C. O. BULOCK.
CARBURETER.
APPLICATION FILED APR. 6, 1911.

**1,019,128.** Patented Mar. 5, 1912.

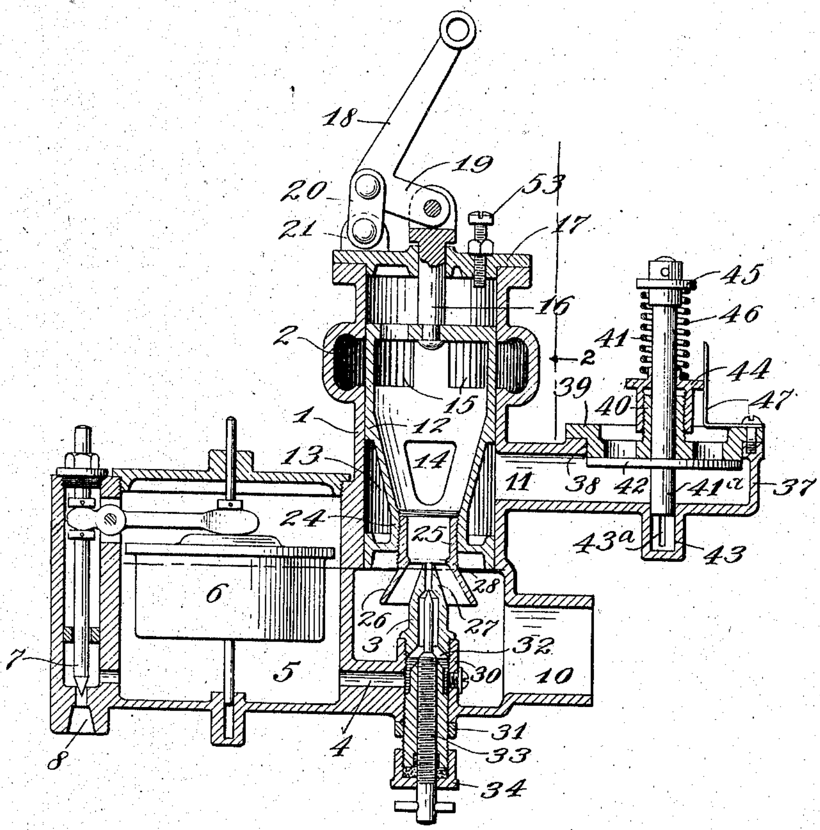


FIG. 1

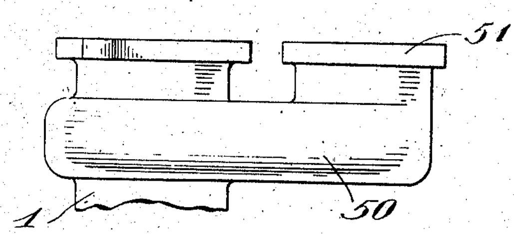


FIG. 2

WITNESSES:
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# UNITED STATES PATENT OFFICE.

CHARLES O. BULOCK, OF CLEVELAND, OHIO.

## CARBURETER.

1,019,128. Specification of Letters Patent. Patented Mar. 5, 1912.

Application filed April 6, 1911. Serial No. 619,197.

*To all whom it may concern:*

Be it known that I, CHARLES O. BULOCK, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvements in Carbureters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to carbureters for use with explosion engines and has for its object the provision of a device of this character which shall exhibit great economy in the use of liquid fuel and shall at all times deliver to the engine a properly constituted explosive mixture independent of the engine's speed.

Another object of the invention is the provision of a device of this character wherein the mixture of fuel and air shall be maintained at substantially the same richness at all times while permitting the adjustment of the quantity of such mixture by means of the manipulation of a single valve and further objects and advantages will become apparent in the course of the following description and claims.

One embodiment of my invention is illustrated in the drawings accompanying and forming a part of this specification, wherein:

Figure 1 is a longitudinal vertical cross sectional view through a carbureter built in accordance with my invention, and Fig. 2 is a detail side elevation of a portion of the mixing chamber and outlet branch.

