Jan. 12, 1954 M. L. SMITLEY 2,665,891

ANTISTALL DEVICE

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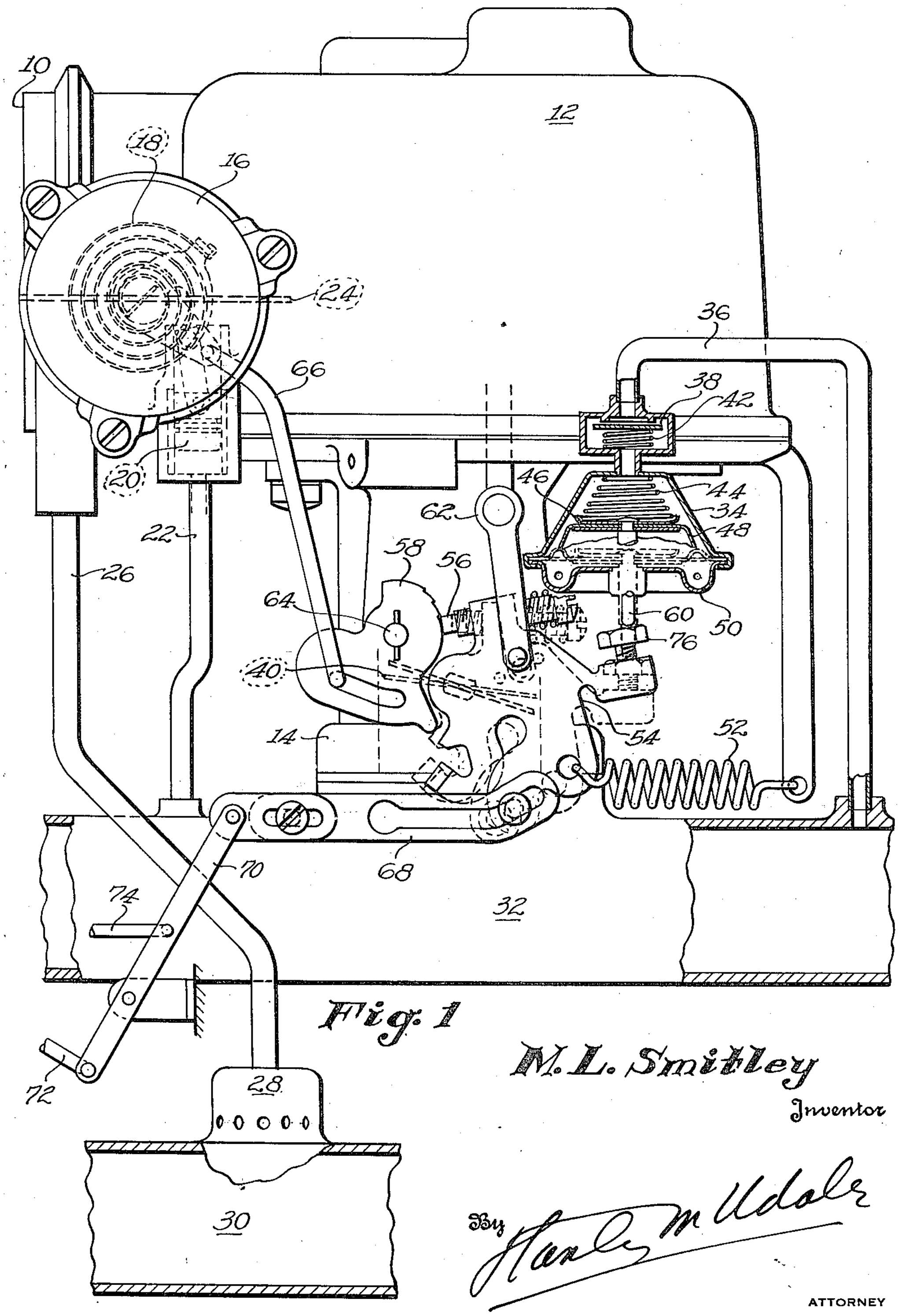

