Aug. 21, 1923. 1,465,449

G. B. MAEGLY

CARBURETOR

Filed Jan. 10, 1917 2 Sheets-Sheet 1

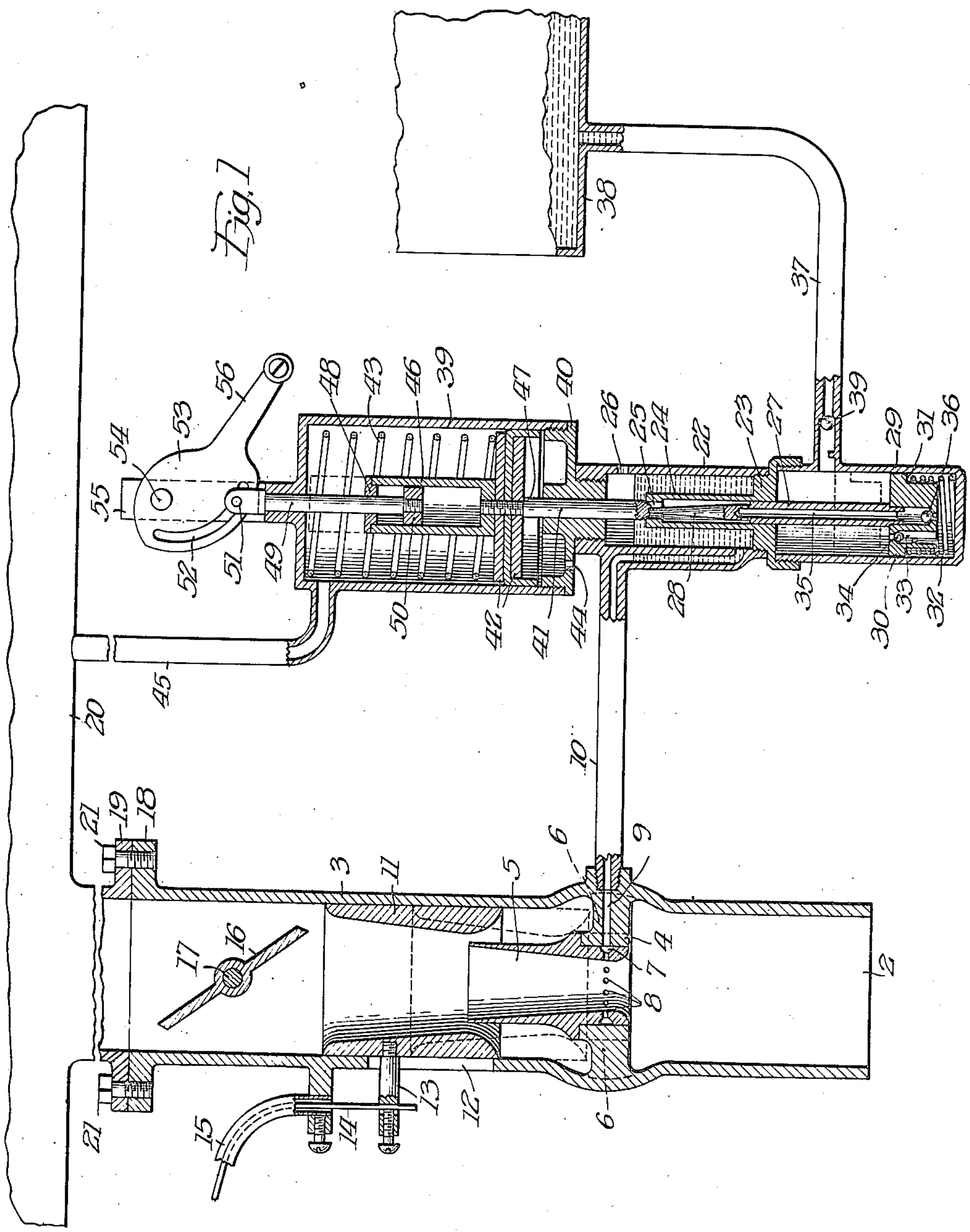

Fig. 1

