June 5, 1923.

1,457,408

F. R. SUNDERMAN

CARBURETOR

Filed April 17, 1919

Fig. 1.

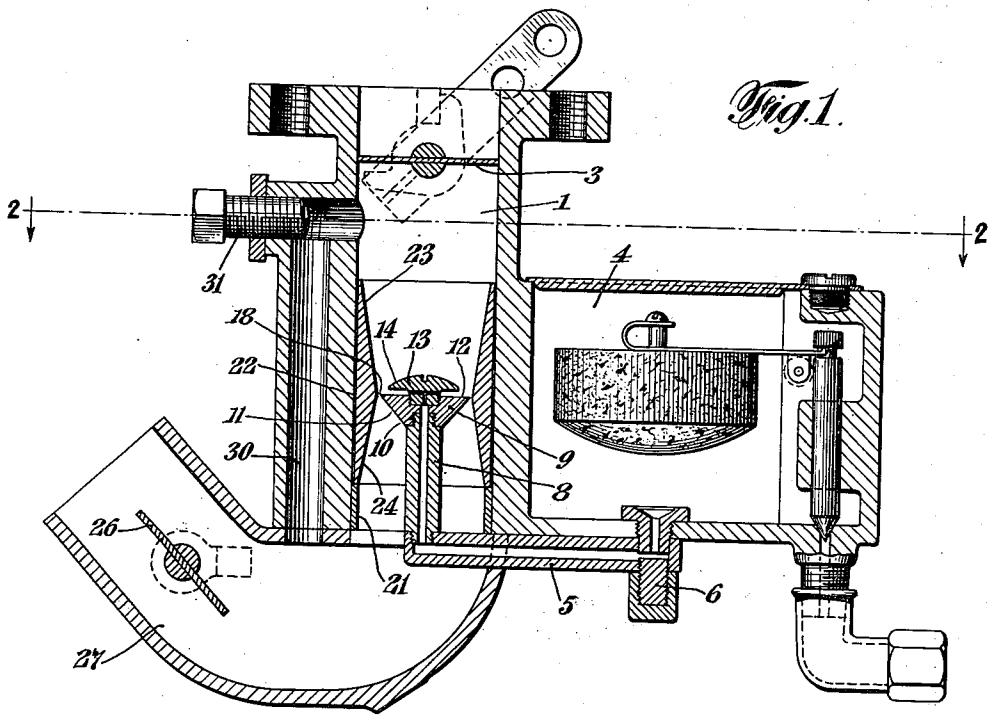
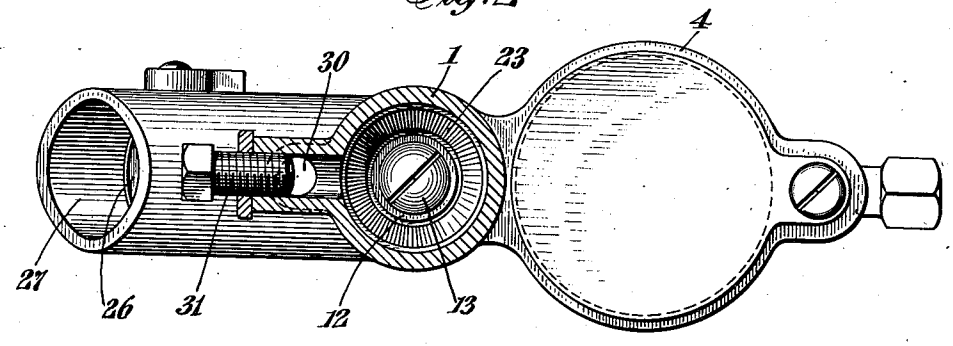


Fig. 2.



INVENTOR

Frederick R. Sunderman

BY

S. Mortimer Ward Jr.

ATTORNEY

Patented June 5, 1923. 1,457,408

UNITED STATES PATENT OFFICE.

FREDERICK R. SUNDERMAN, OF DETROIT, MICHIGAN, ASSIGNOR TO SUNDERMAN PRODUCTS, INC., OF NEWBURGH, NEW YORK, A CORPORATION OF NEW YORK.

CARBURETOR.

Application filed April 17, 1919. Serial No. 290,657.

To all whom it may concern:

Be it known that I, FREDERICK R. SUNDERMAN, a citizen of the United States, and a resident of Detroit, Wayne County, Michigan, have invented certain new and useful Improvements in Carburetors, of which the following is a specification.

My invention relates to carburetors and more particularly to the regulation of the mixture of air and fuel therein. One object of the invention is to provide a regulating venturi member of improved form and operation. A further object of the invention is to provide an air passage leading into the mixing chamber above the fuel discharge and venturi to affect the regulating action of the venturi member producing new and improved results. Further and more specific objects, features and advantages will more clearly appear from the detail description given below taken in connection with the accompanying drawings which form a part of this specification.

In the drawings, Fig. 1 is a central vertical section of a carburetor embodying my improvements in a preferred form, and Fig. 2 is a transverse section taken on the line 2—2 of Fig. 1.

