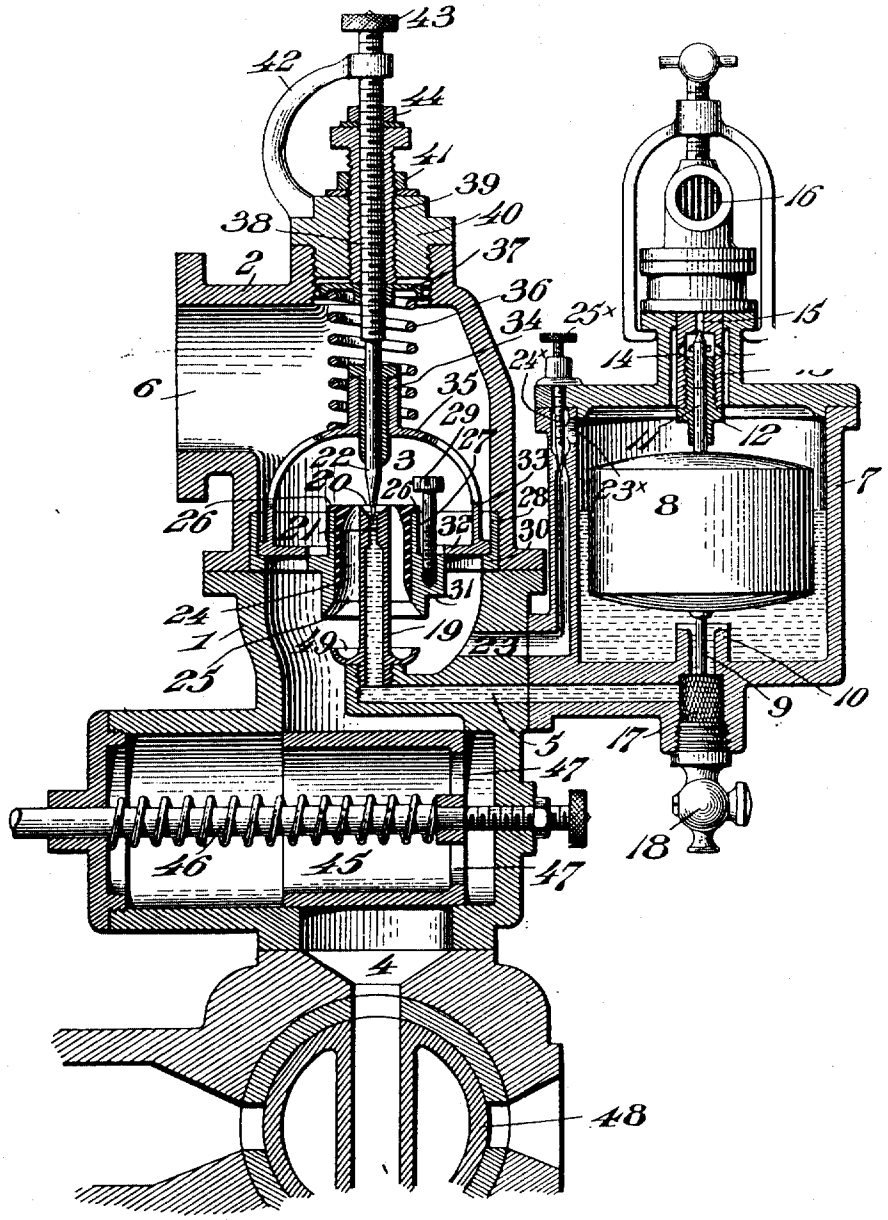
J. M. ULRICH.

CARBURETER.

APPLICATION FILED JUNE 20, 1908.

1,000,054. Patented Aug. 8, 1911.



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CARBURETER.

1,000,054. Specification of Letters Patent. Patented Aug. 8, 1911.

Application filed June 20, 1908. Serial No. 439,534.

To all whom it may concern:

Be it known that I, JULIUS M. ULRICH, a citizen of the United States, residing at Greenwich, in the county of Fairfield, State of Connecticut, have invented a new and useful Carbureter, of which the following is a specification.

My invention relates to carbureters and has for an object a construction of an apparatus whereby the supply of fluid, fuel and air will be automatically regulated in order to deliver from the mixing chamber of the carbureter to the inlet port of the engine cylinder, a mixture correctly proportioned to the demand for power upon the engine.