Describing the parts by reference characters, my carbureter comprises an interiorly cylindrical casing 1 having near its upper end an annular passage 2, and having at its lower end an axial fuel supply nozzle 3. The fuel supply nozzle is connected by means of a duct 4 with a gasolene reservoir 5 provided with means such as a float 6 and float valve 7 for maintaining the level of the fuel liquid just below the discharge orifice of the nozzle 3. Fluid fuel is supplied to this reservoir by means of a pipe (not shown) attached to the connection 8. Adjacent the nozzle 3, the casing 1 is formed with an air inlet port 10 and between this port and the passage 2 is formed an auxiliary air inlet port 11. Slidably mounted within the casing 1 is a hollow piston 12 having between its ends an exterior annular groove or recess 13 adapted to register with the auxiliary air inlet port 11 in all positions of the piston, and communicating with the hollow interior of the piston by ports 14. Near its upper end the side walls of this piston are formed with laterally opening ports 15 adapted to be brought into register with the annular passage 2 when the piston is in its extreme depressed position as illustrated in Fig. 1, and to be brought out of register therewith when the piston is raised. This piston is provided with an operating rod 16 projecting through the apertured cover 17 of the chamber and there connected to an operating lever 18. In the embodiment shown this lever is illustrated as of the bell crank type, having its shorter end 19 articulated to the end of the piston rod and having the angle of its elbow pivoted to a link 20, the other end of which is pivoted to lugs 21 formed on the cover. To the end of the operating arm of this lever is connected an operating rod (not shown) which leads to a position where it may be readily reached by the operator. The lower end of this piston is interiorly contracted as shown at 24 and a carbureting tube 25 having a flaring or bell shaped portion 26 at its lower end is secured therein. The upper end of the nozzle 3 projects upwardly into the flaring portion of this tube and has its exterior tapered as at 27 preferably at a less angle than the angle of the bell 26 for a purpose to be hereinafter described. This carbureting tube is preferably formed with an interior annular rib 28 substantially at the inner end of the flaring portion 26.

The nozzle 3 is preferably secured in a vertical interiorly cylindrical threaded sleeve 30 being introduced from within the casing and secured in place by a locked nut 31. Radial ports 32 connect the central orifice thereof with the duct 4, and a needle valve 33 permits the adjustment of the passage therethrough, leakage around the needle valve being prevented by the gland 34.

The auxiliary air admission port 11 communicates with an extension 37 carried by the casing and having an aperture 38 formed in the wall thereof. Secured in this aperture is a spider 39 having a central guiding sleeve 40 in which is slidably mounted a valve stem 41 carrying a disk valve 42. This valve is arranged to seat against the inside of the spider 39, and the further end $41^a$ of the valve stem is preferably carried across the extension 37 and mounted in a recess 43 formed in the further wall thereof. This recess has a longitudinal groove $43^a$ in its wall and the end $41^a$ of the valve stem fits snugly in the recess so as to form a dash pot that shall prevent chattering of the valve. The outside of the sleeve 40 is threaded to receive an adjusting nut 44 between the upper end of which and a collar 45 carried by the valve stem a compression spring 46 is placed. The nut 44 is held against accidental displacement by means of the locking spring 47. With this construction it is obvious that a sufficient decrease of pressure within the carbureter will cause the valve 42 to open against the pressure of the spring 46, and the pressure of the spring 46 can be adjusted by means of the nut 44. The annular passage 2 communicates with a laterally extending branch 50 preferably formed integral with the casing 1 and having at its upper end an open mouth 51 adapted to be connected to the inlet pipe of an explosion engine.

