Dec. 1, 1925. 1,564,039

H. A. WHITEHORN

CARBURETOR

Filed Feb. 24, 1920

Fig. 1.

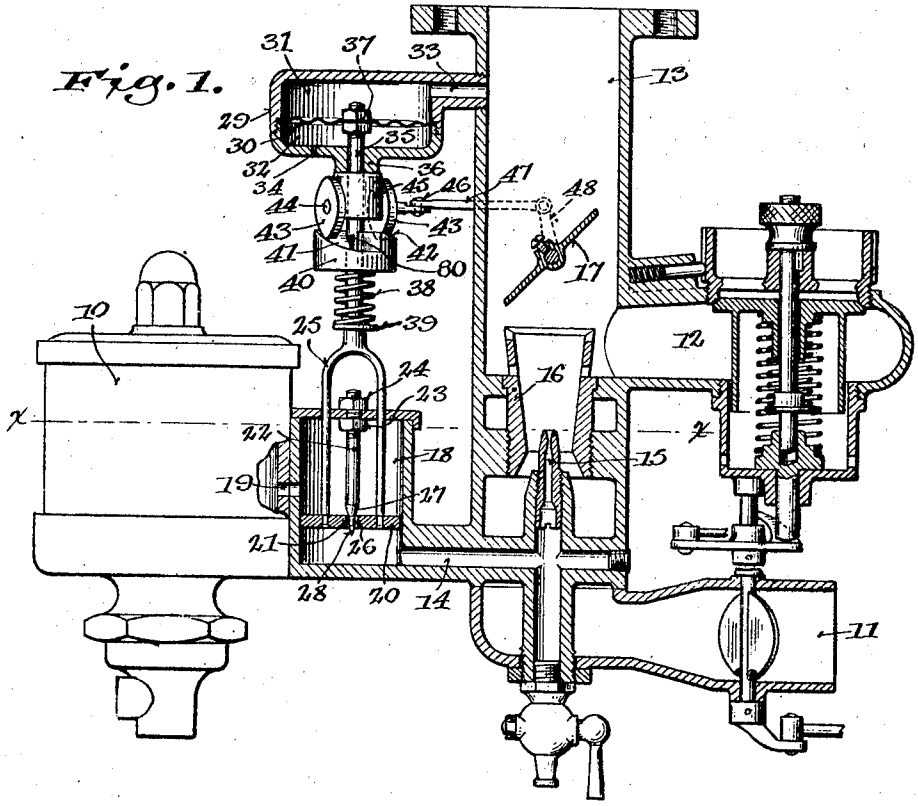


Fig. 2.

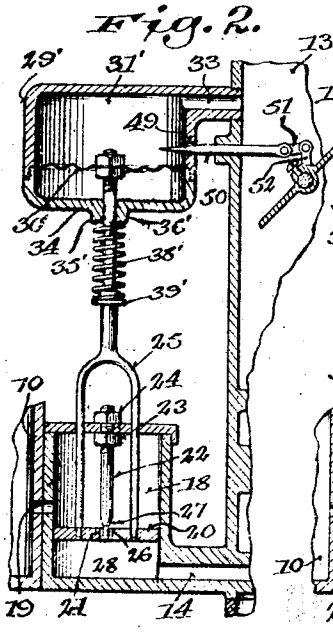


Fig. 3.

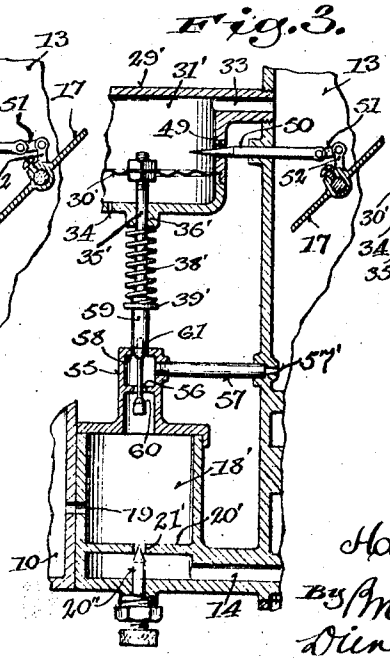
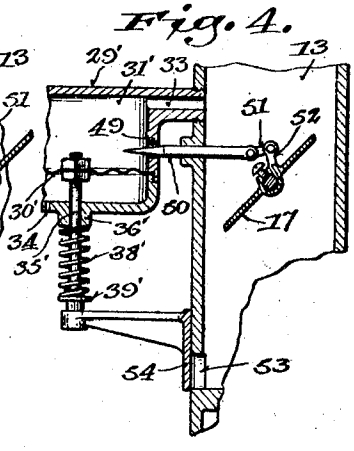


