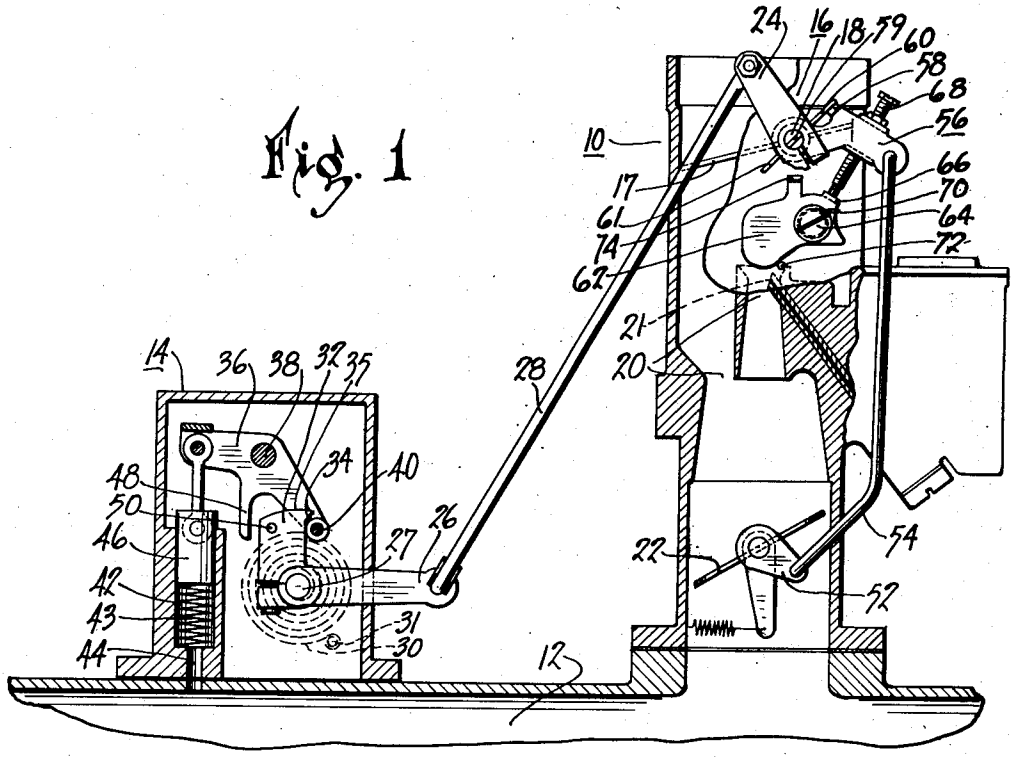
July 9, 1946. S. F. HUNT 2,403,720

CARBURETOR

Filed Aug. 24, 1932 2 Sheets-Sheet 1

Fig. 1



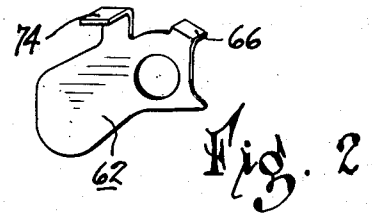


Fig. 2

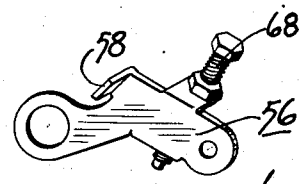


Fig. 3

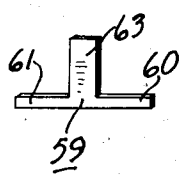


Fig. 4

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CARBURETOR

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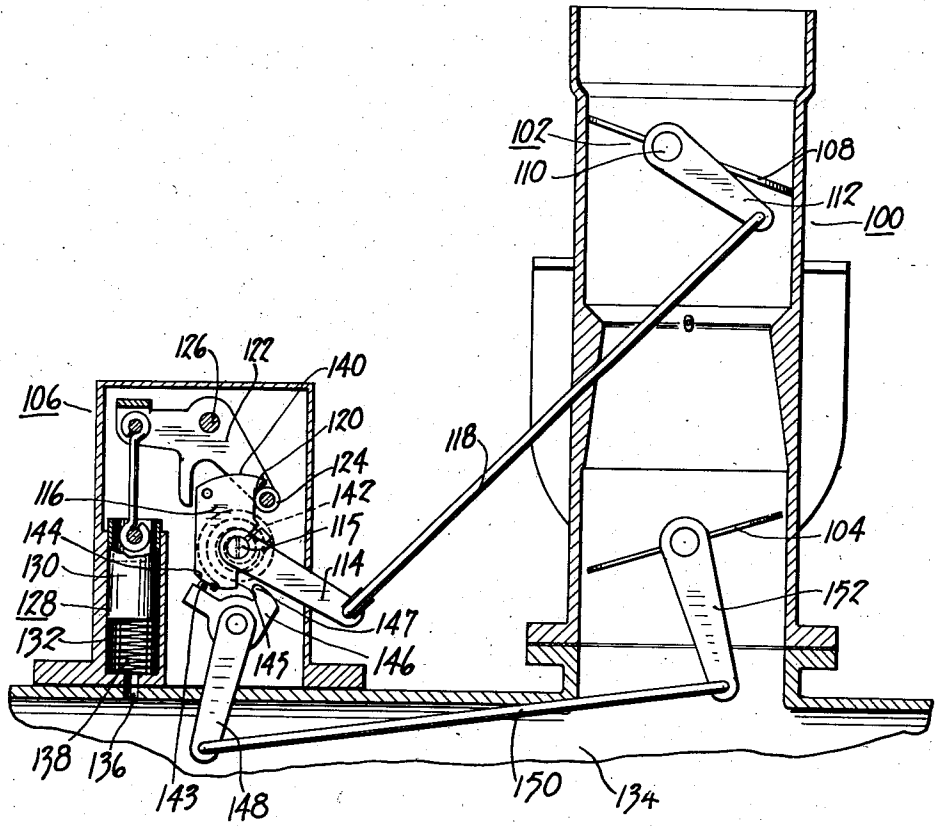


Fig. 5

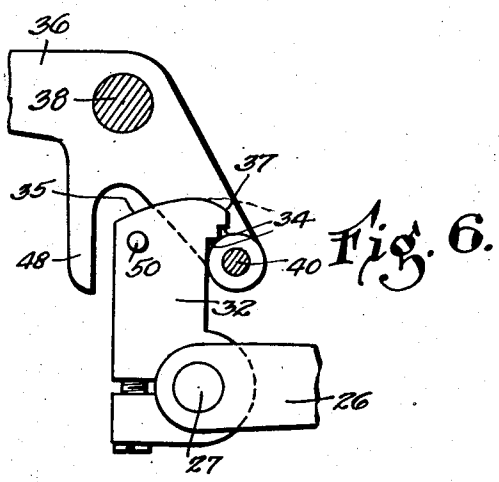


Fig. 6.

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UNITED STATES PATENT OFFICE

2,403,720

CARBURETOR

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Application August 24, 1932, Serial No. 630,274

36 Claims. (Cl. 123—119)

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This invention relates to carburetor choke valves and particularly to those which are automatic in operation.

Internal combustion engines using liquid fuel are ordinarily equipped with carburetors having either manually or automatically operated choke valves for closing off the air supply and enriching the fuel mixture as is necessary during engine starting. Automatic choke valves which are operated and controlled by the variables in engine operation, including manifold suction, temperature, intake suction, etc., during the starting period as well as while running, provide a mixture fairly consistent with engine requirements. One of the principal variables utilized is that of engine manifold suction which is employed for the purpose of unlocking the choke valve upon rise of vacuum due to engine starting. Manifold suction, however, is subject to extreme and rapid changes, especially in the event of spasmodic or irregular firing, back-firing, etc., during starting which may act to greatly exaggerate the