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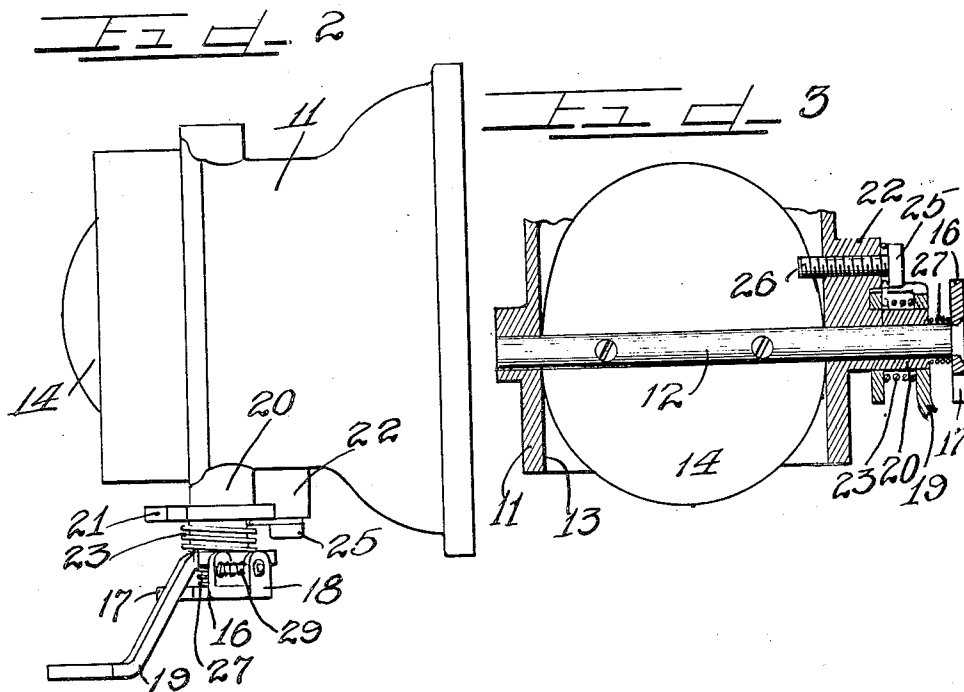
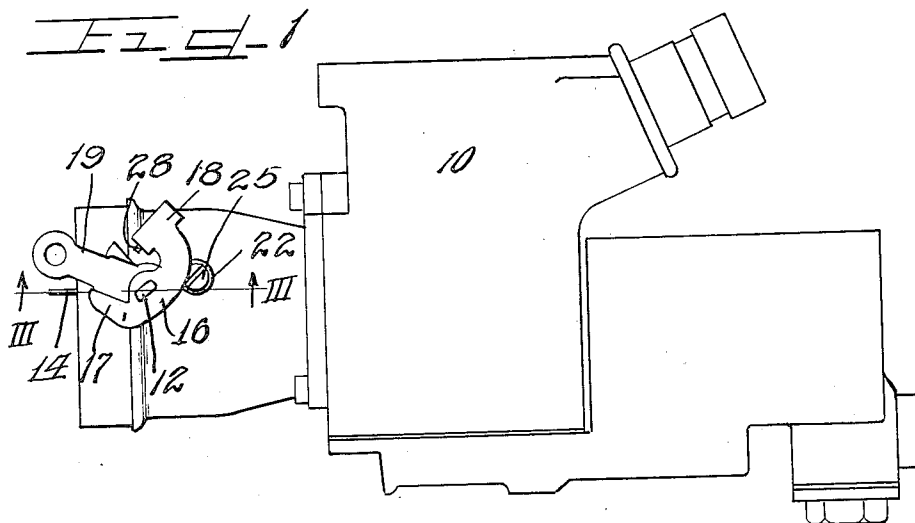
D. FIRTH

1,966,201

AUTOMATIC CHOKER VALVE

Filed Nov. 18, 1931

2 Sheets-Sheet 1



INVENTOR
David Firth
Charles Miller
Attys.