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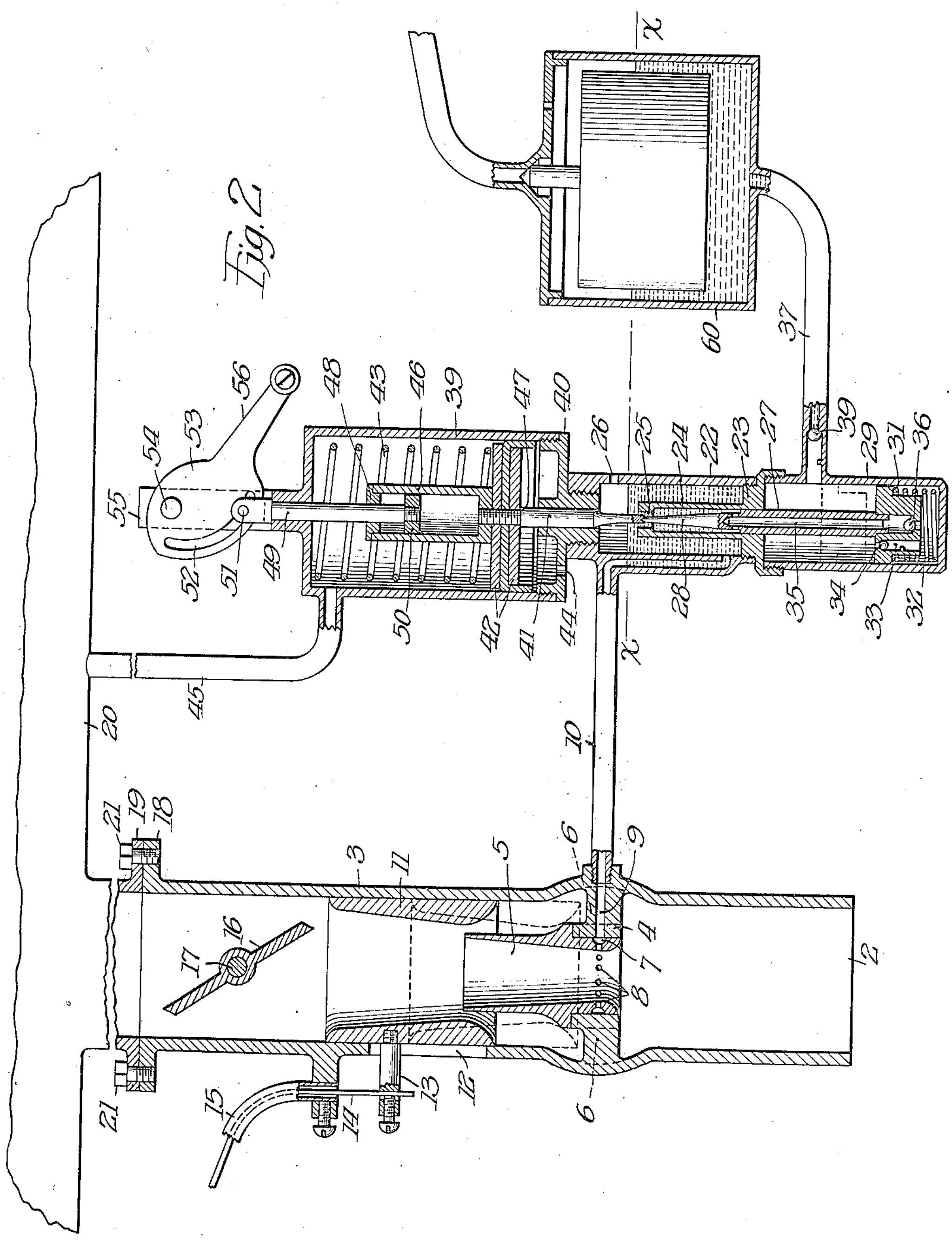

Fig. 2

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UNITED STATES PATENT OFFICE.