Fig: 1

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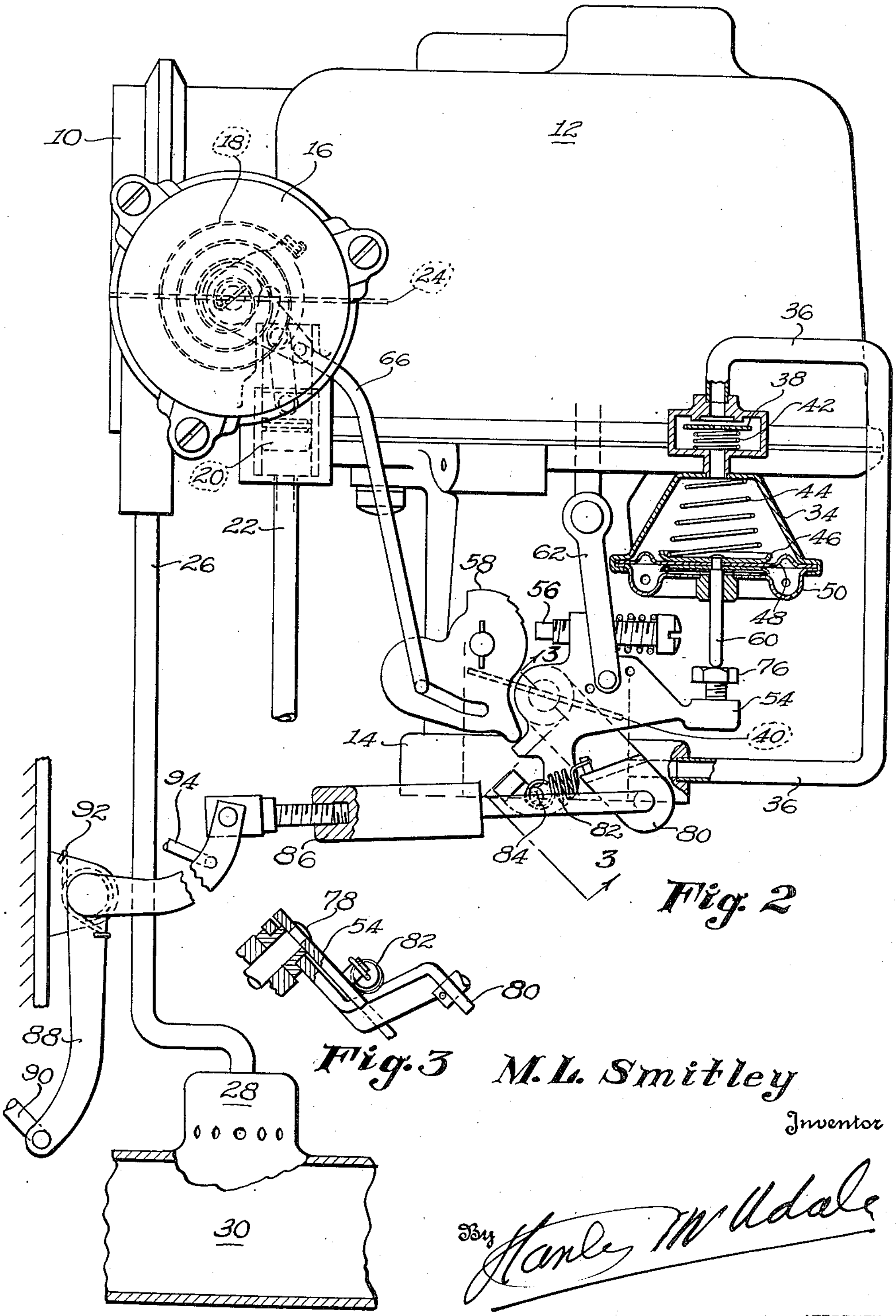

Fig. 2

Fig. 3

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ANTISTALL DEVICE

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8 Claims. (Cl. 261—52)

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The objects of my invention are:

(a) To prevent stalling of the engine in an automobile equipped with an automatic transmission whenever the throttle is suddenly closed.