Fig. 4.



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UNITED STATES PATENT OFFICE.

HOMER A. WHITEHORN, OF PORT WASHINGTON, NEW YORK, ASSIGNOR TO STROMBERG MOTOR DEVICES COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CARBURETOR.

Application filed February 24, 1920. Serial No. 360,836.

To all whom it may concern:

Be it known that I, HOMER A. WHITEHORN, a citizen of the United States, residing at Port Washington, in the county of Nassau and State of New York, have invented a certain new and useful Improvement in Carburetors, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to carburetors.

It is a well recognized fact among automobile engineers that for maximum power a slightly richer mixture is required than that which gives maximum efficiency under normal running conditions. In other words it is desirable to enrich the mixture when the motor is operating under heavy load conditions. Various schemes have been devised for automatically effecting this change in mixture, notable among which are those which depend for their action upon the partial vacuum created in the manifold and carburetor under the suction of the motor. This is due to the fact that the degree of vacuum varies with the speed of the motor and the speed of the motor is reduced under heavy load conditions.

The degree of vacuum also varies however with changes in the position of the throttle. That is under constant motor speed the vacuum is a maximum when the throttle is closed and is reduced as the throttle is opened. This factor has apparently been overlooked in devices heretofore made with the result that the automatic control of the mixture has proved only partially successful.

The primary object of the present invention is the provision of means for automatically varying the richness of the mixture in accordance with the load upon the motor and independently of the position of the throttle.

Another object is the provision of vacuum controlled means for varying the richness of the mixture so constructed and arranged that compensation is made for changes in the vacuum due to changes in the position of the carburetor throttle.

Other objects and advantages will hereinafter appear.

Several typical forms of the invention are illustrated in the accompanying drawings, in which:

Figure 1 is a vertical section, partly in elevation, of a carburetor embodying the features of the present invention.

Figure 2 is a fragmentary section illustrating a different mechanical embodiment of the invention.

Figure 3 is a fragmentary section of another form of the invention.

Figure 4 is a fragmentary section of another modification.

For purposes of illustration several forms of the invention are shown applied to a carburetor of conventional form. This carburetor includes a liquid fuel float chamber 10 of ordinary construction, a main air inlet 11, an auxiliary inlet 12, and a fuel mixture outlet 13 designed for connection with an engine manifold pipe not shown. The liquid fuel, ordinarily gasoline, passes from the float chamber 10 through the passageway 14 into the spray nozzle 15 and assumes a level corresponding substantially to the line x—x. (See Fig. 1.)

When the motor is running air enters the inlet 11 and passes up and around the nozzle 15 and through the Venturi tube 16, drawing the gasoline from the nozzle 15, and carrying the gasoline with it up into the outlet 13 past the throttle 17. The fuel mixture is thus formed and enters the manifold in the usual manner. Since the construction and operation of carburetors of this general type are well known in the art a further or more detailed description of the same is deemed unnecessary.

In the forms of the invention illustrated in Figures 1 and 2 a well or chamber 18 is interposed between the float chamber 10 and passageway 14. The passageway 14 communicates with the lower portion of well 18 and a port 19 effects communication between the float chamber and well at a point above the passageway. A partition preferably in the form of a disc 30 is interposed between port 19 and the entrance to passageway 14. The disc is provided with a valve port 21.

A needle valve 22 cooperating with valve port 21 controls communication between the float chamber and passageway and thus controls the supply of liquid fuel to the nozzle 15.

