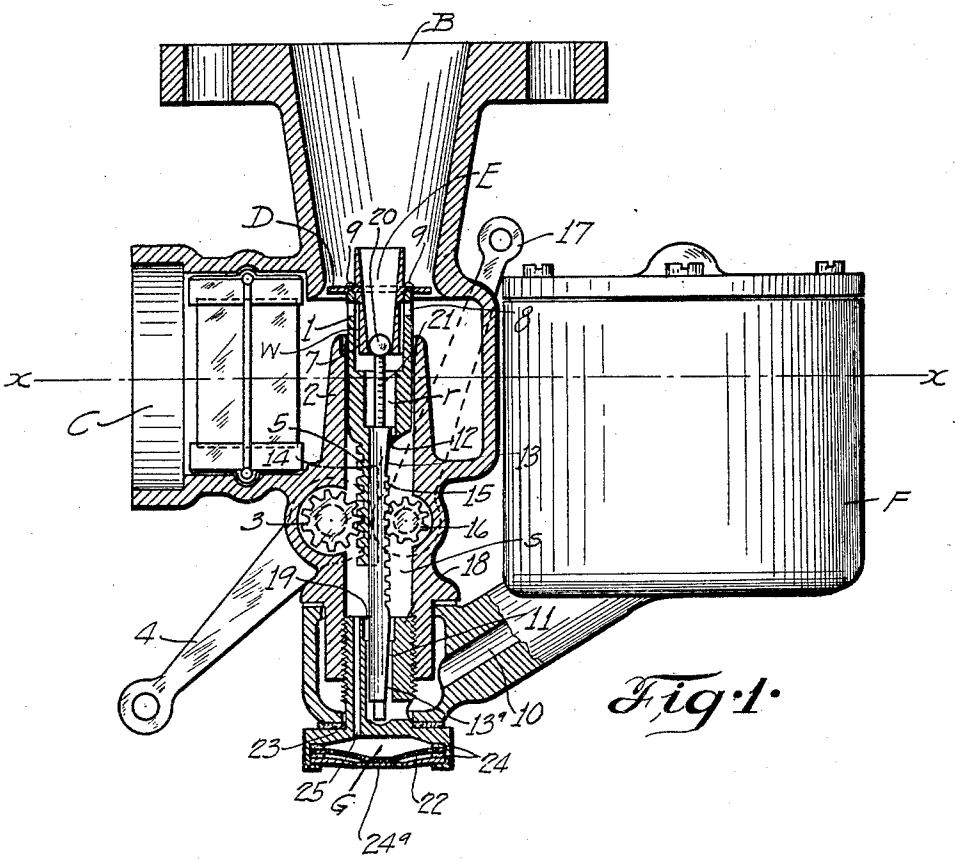
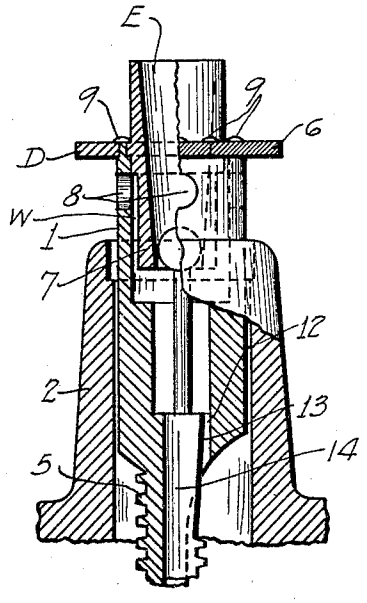
Dec. 17, 1929. W. C. CARTER 1,740,282

CARBURETOR

Filed July 24, 1924



Fig·1·



Fig·2·

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CARBURETOR

Application filed July 24, 1924. Serial No. 728,052.

This invention relates to carburetors for internal combustion engines.

The main object of the invention is to provide a carburetor of simple design that is reliable in operation, economical in the consumption of fuel and inexpensive to manufacture.

Figure 1 of the drawings is a side elevational view of my improved carburetor, partly in vertical section; and

Figure 2 is an enlarged view, partly in elevation and partly in section of the throttle valve and certain of the parts associated with same.