GEORGE B. MAEGLY, OF KANSAS CITY, MISSOURI, ASSIGNOR TO STROMBERG MOTOR DEVICES COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CARBURETOR.

Application filed January 10, 1917. Serial No. 141,671.

To all whom it may concern:

Be it known that I, George B. Maegly, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, 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.

My invention relates to carburetors for internal combustion engines and contemplates an improved device, the purpose of which is to regulate the proportion of fuel and air for various engine conditions and to secure a better quality of mixture than has heretofore been possible.

My invention contemplates a positive fuel control governed by the sub-normal pressure of the engine side of the throttle, referred to conveniently as the side above the throttle, the fuel, of course, and the air being admitted below the throttle. Furthermore, my invention contemplates, as part of the combination, means for securing an increment of fuel upon engine acceleration and it will be seen that the means which I provide is particularly and peculiarly adapted to the fundamental and underlying principle from which my invention proceeds.

The arrangement which I propose also lends itself particularly and peculiarly to an operator's control for getting the minimum fuel on low running and for limiting the maximum fuel on high running.

A further feature of my invention lies in the operator's control of the air passage from the atmosphere to the engine whereby there is provided not only an efficient choking device for starting purposes, but also a regulator for suction effect on the fuel inlet during subsequent running.

In the preferred form of my invention, I do away entirely with the common float chamber of the prior art, thus greatly simplifying the structure, reducing the number of moving parts, and at the same time providing a definite fuel control dependent upon engine conditions.

My invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1, more or less diagrammatically illustrates the preferred form; and

Figure 2 illustrates that form of my invention wherein a float chamber is employed.

Referring first to Figure 1, it will be seen that the carbureting chamber is formed by the provision of a generally tubular member 3 to which air is admitted at the bottom 2 where a hot air pipe may be connected, if desired. A bridge or spider 4 extends transversely across the tubular member 3 and supports the primary Venturi tube 5, the member 4 being provided with passageways 6, 6, through which air may pass upwardly around the Venturi tube 5. The Venturi member 5 is provided with an annular groove 7 which, when the tube is inserted in the bridge 4, as shown, forms an annular passageway from which numerous fuel inlets 8, 8, lead radially inwardly and to which a fuel supply passage 9 extends, this fuel supply passage being fed by a fuel pipe 10 to which I shall refer later.

Mounted for sliding adjustment in the tubular member 3 is the secondary Venturi tube 11 which is arranged to surround the primary Venturi tube 5 and which is adjustable from its uppermost position, shown approximately in full line, to its lowermost position, shown in dotted line.

In the wall of the member 3 there is provided a longitudinal slot 12 through which a pin 13, set into the secondary tube 11, extends, a wire 14 being secured to this pin and passing on to an operator's position, in an automobile for instance, to a flexible wire guide 15. By means of suitable adjusting mechanism on the steering column, for instance, the operator is enabled to move the second Venturi tube 11 up and down between the two positions noted. It will be seen that when the member 11 is in its lowermost position, shown in dotted line, it closes off the passageway surrounding the primary Venturi tube 5 and confines all the air entering the carburetor and passing on to the engine to the smaller primary Venturi tube 5. In this way the desirable rich mixture for starting is obtained. For subsequent running the secondary Venturi tube 11 is lifted to a point where the primary Venturi tube 5 terminates in approximately the most restricted and effective portion of the secondary Venturi tube 11 and it will be clearly understood that by the vertical adjustment of the member 11 the suction effect upon the inner Venturi tube may be effectively regulated.

Above the Venturi tube 11 the usual butterfly throttle 16 is provided, being mounted upon the transverse shaft 17 which, as usual, is under operators' control. At the top of the tubular member 3 there is provided the usual flange 18 for attachment to the flange 19 of the manifold 20, by means of bolts 21, 21, the manifold being, of course, provided in the case of a multi-cylinder engine but it being understood that my invention can also be employed in connection with a single cylinder engine.

