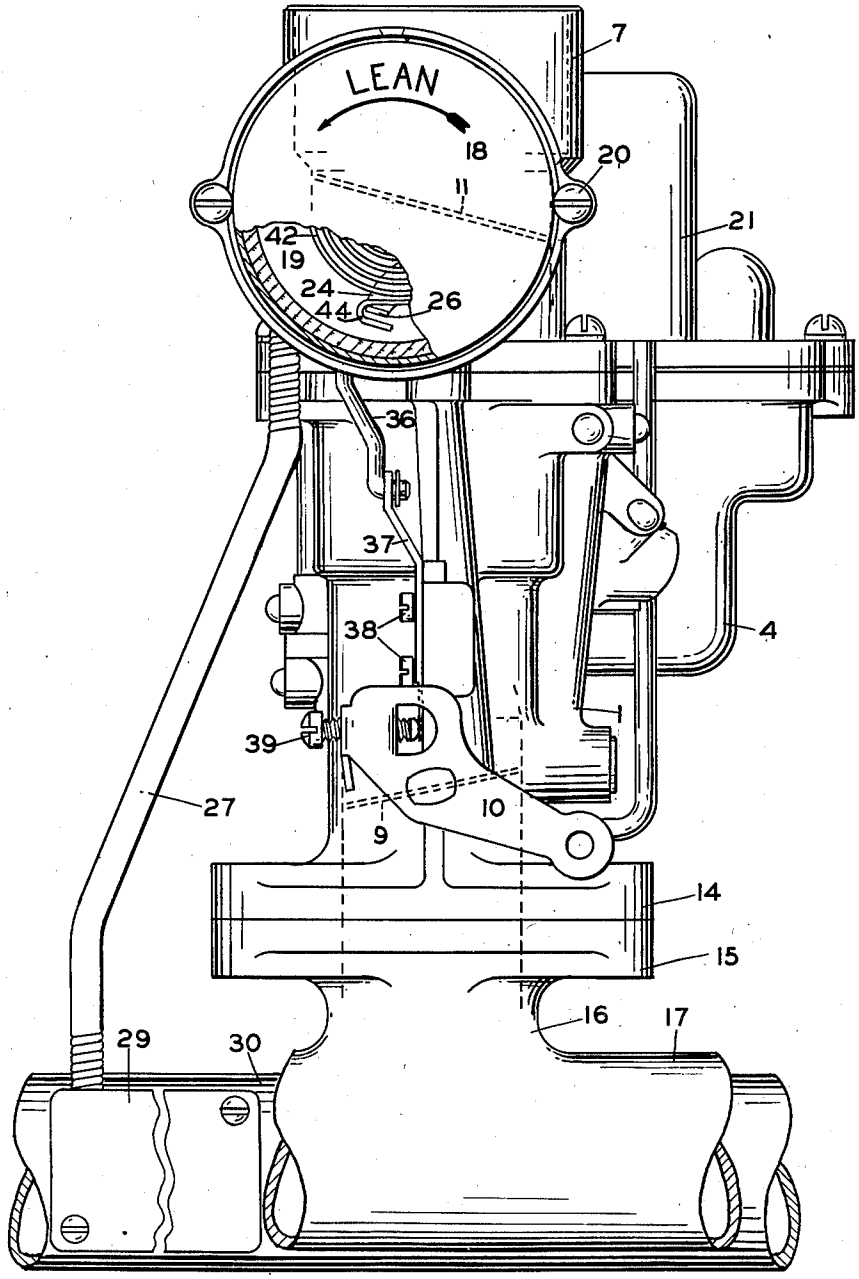


FIG. 1

IRVEN E. COFFEY
INVENTOR

BY Donald U. Rich
ATTORNEY

Dec. 6, 1938. I. E. COFFEY 2,139,355

CARBURETOR DEVICE

Filed March 17, 1936 4 Sheets-Sheet 2

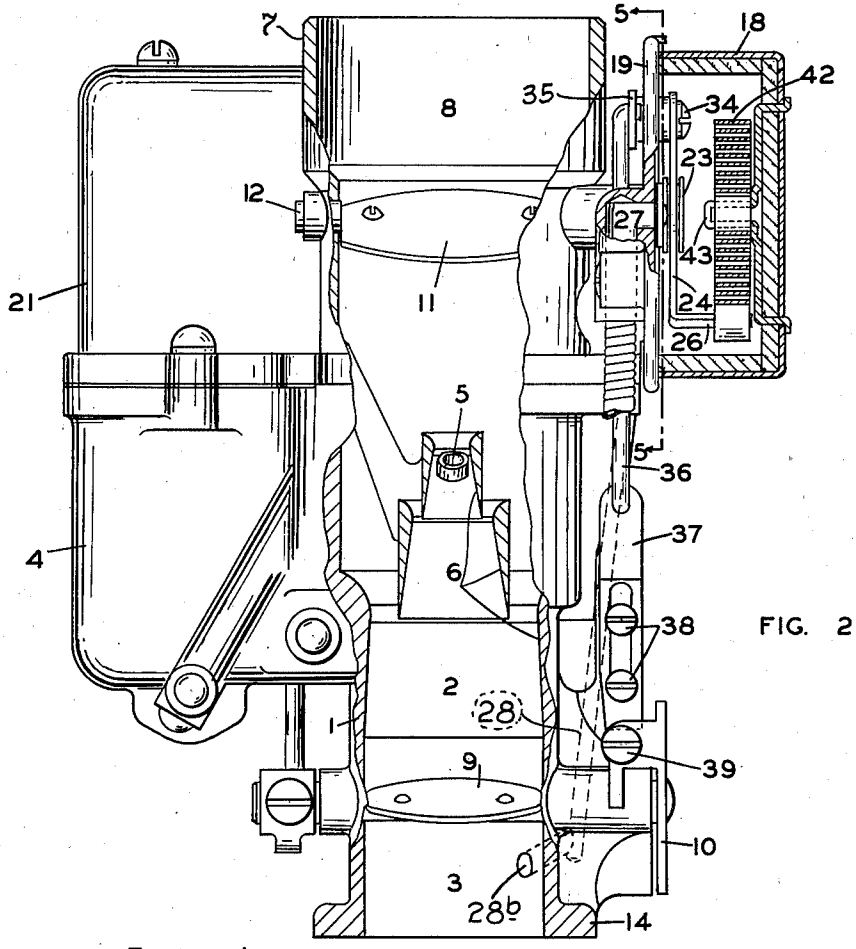


FIG. 2

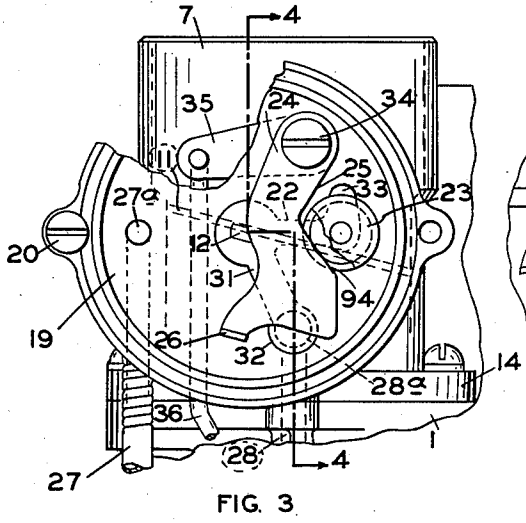


FIG. 3

