June 11, 1929. G. TACCONI 1,716,988

CARBURETOR

Filed Jan. 28, 1927 2 Sheets-Sheet 1

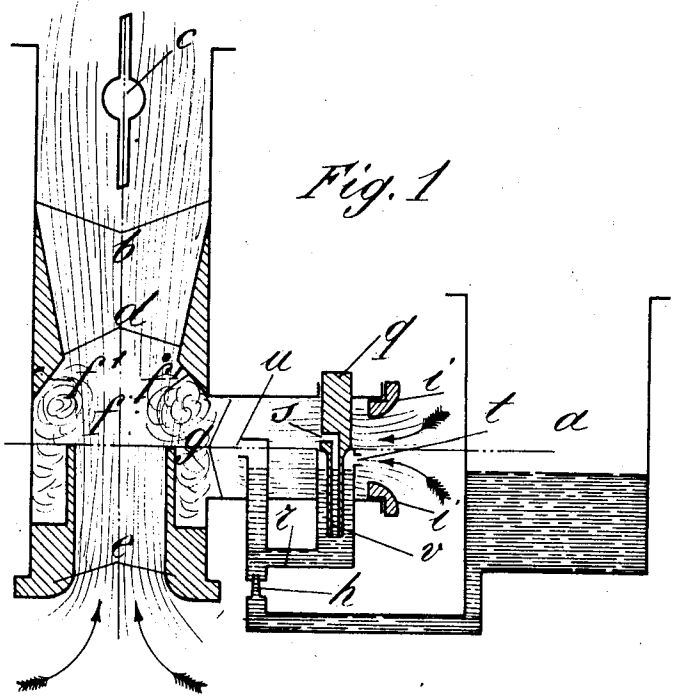


Fig. 1

Fig. 2

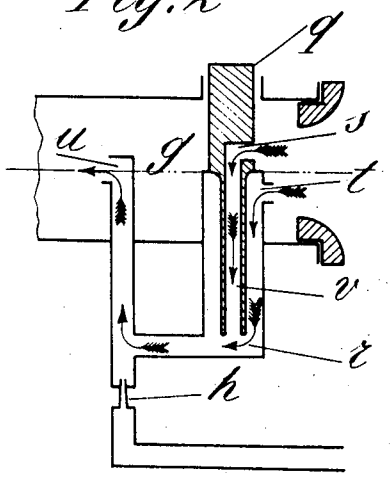
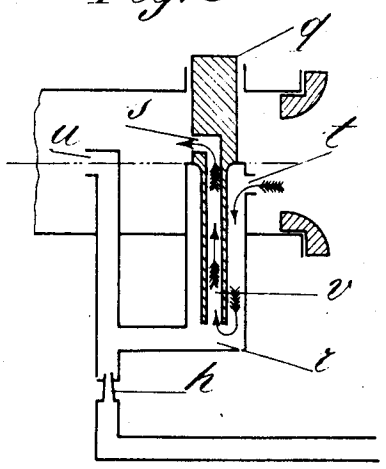


Fig. 3



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June 11, 1929. G. TACCONI 1,716,988

