Nov. 6, 1934. L. W. JENKS 1,979,834

CARBURETOR

Filed May 4, 1931 2 Sheets-Sheet 1

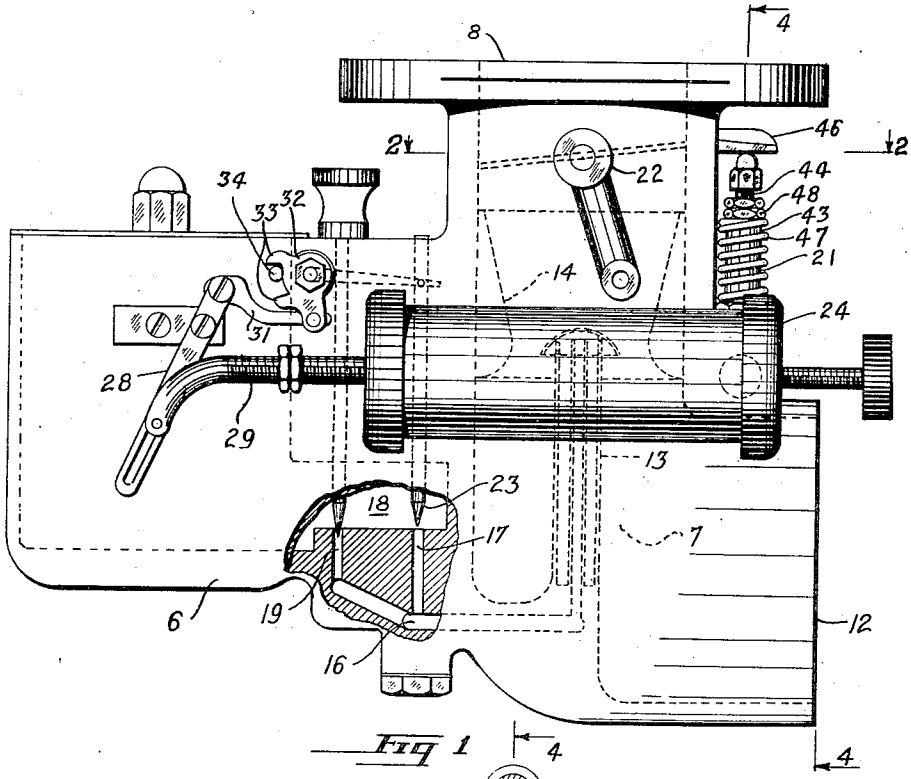



Fig 1

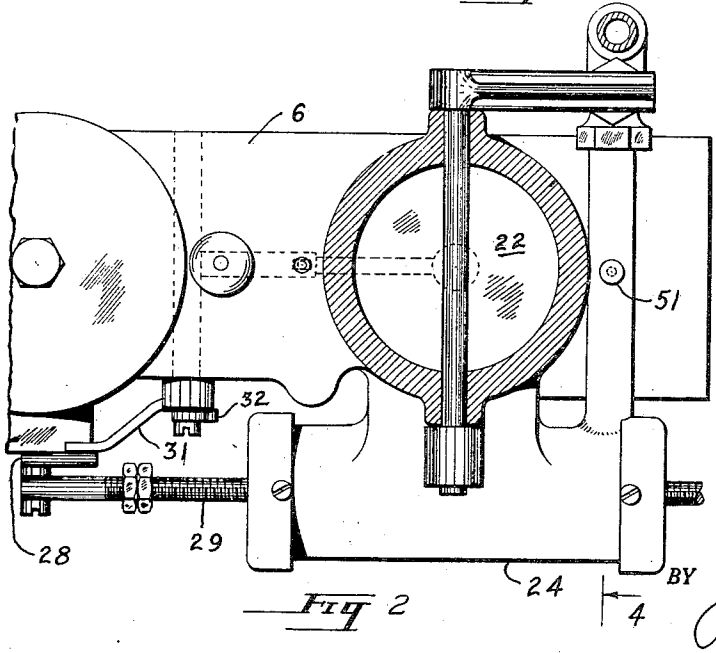



Fig 2

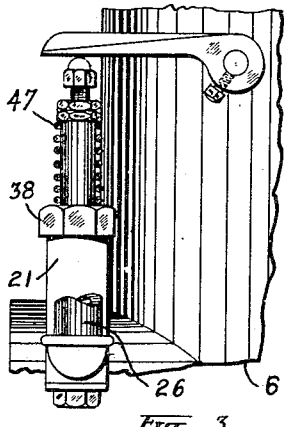



Fig 3

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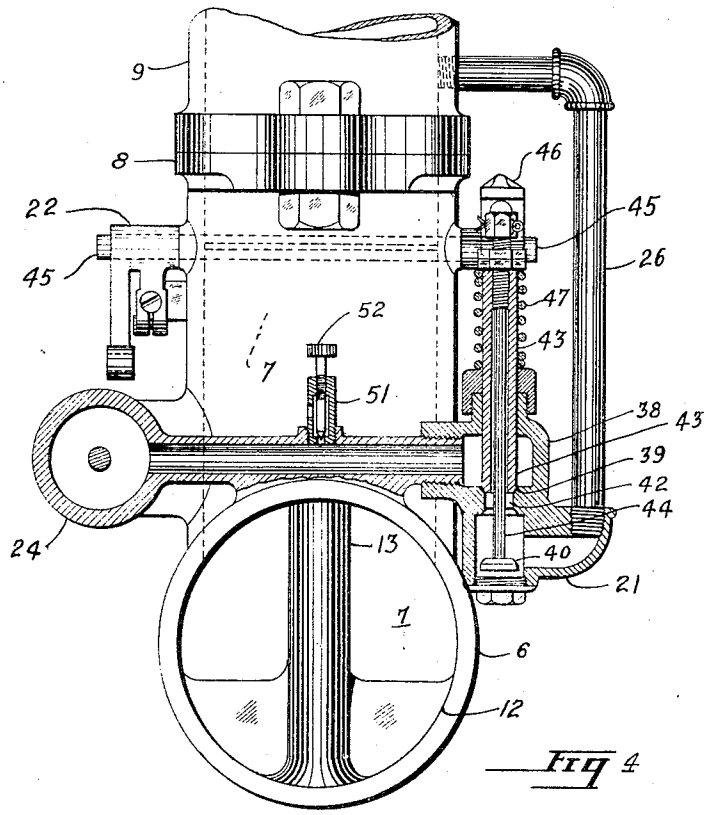



Fig 4

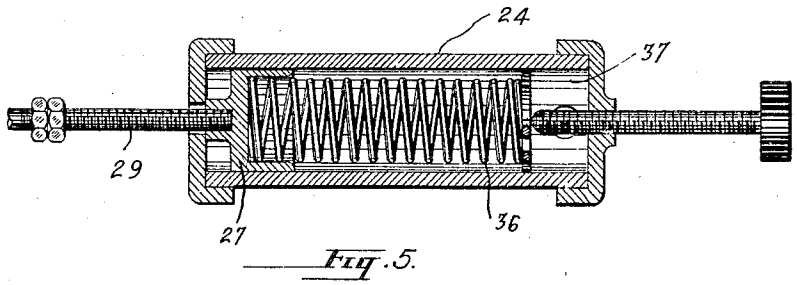



Fig. 5.

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Patented Nov. 6, 1934 1,979,834

# UNITED STATES PATENT OFFICE

1,979,834

## CARBURETOR

Louis W. Jenks, Berkeley, Calif., assignor of one-half to Edmund Bow, Berkeley, Calif.

Application May 4, 1931, Serial No. 534,738

6 Claims. (Cl. 261—51)

The invention relates to devices for mixing fuel and air such as required for internal combustion engines, and relates more particularly to means incorporated with the device for automatically varying the mixture in accordance with the engine requirements under different speeds and loads so as to insure the most economical operation. Specifically such means are arranged for automatically supplying a lean mixture for high efficiency at light engine loads and a rich mixture for high power at heavy engine loads.