A further object of my invention is to provide means for delivering a fluid fuel into the mixing chamber of the carbureter in such a manner as to expose the entire charge of such fuel to all of the air delivered to the engine for any given cylinder charge, the complete charge of fuel being injected forcibly into the carbureter at the beginning of the period of air delivery.

My present invention consists of a fluid inlet terminating in a nozzle adjacent to which is a self-regulating valve controlling the air inlet for a preliminary vaporization of the fluid and in close proximity to which is a main air valve capable of adjustment which automatically opens and closes in accordance with the demand for gas from the engine.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

The figure represents a vertical section through a carbureter embodying my invention.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings:—1 designates the inclosing casing of my carbureter, the same being made, for convenience in assembling, in several separate and distinct parts, of which 2 designates the coupling portion for attaching said casing 1 in position upon the engine cylinder.

The casing 1 includes a mixing chamber 3 having an air inlet 4, a fluid inlet 5 and a mixture outlet 6. The fluid inlet 5 communicates with a float chamber 7 mounted adjacent the main casing 1 and having therein a float 8 provided with a guide rod 9 operating in suitable guides 10 of the casing 7 and a valve stem 11 slidingly mounted in a bushing 12. This bushing 12 is secured to a sleeve 13 which has suitable ports 14 whereby communication is established between the interior of the sleeve 13 and the float chamber, a port 15 controlling the main fluid supply conduit 16. It will be clear that with little or no fluid in the chamber 7 that the float 8 will be in its lowermost position and the valve 11 withdrawn from its seat so that a free flow of fluid from the inlet 16 is permitted to the float chamber 7 by way of the several ports 14. As the fluid enters the float chamber 7, the float 8 gradually rises until a predetermined level has been reached, at which point the valve 11 closes the opening 15, thus automatically cutting off the supply of fluid, as is usual in this type of float regulator.

17 designates a strainer in the fluid conduit inlet 5 whereby the fluid is cleaned and any sediment therein or other particles removed. A blow-off valve 18 is provided adjacent the strainer 17 whereby the particles collected may be blown off. The fluid inlet 5 has secured thereto an outlet pipe 19 terminating in a spraying nozzle 20 which is substantially cup shaped for the purpose of presenting a fluid surface of sufficient area to properly mingle with the air entering the mixing chamber 3. Adjacent the nozzle 20 is a restricted portion 21 with which a needle valve 22 coöperates to either cut off the fluid supply or regulate the same. In order to maintain the fluid in conduit 19 at the required height as determined by the level in the float chamber, a passage 23 is provided connecting the mixing chamber with the space above the fluid inlet float chamber 7. The flow of air through the passage 23 may be controlled by providing a valve seat $23^{\times}$ upon which a valve $24^{\times}$ is adapted to seat, the control being had by means of an adjusting screw $25^{\times}$ suitably

secured to the top of the float chamber 7. Thus it will be apparent that whatever the pressure in the lower part of the mixing chamber, the same will affect the fluid in the float chamber 7 and thus accurately regulate the flow of fuel from the nozzle 20. It will be seen that the action differs from that of the ordinary carbureter in that instead of the fluid being drawn from the delivery nozzle by a suction action it is ejected therefrom, owing to the pressure in the supply reservoir 7. Inclosing the conduit 19 and positioned so as to contact with the nozzle 20 is a gravity valve 24 provided with flaring sides 25 and a flanged edge 26, the latter forming a lip adapted to seat on a hub 27 connected to an annular ring 28, secured to the interior of the casing 1. This gravity valve 24 is adapted to be unseated by the air entering from the crank case and thereby permits a quantity of air to escape past the fluid nozzle 20 and in order that this valve may not be pushed entirely out of the hub 27 an adjusting screw 29 is threaded into the hub 27 and so located that the head thereof projects into the upward path of movement of the valve member 24. The ring 28 is provided with an internal flange 30 and the hub 27 with an external flange 31, whereby a seat is formed for a valve member 32 normally held to close the opening between the two flanges 30 and 31. It will of course be apparent that as this valve 32 is raised from its seat a direct communication is established for passage of air from the inlet 4 to the outlet 6. The valve 32 consists of an annular ring 33 secured to a hub 34 by spokes 35 suitably apertured to allow free passage of air therethrough. The valve member 32 is normally held closed by a spring 36 seated on the hub 34, adjustment of said spring being obtained by a follower 37 loosely mounted on a needle valve rod 38 and controlled by an adjusting screw 39. The adjusting screw 39 is inserted into a closure 40 and has a lock nut 41 whereby after the follower 37 is correctly positioned it may be maintained securely locked. The threaded rod 38 is suitably guided in an arm 42 and may be adjusted relative to the opening 21 by means of a thumb screw 43, a lock nut 44 being provided to hold the same in set position. The tension of the spring 36 determines the pressure of the interior air necessary to open valve 32 and it is practically the small fraction of time that this valve 32 remains seated that the air passes through the free channel 23 and acts upon the fluid supply in chamber 7 to eject a certain amount thereof from the nozzle 20. It will therefore be apparent that the amount of oil may thus be definitely controlled by a simple adjustment of the spring 36, thereby accurately determining the mixture according to the air admitted.