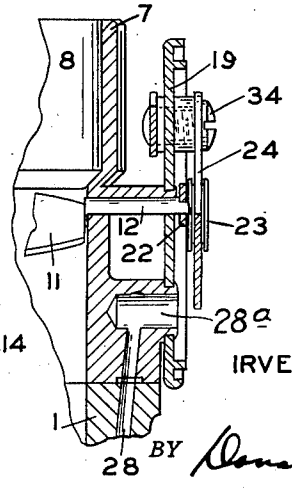


FIG. 4

IRVEN E. COFFEY
INVENTOR

BY Donald U. Rich
ATTORNEY

Dec. 6, 1938. I. E. COFFEY 2,139,355

CARBURETOR DEVICE

Filed March 17, 1936 4 Sheets-Sheet 3

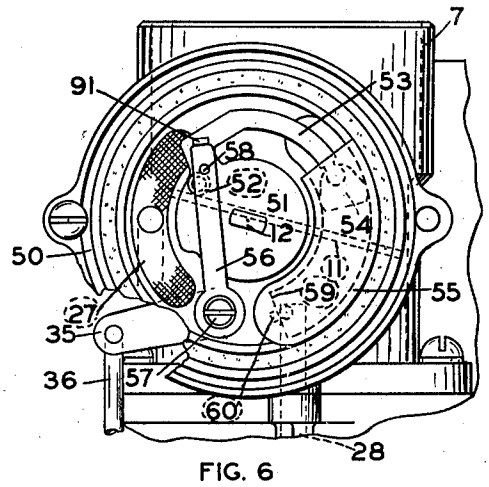


FIG. 6

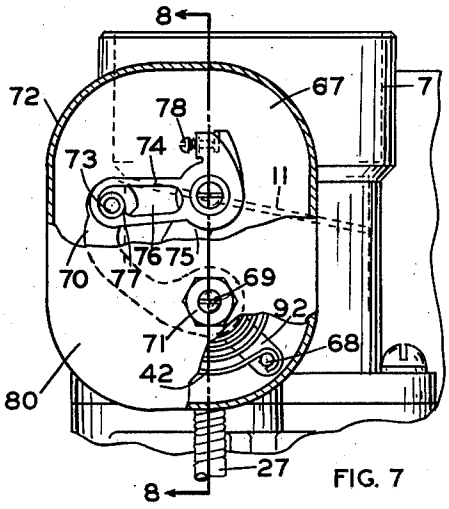


FIG. 7

