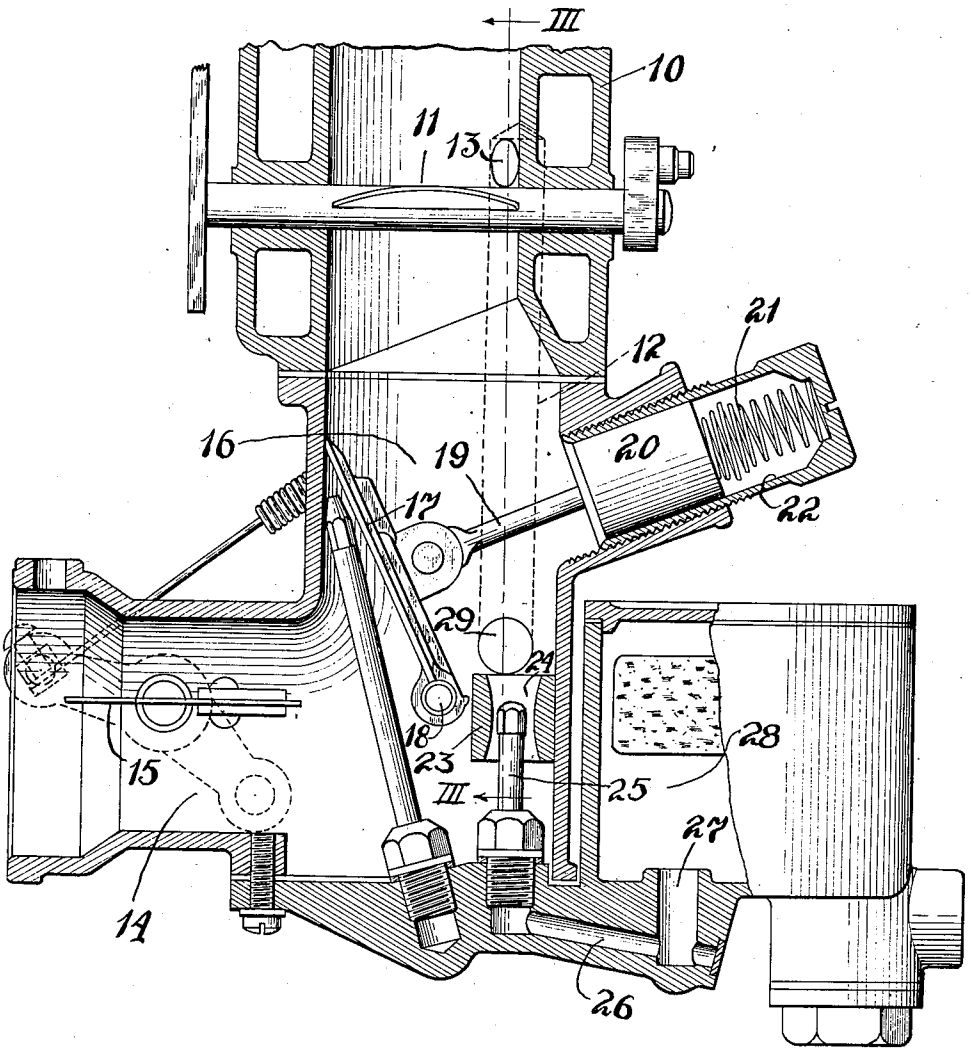
Feb. 13, 1934. D. FIRTH 1,947,040

AUTOMATIC BY-PASS VALVE

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Fig. 1



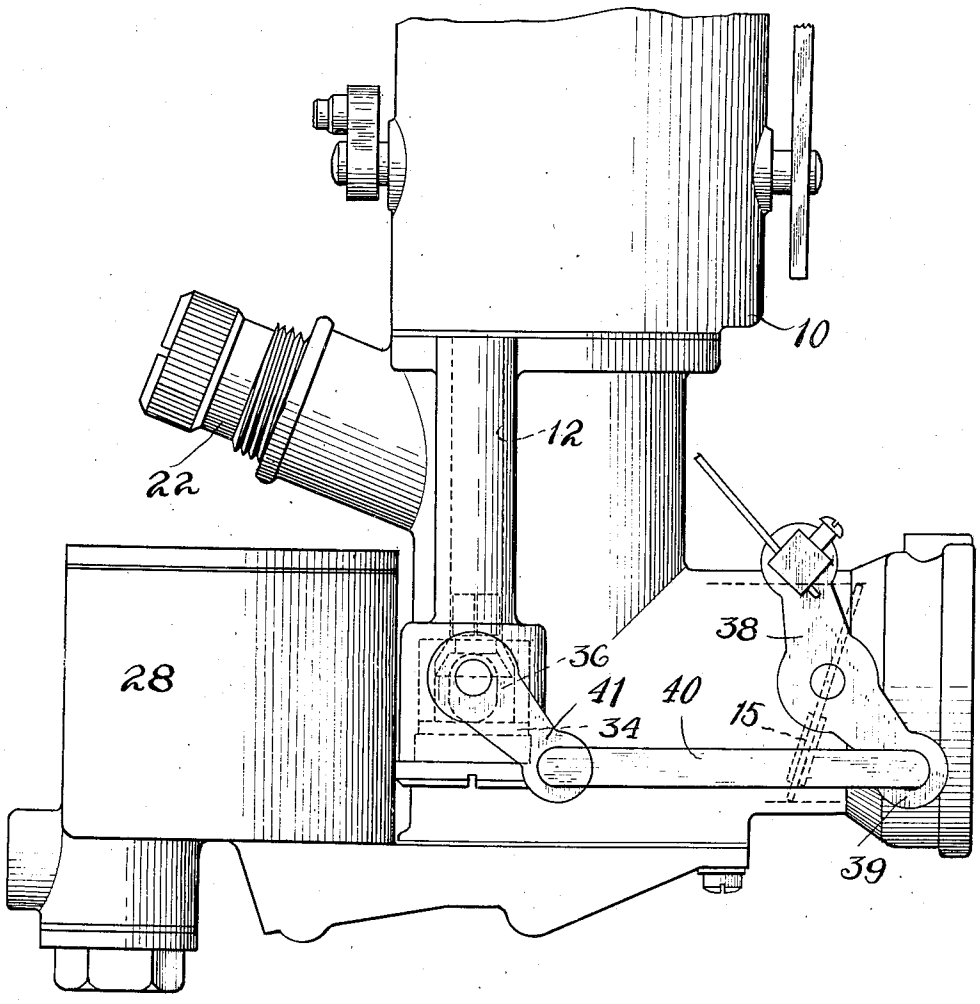
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AUTOMATIC BY-PASS VALVE