Coming now to the gasoline supply, it will be seen that the pipe 10 leads from the bottom, or near the bottom of a cup 22, the bottom of which is in the form of a union 23, from which a nozzle 24 extends upwardly into the cup, the nozzle 24 being in axial alignment with the cup, as shown. The nozzle 24 has the outlet 25 at the top and the cup has the atmosphere inlet 26 at the top thereof. A needle valve stem 27 is fitted for reciprocation within the nozzle 24 and terminates in a reduced needle valve 28 which extends into the outlet 25 and which, upon vertical movement, varies the effective size thereof. As shown, the needle valve 28 is in its lowermost position.

Mounted upon the union 23 in axial alignment with and below the cup 22 is a cylinder 29 in which there is provided a piston 30 secured to the bottom of the valve stem 27. The piston 30 is provided with a downward facing shoulder 31 between which and the bottom of the cylinder 29 a helical spring 32 is disposed. The piston 30 is provided with a passageway 33 therethrough, this passageway being controlled by a downwardly opening check valve 34. There is also a passageway 35 provided through the valve stem 27 and the piston 30, this passageway being controlled by an upwardly opening check valve 36, and being thus arranged to connect the chamber below the piston and the interior of the nozzle 24. A fuel pipe 37 feeds into the cylinder 29 above the piston 30 and leads directly from a main supply tank 38 containing liquid fuel. A check valve 39 is provided in this fuel pipe, this valve being overcome by the head of liquid fuel but being there to prevent back flow of the fuel.

A cylinder 39 has its bottom 40 screwed into the top of the cup 22, the bottom 40 providing a central bearing for the reciprocating plunger 41 to which the piston 42, mounted for operation in the cylinder 39, is secured. The plunger 41, as shown, extends down into the cup 22 and has a beveled end which, as illustrated, is adapted to seat upon the nozzle 24, absolutely closing the outlet 25 thereof, when the piston 42 is in its lowermost position. As a matter of convenient construction, the lower end of the plunger 41 is provided with a small pocket in which the needle valve 28 extends, the needle valve and the plunger thus operating together. A spring 43 extends between the top of the cylinder 39 and the piston 42, this spring being stronger than the spring 32. Atmosphere is admitted to the bottom of the cylinder 39 by way of a passageway 44 and the top of the cylinder is connected to the manifold 20 by means of a pipe 45, so that the subnormal pressure in the manifold will be effective in the cylinder 39 over the piston 42.

A small cylinder 46 is mounted upon the piston 42, conveniently forming a clamping member between which and the shoulder 47 on the plunger 41 the piston 42 is secured. The cylinder 46 is closed at the top by means of a member 48 and a piston rod 49 is mounted in the member 48 and within the cylinder 46 has secured thereto a piston 50 fitting into the cylinder 46 in such a way as to leave sufficient by-pass to permit proper action but with dash-pot retardation. The piston rod 49 passes upwardly out of the cylinder 39 and at the top is provided with a pin 51 which rides in a slot 52 in the positive motion cam 53 pivoted at 54 in the vertical standard 55 conveniently extending upwardly from the top of the cylinder 39. The cam 53 has the operating lever 56 which by means of suitable connecting linkage goes to an operators' position.

It will now be seen that with the subnormal pressure of the manifold during running condition effective on top of the piston 42 with atmosphere effective below it, the piston 42 will tend to rise against the tension of the spring 43, and the spring 43 is, of course properly chosen for this purpose. When there is no subnormal pressure in the manifold, the piston 42, of course, lies at its lowermost position and there, as has been pointed out, the lower end of the plunger 41 absolutely closes off the outlet 25 from the nozzle 24, thus, although there is a constant head or at least continuous head of gasoline tending to move out of the nozzle, the entire system is at rest, and in this way the use of a float chamber is entirely dispensed with.