The operation of the device is as follows: It is obvious that the main air inlet port 10 is always open and that the interior of the piston 12 is always in communication with the auxiliary air inlet port 11. With the piston 12 in the position shown in Fig. 1, the full suction of the engine will be transmittted to the carbureter because of the completely open condition of the ports 15. At the same time the air inlet aperture between the nozzle 3 and inlet tube 25 is at its smallest extent, thus creating a maximum amount of suction upon the inlet nozzle 3 and causing the maximum amount of fuel to be delivered therethrough. The remainder of the air necessary for the proper combustion of the fuel charge is admitted through the auxiliary air inlet valve 42, the tension of the spring 46 being suitably adjusted to permit this action. If the piston 12 be raised, the effect is twofold; the area of the inlet ports 15 is reduced, and the flaring portion 26 of the carbureting tube 25 is drawn away from the nozzle 3 so as to increase the area of the air passage therethrough. The result is a decrease in the suction exerted upon the fluid supply nozzle and a corresponding decrease in the amount of fuel delivered. I prefer to secure the carbureting tube 25 adjustably in place as shown so that the relation between the opening of the port 15 and the aperture surrounding the nozzle can be suitably varied. Furthermore, I prefer to equip the cover 17 of the casing with a set screw 53 so that the amount of closing of the ports 15 can be limited to exactly that point at which the engine will run smoothly at its very slowest speed.

It will be noted that there are four adjustments possible with my carbureter: first, adjustment of the fuel supply by means of the needle valve 33; second, adjustment of the suction upon the nozzle 3 by moving the carbureting tube 25; third, the adjustment of the spring 46 determining the pressure required to open the auxiliary air inlet valve; and fourth, the set screw 53 whereby the minimum opening of the throttle valve can be regulated. The relation of these different adjustments needs ultimately to be determined with reference to the particular engine to be operated, and the speed at which said engine is normally to run. In general it may be stated that the best and most economical results are obtained by operating the engine at the highest speed at which it is normally to run, meanwhile closing the needle valve 33 to the farthest point possible without impairing the running of the engine. The spring 46 is adjusted at the same time so as to admit the largest quantity of air to the cylinder that is permissible. The piston 12 is then moved so as to slow the engine down and the carbureting tube 25 adjusted so as to cause the suction upon the nozzle 3 to decrease at the proper ratio. It may be necessary after this is done to readjust the valve 33 and spring 46, but a few trials will adjust my carbureter so as to cause it to operate an engine smoothly at all speeds and with the greatest possible economy of fuel.

While I have shown and described the auxiliary air inlet port as positioned between the main air inlet and mixture outlet ports, it is obvious that it could be placed beyond the mixture outlet port without changing the operation of the carbureter. It is sufficient if this port be in communication with the interior of the piston at the time when the suction therein is so great that the passage between the carbureting tube and the nozzle is insufficient to deliver a sufficient quantity of air to combine with the charge. Furthermore, while I have necessarily described my invention in detail, I do not propose to be limited to such details except as the same may be positively included in the claims hereto annexed, or may be rendered necessary by the prior state of the art.

Having thus described my invention, what I claim is:

1. In a carbureter, in combination, a cylindrical chamber having a main air inlet port at one end, a mixture outlet port, and an auxiliary air inlet port, a hollow piston slidably mounted in said cylinder and adapted when moved away from said air inlet port to close said mixture outlet port, the interior of said piston being always in communication with said auxiliary air inlet port, a carbureting tube carried by said

piston adjacent said air inlet port and having a flaring outer end, a fluid fuel supply nozzle carried by said casing adjacent said air inlet port and projecting into said carbureting tube, said nozzle having a tapered apex, means for supplying liquid fuel to said nozzle, a spring pressed valve associated with said auxiliary air inlet port and controlling the supply of air thereto, and means for adjusting the pressure at which said valve opens.

2. In a carbureter, in combination an elongated chamber having a main air inlet port at one end, a mixture outlet port, and an auxiliary air inlet port, a hollow piston slidably mounted in said chamber and adapted when moved away from said air inlet port to close said mixture outlet port, the interior of said piston being always in communication with said auxiliary air inlet port and the sole communication between all said ports being through the interior of said piston, a carbureting tube carried by said piston adjacent said air inlet port and having a flaring outer end, means for adjusting said tube along said piston, a fluid fuel supply nozzle carried by said casing adjacent said air inlet port and projecting into said carbureting tube, means for supplying liquid fuel to said nozzle, a spring pressed valve associated with said auxiliary air inlet port and controlling the supply of air thereat, and means for adjusting the pressure at which said valve will open.

