H. E. CURTIS.

CARBURETER.

APPLICATION FILED MAY 27, 1916.

1,233,557. Patented July 17, 1917.

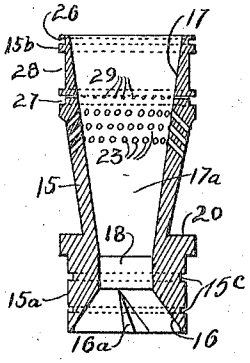


FIGURE 3

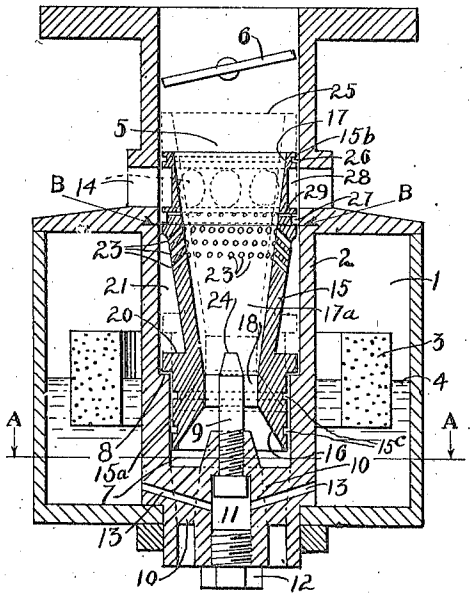


FIGURE 1

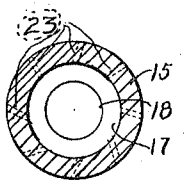


FIGURE 5

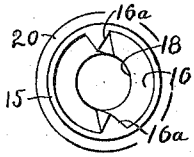


FIGURE 4

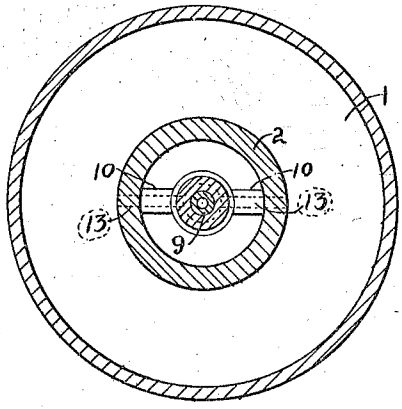


FIGURE 2

INVENTOR

Henry E. Curtis

BY John A. Marison 4th

HIS ATTORN

UNITED STATES PATENT OFFICE.

HENRY E. CURTIS, OF SAN JOSE, CALIFORNIA, ASSIGNOR OF ONE-THIRD TO FRANK P. SCHEMMEL, OF SAN JOSE, CALIFORNIA.

CARBURETER.

1,233,557. Specification of Letters Patent. Patented July 17, 1917.

Application filed May 27, 1916. Serial No. 100,363.

To all whom it may concern:

Be it known that I, HENRY E. CURTIS, a citizen of the United States, and resident of San Jose, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Carbureters, of which the following is a specification.

My invention relates to carbureters, and particularly to the means for regulating the fuel and air mixture in the same.

One object of my invention is to provide means for automatically regulating the inflow of air into the carbureter so that the quantity of air drawn in will at all times be in proper proportion to the amount of fuel being used, and to provide a means of the nature specified that will be simple, compact, efficient and cheap to manufacture. Other objects of my invention are, to provide a carbureter provided with a Venturi tube that is self cleaning, that is revolubly as well as slidably mounted, and that is provided with means for causing it to revolve automatically when in use.

With the above and other objects in view, the invention consists in the novel and useful formation, construction, combination and relative arrangement of parts as hereinafter described, and illustrated in the accompanying drawings, in which,—

Figure 1 shows a sectional view of a carbureter embodying my invention.

Fig. 2 shows a sectional view on line A—A of Fig. 1.

Fig. 3 shows a sectional view of a Venturi tube fitted with vanes.

Fig. 4 shows a bottom view of the tube shown in Fig. 3.