irregular firing condition. As the engine moving parts have relatively high inertia they do not follow the rapid changes in manifold suction, and this invention is therefore directed towards smoothing the action of the manifold suction upon the operation of the choke valve so as to satisfy the engine requirements more accurately. Another feature of the invention has to do with assuring a uniform position of the throttle valve during starting to minimize the number of variables with which the automatic choke must contend.

Further the invention is directed to throttle operated mechanism whereby the choke may be positively opened manually in the event of flooding, so that the operator can in an emergency, air out or draw out, excessive fuel concentrated in the engine, without delay or crank case dilution. The invention also contemplates provision for positively opening the choke valve while the same is under the influence of a thermostat, thus doing away with the danger of the valve sticking or being held too tightly shut by the thermostat as in extremely cold weather.

It is accordingly an object of this invention to provide an automatic carburetor choke mechanism adapted to prevent over choking of the engine during the starting period at such times as spasmodic or irregular firing may occur.

A further object of the invention is to provide an automatic carburetor choke mechanism adapted to prevent over choking of the engine which might result from excessive cold temperatures on the thermostatic regulator, or sticking of the choke valve.

A further object of the invention is the provision of means whereby the throttle valve may tend to naturally place itself in a proper fast

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idling position for starting, thus relatively fixing one variable.