(b) To automatically provide sufficient throttle opening during the starting operation to insure an engine speed of at least 600 to 700 revolutions per minute immediately after starting so that the starting mechanism is positively released, where a starting mechanism of the lock-in type is used.

(c) To reduce engine stalling encountered when a partially warmed up engine is allowed to idle in cold, damp weather, when the engine would otherwise stall due to carburetor icing.

(d) To reduce creeping of the automobile due to drag of the automatic transmission by permitting a lower idle speed adjustment which would otherwise be prohibitive because of the danger of engine stalling.

(e) To permit the engine to be started with the least possible mental and physical effort. With my invention it is not necessary to mechanically depress the throttle in order to set the automatic choke. In installations where a key type starter switch is used, along with my invention, the engine may be started by simply inserting and turning the ignition key.

(f) To obtain improved starting of a hot engine by providing at all times a partially open throttle under starting conditions. Where my invention is not used and a hot engine is started with the throttle closed, there is a tendency for the engine to fire just enough to kick out the Bendix drive and stall. With my invention the engine will start with sufficient speed to continue running.

(g) To enable the anti-stall device with its auxiliary throttle return spring to be assembled and calibrated as a self-contained assembly with the carburetor so that the throttle closing rate can be preset at the factory and will not be influenced by variations in the throttle return spring which is a part of the foot operated accelerator mechanism on the automobile.

One problem heretofore unsolved has been due to the accumulation of heat flowing into the carburetor after the engine stops in hot weather. The result is to cause fuel to boil out of the nozzle down the mixture outlet past the almost closed throttle and so into the inlet manifold. The mixture thus trapped in this manifold will not fire. The throttle heretofore has been held in the slow idle position called for by the thermostatically controlled choke or by the manually controlled choke mechanism. This is an almost closed position of the throttle. The rich mixture in the manifold is thus trapped.

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By holding the throttle partially open two results are obtained:

(1) Natural ventilation permits the vapors to escape.

(2) When starting, air enters freely without opening the throttle. With the old construction when the throttle is touched the accelerating pump immediately discharges and makes the condition worse.

Once the engine attains 1000 revolutions per minute it can safely be slowed down to 400 revolutions per minute at which speed it will continue to run. This speed is determined by the vacuum operated thermostatically controlled choke valve in general use. This conventional choke is a non-stalling device and this invention is to supplement the non-stalling feature of the automatic choke by delaying the motion of the throttle to its idle position, whether that position is the fast idle position for a cold engine or the normal idle position when the engine is hot.

Briefly this invention includes a passage connected to the inlet manifold and to a chamber with a movable wall and a check valve in the passage so as to permit air at atmospheric pressure or near atmospheric pressure to flow freely into the chamber. When the throttle is closed the check valve prevents inlet manifold suction acting on the movable wall. A restricted bypass in the middle of the check valve (a disc) regulates the rate at which the pressure falls in the chamber. This chamber contains a compression spring and operates a stop which prevents the throttle closing completely.

Fig. 1 shows one form of my invention in partial cross-sectional elevation. The throttle stop being shown in the inactive position.

Fig. 2 shows the preferred form of my invention. The throttle stop being shown in the active position.

Fig. 3 shows a partial cross-sectional elevation on plane 3—3 of Fig. 2.

In Fig. 1, 10 is the air entrance. 12 is the air entrance cover which also enclosed the float chamber, not shown. 14 is the mixture outlet flange. 16 is the automatic choke cover containing a coil thermostat 18. 20 is the vacuum operated piston operated by inlet manifold suction transmitted through the pipe 22. 24 is the choke valve. 26 is the hot air pipe deriving hot air from stove 28 located on the exhaust pipe 30. 32 is the inlet manifold on which the flange 14 is mounted.