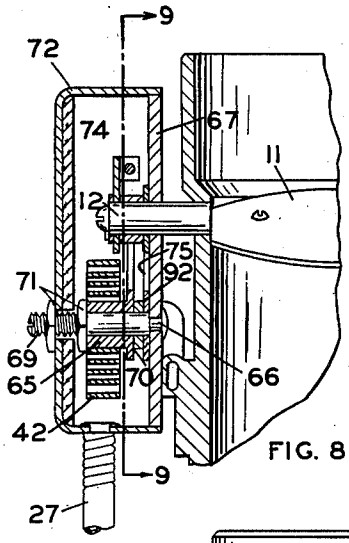


FIG. 8

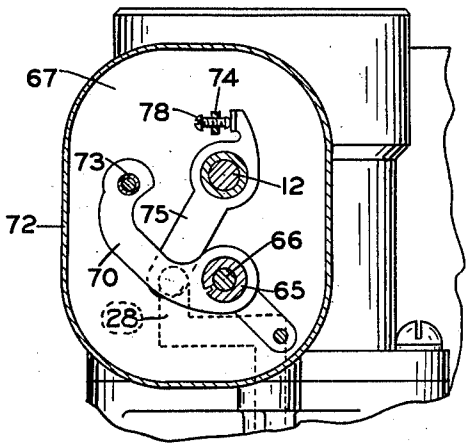


FIG. 9

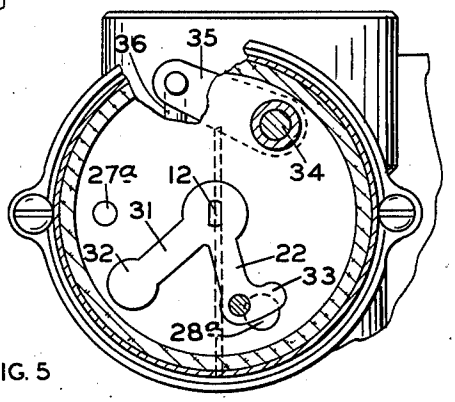


FIG. 5

IRVEN E. COFFEY
INVENTOR

BY Donald U. Rich

ATTORNEY

Dec. 6, 1938. I. E. COFFEY 2,139,355

CARBURETOR DEVICE

Filed March 17, 1936 4 Sheets-Sheet 4

FIG.10.