Referring to the various figures, 1 represents a cylindrical mixing chamber in which the air and hydrocarbon fuel, such as gasoline, are mixed before being led to the engine from the top thereof in a well known manner. 3 is a throttle valve of any well known or suitable form for controlling the passage of the mixed air and fuel to the engine. 4 is a float chamber of any well known or suitable variety in which a supply of liquid hydrocarbon fuel is maintained and from the bottom part of which a pipe 5 extends horizontally into the bottom of the chamber 1 and is maintained rigid with the bottom of the float chamber 4 by means of the double threaded hollow screw 6 having passages whereby the gasoline or other fuel may run out of the float chamber 4 into the pipe 5.

Arranged centrally within the chamber 1 is the hydrocarbon discharging means which, according to the present form of my invention, is constructed as follows: A nozzle tube 8 is provided with upper and lower threaded portions, the lower portion being threaded into an opening in the pipe 5 which leads from the float chamber. A member 9 is provided with a central screwthreaded bore 10 to fit over the tube 8, which permits the member 9 being threaded onto the upper end of tube 8. The member 9 is frustro-conical in general outline, having its outer surface 11 tapering downwardly, while the upper portion of the member is flat as at 12 to form a circumferential ledge from which the fuel may be vaporized by the passing air. Screw-threaded into the top of the member 9 is a cap member 13 provided with a vertical bore in the screwthreaded part and lateral bores leading out therefrom, through which the fuel may flow from the pipe 8 out onto the surface 12 below the main lower face 14 of the cap member 13. The diameter of the face 14 is somewhat less than the diameter of the face 12 and the upper face of the cap member 12 is rounded off as shown in Fig. 1. The lower surface 14 of the cap member and upper surface 12 of the member 9 form between them a narrow annular passage for the discharge of fuel to the mixing chamber.

The width of this passage in one embodiment of the invention which has given very satisfactory results, was adjusted to about one-sixteenth of an inch, although it will be understood that this width may be modified to suit various sizes and types of carburetors and for different engines.

It will be observed that by screwing the cap up or down the size of the discharge passage may be varied. The adjacent outer edges of the two members are preferably quite sharp. A venturi member 22 surrounds the discharge member 9, 13 and is adapted to slide vertically in the cylindrical mixing chamber 1 being normally positioned against a stop 21 by the action of gravity. The sliding sleeve venturi member 22 has a relatively loose fit in the mixing chamber being spaced from its inner walls by about 7½ thousandths of an inch. The venturi member 22 has its upper face 23 inclined to the vertical and its lower face 24 also inclined to the vertical. These inclined faces meet on a circumferential line 18 lying substantially in the horizontal plane of the fuel discharge opening in the discharge member 9, 13. The angle of inclination to the vertical of the lower surface 24 of the sleeve is greater than the angle of inclination to the vertical of the upper surface 23 of the sleeve. At 26 is shown a "strangle" valve in the air inlet 27 for the purpose of adjusting or controlling the admission of air to the

carburetor in starting. Extending from a point inside the strangle valve 26, into the mixing chamber at a point above the discharge member 9 and between it and the valve 3 is an air bypass 30 about five sixteenths inch in diameter. A screw 31 is provided to regulate the size of the opening of the bypass leading into the mixing chamber.

In operation, when the engine is about to be started and the parts are in the position shown in Figure 1, the space for admission of air between the venturi member 22 and the fuel discharge member is at a minimum, being just enough to permit the engine to idle properly. The parts are so adjusted that when the sleeve 22 is in its lowest position it maintains the necessary velocity and amount of air flowing past the hydrocarbon discharge passage to insure the desired mixture at this speed. As greater engine speed is attained and greater suction is applied to the mixing chamber the throttle valve 3 being opened somewhat, the relative difference in air pressure exerted on the faces 24 and 23 causes the valve sleeve 22 to rise against the action of gravity and thereby increase the minimum cross-sectional area of the passageway so that as the suction in the mixing chamber is increased, a greater volume of air will be permitted to flow into the mixing chamber and thus the quantity of air passing through the mixing chamber and its velocity are nicely regulated in a most desirable manner. In normal operation the venturi member 22 is maintained in a floating or balanced condition by the opposing forces of gravity and that due to the relative air pressure exerted on the faces 24 and 23 due to the suction applied to the mixing chamber from the engine. In the present form of the invention this is accomplished in the most satisfactory manner by providing inclined faces 23 and 24 meeting substantially in the horizontal plane of the discharge opening when the venturi member is in its lowermost or retracted position. By providing a relatively loose sliding fit of the venturi member 22 in the cylindrical mixing chamber the tendency of the same to jam because of grit or dirt accumulating behind it is materially reduced and a very free and even up and down movement of the sliding venturi member is provided. When the suction in the mixing chamber reaches a predetermined value, the throttle being opened to a sufficient extent the sliding venturi member will begin to obstruct the air bypass 30 leading into the mixing chamber and thus increase the suction or decrease the pressure in the mixing chamber causing a relatively rapid further upward movement of the venturi member to totally obstruct the air bypassage 30 so that the sliding venturi member may be held up at relatively less engine speed and the venturi member will only drop when the engine speed drops considerably below the value at which it began to cut off the bypass 30. Because of the fact that the venturi member is more readily lifted and held in the lifted position at higher speeds— i. e., after the by-pass has been partially or wholly obstructed by the venturi movement, and because of the relation of the fuel discharge member and the lower tapering portion of the venturi, a relatively larger passage for the air past the fuel discharge member will be provided at such higher speeds for a given suction or pressure in the mixing chamber above the discharge member as compared with the opening at lower speeds, and this, of course, results in a relatively poorer mixture at the higher speeds, which is a desired attainment. Without such a bypass it would be necessary to provide the sliding venturi member with a relatively tight fit or to use springs or some other device to keep the relatively strong suction applied to the mixing chamber from pulling the venturi right up to the top at too low engine speed. By providing the air by-pass, this breaks the partial vacuum to some extent in the mixing chamber until high speed is reached, and this feature, coupled with the loose fit between the sliding venturi and the shell of the carburetor causes the venturi member to move more gradually and with reduced force and insures a smoother and more even operation.