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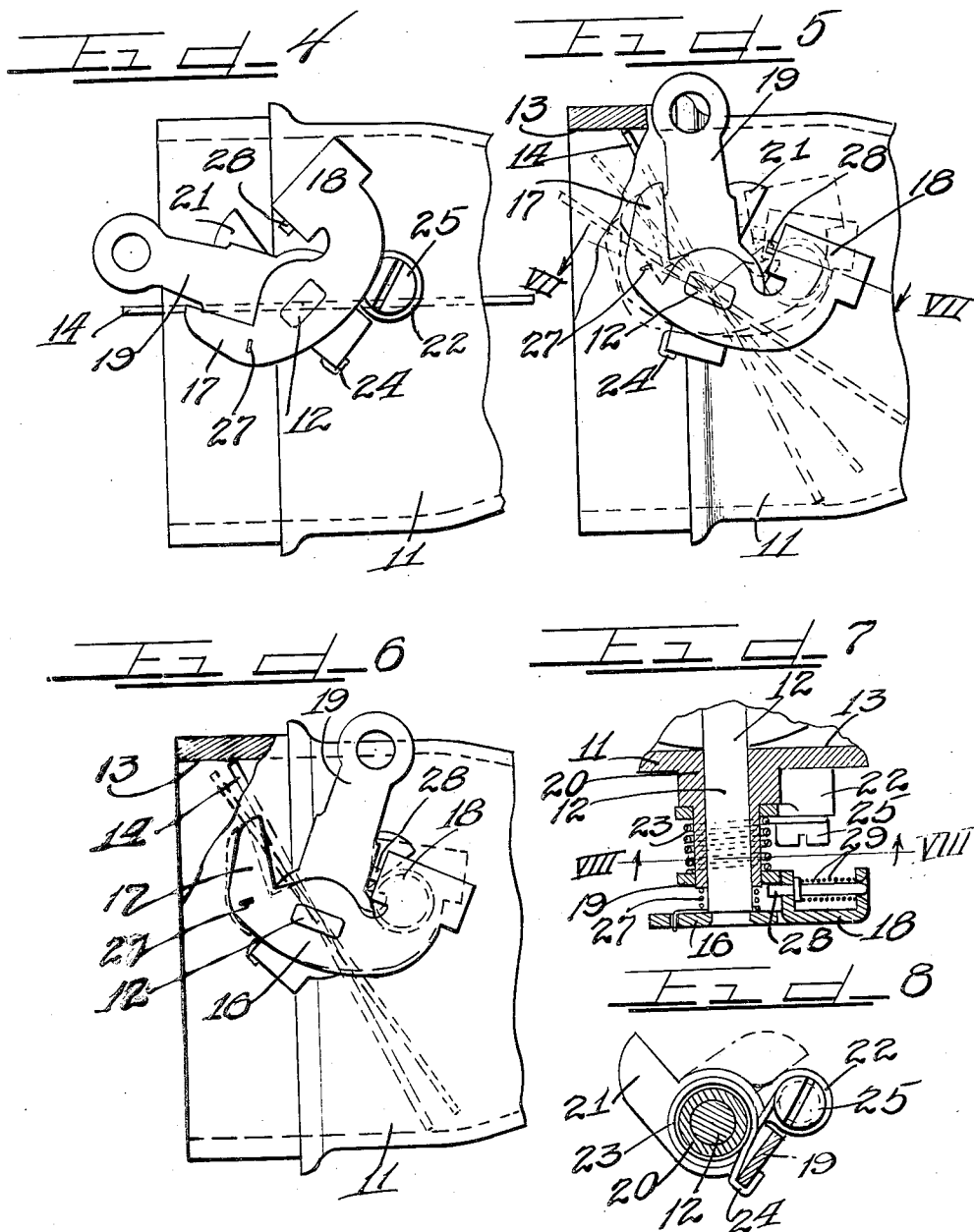
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2 Sheets-Sheet 2



INVENTOR
David Firth

Charles Hill
Attys.

UNITED STATES PATENT OFFICE

1,966,201

AUTOMATIC CHOKER VALVE

David Firth, Flint, Mich., assignor to Marvel Carburetor Company, Flint, Mich., a corporation of Illinois

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13 Claims. (Cl. 137—139)

This invention relates to an improved valve control particularly adapted for controlling the choke or air valves of carburetors for internal combustion engines, to facilitate the starting thereof by reducing the supply of air and thus enriching the remaining air supply both by varying the ratio and increasing the suction on the fuel jets. While this invention has been illustrated and described as applied to a choke valve in the air inlet it is to be understood that in an air valve type of carburetor a choke control has sometimes been applied directly to the air valve in lieu of the provision of a separate choke valve, so that the improved valve control of this invention may be so applied if desired.