The needle valve is preferably mounted in the top of the well 18 and is adjustably fixed in the wall thereof by any suitable means such as nuts 23 and 24. The disc 20 is preferably movably supported by means of a forked member 25 fixed to the disc and projecting through the top of the well. The end of the needle valve is preferably formed with a straight portion 26 normally within the valve port 21, a beveled shoulder 27 above the disc and a pointed end 28 normally projecting beneath the disc. Thus the flow of the liquid fuel through port 21 is materially decreased or increased by the extreme upward or downward movement of the disc.

Various means may be provided for actuating the forked member 25 and thus controlling the relation of the needle valve and valve port in accordance with the load on the motor. In the embodiment of the invention illustrated in Figure 1 this means includes a vacuum chamber 29 having a flexible diaphragm 30 secured therein and dividing the chamber into upper and lower compartments 31 and 32 respectively. The upper compartment communicates with the carburetor outlet 13 through a passageway 33 preferably arranged above the throttle 17, so that the pressure upon the top of the diaphragm corresponds with the pressure in the outlet 13. An atmospheric port 34 through the wall of the lower compartment 32 insures atmospheric pressure upon the bottom of the diaphragm at all times.

A stem 35 slidably mounted in a suitable bearing 36 formed preferably on the bottom of the vacuum chamber is secured at one end to the diaphragm as indicated at 37. The lower end of this stem is connected with the forked member 25 above referred to so that upon an upward flexure of the diaphragm the flow of fuel through valve port 21 is reduced and upon a downward flexure the flow of fuel is increased. A compression spring 38 bearing against a flanged shoulder 39 on the forked member tends at all times to force the forked member and the disc 20 downwardly. While the motor is running the action of the spring 38 is resisted due to the partial vacuum created in the upper compartment 31 of the vacuum chamber under the influence of engine suction.

Thus when the speed of the engine is reduced due to the application of a load, and the vacuum in compartment 31 is correspondingly reduced, the spring 38 acts to lower the disc 20 and thus increase the flow of fuel through valve port 21. The vacuum in the compartment 31 however also varies with changes in the position of the throttle 17. Thus it becomes necessary to compensate for these changes in vacuum that are due to the position of the throttle.

This may be accomplished by varying the tension in spring 38 in accordance with the position of the throttle. One means for accomplishing this purpose is illustrated in Figure 1. This means includes a collar 40 slidably mounted upon the stem 35 and bearing against the upper end of spring 38. The collar is held against rotation on the stem by any appropriate means such as the lug 80 and keyway shown on the stem between the cam surfaces. The collar is provided with cam surfaces 41 and 42 for cooperation with a plurality of cam rollers 43. In the mechanism shown a pair of such rollers are employed, each journaled upon a suitable spindle 44 carried by a collar 45 rotatably journaled upon the stem 35, and bearing against the bearing 36.

One of the roller spindles is extended and pivotally connected as shown at 46 with a suitable link 47 mechanically connected with the throttle 17 through a lever 48. Thus when the throttle is moved to closed position rollers 43 ride upon the cam surfaces 41 and 42, forcing the collar 40 downwardly and increasing the tension in the spring 38. The parts are so proportioned that this increase in spring tension balances the effect of increase in vacuum in the upper compartment 31 due to the closing of the throttle. Thus it will be seen that the position of disc 20 and hence valve port 21 will vary only with changes in motor speed, or in other words, with the load on the motor.

Another method of compensating for variations in vacuum in the outlet 13 is carried out by means such as illustrated in Figures 2, 3 and 4. In each of these constructions the tension in spring 38′ is not changed by adjustment of throttle 17, the spring being interposed between the shoulder 39′ on the stem 35′ and the bearing 36′ on the vacuum chamber 29′. A valve port 49 extends through one wall of the upper compartment 31′ of the vacuum chamber. A needle valve 50 connected by a link 51 and lever 52 to the throttle 17 cooperates with the valve port 49 to admit more or less air to the compartment 31′ in accordance with the position of the throttle. Thus when the throttle is turned toward closed position, the needle valve is moved outwardly and more air is admitted to the compartment to reduce the vacuum therein and thus compensate for the increase in vacuum created in the outlet 13 due to the movement of the throttle. The reverse action occurs when the throttle is turned toward open position so that the condition of the diaphragm and the position of stem 35′ depends solely upon the speed of or, in other words, upon the load on the motor.