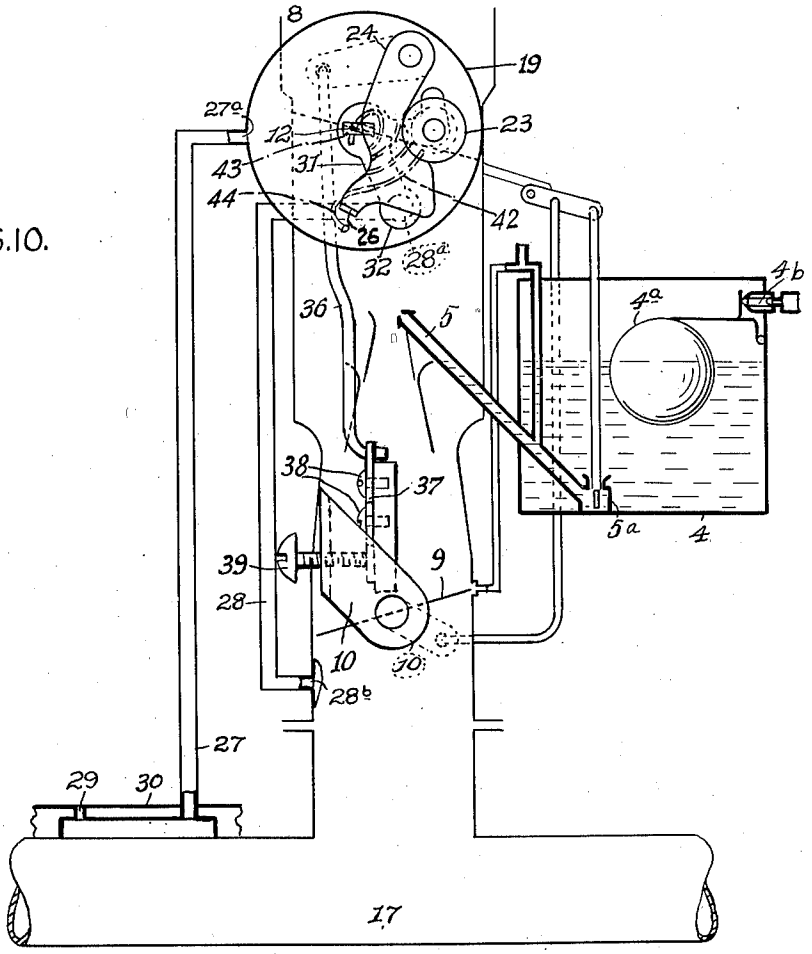


FIG.11.

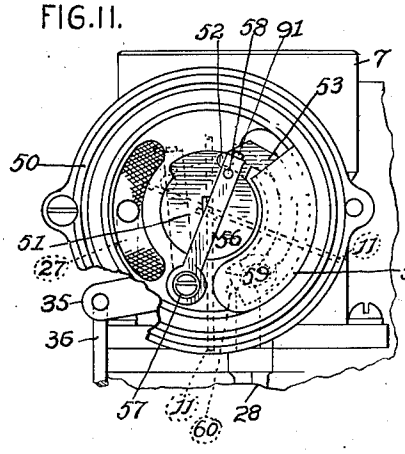


FIG.12.

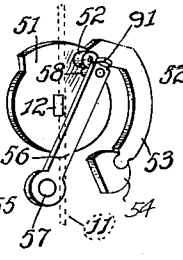


FIG.13.

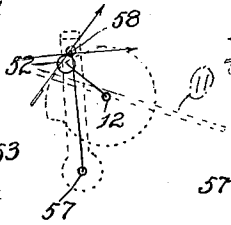
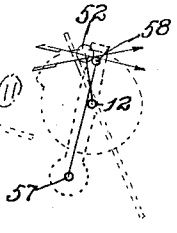


FIG.14.



IRVEN E. COFFEY
INVENTOR

BY P. A. Rich
ATTORNEY

Patented Dec. 6, 1938

2,139,355

UNITED STATES PATENT OFFICE

2,139,355

CARBURETOR DEVICE

Irven E. Coffey, St. Louis, Mo., assignor to Carter Carburetor Corporation, St. Louis, Mo., a corporation of Delaware

Application March 17, 1936, Serial No. 69,288

11 Claims. (Cl. 123—119)

This invention relates to carburetors for internal combustion engines and consists particularly in means for operating the choke valve.

Carburetor choke valves have been previously associated with heat and suction controlled devices which function to hold the valve closed when the engine is cold. Such devices are arranged to respond to engine heat and/or suction in the intake manifold to substantially reduce the resistance to opening of the choke under the influence of suction in the carburetor after the engine is started and to permit free opening of the choke when the engine becomes hot. With these devices there is a problem of providing, during cranking and immediately after the start, an adequate flow of air for running the engine, due to the fact that suction in the carburetor at such times may not open the choke valve sufficiently against the force of the thermostat. Where the choke valve is held slightly open during cranking, or an air inlet of constant size is provided for starting, improper vaporization of the fuel may result and there may not be sufficient draft for conveying the fuel mixture to the cylinders.

It is desirable, therefore, to provide for intermittent or pulsating opening of the choke valve during cranking and to permit the intake suction to build up between opening periods. Then, when the choke opens momentarily, air is drawn in puffs around the edges thereof and through the carburetor and intake manifold at a rate sufficient to properly atomize the extra charges of gasoline drawn from the fuel nozzle, thoroughly mix the gasoline with air, and carry the fuel mixture to the firing chambers.