45 designates a throttle valve adapted to control the admission of air to the mixing chamber, the same being connected in any suitable manner by rod 46 to the usual hand operated lever. The valve 45 is preferably provided with apertures 47 therethrough in order that the pressure upon the sides of the valve may be properly balanced so that there will be no tendency to suddenly push the throttle open, due to an excessive air pressure or an explosion, resulting from an improper mixture.

48 designates a rotary valve mechanically operated at a predetermined time to admit air to the carbureter in correct relation to the intake port in the cylinder. Attention is called to this valve as it is usually set with a slight lead over the inlet port in order that the fluid and air may have sufficient time to be readily forced into the cylinder as soon as the intake port is open.

49 designates a flange secured to and surrounding the inlet pipe 19 in order to form a cup shaped depression, the function of which is to allow a small portion of the fuel to collect therein and be used for priming purposes.

It will be understood that only a small amount of air passes through the converging orifice formed by the valve 24 and that is so regulated as to admit just a sufficient quantity to aid in vaporizing the gasolene from the nozzle 20, the maximum quantity of air being passed through the main valve 32, the regulation of which is adjusted by means of the spring 36. The function of this valve 32 will be made apparent if we imagine air entering the mixing chamber from the crank case of the engine under a pressure of say five pounds and assuming that the valve 32 is entirely removed, thus leaving a free opening through the casing 1. In this case there would be five pounds pressure in the passage of the spray nozzle, in the mixing chamber and also in the float chamber 7 and there would therefore be no flow of fuel from the nozzle. Now assuming the valve 32 to be in position and the spring 36 so regulated that the pressure exerted on this valve by the air passing through the ports is slightly greater than that passing through the restricted opening controlled by the valve 24, we would then have a pressure which would eject a definite quantity of fluid from the spray nozzle 20 to mix with the air passing adjacent the nozzle. The passage 23 must of course be of such a diameter as to allow free transfer of air from the mixing chamber to the float chamber. Should, at any time, the back pressure through the intake port and cylinder become so high as to interfere with the supply of fuel, the tension of the spring 36 may then be adjusted so as to produce a somewhat higher pressure in the mixing

chamber, whereby the supply of fuel at the nozzle would be maintained. The adjustment of stud 29 to limit the opening of the valve 24 will be readily found by experimenting and this valve will lift and fall according to the position of the throttle and the amount of air passing therethrough will be regulated accordingly, that is as more air enters through valve 32 an increase will be apparent through valve 24 and the mixture controlled according to the demand upon the carbureter.