The subject of this invention comprises the chamber 34 connected to the inlet manifold suction by pipe 36. A perforated check valve 38 permits the high atmospheric pressure existing in the inlet manifold 32, when the throttle 40 is suddenly opened wide, to flow freely into the chamber 34, which contains air under a vacuum. When the throttle 40 is suddenly closed the high suction in the inlet manifold 32 cannot enter the chamber 34 at a faster rate than that determined by the small hole in the check valve 38. A compression spring 42 holds valve 38 on its seat but the stiffness of the spring 42 is so feeble that a low pressure difference unseats the valve 38 in a downward direction. A compression spring 44, inside the chamber 34, pushes a washer 46 and therefore a diaphragm 48 in a downward direction. A perforated cover 50 protects the diaphragm 48 but permits atmospheric pressure to compress the spring 44 when the throttle 40 is closed suddenly.

A tension spring 52, anchored on the throttle body, pulls the throttle 40 shut. The spring 52 engages with a lever 54 and rotates the throttle 40 anti-clockwise causing the throttle stop 56 to engage the cam surface 58. In the position shown the diaphragm 48 and stop 60 have been brought up to their top position so as to permit the idle stop 56 to engage with the face of the idle cam 58 and the stop 76 does not interfere. A link 62 is operated by the throttle lever 54 and operates an accelerating fuel pump, not shown. A cam 58 is mounted on a pin 64 and is operated by a link 66. This link 66 is connected to the choke 24. The movement of the link 66 permits a fast idle to be used in cold weather.

68 is a substantially horizontal adjustable and slotted link operated by lever 70 connected to the foot accelerator through the link 72. The link 74 connects the lever 70 with the transmission. The slotted link 68 is designed to permit the spring 52 to close the throttle 40 to the position determined by the idle cam 58 and the adjustable stop 56. When the diaphragm 48 and the anti-stall stop 60 are in the position shown in Fig. 1 then the idle stop 56 engages the cam 58.

In Figs. 2 and 3 similar numbers refer to similar parts.

In Fig. 2 the diaphragm 48 is shown fully extended in the downward direction under the influence of the compression spring 44. A lever 54, which carries the adjustable stop 76, engages with the stop 60 and holds the idle stop 56 away from the idle stop 58. However, in a short period of time the air contained in the chamber 34 is brought down to the suction prevailing in the mixture outlet downstream of the throttle 40 which suction is transmitted to the chamber 34 through the pipe 36.

Fig. 3 shows a side view of the detail of the actual linkage. 78 is the throttle shaft. A loose link 80 is mounted on this throttle shaft 78 and is connected through a tension spring 82 with the pin 84 mounted on the lever 54. The lever 80 can thus move in the anti-clockwise direction and stretch the spring 82 and apply pressure on the stop 76 against the pin 60 and therefore against the compression spring 44. The volume of the chamber 34 and the size of the small hole in the center of the disc valve 38 establishes a time interval during which the throttle 40 is slowly moving to the full idle position as determined by the adjustable idle stop 56 and the movable cam 58. The lever 80 is connected by the adjustable link 86 to the lever 88 which is operated by the foot accelerator and connected through the link 90. A fairly powerful spring 92 is used to return the lever 88 to the idle position when the foot is removed from the foot accelerator. Link 94 corresponds to link 74 of Fig. 1 and is connected to the automatic transmission.

The loose lever 80 (Figs. 2 and 3) is offset to such a degree that if the throttle sticks open it can be moved at any rate to a partially closed position whenever loose lever 80 engages the fixed throttle lever 54.

Operation

In the position shown in Fig. 1 the throttle is shown in broken lines and in full lines. As shown in full lines it is actually in the closed position as determined by the cam 58 and the throttle stop 56. This is the position in which the anti-stall device is not operative. Manipulating the foot accelerator the lever 70 is moved clockwise and the slotted link 68 moves to the right permitting the throttle lever 54 to rotate in an anti-clockwise direction under the influence of the tension spring 52 until the stop 76 engages the stop 60. The motion continues until the low speed throttle stop 56 engages with the cam 58.

The time necessary for the throttle lever 54 to rotate anti-clockwise from the position shown in broken lines to the full line position is determined by the size of the opening in the valve 38 and by the strength of the compression spring 44. This time effect is the subject of this invention.

The operation of vacuum piston 20, coil spring 18 and the link 66 are no part of this invention as they are in almost universal use today whereever an automatic choke is used.