The choke valve control as heretofore used has been subject to great abuse at the hands of unskilled or careless operators, since it must provide for starting engines under the most difficult conditions and must therefore be at least partially released immediately upon starting the engine if loading due to over-richness of the mixture is to be avoided. The present invention eliminates the probability of engine flooding due to a failure to release the choke control, this result being obtained by so mounting the control that the choke valve is never positively shut when in its closed position, but will yield to a varying extent, entirely under the operator's control, when engine suction increases as the engine picks up speed after starting.

It is another object of this invention to provide an improved choke valve control mechanism wherein an unbalanced choke valve is arranged to yieldingly follow the movement of a manual control up to a full closed position of the valve, the yielding or opening movement of the valve relative to the manual control being thereafter decreased to a predetermined minimum by a further movement of the manual control.

It is also an object of this invention to provide an improved choke valve control wherein the valve is not adapted to be positively closed by the manual control but in which the manual control acts to build up or increase the load tending to cause the valve to follow the manual control thus providing a maximum choke control adapted to resist a higher suction pressure than at an intermediate position of the manual control.

It is another object of this invention to provide an improved and simplified automatic choke control that will facilitate starting internal combustion engines by operators unacquainted with the technical requirements thereof and hence liable to abuse an engine through ignorance or carelessness.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

This invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 represents an outline of a carburetor and its air-horn in which one embodiment of the choke valve of this invention is incorporated.

Figure 2 is an enlarged plan view of the air-horn and choke valve control mechanism.

Figure 3 is an enlarged fragmentary section on the line III—III of Figure 1, with parts shown in elevation.

Figure 4 is a fragmentary enlarged detail of the valve control mechanism in its full open position.

Figure 5 is a view similar to Figure 4 showing in full lines the position of the linkage when the choke valve is just barely closed, the dotted lines showing progressive opening of the choke valve in response to engine suction.

Figure 6 is another view similar to Figure 4 showing the position of the linkage when the valve operating lever has reached its extreme closed position, the dotted lines showing the limited valve opening then permitted in response to high engine suction.

Figure 7 is a fragmentary section through the operating linkage on the line VII—VII of Figure 5.

Figure 8 is a section on the line VIII—VIII of Figure 7.

As shown on the drawings:

A carburetor 10 is outlined in Figure 1 to show the application of an air inlet or air-horn 11 relative thereto, it being understood that since the invention relates to the operating mechanism for the choke or air inlet valve, the particular type of carburetor is immaterial to the subject matter.

A choke valve shaft 12 is mounted in offset relationship relative to a major diameter of the approximately circular passage 13 in the air-horn, the offset mounting accommodating an unbalanced butterfly choke valve 14 which in its fully closed position does not reach a right angular position across the passage. The overbalanced side of the valve is arranged to open towards the carburetor in order that the engine suction may have a tendency to open the valve. The extent of unbalance of the valve, of course, determines the opening force resulting from the pressure differential or suction set up by the engine and by a proper proportioning thereof as well as a selection of the opposing spring tension, to be hereinafter described, the pressure differential required to open the valve can be closely adjusted to the operating characteristics of a given engine type.

One outboard end of the shaft 12 has a control arm 16 rigidly secured thereto, which arm has spaced stops 17 and 18 between which the shank of an operating lever 19 has a limited range of

movement, the lever being journaled on a boss 20 enveloping the shaft 12. The journaled end of the lever is folded back on itself to form a double bearing, the folded back end being extended at 21 to form a limiting stop for the closing movement of the lever by striking against a boss 22. A coiled or torsion spring 23 is wound about the boss 20 between the two journals of the lever, one end 24 of the spring being hooked over the side of the lever and the other end being anchored by a screw 25 in the boss 22, this screw extending through the wall of the air-horn to form a stop 26 for the wide open position of the choke valve. The spring 23 serves to return the choke valve to its full open position and hold it there when the usual manual choke control, acting on the lever 19, is fully released.

A relatively light torque spring 27 is coiled on the shaft 12 between the lever 19 and the control arm 16, the ends of the spring being anchored on the lever and arm respectively. This spring is so wound that it normally holds the control arm stop 17 against the side of the lever so that the choke valve is thus caused to follow the closing movement of the lever 19 until the valve reaches its seated position as shown in Figure 5. The lever is then permitted a further movement towards the control arm stop, into the position of Figure 6, this further movement progressively decreasing the possible range of opening movement of the choke valve in response to engine suction sufficient to overcome the light spring 27.