A co-pending application, Serial No. 679,201, filed July 6, 1933 in the name of the present inventor (now Patent No. 2,085,351) illustrates and claims an automatic choke device in general of the type described above and embodying means for utilizing suction in the intake manifold to draw hot air from a stove mounted on the engine exhaust manifold to a chamber enclosing the thermostatic valve control member.

An object of the present invention is to provide means for resisting opening of the choke valve, particularly when the engine is cold, which means applies variable resistance depending upon the position of the choke.

Another object is to provide a device of the above type including means for causing the choke valve to open intermittingly during cranking.

Another object is to provide a device of the above type embodying means for utilizing suction in the engine intake, when the engine is running, to draw hot air from a stove mounted on the exhaust manifold to a point adjacent the valve-controlling thermostat, while avoiding the consequent slight reduction in suction within the carburetor during the cranking period.

Still another object is to provide means for automatically controlling the choke valve responsive to and influenced by the heat of the engine, the presence of suction in the intake passages, and the position of the throttle valve.

These objects and other more detailed objects hereafter appearing are attained by the structures illustrated in the accompanying drawings in which:

Figure 1 is a side view of a carburetor and other parts of an internal combustion engine embodying the invention, a portion being broken away for clearer illustration.

Figure 2 is a view taken at 90° to Figure 1, portions being broken away and sectioned to show the underlying structure.

Figure 3 is a detail view taken from the same direction as Figure 1, but with parts removed to show the underlying structure.

Figure 4 is a section taken on line 4—4 of Figure 3.

Figure 5 is a detail section taken on line 5—5 of Figure 2, but showing the position of the parts when the choke is in fully open position.

Figure 6 is a view similar to Figure 3 but showing a modification.

Figure 7 is a detail view taken from the same direction as Figures 1, 3 and 6 but showing another modification.

Figure 8 is a section taken on line 8—8 of Figure 7.

Figure 9 is a section taken on line 9—9 of Figure 8.

Figure 10 is a diagrammatic view illustrating the first form of the invention.

Figure 11 is a view similar to Figure 6 but showing the choke in a different position.

Figure 12 is a detail perspective showing the form in Figures 6 and 11.

Figures 13 and 14 are diagrammatic views illustrating the form in Figures 6 and 11.

Figures 1 to 5, inclusive, and 10 illustrate a carburetor for an automobile engine comprising a barrel 1 having a mixing chamber 2 and fuel outlet 3, and a fuel bowl 4 enclosing a float 4a controlling needle valve 4b for maintaining fuel in the bowl at a substantially constant level. Fuel passes from the bowl through metering orifice member 5a and main nozzle 5 into the small-

est of three venturis 6. The upper part of the carburetor includes an air horn 7, forming an air inlet 8. Pivotally mounted within the body portion of the carburetor is a throttle valve 9, having a crank arm 10 rigid therewith for manually controlling the valve from a point adjacent the driver's seat. Located in the upper part of the barrel is a choke valve 11 of the unbalanced butterfly type, secured to a pivot shaft 12 seated in the carburetor wall. At the lower end of the carburetor is a flange 14, secured to a flange 15 on the riser portion 16 of the engine intake manifold 17. The above described structure in itself does not constitute the present invention and is not described in detail herein.

Secured to the upper part of the carburetor adjacent choke valve 11 is a housing including a cover portion 18 and a base plate portion 19. Cover member 18 is lined with a suitable insulating substance such as cork and the edge thereof preferably engages an annular ridge or groove on the face of base plate 19 and is secured thereto by screws 20 whereby the housing is substantially air tight.

Choke valve shaft 12 extends through base plate 19 and at its extremity within housing 18, 19 rigidly mounts a bell crank including an arm 22 having a roller 23 at its outer extremity. Pivotally secured to a portion of the base plate 19, spaced radially from the choke valve pivot 12, is an arm 24 having a recessed edge 25 engaging the roller 23. A lug 26 at the outer extremity of arm 24 serves for engaging the thermostat to be described hereafter.

Opening through the base plate 19 by means of apertures 27*a* and 28*a* are conduits 27 and 28 communicating, respectively, with a stove 29 mounted on the engine exhaust manifold 30, and with a portion of the engine intake passage posterior to throttle valve 9, as at 28*b*. Stove 29 is open to the atmosphere and serves to confine a body of air heated by the exhaust.