Fig. 5 shows a sectional view on line B—B of Fig. 1.

Similar characters of reference refer to similar parts throughout the several views.

Referring now more particularly to the drawings, 1 indicates the float chamber of a carbureter, 2 the inner wall of said chamber, 3 the float and 4 the liquid fuel in said chamber. At 5 is indicated the mixing chamber provided with a throttle valve 6. Mixing chamber 5 is shown cylindrical in shape and is a continuation of primary air chamber 7, said air chamber 7 being formed of the inner wall 2 of float chamber 3. A shoulder 8 is formed in the inner surface of wall 2 as shown and for the purpose hereinafter set forth. At 9 is shown a spraying tube concentrically and axially positioned in said primary air chamber 7, the same being held in position by webs 10 preferably cast as an integral part of inner wall 2. Chamber 11 with its outer end closed by plug 12 and connected to float chamber 1 by conduits 13, provides a means by which fuel may be drawn from float chamber 1 through spraying tube 9 to the carbureting chamber 17ª. At 14 are shown air inlet ports formed in the wall of the carbureter above float chamber 1.

At 15 I show a true Venturi tube slidably and revolubly positioned in primary air chamber 7 in the following manner and having the following characteristics: The lowermost portion of the tube has an inner surface 16 in the form of a short truncated cone joined to the lower and smaller end of a comparatively longer truncated cone 17 by a short throat-piece 18, cone 17 forming the carbureting chamber 17ª. The outer surface of the lower portion of said Venturi tube 15, shown at 15ª, is of such a form and size as to slide easily in the lower portion of primary air chamber 7, and is provided with a flange 20 of the proper size and form to engage shoulder 8 in wall 2. The outer surface of the upper portion of tube 15, indicated at 15ᵇ, is of the proper size and form to slide easily in chamber 7 and has, preferably, three annular grooves formed therein as indicated at 26, 27 and 28 respectively. At 29 are shown a number of small perforations or conduits connecting groove 27 with chamber 5. Groove 28 is formed to diminish the weight of tube 15 and to collect the material, as it advances and retracts, that might otherwise gather on the inner surfaces of the webs between ports 14. Grooves 26 and 27, one on each side of groove 28, are provided to act as receptacles for any particles that might penetrate the space between tube 15 and wall 2 and thereby interfere with the free longitudinal or revolving movement of said tube. Conduits 29 permit a small amount of air to enter chamber 5 when tube 15 is slightly advanced upon starting the engine thereby preventing too rich a mixture and a quick, even start is effected, the continued action of the engine causing tube 15 to still further advance and thereby bringing apertures 23 into use and thus adjusting the inflow of

air and fuel to the changing requirements of the engine when in operation. The relation of flange 20 to shoulder 8 is such that when the engine is started tube 15 does not at once jump forward to the limit of its forward movement, but advances a little way quickly when it is retarded by the slow entrance of air into the space between flange 20 and shoulder 8, the speed of its continued forward movement depending of course upon the pull of the engine. Inasmuch as tube 15 is of light weight it is extremely sensitive to the varying pressures in chambers 17^a and 5 due to the varying speed and load of the engine, and consequently is susceptible of accurate adjustment and control. Apertures or orifices 23 are angularly positioned with relation to any plane or planes passing transversely through tube 15 at right angles to its axis and are so positioned in tube 15 as to permit the passage of air through openings 14 and passage 21 to mixing chamber 5 when tube 15 is advanced a distance. Passage 21 is formed by cutting away a large proportion of the exterior of the wall of cone 17 thereby reducing the weight of tube 15.