When the lever 19 is rotated to its full closed position wherein its stop 21 strikes the boss 22, the lever will have taken up all but a slight amount of the available play between the two stops 17 and 18 and the lever. The slight remaining clearance between the stop 18 and the lever 19 is occupied by a pin 28 urged outwardly by a spring 29 relatively stiffer than the spring 27. The pin can thus yield to permit the choke valve to open to a small extent if it is subjected to a sufficiently high pressure differential to overcome both the springs 27 and 29. With this arrangement even when the lever 19 is moved to the limit of its closing movement the choke valve will not be positively held seated against a high suction since the spring loading builds up as the lever is moved past the position of Figure 5 to its limit shown in Figure 6 where the supplemental spring 29 comes into play to add a further increment to the spring load tending to prevent the choke valve from opening beyond the position determined by the lever 19.

In the operation of the choke valve control of this invention, assuming that a cold engine is to be started, the lever 19 is pulled clockwise to the limit of its motion, determined by the stop 21 and the boss 22. During this rotation of the lever the control arm follows until the choke valve reaches its closed position and then the arm remains stationary until the pin 28 in the arm 18 approximately contacts the side of the lever. In this position a large part of the play between the lever and the arm has been taken up, leaving only the projecting length of the pin to allow an opening movement of the choke valve in response to suction. When the engine starts and the resulting suction reaches a sufficiently high value the choke valve will yield to a predetermined amount established by the projecting pin.

After the engine starts, by releasing the choke control slightly the lever moves away from the pin 28, perhaps as far as the position shown in

Figure 5. Under such conditions the unbalanced valve is held closed by the light spring 27 and therefore the amount of valve opening will be greater for a given suction and this opening could be further increased by the travel of the pin 28 should the suction be sufficient to overcome the added load of the spring 29.

As a result of the non-positive closing of the choke valve and the decreasing spring load thereon as the choke control is partially released, the engine can be called on for substantial increases in both power and speed without producing loading even though the choke control is not entirely released. It will thus be seen that I have invented a greatly improved and simplified choke control that will not be subject to abuse in the hands of careless drivers.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. A choke valve operating mechanism comprising an unbalanced choke valve adapted to open in response to engine suction, a shaft therefor, a control arm rigidly secured to said shaft, an operating lever journaled on said shaft, the shaft being movable relative thereto within limits imposed by said control arm, yielding means for normally causing said control arm to follow the closing movement of said operating lever, whereby a predetermined degree of suction on said unbalanced valve will cause an opening movement of the valve limited to the range of movement provided between the control arm and the operating lever, and yielding means carried by said control arm adapted to permit a further limited movement of the choke valve beyond the normal limiting position of the control arm whereby a predetermined increase of suction is adapted to slightly open the unbalanced valve when the operating lever has reached its extreme closed position.

2. A choke valve operating mechanism for an unbalanced valve adapted to open in response to engine suction, comprising a valve shaft on which the valve is mounted, an operating lever on the shaft and movable relative thereto, yielding means for normally causing said valve to follow the closing movement of said lever but yielding to permit a partial opening of the valve in response to a predetermined degree of suction, means for normally limiting the opening movement of said valve relative to the lever in proportion to the lever movement towards its extreme closed position and yielding means for permitting a slight opening of said valve in response to a predetermined higher degree of suction when the lever is in its extreme closed position.

3. A choke valve operating mechanism for an unbalanced valve adapted to open in response to engine suction, comprising a valve shaft on which the valve is mounted, an operating lever on the shaft and movable relative thereto, yielding means for normally causing said valve to follow the closing movement of said lever but yielding to permit a partial opening of the valve in response to a predetermined degree of suction, means for normally limiting the opening movement of said valve relative to the lever and yielding means for permitting a slight opening of said

valve in response to a predetermined higher degree of suction when the lever is in its extreme closed position.

4. A choke valve operating mechanism for an unbalanced valve adapted to open in response to engine suction, comprising a valve shaft on which the valve is mounted, an operating lever on the shaft and movable relative thereto, spring means normally tending to move said lever to its full open position, yielding means for normally causing said valve to follow the closing movement of said lever but yielding to permit a partial opening of the valve in response to a predetermined degree of suction, means for normally limiting the opening movement of said valve relative to the lever in proportion to the lever movement towards its extreme closed position and yielding means for permitting a slight opening of said valve in response to a predetermined higher degree of suction when the lever is in its extreme closed position.