It is a further object of the invention to provide a mechanism for manually and positively opening the choke without additional controls when it is desired to clear out excess fuel in the motor, as might result from over choking.

A further object of the invention is to provide means for positively opening the choke valve during such engine operation as produces manifold vacuum sufficient to warrant opening of the choke.

A further object of the invention is the provision of several stages of resistance to the initial opening of the choke, so that the same may be held in slightly open position as well as closed position depending upon the stage of starting operation.

Another object of the invention is the provision of means for preventing the throttle from closing to its normal slow idling position during the starting or warming up period which means may not interfere with the operation of a sensitive thermostatic control.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in connection with the accompanying drawings. It is expressly understood, however, that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawings wherein similar reference characters refer to similar parts throughout the several views:

Figure 1 is a diagrammatic illustration partly in section of a carburetor and automatic choke combined in accordance with this invention;

Figure 2 is a perspective view of a cam adapted to control the closed position of the throttle;

Figure 3 is a perspective view of a lever stop member adapted to engage the cam of Figure 2;

Figure 4 is a perspective view of a member employed to engage the lever of Figure 3;

Figure 5 is a modified form of the invention and is a diagrammatic illustration partly in section of a carburetor and automatic choke mechanism; and

Figure 6 is an enlarged vertical section showing a portion of the choke actuating mechanism.

Referring to the drawings and particularly to Figure 1, there is shown a common type of down draft carburetor 10 secured to a manifold 12 to which is also affixed a control mechanism 14 for operating the choke valve mechanism 16. Referring to the carburetor, there is shown a choke valve comprising an unbalanced disk 17 rigidly mounted on a shaft 18 which is pivotally mounted in the carburetor housing. Below the venturis 20

and jet 21 there is provided the usual butterfly throttle valve 22 which is adapted to control the flow of mixture into the intake manifold 12. Secured to the choke valve shaft 18 is a crank 24 which is connected by a link 28 to a second crank 26 mounted on the shaft 27 of the control mechanism 14, so that shaft 27 and the choke valve may operate together. The shaft 27 carries one end of a spirally arranged thermostatic bimetallic spring 30 which is secured at its other end on a suitable pin 31 which may be fixed to the housing or arranged for suitable adjustment, as may be desired, the thermostat being adapted to urge the choke closed when below normal operating temperatures. The shaft 27 also carries a cam 32 rigidly secured thereto which is provided with several notches 34, which may be varied in number or in size or may even be a smooth surface of proper length, as may be desired, and which engage a roller follower 40 provided on the end of a lever 36. The notches 34 are arranged with respect to the pivot 38 of the lever 36, so as to transmit an extremely small circumferential force or turning torque to the lever, so that a relatively low mechanical advantage exists when the choke valve, in its initial movement, attempts to rock the lever by means of the cam notches 34 and roller follower 40. Ordinarily, this mechanical advantage is so low that suction upon the unbalanced choke valve 17 is incapable of actuating the lever 36 through the cam and roller, so that in order to permit the unbalanced valve to open at such times as the engine may require, a vacuum cylinder 42 directly connected to the manifold 12 through the aperture 44 is provided, and upon a certain degree of suction being present in the manifold, as may be present when the engine starts to run, the piston 46 therein will be urged downwardly against the spring 43 and will aid the movement of the lever 36 and roller 40, and thus permit the unbalanced valve to open. Once the unbalanced valve has passed the initial opening movement, the circumferential portion 35 of the cam 32 engages the roller which offers little or no resistance to subsequent choke valve movement and tends to retain the piston in depressed position within the cylinder, so that during any period when the suction may be insufficient to retain the piston at the bottom of its stroke, undue fluttering may not take place. While the engine is operating normally, there is usually sufficient suction to draw the piston 46 well down in the cylinder 42 and maintain the roller follower 40 entirely free from the cam 32 thereby leaving subsequent control of the choke valve solely to the bimetallic thermostat coil 30 and the intake suction, as hereinafter described.

When there is a fair vacuum present in the manifold which can only occur at such times as the engine rotates at a fairly high rate of speed or above cranking speed, it is always desirable that the choke valve be open sufficiently to prevent flooding or over choking the engine. To insure this result, the lever 36 is provided with an extension arm 48 which is adapted to engage a pin 50 secured to the cam 32 and thus positively open the choke valve a small amount when the piston 46 is depressed.