It will of course be understood that in the operation of my carbureter the gasolene or other liquid fuel enters the float chamber from the supply tank under a somewhat greater pressure than that existing in the mixing chamber. This difference in pressure, in the construction illustrated, is suddenly applied, and is sufficient to cause a forcible ejection of the liquid fuel through the nozzle 20, which causes its distribution over a considerable area of the upper portion of the mixing chamber, the liquid being thrown substantially to the top of said chamber. This is followed by an equalization of the pressure in the fluid chamber and in the upper portion of the mixing chamber, as soon as the valve 32 is lifted from its seat for the delivery of the upper portion of the air charge through the mixing chamber to the engine cylinder, said pressures being equalized to such an extent as to stop the flow of liquid fuel through the nozzle. It will thus be observed that substantially the entire charge of liquid fuel is delivered during the initial portion of the period of air delivery, or preparatory to the period of air delivery, with the result that the lighter portions of the fuel are vaporized and carried into the engine cylinder with the first rush of air through the carbureter, thus leaving the heavier portions of the fuel exposed continually to fresh air coming through the carbureter during the entire remaining portion of the period of air delivery. Another advantage secured is in the fact that the forcible ejection of the liquid charge from the float chamber not only distributes the liquid over a large surface area in the mixing chamber, but avoids much of the liabilty of clogging in the nozzle due to the obstruction by sediment of the opening around the needle valve 22. A still further advantage is secured in the fact that the delivery of the liquid in the required quantity is made practically independent of the height of the liquid column in the float chamber, the force of the jet being so great that a difference in pressure, due to variations in the height of the liquid column in the float chamber, is too small to produce a material effect in the quantity of liquid delivered. I also consider the valve 48 as an important, though not an essential feature of my invention. It is of great importance where my carbureter is used in connection with a two cycle engine, for the reason that it permits a partial compression in the crank chamber or compression chamber of such an engine, and thus stores up sufficient energy to more effectively produce the results above stated regardless of any suction in the engine cylinder. In a four-cycle engine, a reduction in pressure will of course be first produced by suction of the engine piston exerted in the upper portion of the mixing chamber, and this will develop a difference in pressures sufficient to cause a fuel delivery in a manner which corresponds, to a large extent, to that above described as resulting in my carbureter when applied to a two-cycle engine. But I believe that a valve at the air inlet of my carbureter is desirable even where the carbureter is used for a four-cycle engine, in order that a partial vacuum may first be built up throughout the carbureter, and then satisfied with a quick rush of air adapted to produce an impact pressure upon the liquid fuel. This is particularly desirable, since the engine piston moves slowly at the beginning of its return stroke and by employing a valve which opens after the return or suction stroke has commenced, the air will not be delivered until the piston has acquired a rapid movement, capable of maintaining a strong suction and consequent difference in pressure in the upper portion of the mixing chamber as compared with that in the float chamber prior to the opening of the valve 32.

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

1. In a carbureter, a casing having an air inlet and a fluid inlet, a nozzle for said fluid inlet, a main pressure controlled valve for said air inlet, an annular ring forming a seat for said valve, a hub on said ring, and means thereon adjacent said nozzle for controlling an auxiliary supply of air.

2. In a carbureter, a casing having an air inlet and a fluid inlet, a nozzle for said fluid inlet, a main pressure controlled valve for said air inlet, an annular ring forming a seat for said valve, a hub on said ring having a bore surrounding said nozzle, and a valve slidingly mounted in said bore for controlling an auxiliary supply of air.

3. In a carbureter, a casing having an air inlet and a fluid inlet, a nozzle for said fluid inlet, a main pressure controlled valve for said air inlet, an annular ring forming a seat for said valve, a hub on said ring having a bore surrounding said nozzle, and a gravity valve slidingly mounted in said bore for controlling an auxiliary supply of air.

4. In a carbureter, a casing having an inlet and a fluid inlet, a nozzle for said fluid inlet, a main pressure controlled valve for

said air inlet, an annular ring forming a seat for said valve, a hub on said ring having a bore surrounding said nozzle, a gravity valve slidingly mounted in said bore for controlling an auxiliary supply of air, and means to limit the movement of said gravity valve.

5. In a carbureter, a casing having an air inlet and a fluid inlet, a nozzle for said fluid inlet, a main pressure controlled valve for said air inlet, an annular ring forming a seat for said valve, a hub on said ring having a bore surrounding said nozzle, a gravity valve slidingly mounted in said bore for controlling an auxiliary supply of air, and adjusting means to vary the opening of said gravity valve.

6. In a carbureter, the combination of a chambered casing provided with an air inlet and a vapor outlet, of a supply duct for liquid fuel communicating with said chamber, means for intermittently delivering currents of air through said air inlet to the vapor outlet, and means for injecting a complete charge of liquid fuel through said fuel supply duct during the initial portion of each period of air delivery, said fuel injecting means being inoperative for fuel delivery during the final portion of such period.