5. A choke valve operating mechanism for an unbalanced valve adapted to open in response to engine suction, comprising a valve shaft on which the valve is mounted, an operating lever on the shaft and movable relative thereto, spring means normally tending to move said lever to its full open position, yielding means for normally causing said valve to follow the closing movement of said lever but yielding to permit a partial opening of the valve in response to a predetermined degree of suction, means for normally limiting the opening movement of said valve relative to the lever and yielding means for permitting a slight further opening of said valve in response to a predetermined higher degree of suction.

6. A choke valve for controlling the air supply to a carbureter, comprising a valve shaft, a valve thereon unbalanced relative to the air passage so as to be opened by suction therein, an operating lever for the valve and movable independently relative thereto, spring means connecting said valve to said lever and normally tending to cause said valve to follow the closing movement of said lever, means for progressively limiting the opening movement of said valve relative to said lever as the lever approaches its limit of closing movement, and yielding means interposed between said limiting means and the lever whereby a predetermined high degree of suction on said valve will slightly open the same after the lever has reached its extreme of closing movement.

7. In a carburetion system including a choke valve and means for operating the same, comprising yielding connections between said valve and said means for progressively applying tension to said valve to provide a plurality of different stages of operation whereby in one stage said valve will be movable towards an open position under a predetermined minimum pressure differential, and in another stage said valve will only be responsive to a predetermined increased pressure differential to move towards an open position and means for admitting a limited amount of air past said valve when the operating means is in its extreme closed position.

8. In a carburetion system including an unbalanced choke valve tending to open in response to engine suction, an operating lever therefor, a yielding connection between said lever and said valve for applying tension to said valve to cause the same to normally follow the lever in its closing

movement, said connection yielding under a predetermined engine suction to permit an increased opening of the valve relative to the lever position, and means for imposing a supplementary tension on said connection when said lever reaches its extreme closed position.

9. In a carburetion system including an unbalanced choke valve tending to open in response to engine suction, an operating lever therefor, spring means normally tending to move said lever to its full open position, a yielding connection between said lever and said valve for applying tension to said valve to cause the same to normally follow the lever in its closing movement, said connection yielding under a predetermined engine suction to permit an increased opening of the valve relative to the lever position, and means for imposing a supplementary tension on said connection when said lever reaches its extreme closed position.

10. In a carburetion system including an unbalanced choke valve tending to open in response to engine suction, an operating lever therefor having a limited movement with respect thereto, a spring normally causing the valve to follow the lever in its valve closing movement, said spring being adapted to yield to engine suction to permit an increased valve opening relative to the lever position and means increasing the degree of suction required to pass air through said valve when the lever reaches its extreme position.

11. In a carburetion system including an unbalanced choke valve tending to open in response to engine suction an operating lever therefor having a limited movement with respect thereto, a spring normally causing the valve to follow the lever in its valve closing movement, said spring being adapted to yield to engine suction to permit an increased valve opening relative to the lever position, and means for admitting a limited amount of air past said valve in response to a higher degree of suction when said lever reaches its extreme position.

12. In a carburetion system including an unbalanced choke valve tending to open in response to engine suction an operating lever therefor having a limited movement with respect thereto, a spring normally causing the valve to follow the lever in its valve closing movement, said spring being adapted to yield to engine suction to permit an increased valve opening relative to the lever position, said lever being adapted to progressively limit the opening movement of the valve in response to suction as the lever is moved past the valve closed position, and means responsive to a higher degree of suction adapted to admit a limited amount of air past said valve when the lever is in its extreme position.

13. In a carburetion system including a suction responsive choke valve adapted to admit air therepast in proportion to the suction acting thereon, an operating lever having a lost motion connection to the valve, yieldable means adapted to normally cause the valve to follow the closing movement of the lever until the valve reaches its closed position said lever being adapted to progressively restrict the yielding movement of the yieldable means as the lever is moved past the valve closed position, and means responsive to a higher degree of suction adapted to admit a limited amount of air past said valve when the lever is in its extreme position.

DISCLAIMER

1,966,201.—*David Firth*, Flint, Mich. AUTOMATIC CHOKER VALVE. Patent dated July 10, 1934. Disclaimer filed March 28, 1938, by the assignee, *Borg-Warner Corporation*.

Hereby enters this disclaimer to claims 7, 11, 12, and 13 of said patent.
[*Official Gazette April 26, 1938.*]