An object of the invention is to provide a carburetor in which the aforementioned characteristic of operation is accomplished by automatically varying, in accordance with the suction in the engine intake manifold, the effective cross sectional area of the main fuel passage leading to the mixing chamber of the carburetor.

Another object of the invention is to so design the above described means for effecting the desired mixture of the fuel and air that it will be operative to vary said mixture throughout a wide range of engine speeds and loads.

A further object of the invention is to provide means for varying the mixture as aforesaid which will be positive in and easy of operation and will not require the use of moving parts in the mixing chamber.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form in the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawings,

Figure 1 is a side view of the carburetor with parts broken away to disclose the inner construction.

Figure 2 is a horizontal sectional view of the carburetor taken at the throttle valve, the plane of the section being indicated by the line 2—2 of Figure 1.

Figure 3 is a fragmentary side view of the device which defines the range of engine operation through which the automatic control of my invention is operable.

Figure 4 is a vertical sectional view taken through the line 4—4 of Figures 1 and 2.

Figure 5 is a longitudinal sectional view of the vacuum chamber.

In most conditions of operation, it is found that the rate of emission of fuel through the nozzle in the mixing chamber of the carburetor is more than proportional to the flow of air through the chamber. Thus when the air demand of the engine is great, the mixture will be rich in fuel, and correspondingly when the air demand is small the mixture would be lean. While it may be be desirable to vary the richness of the mixture to produce maximum power on the one hand or maximum efficiency on the other hand, most carburetors as heretofore constructed are not ideal for the purpose because large air demand may be due either to high engine speed at moderate throttle opening or to wide-open throttle at moderate engine speed. These two conditions dictate widely different mixture proportions, but the usual carburetor cannot properly discriminate between the two conditions. It is therefore desirable to modify the feeding characteristics of the fuel nozzle or the air passage. In a copending application, Serial 292,095, filed jointly by Edmund Bow and myself and which matured to Patent 1,819,698 granted August 18, 1931, the said modification was shown accomplished by varying in accordance with the suction in the intake manifold of the engine, the position of the venturi in the mixing chamber relative to the fuel nozzle. In the present instance the said modification or varying in the mixture is effected by varying, throughout the range of most common engine speeds and loads, the characteristics of the main fuel feed to the mixing chamber.

As illustrated in the drawings, the carburetor in the present embodiment of the invention, comprises a housing 6 containing a suitable mixing chamber or conduit 7 and arranged to be attached at the discharge end 8 of the chamber to the intake manifold 9 of an internal combustion engine. Air is introduced into the chamber through an opening 12, while the fuel, such as gasoline, is arranged to be introduced in the chamber through a nozzle 13 having its discharge orifice located adjacent the constricted portion of a venturi 14. Flow of the fuel to the nozzle is through a passage 16 communicating at its intake end 17 with a suitable fuel reservoir such as the float chamber 18 and as shown in Figure 1, a branch 19 of the passage 16 serves as a means of insuring a constant supply of fuel to the nozzle for the idling or slow speed of the engine regardless of flow through the end 17. A valve 21 is manually operable for adjusting the size of the opening to branch 19. Control of the mixture discharge from the mixing chamber is had by means of the usual throttle valve 22. Introduc-

tion of fuel to the passage 16 for engine speeds ranging from relatively low to normal or average values, and for engine loads ranging from extremely light to fairly medium loads, is arranged to be controlled by means of a floating or metering valve 23. The position of the latter is arranged to vary throughout the range of the engine operations aforesaid, and such variation is in accordance with the suction or pressure conditions existing in the intake manifold. More specifically, when the throttle valve is in or near closed position whereby a relatively high suction obtains in the manifold, the valve 23 will close or nearly close the orifice 17 to passage 16, and on the other hand, as the load or speed of the engine is increased, and the suction in the manifold lowers, the valve will be proportionally raised to allow a correspondingly greater amount of fuel to enter the orifice.