7. In a carbureter, the combination of a chambered casing provided with an air inlet and a vapor outlet, of a supply duct for liquid fuel communicating with said chamber, means for intermittently delivering currents of air through said air inlet to the vapor outlet, and means for injecting a complete charge of liquid fuel through said fuel supply duct prior to the final portion of each period of air delivery, together with a manually adjustable valve controlling the delivery of said fuel through the supply duct; said fuel injecting means being inoperative for fuel delivery during the final portion of such period.

8. In a carbureter, the combination of a chambered casing provided with an air inlet and a vapor outlet, of a supply duct for liquid fuel communicating with said chamber, means for intermittently delivering air currents through said air inlet to the vapor outlet, and means controlled by the pressure of the air so delivered for developing sufficient pressure upon the liquid fuel to cause a forcible injection of a complete fuel charge into said chamber at the beginning of each period of air delivery through such chamber.

9. In a carbureter, a casing having an air inlet, a vapor outlet and a fuel inlet, in combination with a valve controlling the air inlet, a fuel supply chamber communicating with said fuel inlet, means for developing an initial pressure upon the fuel supply greater than that within said casing at the fuel inlet during the initial portion of the period of air admission to said casing, and means for equalizing said pressure upon the fuel with the pressure within the casing sufficient to stop the flow of fuel prior to the final portion of the period of air delivery.

10. In a liquid fuel carbureter, the combination of a casing provided with a mixing chamber, having air inlet, fuel inlet, and vapor outlet passages, a fuel reservoir having an outlet communicating with the fuel inlet of the mixing chamber, an obstruction in the mixing chamber restricting the passage of air therethrough at a point in advance of the fuel inlet, a duct leading from the mixing chamber below said obstruction to a point above the fuel in said reservoir, whereby the air entering said air inlet is permitted to build up a pressure in advance of the obstruction and in said reservoir, sufficient to cause the ejection of the required quantity of fuel through said passage, said obstruction permitting the passage of air in sufficient quantity to equalize the pressure in said reservoir, and in the mixing chamber beyond said fuel inlet during the final period of air delivery sufficiently to cause a cessation of fuel delivery, said fuel reservoir being otherwise normally closed.

11. In a vapor carbureter, the combination of a liquid fuel reservoir, a mixing chamber having a fuel inlet in communication with said reservoir, said mixing chamber having an air inlet and a vapor outlet, means for developing a working preponderance of air pressure in said fuel reservoir for a delivery of fuel during initial air admission to the mixing chamber, and means for permitting an equalization of such pressure during the final portion of the period of air admission, sufficient to stop the flow of fuel.

12. In a vapor carbureter, the combination of a liquid fuel reservoir, a mixing chamber having a fuel inlet in communication with said reservoir, said mixing chamber having an air inlet and a vapor outlet, means for developing a working preponderance of air pressure in said fuel reservoir for a delivery of fuel during initial air admission to the mixing chamber, under sufficient pressure to violently scatter the delivered fuel charge over the interior surfaces of the mixing chamber, and means for permitting an equalization of such pressure during the final portion of the period of air admission sufficient to stop the flow of fuel.

13. In a carbureter, the combination of a chambered casing provided with a vapor outlet and a valve controlled air inlet, of a supply duct for liquid fuel communicating with said chamber, means for directing the air admitted by the valve at said inlet to first develop a pressure upon the liquid fuel sufficient to produce a forcible fuel delivery through said duct, and then through said casing around and beyond said duct in such quantity as to equalize the pressures and

stop the fuel delivery while the air delivery through said casing continues.

14. In a carbureter for two-cycle internal combustion engines, the combination of a chambered casing provided with a vapor outlet, and having a valve controlled air inlet adapted to be connected with the compression chamber of said engine, a reservoir for liquid fuel having a liquid conveying duct leading to said chamber, said reservoir and casing having an air duct leading from the lower portion of said chamber to the upper portion of the reservoir and said reservoir being otherwise normally closed, and an obstruction in said chamber between the air inlet valve and the inlet of the liquid conveying duct, adapted to delay the flow of air through said chamber to the vapor outlet sufficiently to permit the development of an initial preponderating pressure in said reservoir sufficient to cause the delivery of the fuel charge, said ducts and said obstruction being arranged and proportioned to permit an equalization of pressures, sufficient to stop the fuel flow during the final period of air delivery through the casing.

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