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Fig. 2



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AUTOMATIC BY-PASS VALVE

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Fig. 5

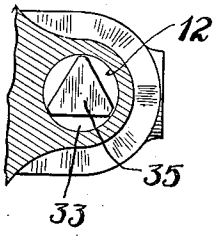


Fig. 3

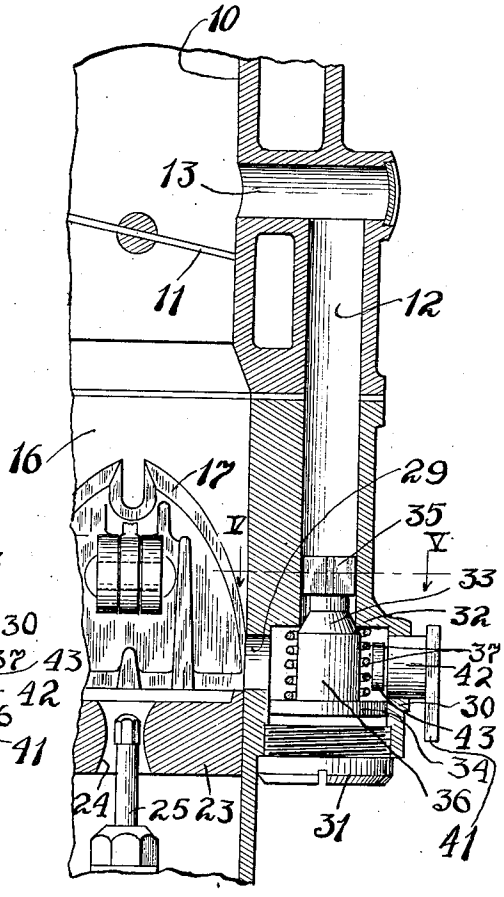
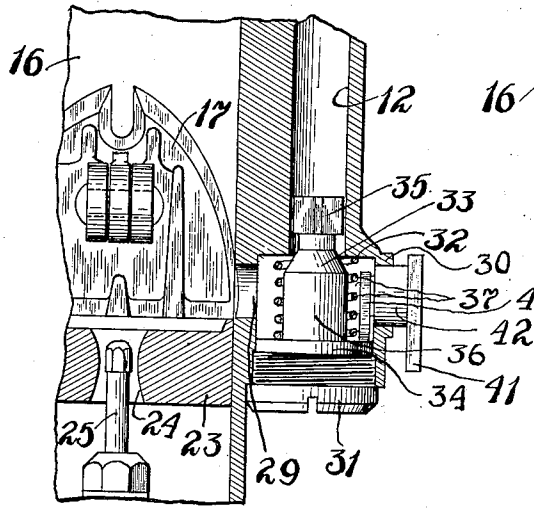