CARBURETOR

Filed Jan. 28, 1927 2 Sheets-Sheet 2

Fig. 4

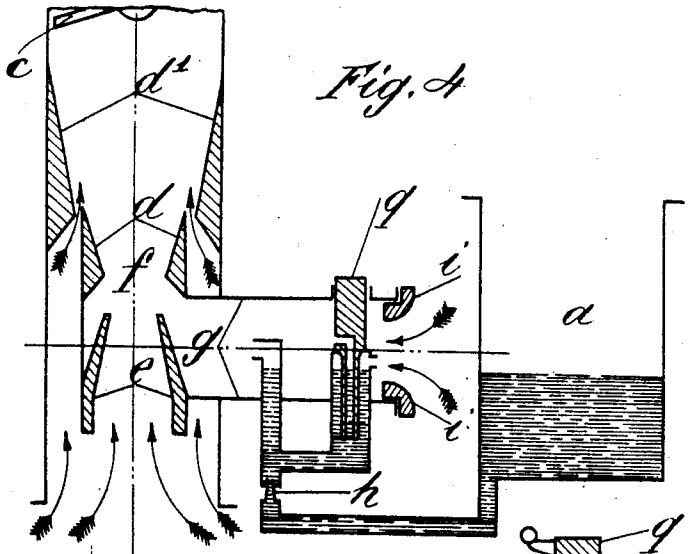


Fig. 6

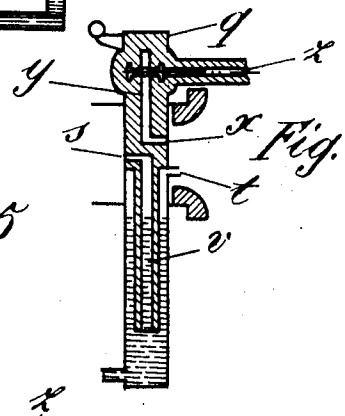


Fig. 5

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UNITED STATES PATENT OFFICE.

GUIDO TACCONI, OF FLORENCE, ITALY.

CARBURETOR.

Application filed January 28, 1927, Serial No. 164,241, and in Italy February 8, 1926.

The present specification has for its object a carburetor for internal combustion motors, wherein the composition of the mixture of volatile liquid and air is rendered substantially constant regardless of the speeds, loads or stresses to which the motor is subjected, and without any correction by hand.

A modification moreover ensures a quick pick-up and a manually operated device allows of an adjustment being applied to correct for variations of the barometrical pressure due to the varying altitudes at which the apparatus is required to function.

In order to understand the principle whereupon said invention is based it is well to bear in mind that in an ordinary carburetor an excess of fuel obtains at high speeds of the motor and a deficiency of fuel obtains at low speeds, this being due to the diverse nature of the two fluids constituting the mixture, the one liquid fuel the other gaseous (air).

According to the present invention this drawback is done away with as the carburetor generates two gaseous currents which are mixed in such manner as to secure perfect compensation and hence a mixture that is in the highest degree homogeneous.

The apparatus is also provided with means for effecting the necessary corrections in motors for aviation purposes, which are exposed to considerable barometrical variations due to the different altitudes.

The annexed drawings diagrammatically show practical examples of the invention.

Fig. 1 shows a section through a carburetor according to the invention,

Fig. 2 is an enlarged view of the adjusting mechanism shown in Fig. 1.

Fig. 3 shows the adjusting mechanism in a different position.

Fig. 4 shows a modification.

Fig. 5 shows a further modification.

Fig. 6 is a detail view of the adjusting plug of the carburetor as shown in Fig. 5.

As is apparent from Fig. 1 of the annexed drawings, in the carburetor according to the invention, we have the usual constant level tank —*a*—. In the body —*b*— of the carburetor is formed a chamber, which is preferably cylindrical. In this chamber are located the butterfly valve —*c*— and a Venturi tube —*d*— as well as a regulating air intake passage —*e*—, communicating at one end with atmosphere and at the other end with a secondary mixing chamber —*f*—. A nozzle —*h*— supplies a mixture of atomized and vaporized fuel to the conduit —*g*— which acts as a primary mixing chamber, and at its other end communicates with the atmosphere through the air intake —*i*—.

Intake passage —*e*— has been termed regulating, as by reason of its special shape and arrangement in relation to the Venturi tube —*d*— and to the conduit —*g*—, it effectively brings a regulation to bear upon the rate of outflow of the rich mixture which proceeds from the conduit —*g*—. In point of fact a part of the air passing through the passage —*e*— passes directly through the Venturi tube, but a part of the stream, owing to its impact against the conical surface —f^1— generates a whirling movement in the mixing chamber —*f*— such as to cause the pressure in conduit —*g*— to vary with the speed of the motor in such manner as to vary the ratio of the flow from —*g*— to the flow through —*e*— and thus to automatically adjust the richness of the mixture to the speed of the motor.

The device intended to ensure an economical running of the motor acting solely on the performance of delivery of the air intake passage, is shown in Figs. 2 and 3 drawn to an enlarged scale, by the letters —*q*—*r*—*t*—*u*—*v*—.