As here shown, the means rendering the metering valve 23 responsive to variations in the suction of the manifold, comprises a vacuum cylinder 24 preferably positioned at the side of the carburetor housing and operatively communicating with the intake manifold above the throttle valve by means of a conduit 26. Mounted for reciprocation in the cylinder 24 is a piston 27 which is arranged for connection with valve 23 in such manner that movement of the piston will be proportionally translated to the valve. Such connection is here shown effected by means of lever 28 having one arm adjustably connected to the piston rod 29 and the other arm connected by means of a link 31 to a crank lever 32 pivotally carrying the valve 23. With such connection, as the piston is moved outwardly the valve will proportionally open the passage 16, and likewise as the piston is drawn inwardly the valve will proportionately close said passage. Movement of the valve beyond its predetermined extreme opposite positions is preferably prevented by engagement of stops 33 on lever 32 with a pin 34 fixed to the carburetor housing.

It will be understood that the maximum economy in the use of fuel will result from limiting, during each instant in the operation of the engine, the flow of fuel through passage 16 to the least possible amount necessary to operate the engine under the conditions prevailing at such instant. It becomes therefore a matter of holding the valve as far out of its fully open position as conditions will permit. Urging the valve 23 in all positions thereof to completely uncover the full area of the orifice 17, is a suitable spring 36 here shown arranged within the cylinder 24 and interposed between the piston and suction end 37 of the cylinder, whereby the piston will normally move the valve to its fully open position. It will now be clear that with the throttle in open position and the engine operating at relatively high speed or under heavy load, the suction in the manifold will be negligible and therefore the piston under the action of spring 36 is free to retain the valve 23 in fully open position. When, however, the speed of the engine decreases or the load lightens, a vacuum in the manifold commences to build up and as a consequence the piston becomes influenced thereby and causes a corresponding opening of the valve against the action of spring 36. As the speed or load continues to decrease, the orifice 17 is proportionally closed to effect further economy in the use of the fuel. This fluctuation in the position of the valve is arranged to take place throughout the normal operation of the engine so that the proportion of fuel to the air in the mixing chamber is constantly varied as the conditions in the operation of the engine change.

Automatic means are also provided for rendering the automatic mixture control inoperable when the throttle is closed or nearly so and also when the throttle is more than normally open, such as when the engine is at high speed or under heavy load. This is done to insure a maximum richness of mixture for starting purpose and for steady heavy load conditions. Arranged in the conduit 26 for controlling communication of the vacuum cylinder with the manifold is what may be conveniently termed a pilot valve 38. The latter comprises a pair of opposed valve members 39 and 40 arranged on opposite sides of an orifice 42 with which said members may engage one at a time to close the passage through the conduit. The valve members are carried on stems 43 and 44 which are secured together by threaded engagement whereby the spacing between the valve members may be varied as desired. The stems extend upwardly from the conduit and the upper extremity of the inner stem is arranged to engage the under side of an arm 46 fixed to the pivot pin 45 of the throttle. Engagement of valve stem with the arm 46 is maintained by means of a spring 47 encircling the stems and interposed between the conduit and a nut 48 on the outer stem. The valve members are so positioned with respect to arm 46 that when the throttle is in substantially closed position the valve member 43 will close the orifice 42 so that a maximum richness of mixture will be available for rapid engine speed acceleration from starting or low speed position. Likewise when the throttle is opened to more than a normal degree the pilot valve will have raised to such an extent that the valve member 40 will close the orifice and thereby prevent the actuation of the metering valve in accordance with a variation in pressure in the manifold. It will be understood that during the economy range of operation, that is, when the metering pin is subject to automatic regulation, the valve members float on either side of the orifice, and that by changing the relationship between the valve members the economy range of operation may be varied at will. Preferably the arm 46 is adjustably fixed to the throttle pin so that the proper relationship between the throttle and pilot valve may be maintained regardless of the adjustment of the valve members.