Fig. 4



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Patented Feb. 13, 1934 1,947,040

UNITED STATES PATENT OFFICE

1,947,040

AUTOMATIC BY-PASS VALVE

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Application August 12, 1929. Serial No. 385,195

6 Claims. (Cl. 123—119)

This invention relates to priming or starting devices for internal combustion engines adapted to supply a rich starting mixture at low cranking speeds.

It is an object of this invention to provide an improved and simplified automatic primer to assist in starting an engine as well as to keep an engine running during the warming up period should it tend to stop due to an insufficient idling fuel supply resulting from cold starting conditions. To this end I have provided an idling bypass around the carbureter throttle that is controlled by a suction actuated automatic valve so proportioned as to open the bypass for moderately strong manifold suctions such as are set up by slow cranking speeds, but which valve is adapted to be closed by the extreme manifold suction created by a properly idling engine. With this arrangement the cranking speed is not great enough to cause sufficient suction to close the valve so that starting is assisted by the bypass of a rich fuel mixture under such conditions, while when the engine is operating under idling conditions the suction is sufficient to close the valve and thus cut off the bypassed fuel supply. If the engine has been started and tends to stop again, the suction drops and the bypass valve opens again so that the engine is enabled to pick up speed instead of stalling.

It is another object of this invention to provide an improved and simplified automatic bypass arrangement for delivering fuel, from the usual idling fuel nozzle, above the throttle when the suction within the carbureter is insufficient to create and deliver a satisfactory fuel and air mixture through the normal carbureter passages.

It is also another object of this invention to provide means associated with the usual choke valve for maintaining the bypass open as long as the choke valve is closed in order to maintain the engine speed fairly high while warming up a cold engine.

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 is a vertical section through a carbureter and a portion of the intake manifold riser, showing a bypass passage embodying the features of this invention.

Figure 2 is an elevation of the reverse side of the carbureter, showing the choke valve linkage controlling the bypass valve.

Figure 3 is a fragmental section on the line III—III of Figure 1, showing the bypass and valve of this invention.

Figure 4 is a fragmental section similar to that of Figure 3 wherein the bypass valve is shown in its open position.

Figure 5 is a fragmental section on the line V—V of Figure 3.

As shown on the drawings:

One embodiment of this invention is shown as incorporated in a carbureter of the air valve type which is secured to a jacketed manifold riser 10 containing the usual throttle valve 11. This particular arrangement is not important in connection with the present invention wherein a bypass passage 12 has its outlet 13 into the riser above the throttle location which may be varied in location without in any way affecting the purposes of this invention except that the throttle location determines the position of the bypass outlet, which must be subjected to the manifold suction as distinguished from the carbureter suction, as the variation of the manifold suction operates the bypass valve, as will hereinafter more fully appear.

The essential parts of the carbureter shown comprise an air inlet 14 controlled by a choke valve 15. The inlet leads to a mixing chamber 16, past a flap air valve 17 pivoted at 18, and closed by a link 19 carrying a piston 20, backed by a spring 21 in a chamber 22 which acts as a dash pot. The passage back or to the right of the pivot 18 is closed by a member 23 containing a small Venturi shaped passage 24. A low speed fuel nozzle 25 is positioned at the throat of the venturi and is supplied with fuel through passages 26 and 27 leading from a float chamber 28.

The bypass passage 12 is formed in the wall of the carbureter body and has a side inlet port 29 opening into the mixing chamber immediately above and to one side of the member 23 so that the bypass passage tends to draw a rich fuel and air mixture from the Venturi passage 24 and nozzle 25. The lower end of the passage 12 adjacent the port 29 is enlarged to form a valve chamber 30 the lower end of which is closed by a plug 31. The shoulder 32 at the upper limit of the chamber 30 forms a valve seat cooperating with a tapered neck 33 on a valve 34, an upward extension of the neck being formed as a polygonal valve centering guide 35 without obstructing the passage of a fuel and air mixture.