By suitable adjustment the variation of suction exerted in the mixing chamber may be maintained within determined limits until high speed is reached, say, when the engine is running at about 1200 to 1500 R. P. M. whereupon the sliding venturi will cut off the by-pass and be drawn up more rapidly for a given pressure in the mixing chamber to effect a relatively larger opening for the air past the fuel discharge member, and once the venturi moves into position to cut off the by-pass and as long as the by-pass is cut off, this relatively larger opening is maintained for a given suction in the mixing chamber, as previously stated.

Due to the very small section of the passage between the fuel discharge member and the venturi at the lowermost position of the venturi, it is possible to provide an unusually loose fit between the sliding venturi and the shell of the carburetor, and these two features, taken in connection with the by-pass, are features that have been combined in the preferred embodiment of the invention which result in a carburetor which is very flexible, efficient and reliable in operation.

While I have described my invention in detail with respect to the preferred embodiment thereof, it will be obvious to those skilled in the art, after having understood my invention, that certain features thereof may be used to advantage independently of

others, and that various modifications and changes may be made without departing from the spirit and scope of my invention, and I do not wish to be understood as limiting myself other than as indicated in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a carburetor, the combination of a mixing chamber, an air intake portion leading to the mixing chamber, a fuel discharge member in the chamber, a sliding venturi member surrounding the fuel discharge member to control the velocity and quantity of air passing the discharge member responsive to varying degrees of suction applied to the mixing chamber, an air by pass extending from the air intake, around said venturi member and into the mixing chamber above the venturi member when the latter is in normal position so as to be variably obstructed by the upward movement of the venturi member responsive to certain increase of suction applied to the mixing chamber, and a choke valve controlling the flow of air to said by-pass.

2. In a carburetor, the combination of a mixing chamber, a fuel discharge member therein, a sliding venturi member surrounding the fuel discharge member to control the velocity and quantity of air passing the discharge member responsive to varying degrees of suction applied to the mixing chamber, and an air passage extending into the mixing chamber above the discharge member at a point where it may be obstructed by the upward movement of the venturi member to control the flow of air therethrough to the mixing chamber responsive to the upward movement of the venturi member.

3. In a carburetor, the combination of a mixing chamber, a fuel discharge member therein, a sliding venturi member surrounding the fuel discharge member to control the velocity and quantity of air passing the discharge member responsive to varying degrees of suction applied to the mixing chamber, a throttle valve in the outlet of the mixing chamber and an air passage leading into the mixing chamber above the upper edge of the venturi when the latter is in normal position and below the throttle valve, and adjustment means for regulating the amount of air flowing through the by-pass.

4. In a carburetor, the combination of a mixing chamber, a fuel discharge member therein, a sliding venturi member surrounding the fuel discharge member to control the velocity and quantity of air passing the discharge member, responsive to varying degrees of suction applied to the mixing chamber, a throttle valve in the outlet of the mixing chamber, a strangle valve in the air inlet to the mixing chamber and an air by pass extending from the air inlet inside said strangle valve to the portion of said mixing chamber between said discharge member and throttle valve, said air passage being adapted to be variably obstructed by the movement of the venturi member responsive to certain degrees of suction applied to the mixing chamber.

5. In a carburetor the combination of a mixing chamber, a fuel discharge member therein, a sliding venturi member surrounding the fuel discharge member to control the velocity and quantity of air passing the discharge member responsive to varying degrees of suction applied to the mixing chamber said venturi member normally having its restricted portion substantially at the fuel discharge nozzle, and having its inner walls flaring outwardly both above and below said restricted portion, and an air passage extending into said mixing chamber above said discharge member and adapted to be obstructed by the venturi member when the suction in the mixing chamber reaches a predetermined value, whereby the venturi member is more easily held up and a relatively larger passage is provided around the discharge member for a given suction exerted on the mixing chamber.

In testimony whereof, I have signed my name to this specification.

FREDERICK R. SUNDERMAN.