The other arm 31 of the bell crank secured to shaft 12 has a portion 32 at its outer extremity disposed, when the choke valve 11 is closed, to cover and restrict the opening 28*a*, of suction passage 28 through base plate 19 (Figure 3). Arm 22 has a lateral projection 33 disposed, when the choke valve is open, to extend partialy over and restrict this opening (Figure 5).

Rigid with the pivot 34, supporting arm 24, and located between the air horn 7 and base plate 19, is an arm 35 to the outer extremity of which is secured a rod 36. Rod 36 carries, at its lower extremity, a block 37 slidably secured to the body of the carburetor by screws 38 extending through a slot (not shown) in the element. The lower extremity of block 37 forms an abutment cooperating with the adjustable screw 39 in crank 10 on the throttle valve shaft to limit the closing movement of throttle valve 9 to the "fast idle" position when the choke valve is closed. Opening of the choke valve lifts element 37 through link 36 and crank arms 35, 24 and 22 to avoid the effect of the fast idle device.

Mounted on the cover member 18 is a coil spring device 42 of heat responsive material. The inner extremity of spring 42 is secured to a projection 43 on the cover 18 and the outer extremity of the spring includes a hook 44 for engaging lug 26 on the pivoted arm 24.

The operation of the above-described device is as follows:

Thermostatic spring 42, when cold, urges arm 24 in a counter-clockwise direction through lug 26, and, through roller 23 and arm 22, urges the choke valve towards its closed position as shown in Figure 3. The reactive pressure of the spring and consequently the force exerted by the hooked end of thermostat 42 may be varied by rotation of cover 18 as indicated by the arrow in Figure 1. Suction within the carburetor, produced by movement of the pistons, tends to open the unbalanced choke valve 11 which movement of the valve through arm 22, roller 23 and pivoted arm 24 winds up or tightens thermostatic spring 42. During the clockwise or opening movement of choke valve 11, roller 23 moves downwardly along the recessed portion 25 of pivoted arm 24. Thus the distance between roller 23 and pivot 34, which constitutes a leverage arm for transmitting forces between the choke valve and spring 42, gradually increases as the choke valve is opened (see Figure 10). This results in lessening the mechanical advantage of spring 42 and the effective pressure applied thereby, tending to close the choke valve. Thus the force applied to the choke by spring 42 for any given temperature thereof is greater in the closed position of the choke than in any other position thereof. This is desirable since, when spring 42 is properly calibrated, it results in the building up of suction within the carburetor, particularly during cranking when the choke is closed, so that the choke will be opened farther than would be the case otherwise, resulting in a rapid drop in the intake suction and immediate reclosing of the valve. This produces intermittent opening of the choke as the suction rises and falls during cranking.

During the initial opening of the choke valve, roller 23 must pass over the inclined portion 94 at the lower extremity of recess 25, thus momentarily further impeding the opening of the choke valve and insuring the desirable pulsating or breathing thereof during cranking. The size and contour of recess 25 and roller 23 determine the relationship between the movements of the choke valve and the end of the thermostatic spring and these are calibrated to insure the desired choke action.

In order to render the thermostatic coil 42 more sensitive to engine temperatures, heated air is drawn from stove 29 through housing 18, 19 by suction in the engine intake passage through conduits 27 and 28. When the engine is cold and the choke valve held closed by spring 42, opening 28*a* is covered by arm 31 so as to lessen bleeding of the engine suction through this conduit during cranking of the engine. When the choke valve is substantially opened, projection 33 on arm 22 restricts opening 28*a*. In the full open position of the choke (see Figure 5) a small portion of opening 28*a* preferably is left uncovered so as to insure continued drawing of hot air past the thermostat. If desired, either or both of the restricting arms 22 and 31 may be omitted and air tight assembly of housing parts 18 and 19 relied upon to prevent undue loss of suction in the intake manifold. The thermostat, on becoming heated winds upon itself permitting the choke valve to open due to its own weight and the force of air flowing therepast. Arm 22 and projection 33 function, particularly, to prevent excessive heating of spring 42 beyond that necessary to fully open the choke valve.