Referring to the drawings which illustrate the preferred form of my invention, B designates the mixing chamber, constructed preferably in the form of a venturi, and C designates an air intake arranged preferably at an angle to said mixing chamber B and projecting laterally from the lower end of same. The throttle valve of the carburetor is formed by a disk-shaped member D arranged at the small end of the venturi B, thus producing a carburetor in which the mixing chamber or mixture passageway is of gradually increasing diameter from its inlet end towards its discharge end and is arranged between the intake manifold of the engine and the throttle valve that governs the speed of the engine. The throttle valve D is reciprocatingly mounted and is herein illustrated as being arranged at the upper end of a vertically-adjustable displacement member 1 hereinafter more fully described, that fits loosely and slides in a vertically-disposed, tubular bearing 2 that is arranged below the venturi B in longitudinal alignment with the same. Any suitable means can be used for opening and closing said valve, such, for example, as a pinion 3 connected to a lever 4 and arranged in mesh with a rack 5 on the displacement member 1. The throttle valve D is provided at its peripheral edge with inclined or spiral teeth 6, as shown in Figure 2, which tend to impart a whirling action to the air which travels past the peripheral edge of said throttle valve into the mixing chamber B. This whirling action that is imparted to the air that is sucked in through the small end of the venturi B, past the edge of the throttle valve, continues as said air and the atomized fuel with which it mixes flows through the intake manifold of the engine, thus tending to cause the mixture to follow a substantially spiral path, in traveling through the intake manifold.

The throttle valve D is provided at its center with a mixture passageway E arranged in concentric relation with the venturi B that constitutes the mixing chamber and having its upper end or discharge end terminating inside of the small inlet end of the venturi B at a point above the throttle valve D. This passageway E is formed by a sleeve or tubular portion 7 on the throttle valve, and the lower end of said tubular portion is arranged inside of a socket in the upper end of the displacement member 1 and is spaced away from the side wall of said socket so as to form an annular air passageway *w* that leads to an atomizing chamber arranged adjacent the lower end of the passageway *w*. Air is admitted to the passageway *w* through ports 8 in the upper end portion of the displacement member, as shown in Figure 2. For convenience in manufacturing, the throttle valve D and the tubular portion 7 of said throttle valve are attached to the displacement member 1 by upsetting projections 9 on the upper end of said displacement member 1, after they have been inserted through holes provided for same in the throttle valve. The displacement member 1 is provided with a center bore *r* that constitutes a liquid fuel passageway whose upper end communicates with the atomizing chamber above referred to.

The float chamber F of the carburetor, which may be of conventional construction, or any preferred construction, is provided with a fuel outlet 10 that leads to a device which regulates the supply of liquid fuel to a reservoir *s* formed by the lower end portion of the bore in the tubular bearing 2 in which the displacement member 1 slides, said displacement member being enough smaller in diameter than the diameter of the reservoir *s* to slide freely in same. The reservoir *s* constitutes the main liquid fuel passageway of the carburetor, and the device which regu-