Let it be assumed now that the engine is started with the butterfly throttle 16, say, in mid-position. There is, of course, a considerable difference in pressure above and below the butterfly throttle 16, but it will be noted that the pressure to which the piston 42 is subject is that above or on the engine side of the throttle 16. The piston 42 therefore rises against the tension of the spring 43 to the position balancing this subnormal pressure. The plunger 41 rising with the piston 42 thus opens the outlet 25 of the nozzle 24 immediately, throwing the control of that nozzle outlet onto the needle valve 28, which, as has been described, follows the piston 42 in its upward motion due to the extension of the spring 32 under the piston 30. It will be seen therefore that under these conditions liquid fuel has free passage from the main tank 38 through the pipe 37 past the check valve 39 into the cylinder 29 above the piston 30 down through the passageway 33 past the check valve 34, into the chamber below the piston 30, upwardly past the check valve 36 thru the passageway 35, into the nozzle 24, out of the nozzle outlet 25, into the cup 22, out of the bottom of the cup through the pipe stem into the passageway 7 and into the primary tube 5 by way of the ports 8, 8, there mixing with the incoming air and rising past the throttle to the engine. This fuel line is controlled by the action of the needle valve 28 in the passageway 25 which, in turn, is controlled by the movement of the piston 42 responding to the subnormal pressure in the manifold 20. The movement of the piston 42 is made gradual and effective to predominating pressures by the dash-pot action between the piston 50 and the cylinder 46. It will be seen that as the butterfly throttle 16 is moved back and forth, as in the case of the usual running of an automobile, the subnormal pressure in the manifold will vary and the piston 42 will respond to these variations, moving the needle valve 28 accordingly, gradually reducing slightly the size of passageway 25 as the suction increases in order to counteract the tendency of the mixture to grow too rich under such circumstances.

Referring now to the matter of acceleration, it will be clear that when the throttle 16 is nearly closed, as on low running, and is then suddenly opened, the vacuum in the manifold 20 will "break". This means that the piston 42 will drop suddenly, not all the way, but just enough to respond to the condition, this action resulting in the pumping of the pocketed supply of liquid fuel below the piston 30 upwardly through the passageway 35 and out of the nozzle 24 as an increment to the ordinary running supply of gasoline. It will be clear that the supply of liquid fuel in the way of this increment is dependent upon the extent of acceleration. Let it be assumed that a certain acceleration is made which will pump out half the accumulated supply below the piston 30. If thereupon a further acceleration should be made the piston 30 will simply come down further with its proper and effective supplemental increments.

Let it be assumed now that the engine is stopped, by cutting off the ignition, for instance. It will be clear that the pressure in the manifold 20 will rise to atmosphere and the piston 42 will go down to its lowermost position absolutely closing off the nozzle outlet 25, returning to the point assumed at the beginning of the description of operation. It will be kept in mind here that with the closing off of this nozzle outlet 25 there is a certain amount of liquid fuel beyond the control of the plunger 41 and this amount is trapped in the cup 22 around the nozzle, as illustrated, ready as an enriching supply for starting purposes.

It is desirable to be able to adjust the extent to which the range of movement of the piston 42 travels. It will be seen that by the action of the cam 53 the upward movement of the piston is limited by the engagement of the bottom of the cylinder 46 with the piston 50, thus determining the minimum suction opening at 25 for high running. On the other hand, the piston 50 may, on occasion, be made to engage the top of the cylinder 46 so as to limit the downward movement of the piston 42.

Figure 2 is precisely like Figure 1, except that a float chamber of any conventional type, indicated at 60, intervenes between the pipe 37 and the main supply of liquid fuel. The level of gasoline is maintained on the line *x*, *x*. It will be clear that in this form it is not necessary that the plunger 41 shall ever absolutely close the passageway 25 out of the nozzle 24 and in fact the control of the passageway 25 lies always with the needle valve 28. In both cases we have the starting supply of liquid fuel in addition to the regular supply, this extra supply being promptly exhausted upon starting whereupon the cup 22 operates as a primary mixing chamber in which the gasoline is broken up to a great extent by the air entering the opening 26. When the engine is stopped the last stroke or two is sufficient to raise fuel out of the nozzle but is insufficient to carry it to the manifold, and in that way cup 22 is refilled.