It often occurs that an operator inadvertently cranks an engine without switching on the ignition, and it is apparent that under those conditions the motor would flood with raw gasoline and be incapable of starting thereafter unless provision is made for airing out or drawing out the excess fuel from the cylinders. In such an

instance, it would be impossible to clear the cylinders of this raw gasoline unless the choke valve could be held open or until such time as the engine had set long enough to permit the fuel to drain, for instance, into the crank case.

Accordingly, there is provided on the throttle valve 22 means for positively opening the choke valve providing the throttle is moved to substantially wide open position. For this purpose, the crank 52 is provided on the throttle valve, which through the link 54, actuates a lever 56 pivotally mounted upon the shaft 18 of the choke valve. An ear 58 turned up on the lever 56 is adapted to strike a projecting arm 60 of a T-shaped member 59 (see Fig. 4) the body portion 63 of which is secured in a slot in the shaft 18, inside the collar or hub of crank 24, so that opening the throttle valve to full open position may forcibly open the choke valve through the lever 56, ear 58, and projecting arm 60.

Since movement of the choke valve is resisted by the low mechanical advantage cam and roller follower 32 and 40, an increased effort on the part of the operator is necessary in order to open the throttle valve to the wide open position and to overcome the cam and follower resistance when the ear 58 engages arm 60 to open the choke. This extra resistance during initial opening of the choke tends to limit the normal open position of the throttle valve, so that the average operator will open the throttle only to the point where he feels this added resistance, thereby securing substantially fixed position for the throttle during starting.

To provide a fast idle, since it is desirable to idle a cold engine at a slightly higher rate of speed to prevent stalling, a cam 62 is provided which is pivotally mounted on the carburetor casing as at 64 and is adapted by means of a stop in the form of a bent up ear 66 on the periphery of the cam 62 to engage an adjusting screw 68 in the lever 56. By suitable adjustment of the screw 68 the downward movement of the lever 56 may be regulated and thus control the minimum closed throttle position. In order to hold the cam 62 in position so that the stop 66 may engage the screw 68, a helical spring 70 on the mounting 64 is provided which, in conjunction with the force of gravity due to the unbalance of cam 62 about its pivot 64, tends to turn the cam in the counterclockwise direction against the stop pin 72 which accurately positions the cam normally. After the engine is warmed up the fast idle is no longer needed and for the purpose of permitting the throttle valve to close completely to its normal or slow idle position, the arm 61 of the T-shaped member 59 is adapted to engage an ear 74 on the cam 62, so that when the choke valve takes a wide open position, the cam 62 will be rotated in a clockwise direction and will move the stop 66 clear of the path of the adjusting screw 68. The end of the stop screw 68 is then free to pass behind cam 62, allowing the throttle to close to its slow idle position as determined by any conventional throttle stop means.

It is sometimes desirable to close the choker valve sooner than thermostatic action warrants, as would occur for warm engine starting. For this purpose the cam surface 35 may be pitched, as indicated in Figure 6, particularly adjacent the end near the locking cam surface 34, so that the roller follower, when urged by the spring 43 behind the piston at such times as there is no manifold vacuum and engine is stopped, may

cause the cam to turn counterclockwise and close the choke. The extent of the pitch may be varied, but it is preferable that that portion of the cam surface which engages the roller follower when the choke is wide open have a contour such that during normal engine operation and wide open choke there will be no tendency for the valve to close, particularly at such times as the piston is not retained at the bottom of its stroke by manifold vacuum, whereas the remainder (indicated at 37 in Figure 6) of the cam surface has a contour such that when the choke valve is but partially opened the follower 40 will tend to rotate the cam 32 in the counterclockwise direction, to close the choke valve.

In the modification shown in Figure 5, there is provided a down draft carburetor 100, an unbalanced choke valve 102, throttle valve 104, and an automatic actuating mechanism 106, for the choke, designed to function in a manner somewhat similar to that shown in Figure 1. In this modification, the unbalanced choke valve disk 108 mounted on a shaft 110 rotates the lever 112 thereby driving through the link 118, the lever 114, shaft 115, and cam 116 in the actuating mechanism 106. The cam 116 is notched as at 120 and is adapted to rotate the lever 122 carrying the roller follower 124 in a counterclockwise direction about its pivot 126. The lever 122 is also adapted to be rotated in a counterclockwise direction by the suction motor 128 comprising a piston 130 and cylinder 132. The suction motor is preferably mounted so as to have direct access to the intake manifold 134 through a short channel 136, as shown. A spring 138 urges the piston upward in the cylinder against suction of the manifold.