In the form shown in Figure 2 the disc 20 is connected with the stem 35′ through the forked member 25 so that the position of valve port 21 with respect to the needle valve 22 depends at all times upon the position of the stem and hence upon the load on the motor. Thus it will be seen that in this instance, as well as in the form shown in Figure 1, the fuel mixture is enriched as the motor slows down under load by the increased flow of liquid fuel through the port 21. And as the the motor speed increases the mixture becomes lean due to the partial closure of the port 21.

In the form shown in Figure 4 the mixture is diluted under high motor speeds by the admission of air to the mixture. For this purpose the outlet 13 is provided with an air inlet port 53. A slide valve 54 controls the admission of air through the port. This valve is connected with the stem 35′ and is controlled thereby in a manner similar to that previously described. When the motor is operating under a heavy load the valve 54 is in the position shown. When the motor increases in speed however, the upward flexure of the diaphragm 30′ raises the stem 35′ and hence the valve 54 to partially open the port 53 and thus dilute the mixture by the admission of air. This movement of the valve 54 is solely dependent upon the speed of the motor since, as above pointed out, the needle valve 50 automatically compensates for changes in vacuum due to the position of the throttle.

The form of the invention shown in Figure 3 embodies a combination of the features contained in the forms shown in Figures 2 and 4. In other words under very heavy loads and at very low speeds the mixture is enriched by the addition of liquid fuel, while under light loads and at high speeds the mixture is diluted by the addition of air. In the construction shown this is accomplished by providing an extension 55 on the well 18′. A valve port 56 forms a communication between the well 18′ and a pipe 57 leading to a nozzle 57′ formed in the outlet 13. A second valve port 58 is provided for the admission of air to the extension 55 and pipe 57. A valve stem 59 is secured to the diaphragm stem 35′, and carries a valve 60 for controlling the flow of fuel through port 56 and a valve 61 for controlling the admission of air through the port 58. The well 18′ is also provided with a fixed partition 20′ having a valve port 21′ cooperating with a needle valve 20″. The needle valve 20″ may be adjustably fixed in such position as to permit a normal flow of liquid fuel from the float chamber 10 to the passageway and thence to the spray nozzle (not shown) under normal conditions.

The valve 61 is shown closed and the valve 60 open, which are the positions normally assumed under the tension of spring 38′ when the engine is inert.

When the motor is operating under heavy load and at very slow speed the downward flexure of the diaphragm 30′ causes the downward movement of stems 35′ and 59 and the closure of port 58 and the opening of port 56. Under these conditions an additional supply of liquid fuel is drawn into the outlet 13 through pipe 57 to the nozzle 57′ to enrich the mixture. When the diaphragm 30′ and stems 35′ and 59 are drawn upwardly by an increased speed of the motor the valve port 58 is opened, and air instead of liquid fuel enters the outlet 13 through the pipe 57 to dilute the mixture. It will be understood that the extent of dilution depends upon the position of the valve 61 which is in turn dependent upon the vacuum in compartment 31′. As above pointed out the vacuum in the compartment 31′ is always solely dependent upon the speed of or load on the motor, since the needle valve 50 automatically makes compensation for changes in vacuum due to the position of the throttle.

Although the invention has been described in connection with one type of carburetor it will be understood that it is applicable to various other types. Furthermore various changes may be made in any of the embodiments of the invention hereinabove specifically described without departing from or sacrificing any of the advantages of the invention as defined in the following claim.

I claim:

The combination of a carburetor having a fuel mixture outlet for communication with the intake manifold of an internal combustion engine, a throttle for controlling the flow of fuel therethrough, means controlled by engine suction for varying the richness of the fuel mixture, and means connected to the throttle for modifying the action of said first named means so that the richness of said fuel is solely dependent upon the speed of said motor.

In witness whereof I hereunto subscribe my name this 17 day of February 1920.

HOMER A. WHITEHORN.