Figures 6, 11, 12, 13 and 14 illustrate a modified form of the invention including the housing base plate portion 50 mounted upon the upper portion 7 of the carburetor, the cover portion of the housing and the thermostatic spring carried thereby

being omitted. Formed rigid with the extremity of choke valve shaft 12 is a disk 51 having an abutment roller 52 adjacent the periphery thereof. Projecting radially and circumferentially from disk 51 is a curved arm 53 having a pivoted piston 54 at its extremity, the piston being slidable in a curved chamber 55 on base plate 50. A lever 56 is pivoted at 57 to a portion of the base plate spaced radially from the choke valve pivot and has a lug 91 at its outer extremity for cooperating with a thermostatic spring mounted in the cover portion of the housing, as in case of element 26 in the previous form. A pin 58 projecting inwardly from lever 56 is in position to engage abutment 52 on disk 51. Also rigid with pivot 57 is an arm 35 to which is secured link 36 forming part of the fast idle mechanism.

Hot air conduit 27 and suction conduit 28 open through base plate 50, as in the previous form. Conduit 28 communicates directly with the interior of chamber 55, whereby suction in the intake manifold tends to rotate disk 51 and arm 56 in a clockwise direction through piston 54.

As in the previous form, the thermostatic spring, when cold, maintains the choke valve closed. During cranking and when the engine is running under its own power, the unbalanced choke valve is controlled by suction within the carburetor, by the thermostatic spring and by the relative position of roller 52 and pin 58. When the choke valve is closed, as in Figs. 6 and 13, parts 52 and 58 engage each other at such an angle that the resistance of the thermostat applied through lever 56 has substantial mechanical advantage over the choke valve. But after the valve has opened, as in Figures 11 and 12 and diagrammatic Figure 14, pin 58 moves around the periphery of roller 52 and is engaged thereby at a much sharper angle so that the mechanical advantage of the mechanism is reduced. The net effect is that opening of the choke is more strongly resisted when the valve is closed or nearly so than when it is substantially opened. In Figures 13 and 14, the arrows indicate the angles between the directions of movement of parts 52 and 58 for different positions of the choke. Piston 54 fits loosely within chamber 55 so that suction within the chamber can function at all times to draw hot air through conduit 27 and the housing and around the piston. When the piston abuts wall 59 at the inner end of chamber 55, a slight amount of hot air is drawn around the piston through a recess 60 in the chamber end wall to insure a continued flow of hot air past the thermostatic spring. During cranking for a cold start, piston 54 is substantially unaffected by suction but after the engine fires and starts to run, this piston is drawn into chamber 55 partially opening the choke.

In the modification in Figures 7, 8 and 9, thermostatic spring 42 is secured at its inner extremity to a boss 65 on crank arm 70 loosely carried by pin 66. The pin 66 is rotatably mounted on the housing base plate portion 67, and held in position by the nuts 71. The outer extremity of the spring is secured to a pin 68 on the arm 92 which is rigidly carried by the pin 66. Pin 66 includes a threaded end portion 69 extending through the cover member 72 and receiving nuts 71 for securing the cover in position and is slotted at its extremity to provide a means for the adjustment of the tension of the thermostatic coil. This is accomplished by removal of the nuts 71 and cover 80 and rotation of the pin 66 which thereby rotates the arm 92. Crank arm 70 has a lateral finger 73 at its outer end. Arm 74 is formed rigid with the end of choke valve shaft 12, and has a slot 76 slidably receiving finger 73 on arm 70. A restricted projection 77 in the slotted portion of arm 74 engages finger 73 when the choke is fully closed as in Figure 7. An adjusting screw 78 is provided in the arm 74 which contacts a projection on an arm 75 rotatably mounted on the shaft 12.

Communicating with the interior of housing 67, 72 are a hot air conduit 27 opening through the cover portion of the housing and a suction conduit 28 opening through the base plate portion thereof. Arm 75 is disposed to restrict suction conduit 28 when the choke valve is closed. The adjusting screw 78 allows for a variable amount of covering of the suction conduit opening. During opening of the choke valve under the influence of suction within the carburetor, finger 73 moves inwardly along crank arm 74 so as to gradually decrease the mechanical advantage of the mechanism. Projection 77 on arm 74 serves to initially impede opening of the choke valve 11. The shape of slotted arm 74 may be altered to vary the relationship between the choke and thermostat movement, and forces.

In each of the forms, the effective force transmitted between the thermostatic coil spring and the choke valve is variable depending upon the position of the choke valve due to the sliding linkage connecting the choke valve shaft and the tension on the thermostatic spring. The consequent change of mechanical advantage is balanced against the decreasing force applied to the choke valve by the in-rushing air as the choke opens. The resistance offered to opening movements of the choke valve by the thermostatic spring decreases as the engine, and consequently the spring, increases in temperature. The choke valve thus controlled by a plurality of variable factors functions admirably to insure intermittent opening and closing thereof during the cranking and also provides the proper fuel mixture at all speeds.