As in Figure 5, the unbalanced choke valve 108 under starting conditions, does not exert enough force to drive the lever 122 through the cam and follower 124, since the mechanical advantage of the notched portion of the cam and roller is designed especially low. However, upon suction taking place in the manifold, the piston 130 is urged downward and aids the choke valve action thereby permitting the choke valve 108 to open, and having once opened a sufficient amount, the roller 124 may thereafter ride freely upon the cam surface 140 which may have a contour similar to Fig. 1 permitting the thermostatic element 142 to regulate the opening of the choke 108 through its connection to the shaft 115. While the motor is running the piston 130 is drawn to the bottom of the cylinder 132 and will raise the roller 124 completely out of the range of contact with the cam 116, and surface 140, although the cam surface 140 may serve to limit fluttering of the piston during momentary decreases in vacuum due to acceleration, etc.

To provide a fast idle at such times as the choke valve may be functioning either from the thermostatic element 142 or the low mechanical advantage lock consisting of the cam surface 120 and the follower 124, the cam 116 is provided with an additional peripheral surface 144 which is adapted to engage a projection 143 on the lever 146 and through the lever arm 148, link 150 and throttle lever 152, retain the throttle in slightly open position, adjustment of which position may be made by varying the length of the link 150 or the position of the levers on their respective shafts, or by other suitable means.

It will be readily observed that when the choke valve is open wide, the cam surface 144 will be rotated so as to clear the projection 143 on the lever 146, thereby permitting the throttle valve to close completely and eliminating the fast idle. To provide means for positively opening the choke in the event of flooding the motor, the lever 146 at its opposite end is provided with an arm 147 which is adapted to engage the radial end portion 145 of the cam 144, so that upon full opening of the throttle valve 104, the projection 147 may strike the radial surface 145 and force the cam 116 to rotate against the resistance of the lock provided between the cam surface 120 and follower 124 thereby opening the choke valve.

In operation, the throttle valve is set in a partly open position either manually or by other suitable means as by interconnection with the starter, which position is governed in Figure 1 by the resistance offered by the choke when attempt is made to open the throttle wide, and once the throttle is thus opened partially, it cannot be completely closed, since the cam 62 with its stop 66 shifts to a position so as to engage the fast idle adjustment screw 68. As the engine is cranked a heavy fuel charge will be drawn from the jet 21 since the choke valve is substantially locked closed. Upon initial firing the manifold vacuum may suddenly rise possibly for an instant, but may in that instant, cause the piston 46 to move which may combine with the pressure on the choke valve 16 and thereby cause or permit the choke valve to open. A single explosion or plurality of explosions thereby may cause either the choke valve to open wide enough to clear the resistance offered by the cam and follower, or to open partially as would be the case should the follower 40 move to a different notch in the cam 32. During irregular firing, the motor may not be self-sustaining but its cranking speed may be materially increased, so that a partial opening of the choke is necessary to prevent over choking. The notches in the cam provide for a partial opening and tend to damp the movement of the choke since otherwise the choke would flutter between locked and unlocked position, thereby giving erratic mixture variations. When the motor starts to run of its own accord rather than in spasmodic or irregular fashion, the piston 46 is drawn to the bottom of the cylinder clearing the roller follower from the cam and further action of the choke is dependent upon the temperature surrounding the thermostat 30 except that the choke may be maintained partially open by the lever 48 and pin 50. As the engine is cool the thermostat spring 30 will urge the choke to a closed position but being resilient may permit the same to open to accommodate and regulate air flow into the carburetor.

Further operation of the choke is entirely dependent upon the temperature surrounding the thermostatic element and as the thermostatic element is heated to a normal operating temperature it tends to coil up and finally exert no force upon the choke valve whatever, thereby permitting the same to remain in open position. In assuming this position the projecting arm 61 of member 59 carried on the choke valve shaft 18 engages the projection 74 of the cam 62 rotating the same so as to bring the stop 66 out of contact with the fast idle adjusting screw 68 thereupon discontinuing the fast idle during further engine operation. Since when there is sufficient suction to draw the piston 46 to the bottom of its stroke, the choke must be open a certain amount to prevent over choking, under such conditions the extension arm 48 on the lever 36 operated by the piston 46 is adapted

to positively engage the pin 50 and force the choke to a slightly open position.

In the event of flooding the engine as by cranking with the ignition turned off, it is possible to air out the cylinders by opening the trottle wide open which forces the choke valve to be open sufficiently to release the vacuum around the venturi 20 and jet 21, and prevent the flow of excess quantities of fuel therefrom whereupon after sufficient cranking, the engine may clear itself of the excess fuel, by exhausting the same.

