E. M. WHITE.

CARBURETER.

APPLICATION FILED APR. 1, 1918.

1,377,535. **Patented May 10, 1921.**

Fig.1.

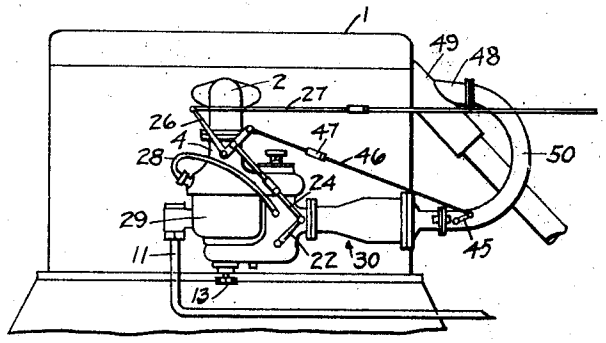


Fig.3.

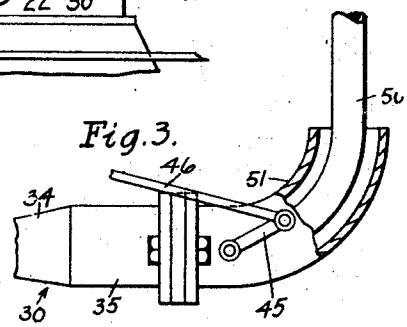
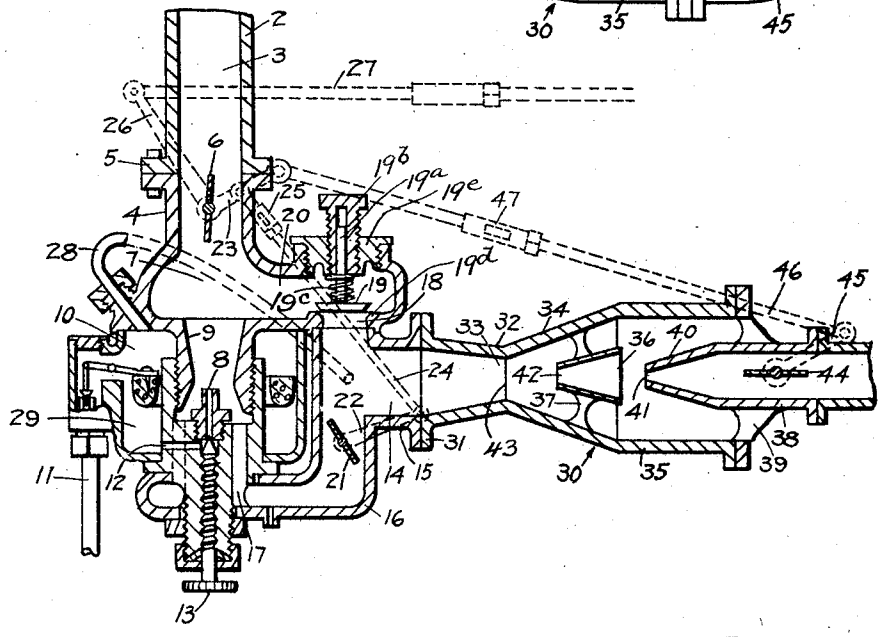


Fig.2.



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UNITED STATES PATENT OFFICE.

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CARBURETER.

1,377,535. Specification of Letters Patent. Patented May 10, 1921.

Application filed April 1, 1918. Serial No. 226,108.

To all whom it may concern:

Be it known that I, ERNEST MILTON WHITE, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Carbureters, of which the following is a specification.

My object is to make an improved carbureter for internal combustion engines and especially for engines used in flying machines, and my invention consists in the novel features herein shown, described and claimed.

A specific object of my invention is to increase the volumetric efficiency of an internal combustion engine by forcing through the carbureter and into the engine cylinders a greater volume of air and fuel than is normally sucked through the carbureter by the suction action of the engine pistons, and this object is accomplished by using an injector operated by the exhaust gases of the engine.

Figure 1 is a front elevation of an internal combustion engine equipped with a carbureter in accordance with the principles of my invention.

Fig. 2 is an enlarged fragmentary vertical central section of the carbureter upon a plane parallel with Fig. 1, the operating parts cut away by making the section being shown in dotted lines.

Fig. 3 is a fragmentary view analogous to Fig. 1 and showing a heater for the fresh air intake.