In Fig. 2 the operation is similar to that used for describing Fig. 1 but here the throttle is shown held open by the anti-stall device.

Another difference is the presence of the loose link 80 which replaces the slotted link 68 of Fig. 1. The action of this loose link 80 is as follows: When the loose link 80 is moved clockwise to open the throttle it positively engages the throttle lever 54 and positively opens the throttle. When the throttle is open then the motion of the foot accelerator under the influence of the return spring 92 is to close the throttle. The tension spring 84 enables the foot accelerator 86—90—92 to close the throttle. The motion of the throttle is arrested when the adjustable stop 76 engages the anti-stall stop 60. The spring 82 is calibrated so that as it stretches it applies a calibrated force on the pin 60. Spring 44 is also calibrated and of course the perforation in the center of the valve 58 is calibrated.

Meanwhile the effect of the throttle 40 as it moves towards its closed position is to build up suction in the pipe 36 equal to the inlet manifold suction. This suction acts through the perforation in the center of the valve 38, which valve is held on its seat by the compression spring 42.

Atmospheric pressure acting through the perforated cover 50 presses the flexible diaphragm 48 in an upward direction and the emergency anti-stall stop 60 is withdrawn permitting the ordinary stop 56 to engage with the fast idle cam 38 in the ordinary way.

Obviously by careful attention to the selection of the spring 82 and 24 it is possible to produce carburetors that close at the same rate so that very little adjustment is needed after the carburetor is shipped by the carburetor manufacturer for assembly on the car by the car manufacturer.

The fact that the spring 92 may vary plus or minus 30% or 40% of an average figure is therefore relatively unimportant. By this means carburetors are assembled and adjusted before delivery and very little work has to be done on the engine after the carburetor has been installed.

Fig. 3 shows the loose link mounted on the throttle shaft 73 and connected to the foot accelerator through the link 80 and to the main throttle lever 54. The loose lever 80 is connected to the throttle lever 54 through the tension spring 82.

The spring 44 may be replaced by a weight which would be the equivalent of the spring.

What I claim is:

1. In a carburetor, choke and throttle valve, a throttle shaft, a manually operated first throttle lever freely rotatable thereon, a second throttle lever fixed to said shaft, a first idle stop carried by said second lever, a spring connecting the first throttle lever to the second throttle lever, an idle cam rotatably mounted on said carburetor and adapted to engage said first stop, an operative connection between said choke valve and said rotatably mounted idle cam so that as the choke is moved towards its open position the idle cam is moved to its slow idle position, a second idle stop also mounted on said second lever, an abutment for engaging said second stop, a dash pot engaging said abutment so as to delay the engagement of said idle cam by said first stop for a period of time determined by the relative stiffness of said spring and the resistance of said dash pot.

2. A device as set forth in claim 1 in which a second spring supplements said dash pot in opposing said first mentioned spring so as to still further delay the said engagement.

3. A device as set forth in claim 1 in which the dash pot comprises a chamber and a passage leading therefrom and connected to the carburetor on the downstream side of the throttle, a restriction in said passage, a movable wall in said chamber connected to said abutment and a second spring acting in opposition to first mentioned spring so as to still further delay the said engagement.

4. A device as set forth in claim 1 in which the dash pot comprises a chamber and a passage leading therefrom and connected to the carburetor at the downstream side of the throttle, a check valve in said passage to freely admit air at near atmospheric pressure to said chamber when the throttle is open and to restrict the admission of air at inlet manifold suction pressure, a restricted bypass around said check valve, a movable wall in said chamber connected to said abutment and a second spring acting in opposition to said first mentioned spring to delay the engagement of said cam by said first stop until the pressure in said chamber has fallen to that of the inlet manifold suction.