The vacuum release means is provided for breaking the residual suction in the vacuum cylinder when the pilot valve closes the conduit 26. Such means as here shown comprises a relief opening 51 adjusted to proper size by means of a screw valve 52.

I claim:

1. In a carburetor, a chamber arranged for communication with the intake of an internal combustion engine and having a fuel nozzle and air passage opening into the chamber, a throttle valve for controlling the discharge of mixture from said chamber to said intake, a metering valve for controlling the flow of fuel through said nozzle, a vacuum chamber communicating with said intake between said throttle valve and the engine cylinder, a spring normally moving said metering valve to open position, a piston in said vacuum chamber operating as the vacuum increases therein to move said valve to closed position against the action of said spring, a pilot valve for controlling communication of the vacuum cham-

ber with the engine intake, means for closing said pilot valve to incapacitate the operation of said piston, and means for relieving suction in said vacuum chamber when the pilot valve is closed.

2. In a carburetor, a mixing chamber arranged for connection with the intake manifold of an internal combustion engine and having a fuel nozzle and an air passage opening into the chamber, a throttle valve for controlling the discharge of mixture from said chamber to said manifold, a metering valve for controlling the flow of fuel from said nozzle, means having connection with the suction in said manifold for regulating said metering valve, and means operative to sever said connection to thereby incapacitate the operation of said first means when the throttle valve is in a predetermined position.

3. In a carburetor, a mixing chamber arranged for connection with the intake manifold of an internal combustion engine and having a fuel passage opening into the chamber, a throttle valve for controlling the discharge of mixture from the chamber to the manifold, a valve for controlling the flow of fuel from said passage into the chamber, means having connection with the suction in the manifold for regulating said valve, and means operative to sever said connection to thereby incapacitate the operation of said first means when the throttle valve is in substantially closed and relatively wide open positions.

4. In a carburetor, a mixing chamber arranged for connection with the intake manifold of an internal combustion engine and having a fuel nozzle opening into the chamber, a throttle valve for controlling the discharge of mixture from the chamber to the manifold, a metering valve for controlling the flow of fuel through said nozzle into the chamber, means normally holding said metering valve in open position, means having connection with and responsive to the pressure in the manifold effecting a closure of the metering valve proportionally as the suction increases therein, and means for severing said connection thereby rendering said means inoperative in predetermined position of the throttle valve.

5. In a carburetor having a mixing chamber provided with an air intake and arranged for connection with the intake manifold of an internal combustion engine and including a fuel valve for admittig fuel to said chamber and a throttle valve adjustable to regulate the flow of mixture from said chamber to said manifold, pressure actuated means having connection with said manifold for controlling said fuel valve, and means operative to sever said connection to thereby incapacitate said first means when the throttle valve is in a predetermined position, said last named means including a passageway forming a part of said connection, a valve means in and operable to open and close said passage, and means connecting said valve means and throttle valve causing upon movement of the latter an actuation of said valve means.

6. In a carburetor having a mixing chamber arranged for connection with the intake manifold of an internal combustion engine and provided with an air intake and a fuel valve for admitting fuel to said chamber to mix with the air and a throttle valve adjustable to regulate the flow of mixture of fuel and air to said manifold, pressure actuated means having connection with said manifold for controlling said fuel valve, and means operative to sever said connection to thereby incapacitate said first means when the throttle valve is in a predetermined position, said last named means comprising a casing having a passage defining a portion of said connection and provided with a pair of opposed valve seats in said passage, a pair of valve members movable in said passage and engageable with said seats, adjustably attached telescopingly disposed stems secured to said members and extending from said casing, a helical spring surrounding said stems and urging same to position one of said members into engagement with one of said seats, and an arm secured to said throttle valve and disposed for engagement with said stems, said arm being arranged on movement of said throttle valve to cause disengagement of said last named member and seat to open said passage and upon further movement of said throttle valve to cause engagement of said other valve member and seat.

LOUIS W. JENKS.