Operation of the modification shown in Figure 5 is similar to that of Figure 1 and differs in that the fast idle cam 144 bears against the lever 146 in such a way as to present friction to the shaft carrying the thermostatic element. In some respects the friction from this contact reduces the sensitivity of the thermostat during such times as the throttle is maintained in fast idle position but since during car operation or especially while the vehicle is under way the throttle valve is seldom closed to the position of fast idle except momentarily, this does not offer a serious disadvantage.

Though several embodiments of the invention have been illustrated and described, it is to be understood that the invention is not limited thereto but may be embodied in various mechanical forms. As various changes in construction and arrangements of parts may be made without departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

I claim:

1. An automatic choke comprising an unbalanced choke valve, a vacuum operated cylinder having a piston resiliently urged outwardly, a lever actuated by said piston, a cam in engagement with said lever and actuated by said unbalanced choke valve, said cam adapted to drive said lever at a low mechanical advantage during initial opening movement of the choke valve.

2. An automatic choke comprising an unbalanced valve, a suction responsive motor, resilient means resisting operation of said motor, and means comprising several stages of low mechanical advantage for transmitting initial opening movement of said unbalanced valve to said motor, said mechanical advantage being so low as to substantially prevent opening movement of said valve except when aided by response of said motor to suction.

3. An automatic choke comprising an unbalanced valve, a suction responsive motor, resilient means resisting operation of said motor, and means for transmitting initial opening movement of said valve to said motor, said means affording several stages of movement of low mechanical advantage throughout the range of initial opening movement of said valve to substantially arrest the transmission of motion, unless aided by said motor.

4. In an automatic choke, an unbalanced choke valve, a low mechanical advantage lock for resisting initial opening movement of said choke valve, said lock adapted to provide several initial opening locked positions for said choke valve, and means for breaking the lock.

5. In an automatic choke, a choke valve responsive to air pressures, means for locking said valve shut, means for locking said valve in slightly opened position, and means for rendering inoperative both of said locking means including a suction motor.

6. In an automatic carburetor choke, an unbalanced choke valve, a suction motor, means for transmitting the motion of said choke valve to said motor affording a plurality of steps of relatively low mechanical advantage during the initial opening movement of said valve to resist opening of said valve through its initial opening range of movement.

7. In an automatic choke, an unbalanced choke valve, a throttle valve, a stop constrained to move with said throttle, a pivoted member having a peripheral portion adapted to engage said stop to prevent complete closure of the throttle, and means carried by said unbalanced valve for shifting said pivoted member to move said portion out of engagement range with said stop, upon movement of said unbalanced valve to partially open position.

8. In an automatic choke, an unbalanced choke valve, means for resisting opening movement of said choke valve due to force of suction thereon, means for aiding said choke valve to overcome said resisting means, a throttle valve, and means connecting said throttle valve to said choke valve and operative upon movement of the throttle valve to fully opened position to forcibly open said choke valve against the resisting means.

9. An automatic carburetor choke, comprising an unbalanced choke valve, locking means therefor, manifold suction responsive means for breaking said locking means, a throttle valve, and means for preventing the throttle valve from completely closing at all times except when said choke is in substantially wide open position.

10. In an automatic carburetor choke, an unbalanced valve, a suction motor, a thermostatic element adapted to urge said valve closed when cold, means connecting said valve to said suction motor, and offering a high resistance to initial opening when unaided by said suction motor, and means operated by said suction motor for positively opening said choke slightly upon high suction therein.

11. In an automatic carburetor choke, an unbalanced valve, a throttle valve, means resisting opening of said unbalanced valve by suction acting on the unbalanced valve, and pivoted means shiftable with said unbalanced valve and having a peripheral surface adapted at times to limit the closing movement of said throttle valve.

12. A thermostatically controlled choke valve, a throttle valve, means for offering a high resistance to initial opening of said choke valve prior to increased air demands due to engine starting, and means operative to limit closure of said throttle valve, said last named means being adapted to be rendered inoperative when the choke valve reaches a substantially open position.

13. An automatic carburetor choke comprising an unbalanced valve, a thermostatic element urging said valve to closed position, a locking means adapted to lock said valve in closed and slightly open positions, and common suction responsive means for breaking the locking means and for forcibly opening said valve against the resistance of said thermostatic element.

14. An automatic carburetor choke comprising a valve responsive to air pressure, means for resisting initial opening movement of said valve, said means adapted to resist the movement of said valve over a range from completely closed to slightly open position, and suction responsive

means for freeing said valve from the effect of said resisting means.