I claim:

1. In combination, a carbureting chamber having a fuel nozzle and an air supply, a throttle controlling the outlet from said chamber, said outlet being adapted to be connected to an internal combustion engine, means for controlling the fuel supply, said means being governed by the pressure on the engine side of said throttle, normally cutting off the full supply and when opened operating to decrease the proportion of fuel as the suction increases, and means operated by first said means for injecting fuel to the fuel nozzle upon starting.

2. In combination, a carbureting chamber having fuel and air supplies, a throttle controlling the outlet from said carbureting chamber, said outlet being adapted to be connected to an internal combustion engine, a reservoir for liquid fuel connected to said

fuel supply, a cut-off valve closing said connection when there is no suction, means subject to the pressure on the engine side of the throttle for opening said cut-off valve when suction begins, and means connected with said valve for injecting a supply of gasoline upon a drop in suction.

3. In combination, a carburcting chamber having fuel and air supplies, a throttle controlling the outlet from said carbureting chamber, said outlet being adapted to be connected to an internal combustion engine, a reservoir for liquid fuel connected to said fuel supply, a cut-off valve controlling said connection, a needle valve controlling said fuel supply, inversely to the suction means subject to the pressure on the engine side of the throttle for operating said cut-off valve and said needle valve, and means connected with first said means operable to enhance the fuel feed upon a drop in pressure.

4. In combination, a carbureting chamber having air and fuel inlets and a mixture outlet, a throttle for said outlet, said outlet being adapted to be connected with an internal combustion engine, a fuel reservoir having the liquid level therein above said fuel inlet and connected with said fuel inlet, a cylinder, a piston operating in said cylinder, a cut-off valve operating with said piston for controlling the main fuel supply to said carbureting chamber, a connection between said cylinder on one side of said piston and the engine side of the throttle, said piston being moved to open said cut-off valve and permit fuel flow to said carbureting chamber upon creation of sub-atmospheric pressure on the engine side of said throttle, and means operated by a drop in suction for supplying an excess of fuel at starting.

5. In combination, a carbureting chamber having air and fuel inlets and a mixture outlet, a throttle for said outlet, said outlet being adapted to be connected with an internal combustion engine, a fuel reservoir having the liquid level therein above said fuel inlet and connected with said fuel inlet, a cylinder, a piston operating in said cylinder, a cut-off valve for said fuel connection operating with said piston, a connection between said cylinder on one side of said piston and the engine side of the throttle, said piston being moved to open said cut-off valve upon creation of subatmospheric pressure on the engine side of said throttle, a needle valve for controlling said fuel connection, said needle valve operating with said piston, a cylinder interposed in the path of fuel and a piston in said cylinder operable by said needle valve for temporarily increasing the flow of fuel.

6. In combination, a carbureting chamber having air and fuel inlets and a mixture outlet, a throttle for said outlet, said outlet being adapted to be connected with an internal combustion engine, a fuel reservoir having the liquid level therein above said fuel inlet and connected with said fuel inlet, a cylinder, a piston operating in said cylinder, a cut-off valve for said fuel connection operating with said piston, a connection between said cylinder on one side of said piston and the engine side of the throttle, said piston being moved to open said cut-off valve upon creation of subatmospheric pressure on the engine side of said throttle, a needle valve for controlling said fuel connection, said needle valve operating with said piston, a secondary cylinder and means for trapping an auxiliary supply of fuel in said secondary cylinder, and a piston operating in said secondary cylinder with said first-named cylinder for pumping the trapped fuel from said secondary cylinder.

In witness whereof, I hereunto subscribe my name this 22nd day of December A. D. 1916.

GEORGE B. MAEGLY.