lates the supply of fuel to said reservoir *s* preferably consisting of a fuel supply orifice 11 whose size or area can be increased or decreased. An independent liquid fuel controlling device which also preferably consists of a fuel supply orifice 12 whose size can be increased and decreased, is arranged between the reservoir or main fuel passageway *s* and the fuel passageway *r* into which air enters from the air passageway *w*. It is immaterial, so far as my broad idea is concerned, how the fuel supplying orifices 11 and 12 are constructed, but I prefer to produce each of said orifices by arranging a plunger, plug or similar element provided with a tapered surface inside of a sleeve or similar element, and then move one of said elements relatively to the other so as to vary the size of the space between the tapered surface on one of said elements and the edge of the hole in the other element past which said tapered surface travels. Thus, as shown in the drawings, the fuel supply orifice 12 is formed by a space between a tapered flat surface 13 on a round rod 14 that is arranged in a hole in the displacement member 1 which is of the same diameter as said rod, but slightly smaller than the bore in the member 1 that constitutes the fuel passageway *r*. The rod 14 and member 1 are arranged so that one of said elements can be moved longitudinally relatively to the other, thus increasing or decreasing the size of the hole between the inclined flat surface 13 on the rod and the edge of the hole in the member 1 in which said rod is positioned. Assuming that the rod 14 and displacement member 1 are arranged in the position shown in Figure 2, upward movement of said rod, or downward movement of said displacement member will cause the orifice or space 12 to be increased, due, of course, to the fact that the flat surface 13 on the rod is inclined inwardly towards the longitudinal axis of the rod from the upper towards the lower end of the rod. In the carburetor herein shown the movement of the throttle valve D into its open position increases the size of the fuel supply orifice 12, and also raises the fuel level in the reservoir *s* by forcing the displacement member 1 downwardly into said reservoir, thereby insuring the liquid fuel being picked up by the air that is drawn downwardly around the depending tubular portion 7 on the throttle valve and upwardly through the passageway E in the throttle valve. In order that the area of the fuel supply orifice 12 may be increased when the throttle valve D is closed or held stationary, a manually-operable means is provided for moving the rod 14 upwardly relatively to the displacement member 1, said manually-operable means consisting of a rack 15 on the rod 14 that meshes with a pinion 16 which is secured to an actuating lever 17 that is adapted to be operatively connected with a device which can be actuated to enrich the mixture when the engine is cold or when the engine is first started. The fuel supplying orifice 11, previously referred to, between the outlet 10 from the float chamber and the main liquid fuel passageway *s* of the carburetor, is constructed in the same manner as the fuel supply orifice 12 and is formed by an inclined, flat surface 13^a on the lower end portion of the rod 14, which is disposed oppositely to the straight side wall of a bore formed in a plug 18 that is used as a closure for the lower end of the liquid fuel passageway *s*, said plug being provided adjacent its upper end with a counterbore 19 of slightly greater diameter than the rod 14. When the rod 14 is moved upwardly the size or area of the fuel supply orifice 11 will be increased, and when said rod is moved downwardly, the area of said orifice will be decreased. Due to the fact that the rod 14 constitutes a means for varying the size of both of the orifices 11 and 12, upward movement of said rod increases the supply of liquid fuel to both of the fuel passageways *s* and *r* and downward movement of said rod decreases the supply of liquid fuel to said passageways. It will be noted, however, that the size or area of the orifice 12 can be varied without producing a change in the size of the orifice 11 by opening the throttle valve D. This is because the displacement member 1 that cooperates with the rod 14 to form the orifice 12 is capable of movement relatively to the rod 14 when said rod is stationary.

The rod 14, in addition to controlling the supply of liquid fuel that is admitted to the fuel passageways *s* and *r* of the carburetor, is also used to control or regulate the passage of the mixture through the passageway E in the throttle valve. To this end the passage E is equipped with a controlling valve formed preferably by a ball-shaped member 20 that is secured to the rod 14 by a shank 21 and which is so arranged that it will close the inlet end of the passageway E when the throttle valve D is in its closed position. When the throttle valve D is moved downwardly towards its open position the area of the annular passageway between the ball-shaped valve 20 and the tapered lower end of the passageway E in the throttle valve will increase in direct proportion to the size of the inlet opening of the mixing chamber B controlled by the throttle valve. Bearing in mind that this movement of the throttle valve also increases the area of the fuel supply port 12, it will be understood that such a construction insures the proper proportioning of both the liquid fuel and the air that is admitted to the mixing chamber in any position of the throttle valve. Likewise, when the rod 14 is raised the controlling valve 20 in the passageway E will be moved upwardly so as to increase the area of the annular space between said valve and the tapered wall of the

passageway E through which the mixture is admitted to the mixing chamber B of the carburetor.

The carburetor is equipped with an accelerating reservoir G of novel construction that is adapted to hold a charge of liquid fuel that is supplied to the main liquid fuel passageway *s* in the event the throttle valve is suddenly opened to accelerate the speed of the engine. The novel feature of this accelerating reservoir is that it is provided with a flexible wall 22 formed from a piece of fabric arranged in such a way that the liquid fuel in the passageway *s* will cause said wall to flex in one direction, due to the weight of the fuel on said wall, thus causing the accelerating reservoir G to fill quickly, and the suction produced in the carburetor by a sudden opening movement of the throttle valve will cause said wall to flex in the opposite direction and thus expel the fuel from the reservoir G into the passageway *s*. As shown in Figure 1, the accelerating reservoir G is arranged at a point beneath the fuel passageway *s* and is provided with a rigid wall 23 arranged opposite the flexible wall 22, said flexible wall 22 being preferably formed by a flexible diaphragm than can be conveniently formed from one or more layers of treated fabric whose edge portions are clamped between gaskets 24 that are secured to the rigid wall 23. Communication is established between the accelerating reservoir G and the liquid fuel passageway *s* by one or more ducts 25 in the plug 18 previously described. Normally, the flexible wall 22 will bow downwardly, as shown in Figure 1, due to the weight exerted on same by the fuel in the passageway *s*, thus forming a space between the walls 22 and 23 of sufficient size to hold an accelerating charge, one side of the flexible wall 22 being exposed to the atmosphere. When the throttle valve is suddenly opened the increased suction causes the accelerating charge to be sucked out of the reservoir G up through the duct 25 into the fuel passageway *s*, thereby insuring a sufficient supply of liquid fuel to the passageway *s* to take care of the increased speed of the engine. So long as the increased suction is maintained, the flexible wall 22 of the accelerating reservoir will remain in an upwardly flexed condition, but as soon as the throttle valve is moved back towards its closed position, thereby permitting liquid fuel to build up in the passageway *s*, the weight of said fuel will be exerted on the flexible wall 22 and cause it to flex downwardly and suck a charge of fuel out of the passageway *s* into the accelerating reservoir G. If desired, a perforated member 24[a] can be arranged over the flexible wall 22 of the accelerating reservoir so as to protect said wall from injury.