15. In a carburetor choke, a thermostatically controlled choke valve, means adapted to close said choke at times when the thermostat is inoperative due to temperatures close to normal operating temperatures, and suction responsive means for preventing the action of said closing means.

16. In an automatic choke, an unbalanced valve, a cam operable thereby and a spring-pressed cam follower tending to close the choke, said cam having a comparatively steep or nearly radial portion of its contour in engagement with said follower when the valve is closed or substantially closed, and a nearly concentric portion of its contour adjacent said follower at other valve positions.

17. In a carburetor, a choke valve responsive to air pressure, means for locking the choke valve closed, vacuum responsive means for breaking the lock, and engine heat responsive means for holding the vacuum responsive means against operation.

18. In an automatic choke, a choke valve responsive to air pressures, temperature operated means for closing said valve, temperature operated means for locking said valve shut and in slightly opened position, and common means for breaking the lock in each position.

19. In an automatic choke for a carburetor adapted for use with an internal combustion engine having an intake manifold, a choke valve, a throttle valve, means carried by the intake manifold and controlled by the position of the choke valve for preventing the throttle valve from completely closing, said means being rendered inoperative when the choke valve assumes substantially wide open position.

20. A carburetor comprising an unbalanced choke valve, a vacuum operated motor including a cylinder and piston, a bimetallic thermostatic unit connected to the choke valve, a throttle valve, connecting means between said choke valve and said throttle valve, and a member actuated by the piston and modifying said connecting means.

21. In a carburetor for an internal combustion engine having an intake manifold, a choke valve, a throttle valve, a thermostatically operated cam supported on the intake manifold and remote from said choke and throttle valves, follower means associated with said throttle adapted to engage said cam to regulate the throttle opening, said cam having a contour such as to permit full closure of said throttle upon heat of normal operation on the thermostat.

22. In a carburetor for an engine having an intake manifold, a throttle, a pressure responsive choke valve, and temperature-controlled stop means mounted on the intake manifold and governed by the position of the choke valve for unyieldingly limiting the movement of the throttle.

23. In a carburetor for an internal combustion engine, a suction responsive choke valve, temperature responsive means urging the choke valve closed when cold, a throttle valve, a stop member movable by movement of the throttle, an abutment member cooperating with the stop member to variably limit closing movement of the throttle valve, said abutment member being movable by gravity into one of its extreme positions, and a lost-motion connection between the choke valve and said abutment member for moving the abutment member into an opposite position when the choke valve is moved to a predetermined position.

24. 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 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.

25. 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 engaging and movable along said first mentioned member, a device for yieldingly resisting pivoting of said 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.

26. In a carburetor, an induction passage having an air inlet, an unbalanced pressure responsive valve controlling the air inlet, temperature responsive means controlling said valve, a throttle valve controlling the induction passage, a movable stop member actuated by the throttle valve, a member actuated by the choke valve and adapted to engage the stop member to limit the closing movement of the throttle valve in accordance with the position of the choke valve, and a vacuum actuated motor communicating with the induction passage posterior to the throttle valve and mechanically connected to the choke valve to influence the movements of the choke valve.

27. In a carburetor, an induction passage having an air inlet, a pressure responsive valve controlling the air inlet, temperature responsive means controlling said valve, a throttle valve controlling the induction passage, a movable stop member actuated by the throttle valve, a rotatable member actuated by the choke valve and adapted to engage the stop member to limit the closing movement of the throttle valve in accordance with the position of the choke valve, a vacuum actuated motor communicating with the induction passage posterior to the throttle valve to modify the position of said rotatable member, and means adapted to engage the rotatable member to move the choke valve from the closed position when the throttle valve approaches the fully open position.

28. In a carburetor having a carbureting passage, an unbalanced choke valve and a throttle valve therein, means operative in accordance with the position of the choke valve to variably limit the closing movement of the throttle, means operative upon opening movement of the throttle to open the choke valve, and pressure responsive means communicating with the carbureting passage posterior to the throttle valve for influencing the position of both the choke and throttle valves when the pressure responsive means is actuated.

29. A carburetor of the character described, comprising a body having a passageway therethrough with air and fuel inlets, a manually operable throttle valve controlling flow through said passageway and freely movable toward open position, said valve being movable to closed engine

idling position at the will of the engine operator to control engine idling operation, and adjustable means for limiting the extent of closing movement of said valve, said means comprising a member rotatably and eccentrically mounted on said body, an adjustable stop member movable with said valve and engageable with the peripheral surface of said eccentric member on valve closing movement, said stop member being carried by said body, means controlled by engine temperature for moving said eccentric member as engine temperature rises to permit further closing movement of said valve, an arm operatively connected to said eccentric member, said temperature responsive means being operatively connected to said arm.