The valve 34 carries a lower outstanding flange 36 against which one end of a spring 37 abuts, the other end of the spring bearing against the chamber shoulder 32.

This spring serves to move the valve as a whole away from its seat, while suction in the passage 12 tends to pull the valve up to its seat to close the bypass, acting against the spring pressure. By a proper calibration of the spring, the valve may be arranged to open for medium suctions but to close for extreme manifold suctions as when an engine is operating properly at idling speed. The manifold suction under proper idling conditions may reach or exceed 15 inches of mercury, whereas at about 12 inches of mercury, an idling engine would be on the verge of stalling. Thus if the spring is calibrated to open at a suction of about 12 inches of mercury, then the valve will open to bypass an additional supply of fuel to permit the engine to pick up speed again.

For starting in cold weather, the cranking speed is not great enough to cause sufficient suction to close the valve against such a spring pressure, so that the valve remains open and supplies a rich fuel and air mixture to the manifold above a closed throttle. If the throttle is partially or wholly open the bypass ceases to function regardless of the degree of suction as in such a case the pressure is substantially equalized above and below the throttle and a direct passage through the carbureter is provided for the fuel and air mixture discharged by the venturi 24. A partial equalization of pressure above and below the throttle reduces the differential suction acting on the valve to a point below the spring value, but the bypass does not function to deliver fuel because of the direct path provided therefor within the carbureter proper.

The choke valve 15 is operated by a double armed lever 38 one arm 39 of which has a link 40 extending to a lever 41 on a stub shaft 42 carrying a cam 43 in the chamber 30 in a position to engage the valve flange 36 to hold the same downwardly with the valve open, when the choke valve is partially or completely closed. With this arrangement, the bypass valve is prevented from closing when the choke valve is in use, thus supplying additional mixture to the engine which allows the engine speed to be kept fairly high during the warming up period as long as the choke valve is even partially closed. The increased idling speed so obtained accelerates warming up and also protects the engine from excessive quantities of raw fuel due to the continued use of the choke.

It will thus be seen that I have provided an improved and simplified automatic primer which will not only assist in starting a slowly cranked engine but will automatically function to admit additional fuel, should the engine slow down to stalling speed, thus permitting the engine to pick up speed again instead of stopping.

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. In combination with a carbureter, a choke valve, and a throttle valve therefor, a bypass passage around said throttle valve location, the discharge end of said passage being subjected to the suction above the throttle while the inlet end of said passage is positioned adjacent the normal carbureter mixture producing arrangements to draw a fuel and air mixture therefrom, an automatic valve so positioned in said bypass passage as to be closed by extreme suction therein, and means operated in unison with the choke valve for preventing the closing of said automatic valve upon a partial closure of said choke valve.

2. In combination with a carbureter, a choke valve, and a throttle valve therefor, a bypass passage around said throttle valve location, the discharge end of said passage being subjected to the suction above the throttle while the inlet end of said passage is positioned adjacent the normal carbureter mixture producing arrangements to draw a fuel and air mixture therefrom, an automatic valve so positioned in said bypass passage as to be closed by extreme suction therein, a spring for opening said valve against the suction in said passage, and means operated in unison with the choke valve for preventing the closing of said automatic valve upon a partial closure of said choke valve.

3. In combination with the choke valve, throttle and mixture producing device of a carbureter, a bypass passage leading from said mixture producing device to the engine side of said throttle whereby the bypass passage is at all times subjected to the varying degrees of suction created by the engine, suction responsive means in said passage for closing the same at high suctions, and means operated by said choke valve for maintaining said suction responsive means open upon a partial closure of said choke valve.

4. In combination with the choke valve, throttle and mixture producing device of a carbureter, a bypass passage leading from said mixture producing device to the engine side of said throttle whereby the bypass passage is at all times subjected to the varying degrees of suction created by the engine, suction responsive means to said passage for closing the same at high suctions, means yieldingly opposing the closing of said suction responsive means, and means operated by said choke valve for maintaining said suction responsive means open upon a partial closure of said choke valve.

5. In combination with a carbureter and the throttle valve thereof, a fuel and air mixture passage bypassing around said throttle, an automatic suction responsive valve for closing said passage, and choke controlled means for opening said automatic suction responsive valve to render the same inoperative.

6. In combination with a carbureter and the throttle valve thereof, a fuel and air mixture passage bypassing around said throttle, an automatic suction responsive valve for closing said passage, means yieldingly opposing the suction on said valve, and choke controlled means for opening said automatic suction responsive valve tc render the same inoperative.

DAVID FIRTH.