The invention is not limited to the details of the various forms shown but may be varied as will occur to those skilled in the art. The exclusive use is contemplated of all modifications that come within the scope of the appended claims.

I claim:

1. In an internal combustion engine, a carburetor, a pivoted choke valve therein, a member having a pivotal support eccentric of said valve and being operatively associated therewith, a heat influenced device for applying pressure to said member to control said valve, and means adjacent said device for heating said device responsive to operation of the engine, said member including structure for substantially depriving said device of the effect of said heating means when said choke valve is open.

2. In an internal combustion engine, means for confining fluid heated by the engine, an intake conduit, a carburetor forming part of said conduit, a pivoted choke valve in said carburetor, a member movable with the choke valve pivot, another member having a pivotal support spaced from said choke valve pivot, said members having engaging parts and one of said parts being susceptible of movement along the other, a heat influenced spring device adapted when cold to resist opening of said choke valve, and passage structure communicating with said fluid confining means and with said intake conduit for uti-

lizing suction in said conduit to conduct heated fluid from said means and adjacent said device, one of said members including a part disposed to restrict said passage structure in at least one position of said choke valve.

3. The combination of parts specified in claim 2 in which said restricting part is disposed to substantially close the communication between said means and said intake conduit when said valve is closed.

4. The combination of elements specified in claim 2 in which one of said members includes an arm rigid with the choke valve pivot and operatively engaging the other member, and also includes a separate arm for substantially closing said passage structure when said valve is closed.

5. In a carburetor, an intake conduit, a pivoted choke valve responsive to suction in said conduit, an element rigid with the choke valve pivot and extending radially therefrom, a member having a pivotal support spaced eccentrically from said valve pivot, said element and said member having engaging parts, and a device for yieldingly resisting movement of said member and said element in a direction to open said valve, one of said parts being movable along the other as said valve is opened independently of said device and said last-mentioned part having a relatively sharply offset portion for offering increased resistance, at least momentarily to relative movements of said parts.

6. The combination of elements specified in claim 5 in which said offset portion is constructed and arranged to momentarily impede opening of said choke valve when in the closed position and when exposed to suction in said conduit due to cranking of the associated engine, so as to permit building up of suction in said conduit.

7. Operating structure for a carburetor choke valve comprising a support, a rotatable member for connection with the choke valve, another member having a pivotal support separate from said first-mentioned member, one of said members being movable along the other, a heat influenced device cooperable with said second-mentioned member for controlling said valve, and means for applying heat to said device, one of said members including means for restricting heat applied to said device by said heating means.

8. In a carburetor, a throttle valve, a member connected thereto, a pivoted choke valve, an element rotatable with said choke valve, structure operatively engaging said element and having a pivotal support spaced eccentrically from the choke valve pivot, and means connected to said structure and cooperable with said throttle member to limit the closing movement of said throttle valve.

9. The combination of elements specified in claim 8 further including a spring acting upon said pivotally supported structure for influencing the operation of said choke valve.

10. In combination, a carburetor choke valve, and mechanism for yieldingly resisting opening of said valve comprising a pair of pivoted members, one of said members being operatively connected to said valve, and means for yieldingly resisting rotation of the other member, one of said members having a part constantly engaging and movable along the other member whereby the mechanical advantage of said mechanism is variable depending upon the relative positions of said members, and the other member having a relatively sharply offset part cooperable with said first-mentioned member for momentarily increasing the resistance to opening of said choke valve.

11. Operating mechanism for a carburetor choke valve comprising a pair of members having spaced pivotal supports, one of said members being constructed and arranged for operative connection with the choke valve, and the other member having a part constantly engaging and movable along said first-mentioned member, a device for yieldingly resisting said pivoting of second member to control said valve, and means at least partially controlled by other parts of the mechanism for varying the resistance applied by said device.

IRVEN E. COFFEY.

DISCLAIMER

2,139,355.—*Irven E. Coffey*, St. Louis, Mo. CARBURETOR DEVICE. Patent dated December 6, 1938. Disclaimer filed October 2, 1940, by the assignee, *Carter Carburetor Corporation*.

Hereby enters this disclaimer to claims 8 and 9 in said specification.

[*Official Gazette October 29, 1940.*]