The normal level of the fuel in the carburetor is indicated by the broken line *x* in Figure 1. If the engine is cold and it is desired to start it, the throttle valve D is moved into its closed position and the lever 17 is manipulated so as to raise the rod 14, thereby increasing the area of the fuel supply orifices 11 and 12 and causing a relatively rich starting charge to be supplied to the mixing chamber B when the engine is set in operation, the air forming part of said charge being drawn through the ports 8 down through the air passageway *w* into the atomizing chamber, where it comes in contact with the fuel in the passageway *r*, and thence travels upwardly with said fuel through the passageway E in the throttle valve. After the engine has warmed up the rod 14 is restored to its normally depressed position so as to reduce the quantity of fuel supplied by the orifices 11 and 12, and thereafter, while the engine continues in operation, the supply of liquid fuel to the passageway *r* is varied automatically by the movement of the throttle valve D. The flexible wall 22 of the accelerating reservoir G is normally held in a downwardly flexed position by the weight of the liquid fuel on same, and accordingly, said accelerating reservoir normally holds a charge of fuel that is in readiness to enter the liquid fuel passageway *s* of the carburetor whenever the throttle valve is opened suddenly. When the throttle valve is in its closed position, as shown in Figure 1, the high vacuum which then exists in the mixing chamber B above the throttle valve is prevented from being exerted on the accelerating reservoir G by the valve 20 which at this time acts as a closure for the lower end of the passageway E in the throttle valve. Opening the throttle valve, however, also causes the lower end of the passageway E in the throttle valve to become opened simultaneously, and consequently, causes the vacuum in the mixing chamber to be exerted on the fuel in the accelerating reservoir G, with the result that the fuel will be drawn upwardly from said reservoir into the fuel passageway or reservoir *s* in which the displacement member 1 moves. Bearing in mind that the movement of the throttle valve into its open position causes the displacement member 1 to be forced downwardly into the fuel passageway or reservoir *s*, thus raising the level of the fuel therein, it will be obvious that in my carburetor a rich accelerating charge is assured whenever the throttle valve is moved into its open position. I make no claim herein to the displacement member, as such a displacement member and the necessary parts that co-operate with the same are claimed in my co-pending application Serial No. 109,660, filed May 17, 1926.

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

1. A carburetor provided with a liquid fuel

passageway, and an accelerating reservoir communicating with said passageway and provided with a flexible fabric wall that is adapted to be flexed in one direction by the weight of the fuel in said passageway, thereby permitting said reservoir to fill, said flexible fabric wall being arranged so that one side of same is subject to atmospheric pressure and the other side of said wall is subject to the suction produced in the carburetor when it is in operation.

2. A carburetor provided with a mixing chamber, a manually-operated throttle valve arranged at the inlet end of said mixing chamber, an atomizing chamber below the throttle valve, means for admitting air and liquid fuel to said atomizing chamber, an opening in the throttle valve through which atomized fuel passes from said atomizing chamber into said mixing chamber, and a means rendered operative by the movement of the throttle valve for diminishing the flow of the atomized fuel into the mixing chamber through the hole in the throttle valve when said valve is moved into its closed position, and for increasing the flow of the atomized fuel into the mixing chamber through the hole in the throttle valve when said valve is moved into its open position.

WILLIAM C. CARTER.