The engine 1 has a manifold 2 provided with a fuel mixture passage 3 in the usual way. The neck 4 of the carbureter is connected to the lower end of the manifold 2 by bolts and flanges 5. The throttle 6 is mounted in the neck 4 and the carbureting chamber 7 discharges past the throttle 6 through the neck 4 to the fuel mixture passage 3. The fuel nozzle 8 discharges through the venturi 9 into the carbureting chamber 7. The float bowl construction 10 is built around the nozzle 8 and controls the flow of fuel through the pipe 11 to the float bowl and from the float bowl the fuel passes through an opening 12 to the nozzle 8, the flow through the opening 12 being controlled by an adjustable needle valve 13. The intake passage 14 leads through a flanged nipple 15 and downwardly through an elbow 16 and upwardly through the passage 17 around the nozzle 8 to the venturi 9. Auxiliary air leads upwardly through the passage 18 past the spring-pressed valve 19 and laterally from above the valve through the passage 20 to the top of the venturi. The valve 19 is formed with a stem 19^a slidingly mounted in a long plug 19^b, and an expansive coil spring 19^c is mounted around the stem 19^a between the upper face of the valve 19 and the lower face of the plug 19^b, so that the tension of the spring 19^c presses the valve 19 toward its seat 19^d. The plug 19^b is adjustably mounted by screwing the plug into a bushing 19^e, and the bushing is screwed into an opening in the casing 16, said opening in the casing being large enough to allow of the passage of suitable tools for making the passage 18 and the valve seat 19^d. A throttle 21 is mounted in the elbow 16 and a crank arm 22 is fixed upon the front end of the stem of the throttle 21. A similar crank arm 23 is fixed upon the front end of the stem of the throttle 6. An adjustable connecting rod 24 connects the outer end of the crank 22 to the center of the crank 23, said connecting rod being provided with a turnbuckle 25 for accurately adjusting the length of the connecting rod. The operating crank arm 26 is formed integral with the crank arm 23 and at right angles, and the operating rod 27 is connected to the outer end of the crank arm 26. A pipe 28 is connected to the float bowl chamber 29 and to the intake passage 14 so as to equalize the pressure in the float bowl with the pressure in the intake passage.

An extension intake 30 is connected to the flanged nipple 15 by bolts and flanges 31, said extension intake comprising a neck 32 having a tapered passage 33 in line with the intake passage 14, a funnel-shaped portion 34 extending outwardly from the neck 32, and an enlarged portion 35 extending outwardly from the large end of the funnel 34. A secondary funnel 36 is centrally mounted in the funnel 34 and supported by arms 37. A pipe section 38 has legs 39 fixed in the outer end of the enlarged portion 35 and the pipe is centrally located. An injector nozzle 40 is formed upon the inner end of the pipe 38, said nozzle discharging through the secondary funnel 36, the nozzle 41 of the injector and the nozzle 42 of the secondary

funnel 36 and the reduced portion 43 of the passage 33 in the neck being in a direct line with the center of the intake passage 14. A throttle 44 is mounted in the pipe 38, a crank arm 45 is fixed upon the forward end of the stem of the throttle 44, and an adjustable connecting rod 46 connects the outer end of the crank arm 45 to the outer end of the crank arm 23, said connecting rod being provided with a turn-buckle construction 47 for accurately adjusting the length. A pipe nipple 48 branches from the exhaust 49 of the engine 1 and a pipe 50 connects the nipple 48 to the pipe 38.

In the operation of carbureters for internal combustion engines, especially on flying machines, it is difficult to obtain a steady flow of fresh air to the carbureter, and it is the principal object of my invention to overcome this difficulty. The pressure of the exhaust coming from the manifold 49 through the pipe 50 will operate as an injector at the nozzle 41 and the injector action will increase the flow of fresh air passing into the carbureter around the nozzle 40. By operating the turn-buckles 25 and 47 relative relations of the throttles 6, 21 and 44 may be adjusted to a nicety, and then by operating the rod 27 all of these throttles are operated simultaneously to control the carbureter. It is preferable that the parts be set so that the throttle 44 will close slightly in advance of the closing of the throttle 6 so that the injector will be shut off before the fuel mixture is shut off.

The carbureter shown and described is especially designed for automobiles and tractors. While I have shown the fuel throttle valve 6 connected to the exhaust gas inlet valve 44 and the air inlet valve 21, so that all the valves operate simultaneously, I desire it to be distinctly understood that any or all of said valves may be operated and controlled independently of the others, it being merely necessary to omit the respective connecting links and provide operating means under the control of the operator.