30. In a carburetor, a throttle valve, a source of suction beyond the throttle valve, a heat sensitive mechanism, means operable by said heat sensitive mechanism including a cam having a contour adapted to engage a stop member to prevent complete closure of said throttle during cold carburetor operation, and pressure responsive means communicating with the source of suction to modify the action of the heat sensitive mechanism.

31. In a carburetor having a downdraft induction passage, a throttle mounted in the lower end of said passage, a choke valve in the upper end of the passage, and means governed by the position of the choke valve for limiting the closing movement of the throttle, said means comprising a thermostatically actuated rotary stop member mounted on the upper end of said carburetor adjacent the choke valve and having a portion on its periphery for providing a fast idle position of the throttle, and means operable by the choke valve to move the rotary stop to inoperative position as the choke valve moves toward open position.

32. In a carburetor for an internal combustion engine, a suction responsive choke valve, temperature responsive means operative when cold to urge the choke valve toward closed position, vacuum responsive means influencing the operation of said choke valve, a throttle valve, a stop member movable by movement of the throttle, a pivoted eccentric abutment member having a portion for limiting closing movement of the throttle valve and being movable into one position wherein said portion is in juxtaposition to the stop member to provide a fast idle and into another position wherein said portion is out of engagement range of the stop member for slow idle, said abutment member having an eccentrically disposed center of mass and being movable by gravity toward one of said positions, and a connection between the choke valve and the abutment member for moving the abutment member toward the other of said positions.

33. In a carburetor for an internal combustion engine, a pressure responsive choke valve, temperature responsive means influencing the operation of said choke valve, a throttle valve, a connection between the throttle valve and the choke valve operative to move the latter toward open position when the throttle valve is moved toward open position, a stop member movable by movement of said throttle, a pivoted abutment member having a portion for limiting closing movement of the throttle valve and being movable into one opsition wherein said portion is in juxtaposition to the stop member to provide a fast idle and into another position wherein said portion is out of engagement range of the stop member for slow idle, said abutment member having an eccentrically disposed center of mass tending under the influence of gravity to move said member toward one of said positions, a light torsion spring acting on said member in a direction to assist the influence of gravity, and a connection between the choke valve and the abutment member for moving the latter to the other of said positions upon movement of the choke valve to one of its extreme positions.

34. In a carburetor for an internal combustion engine, a suction responsive choke valve, means responsive to temperature for influencing the operation of said choke valve, a throttle valve, a stop member movable by movement of said throttle, an abutment member pivotally mounted on the carburetor and having a peripheral portion adapted to engage the stop member in one position of the abutment member to thereby limit closing of the throttle to provide a fast idle, said abutment member being out of engagement range of the stop member in another position of the abutment member, yielding means tending to rotate the abutment member on its pivot toward one of said positions, and a connection between the choke valve and the abutment member operative upon movement of the choke valve toward one of its extreme positions to rotate the abutment member on its pivot toward the other of said positions.

35. In a carburetor, a substantially vertical down draft mixing conduit, a throttle valve at the lower end of the conduit, a choke shaft pivotally mounted in the upper end of said conduit, a choke valve secured to said shaft, a pair of cooperating pivotally mounted stop members, one of said members being pivotally mounted coaxial with the choke shaft and the other being pivotally mounted on an axis adjacent to but spaced from the choke shaft axis, one of said members comprising a cam and the other comprising a lever carrying an adjustable screw adapted to engage a peripheral surface of said cam, a connection between one of said members and the throttle valve and a connection between the other of said members and the choke valve, said connections being so constructed and arranged to limit throttle closing movement at times when the choke valve is substantially closed to thereby provide a fast idle.

36. In a carburetor, a choke shaft having a choke valve thereon, a throttle shaft having a throttle valve thereon, a pair of cooperating stop members, one of said members comprising a rotatable eccentric abutment having a peripheral portion and the other of said members comprising a rotatable lever carrying an adjustment screw adapted at times to engage said portion, one of said members being rotatable about the axis of one of said shafts and the other of said members being rotatable about an axis parallel and adjacent to the first mentioned axis, a connection between the throttle valve and the member carrying the adjustment screw to limit closing movement of the throttle when the screw engages the said peripheral portion, and a connection between the choke valve and the eccentric abutment for rotating the abutment.

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