3. In a carbureter, in combination, an upright chamber having a main air inlet port adjacent its lower end, a mixture outlet port spaced from its upper end, and an auxiliary air inlet port, a hollow slidable piston in said chamber and having ports in its wall adapted to register with said mixture outlet port when said piston is at its lowest position and to be moved upwardly a sufficient distance to completely close said outlet port, a carbureting tube carried by the lower end of said piston and communicating with said main air inlet port, a fluid fuel supply nozzle carried by said casing and projecting into said carbureting tube in all positions of said piston, and a pressure operated valve associated with said auxiliary air inlet port and adapted to permit the entrance of a secondary supply of air thereto dependent upon the amount of suction in said chamber, said auxiliary air inlet port being always in communication with the interior of said piston.

4. In a carbureter, in combination, a chamber having a main air inlet port at one end, a mixture outlet port adjacent the other end, a hollow piston slidably mounted in said chamber and adapted when moved away from said air inlet port to close said mixture outlet port, a carbureting tube carried by said piston adjacent said air inlet port and having a flaring end, a fluid fuel supply nozzle carried by said casing adjacent said air inlet port and projecting into said carbureting tube, the apex of said nozzle being tapered at a less degree than the flared end of said tube, and a fluid fuel supply reservoir communicating with said nozzle.

5. In a carbureter, in combination, an upright cylindrical chamber having a main air inlet port adjacent its lower end, a mixture outlet port spaced from its upper end, and an auxiliary air inlet port, a hollow slidable piston in said cylinder and having ports in its wall adapted to register with said mixture outlet port when said piston is at its lowest position and to move out of registry therewith as said piston is raised, a carbureting tube carried by the lower end of said piston and communicating with said main air inlet port, a fluid fuel supply nozzle carried by said casing and projecting into said carbureting tube, a spring valve associated with said auxiliary air inlet port and adapted to permit the entrance of a secondary supply of air thereto dependent upon the amount of suction in said chamber, said auxiliary air inlet port being always in communication with the interior of said piston, means for adjusting the opening through said nozzle, and means for adjusting the tension of said spring valve.

6. In a carbureter, in combination, an elongated chamber having a main air inlet port at one end, a mixture outlet port adjacent the other end, and a fluid fuel supply nozzle adjacent said air inlet port, a hollow piston slidable in said chamber and having ports in its wall adapted to register with said mixture outlet port, and a carbureting tube surrounding said nozzle and communicating with said main air inlet port, said piston being arranged to draw said carbureting tube away from said nozzle as said ports are moved out of register with said mixture outlet passage, the relative positions of said tube and nozzle being such that said tube can never be withdrawn entirely from said nozzle.

7. In a carbureter, in combination, an elongated chamber having a main air inlet port at one end, a mixture outlet port, and an auxiliary air inlet port, a fluid supply nozzle carried by said casing adjacent said main air inlet port, means for supplying fluid fuel to said nozzle, a hollow piston slidable in said chamber and having ports in its wall adapted to be brought into register with said mixture outlet port and having ports in its wall always in communication with said auxiliary air inlet port, a carbureting tube adjustably carried by said piston and having a flaring end surrounding said fuel supply nozzle and being in free communication with said main air inlet port, said piston being arranged so that said carbureting tube will

be drawn partly away from said nozzle as said mixture outlet ports are closed and the length of said tube and nozzle being such that they can never be drawn entirely away from each other, and a spring pressed valve associated with said auxiliary port and adapted to admit therethrough a sufficient supply of air to dilute the mixture entering through the mixing tube to the proper degree.

8. In a carbureter, in combination, a casing having an air inlet port and a mixture outlet passage, a tapering fuel supply nozzle in said casing adjacent said inlet port, an adjusting valve in said nozzle, a valve for said mixture outlet passage, a carbureting tube in said casing and surrounding said nozzle for causing the air entering said inlet port to create a suction upon said nozzle, said tube having a cylindrical portion beyond the end of the nozzle, a flaring end surrounding said nozzle, and an inwardly projecting rib at the junction of said cylindrical and flaring portions; and means for drawing said tube away from said nozzle as said valve is closed so as to increase the opening therethrough and to decrease the suction thereupon.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

CHARLES O. BULOCK.

Witnesses:
HAROLD E. SMITH,
J. B. HULL.