If desired, a sleeve 51, as shown in Fig. 3, may be provided surrounding the exhaust by-pass 50, said sleeve being open at the end adjacent to the main exhaust pipe, in order to preheat the air which is supplied to the carbureter by the injector action of the exhaust nozzle 41.

Thus I have shown an injector nozzle which takes a portion of the exhaust gases and utilizes them for forcing fresh air into the fresh air intake of the carbureter to compensate for the decreased atmospheric pressure at high elevation, thus insuring that approximately the same quantity of gaseous fuel is introduced into the combustion chambers of the motor.

The main object of the invention is to use the injector action of a current of air or gas to force air into the fresh air intake of the carbureter to insure that the proper quantity of gaseous fuel is formed and introduced into the motor.

Various changes may be made in the details of construction without departing from the spirit of my invention as claimed.

I claim:

1. In a carbureter having an air passage leading through the venturi and through an auxiliary air valve, a throttle in the passage to the venturi, a throttle in the outlet from the venturi, an injector discharging into the air passage pipe between the first throttle and the auxiliary air valve, and means for connecting the injector to an exhaust manifold.

2. In a carbureter having a carbureting chamber, a venturi leading to the carbureting chamber, an air passage leading through the venturi and through an auxiliary air valve to the carbureting chamber, a throttle in the passage leading through the venturi, a second throttle in the outlet from the carbureting chamber, an injector discharging into the air passage, a throttle in the injector, and adjustable connections between the three throttles for operating the throttles simultaneously.

3. In a carbureter, a fresh air passage pipe having a reduced neck and a large intake opening, a funnel mounted in the intake opening, an injector mounted to discharge into the funnel, means for leading exhaust gas to the injector and a throttle for controlling the injector.

4. In a carbureter, a fresh air passage pipe having a reduced neck and a large intake opening, a funnel mounted in the intake opening, an injector mounted to discharge into the funnel, means for leading exhaust gas to the injector, a throttle for controlling the injector and a sleeve around the injector for heating the fresh air.

5. In a carbureter, a fresh air passage pipe, an injector mounted to discharge into the fresh air passage pipe, a branch pipe connecting the injector with the exhaust manifold, a sleeve around the branch pipe and injector for heating the fresh air, and a throttle in the injector for controlling the flow of hot exhaust gas to control the fresh air.

6. In a carbureter, the combination of an air passage leading past a supply of liquid fuel, an injector discharging into the air passage, means to supply the injector with exhaust from an engine, means for controlling the air passing the liquid fuel, means for controlling the supply of exhaust gas to the injector.

7. In a carbureter, the combination of an air passage leading past a supply of fuel, an injector discharging into the air

passage, means to supply the injector with exhaust gas from an engine, means for controlling the supply of said gas to the air passage to the injector and means controlling said air passage operatively connected to said last named means.

8. In a carbureter, the combination of an air passage leading past a supply of fuel, an injector discharging therein, means for supplying a gas to said injector, means controlling said gas, a throttle valve, and means for operatively connecting said throttle valve to said air passage controlling means and said gas controlling means.

9. In combination with a carbureter, having an air intake passage leading past a fuel nozzle, an injector operated by the exhaust gases of the engine adapted to force air into the intake end of the intake passage, and a valve to control the exhaust gases passing to the injector; the air and exhaust gases moving through said intake passage in the same direction.

10. In a carbureter, in combination with a float chamber, an air inlet passage, a fuel nozzle connected with the float chamber and a mixing chamber; means for injecting exhaust gases into the air inlet passage; a controlling valve upon the above mentioned means; and a pressure equalizing tube connecting the air inlet passage with the float chamber.

11. In a carbureter, in combination with an air inlet passage, a fuel nozzle and a mixing chamber, means for controlling the flow of air in said passage; means for injecting exhaust gases into said passage, and a throttle valve mounted upon the means last above mentioned.

12. In a carbureter, in combination with an air inlet passage, a fuel nozzle and a mixing chamber, means for injecting exhaust gases into said air inlet passage comprising a venturi and an exhaust gas nozzle having a throttle valve and directed into the venturi.

13. In a carbureter, in combination with an air inlet passage, a fuel nozzle and a mixing chamber, means for injecting exhaust gases into said air inlet passage comprising a venturi, a short tapered nozzle positioned in the outer part of the venturi and pointing inwardly; and an exhaust gas nozzle positioned to discharge into the short nozzle and having a throttle valve for controlling the flow of gases therein.

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

ERNEST MILTON WHITE.