I have found that if orifices 23 are placed in any plane or planes passing transversely through tube 15 at right angles to its axis, the air drawn therethrough tends to form a blanket in chamber 17^a, or over the same, which interferes with the proper and uniform feeding of fuel and air from nozzle of spraying tube 9 and throat 18, but by placing orifices 23 in the angular position described this trouble is entirely eliminated and the flow of air and fuel is uniform and under proper control. Orifices 23 are not only angularly positioned with reference to any plane or planes passing through tube 15 at right angles to its axis, but are also angularly positioned with relation to any plane or planes passing through the axis of said tube and in which the said axis lies as clearly shown in Fig. 5. The functions performed by orifices 23 are fivefold. First, they assist in advancing tube 15 through the suction of air therethrough; second, they practically eliminate condensation troubles by providing inwardly and upwardly flowing jets of air in that portion of the tube 15 in which an eddy of vapor is most likely to be formed and consequently where condensation is most likely to take place; third, they provide jets of air in close proximity to each other in such a manner as to pick up any condensed vapor that might work down from the mixing chamber 5, and vaporize the same; fourth, being angularly positioned with relation to any plane in which the axis of said tube lies, the movement of air therethrough causes said tube to revolve thereby keeping it at all times free from any obstruction that might otherwise form about a tube with a longitudinal movement only and rendering it entirely self cleaning. The revolving of the tube through the medium of orifices 23 is effected by the reaction of the air against the sides of said angularly positioned orifices on its passage therethrough, the numerous angular surfaces thus presented to the air being, in fact, equivalent to that number of vanes in a fan. This revolving movement may also be secured by forming or positioning vanes or fins in the lower cone portion 16 as shown at 16^a, or the same may be used in conjunction with the orifices 23 hereinbefore described. An important function performed by the revolving of tube 15 in the manner above set forth is that the air entering chamber 17^a is caused to whirl more or less rapidly therein and therefore a more perfect vaporization of the fuel is obtained. This revolving motion of tube 15 also assists in throwing condensed fuel out of chamber 17^a through the action of centrifugal force.

When this carbureter is in position and in full operation its action is as follows:—

Assuming that the engine is running under a light load, a comparatively small amount of fuel is being used and the proper amount of air is being drawn in through air chamber 7, and through throat-piece 18 because tube 15 is in a retracted position and the discharge end 24 of spraying tube 9 is thereby advanced into cone 17.

If now the engine load is increased and the throttle valve 6 opened wide and an increased amount of air and liquid fuel is drawn into the device the following result is effected. The increased velocity of the air drawn in from chamber 7 through throat-piece 18 and the suction of air through orifices 23, causes Venturi tube 15 to advance to a position, say, as indicated in dotted lines at 25, the discharge end 24 of spraying tube 9 being now positioned in approximately the center of throat-piece 18. Orifices 23 now permit air to be drawn in through openings 14, and the increased velocity of air passing through throat-piece 18 draws an increased amount of liquid fuel from the discharge end of spraying tube 9, the increased velocity of air in said throat-piece 18 being due of course to the contracted space relative to the cones 16 and 17. The tube 15 is, of course, revolving continuously as hereinbefore described, and at a variable speed according to the velocity of the air drawn in.

It may now be seen that the action of my improved carbureter is entirely automatic, as the position of tube 15 depends entirely upon the fluid pressure within the same. When the engine load is heavy and the fluid pressure light the tube 15 is advanced as shown, a large amount of air is drawn into mixing chamber 5 and a proportionally large

amount of liquid fuel is drawn from float chamber 1. As the engine load lightens the diminished suction of air permits tube 15 to recede thus diminishing the suction of liquid fuel from spraying tube 9.

By fitting tube 15 into position as hereinbefore described, I obtain the effect of a dash-pot because as the engine pull increases and tube 15 is drawn forward by the increased suction of its forward movement is retarded and steadied by the comparative slowness with which air can be drawn into the space between flange 20 and shoulder 8. Likewise the comparative slow discharge of air from the space between flange 20 and shoulder 8 steadies and regulates the motion of tube 15 upon its return movement when the engine pull is decreased. This dash-pot is desirable as it provides for the gradual movement of tube 15 in either direction according to the necessities of the engine, and thus provides for the exact proportioning of the liquid fuel and air mixture during any and all positions of the throttle valve and effectually prevents chattering or fluttering of the tube. In order to secure this dash-pot action the lower portion of tube 15 is lengthened sufficiently to provide a comparatively long surface 15^a thereby retarding the passage of air from the space between flange 20 and shoulder 8 to the lower portion of chamber 7, and the outer surface of flange 20 is made of the proper width to retard the passage of air from the space between flange 20 and shoulder 8 to passage 21. On account of this construction, when the engine load changes and the tube falls or advances, the air between flange 20 and shoulder 8 can escape but slowly thereby providing the dash-pot action desired. Grooves 15^c are formed in surface 15^a to act as receptacles for any particles that might penetrate the space between surface 15^a and wall 2.