5. An anti-stall control for an internal combustion engine carburetor having the usual fuel and air entrance and an exit and a throttle valve controlling said exit, first spring means for returning the throttle to its closed position, one end of spring being anchored to the carburetor, the other end being positively connected to said throttle, a moveable throttle stop to delay the rate at which the spring moves the throttle to its ultimate closed position comprising a chamber of substantial size having a moving wall connected to said throttle stop, a passage connecting said chamber with the engine suction downstream of said throttle, a check valve in said passage to close when the throttle is closing and engine suction is increasing, a restricted bypass around said valve, a second spring urging said stop to the open position and opposing said first spring, said wall responding to engine suction to overcome said second spring so as to permit first spring to gradually move the stop to its position in which the throttle is fully closed as the air pressure in said chamber gradually escapes through said restricted bypass to said engine suction, and in which there is a foot accelerator pedal, a third spring adapted to return said pedal to the idle position, a slotted link connected to said pedal, a throttle lever making a one-way connection with said slotted lever so that the throttle is positively opened and is permitted to close under the influence of said first spring and against the influence of said second spring.

6. An anti-stall control for an internal combustion engine carburetor having the usual fuel and air entrance and an exit and a throttle valve controlling said exit, first spring means for returning the throttle to its closed position, one end of spring being anchored to the carburetor, the other end being positively connected to said throttle, a moveable throttle stop to delay the rate at which the spring moves the throttle to its ultimate closed position comprising a chamber of substantial size having a moving wall connected to said throttle stop, a passage connecting said chamber with the engine suction downstream of said throttle, a check valve in said passage to close when the throttle is closing and engine suction is increasing, a restricted bypass around said valve, a second spring urging said stop to the open position and opposing said first spring, said wall responding to engine suction to overcome said spring so as to permit first spring to gradually move the stop to its position in which the throttle is fully closed as the air pressure in said chamber gradually escapes through said restricted bypass to said engine suction, and in which there is a first fixed throttle lever and a second loose throttle lever, throttle operating means connected to said second lever, said first spring being connected to said second loose lever and to the first throttle lever so as to bias the throttle towards its closed position in opposition to the second spring which acting through the throttle stop biases the throttle towards its open position.

7. An anti-stall control for an internal combustion engine carburetor having the usual fuel and air entrance and an exit and a throttle valve controlling said exit, first spring means for returning the throttle to its closed position, one end of spring being anchored to the carburetor, the other end being positively connected to said throttle, a moveable throttle stop to delay the rate at which the spring moves the throttle to its ultimate closed position comprising a chamber of substantial size having a moving wall connected to said throttle stop, a passage connecting said chamber with the engine suction downstream of said throttle, a check valve in said passage to close when the throttle is closing and engine suction is increasing, a restricted bypass around said valve, a second spring urging said stop to the open position and opposing said first spring, said wall responding to engine suction to overcome said second spring so as to permit first spring to gradually move the stop to its position in which the throttle is fully closed as the air pressure in said chamber gradually escapes through said restricted bypass to said engine

suction, and in which there is a first fixed throttle lever and a second loose throttle lever, throttle operating means connected to said second lever, said first spring being connected to said second loose lever and to the first throttle lever so as to bias the throttle towards its closed position in opposition to the second spring which acting through the throttle stop biases the throttle towards its open position and in which the loose lever is offset so that it engages the fixed lever when it is moved towards the closed position so that if the throttle sticks wide open it can be moved to a partly closed position.

8. An anti-stall control for an internal combustion engine carburetor having the usual fuel and air entrance and an exit and a throttle valve controlling said exit, first spring means for returning the throttle to its closed position, one end of spring being anchored to the carburetor, the other end being positively connected to said throttle, a moveable throttle stop to delay the rate at which the spring moves the throttle to its ultimate closed position comprising a chamber of substantial size having a moving wall connected to said throttle stop, a passage connecting said chamber with the engine suction down-

stream of said throttle, a check valve in said passage to close when the throttle is closing and engine suction is increasing, a restricted bypass around said valve, a second spring urging said stop to the open position and opposing said first spring, said wall responding to engine suction to overcome said second spring so as to permit first spring to gradually move the stop to its position in which the throttle is fully closed as the air pressure in said chamber gradually escapes through said restricted bypass to said engine suction, and in which there is a choke valve in the air entrance to said carburetor and a second throttle stop connected so as to give a fast idle when the choke valve is moved away from its wide open position, said first stop being adapted to hold the throttle more open than any position determined by the choke operated mechanism.

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