While I have herein described and shown one particular form of construction of my improved carbureter, it is understood that changes in form and construction and minor details may be made within the scope of the appended claims.

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

1. In a carbureter having compensating air inlet ports and a fuel nozzle, a fluid-pressure-controlled Venturi tube slidably and revolubly mounted therein in operative relation to said nozzle and said ports, said tube being provided with means for imparting a rotary motion thereto by the passage of air therethrough.

2. In a carbureter having compensating air inlet ports and a fuel nozzle, a fluid-pressure-controlled Venturi tube slidably and revolubly mounted therein in operative relation to said nozzle and said ports, said tube being provided with means for imparting a rotary motion thereto by the passage of air therethrough, said means comprising a plurality of perforations formed in said tube and angularly positioned with relation to any plane or planes passing through said tube and in which the axis of said tube lies.

3. In a carbureter having compensating air inlet ports and a fuel nozzle, a perforated fluid-pressure-controlled Venturi tube slidably and revolubly mounted therein in operative relation to said nozzle and said ports, said tube being provided with means for imparting a rotary motion thereto by the passage of air therethrough.

4. In a carbureter having compensating air inlet ports and a fuel nozzle, a fluid-pressure-controlled Venturi tube slidably and revolubly mounted therein in operative relation to said nozzle and said ports, said tube being provided with means for imparting a rotary motion thereto by the passage of air therethrough, said means comprising a plurality of perforations formed in said tube and angularly positioned with relation to any plane or planes passing through said tube and in which the axis of said tube lies and angularly positioned with relation to any plane or planes passing through said tube at right angles to its axis.

5. In a carbureter having compensating air inlet ports and a fuel nozzle, a fluid-pressure-controlled Venturi tube slidably and revolubly mounted therein in operative relation to said nozzle and said ports, said tube being provided with means for imparting a rotary motion thereto by the passage of air therethrough, and means for steadying the movements of said tube.

6. In a carbureter having compensating air inlet ports and a fuel nozzle, a fluid-pressure-controlled Venturi tube slidably and revolubly mounted therein in operative relation to said nozzle and said ports, said tube having an annular passage formed in the outer surface thereof and a plurality of orifices formed therein connecting said passage with the interior of said tube and angularly positioned with relation to any plane or planes passing through said tube and in which the axis of said tube lies, and means for steadying the movements of said tube.

7. In a carbureter having compensating air inlet ports and a fuel nozzle, a fluid-pressure-controlled Venturi tube slidably and revolubly mounted therein in operative relation to said nozzle and said ports, said tube having a plurality of annular grooves and an annular passage formed in the outer surface thereof and a plurality of orifices formed therein connecting said passage with the interior of said tube and

angularly positioned with relation to any plane or planes passing through said tube and in which the axis of said tube lies, and means for steadying the movements of said tube.

8. In a carbureter having compensating air inlet ports and a fuel nozzle, a fluid-pressure-controlled Venturi tube slidably and revolubly mounted therein in operative relation to said nozzle and said ports, said tube having a plurality of annular grooves and an annular passage formed in the outer surface thereof, a plurality of orifices formed therein connecting one of said grooves with the interior of said tube, and a plurality of orifices formed therein connecting said passage with the interior of said tube and angularly positioned with relation to any plane or planes passing through said tube and in which the axis of said tube lies, and means for steadying the movements of said tube.

In testimony whereof I have hereunto affixed my signature this 20th day of May, 1916.

HENRY E. CURTIS.