The adjusting plug —*q*— is rotatably mounted and is provided with a longitudinal aperture —*v*— and communicates with the conduit —*g*— through the orifice —*s*—. This orifice —*s*— may be oriented, by rotating the adjusting plug, so as to open either in the direction of the movement of the fluid, (Fig. 3) flowing through the conduit —*g*— or in the opposite direction, (Fig. 2).

When the orifice —*s*— is oriented as shown in Figs. 1 and 3 the fluid entering through the orifice —*t*— and following the path indicated by the arrows, is discharged through —*v*— and —*s*— into the tube —*g*—.

When the orifice —*s*— is turned in the opposite direction, however, the fluid enters the adjusting plug —*q*— through the orifices —*t*— and —*s*—, and passes through the conduits —*v*—, —*r*—, and —*u*— to the conduit —*g*—. The result is to increase the flow through —*g*— which acts upon the nozzle —*h*— in such a manner as to reduce the output thereof.

The adjustment for running at minimum speed is brought about by one of the cus-

tomary devices in use on carburetors for explosion motors.

At slow speeds of the motor the conduits are filled with a mixture of atomized and vaporized fuel supplied by the nozzle —*h*— which is located at a suitable level relative to the level of the liquid in the tank.

On a somewhat rapid opening of the butterfly valve the flow of air through the orifice —*t*— or the orifices —*t*— and—*s*—, according to the orientation of the adjusting plug, draws the atomized fuel and fuel vapor along the path marked by the arrows in either of the cases, the effect being to insure an excess of fuel such as to allow of a quick acceleration.

Fig. 4 represents a modification of the carburetor according to Fig. 1 as regards constructional details, but still in accordance with the principle underlying this invention.

In the modified form likewise, a conduit —*g*— is to be noted wherein the rich mixture is produced; as well as a regulating air nozzle —*e*—; a mixing chamber —*f*— and a venturi —*d*—.

In this case the mixture, excessively rich, but already corrected, as regards the constancy of its constituent proportions, by the regulatng air nozzle —*e*—, is discharged into the constructed portion of a venturi —d^1— where it mixes with the air as indicated by the arrows.

As to the mode of functioning reference should be had to the description hereinbefore set forth for the first case according to Figs. 1, 2 and 3.

In the carburetor according to Fig. 5 a calibrated injector nozzle —2— has been added in the regulating air nozzle —*e*— with a corresponding small tube —*w*— for the sole purpose of facilitating the recuperation and in order the better to diffuse the volatile combustible liquid in the air during operation at mean speeds.

In this device likewise, as in the foregoing according to Fig. 1, compensation is attained in the same way, with the sole difference that in the former the regulating nozzles —*e*— only delivers air, whilst in the latter the regulating nozzle delivers poor mixture. Of course, in this second device the extent of delivery of the two nozzles —*h*— and —2— is so reglated that the sum thereof shall equal the delivery of the nozzle —*h*— shown in Fig. 1.

The modification (whereby the carburetor is adapted to air-craft motors) brought about in the plug —*q*— for the correction of the mixture in order to enable the variation of the efflux of combustible liquid also in relation to the different barometrical pressures is as follows:—The constant level tank —*a*— is closed against the atmospheric pressure and by means of the orifice —*x*— of the conduits —*y*— and —*z*— there is conveyed thereto either the dynamic pressure, if the orifice —*x*— is orientated in a direction opposed to that of the fluid streams in —*g*— as in Fig. 6, or the static pressure if the orifice —*x*— is disposed in the direction of the fluid streams as in Fig. 5, or other pressures, intermediate between these two extremes; the whole for the purpose of varying the capacity of the nozzles, which is compassed by setting the orifices —*x*— and —*s*— at different angles in relation to the axis of the tube —*g*—.

And therefore the adjusting plug —*q*— likewise aims, as hereinbefore stated and illustrated, at reducing the efflux of fuel, while succeeding in varying the depression of retraction from the nozzles —*h*— and —2—.

Therefore, as the two orifices —*s*— and —*x*— are diametrically opposed, although they are not at the same level, their effects will be aggregated, so that the carburetor is capable of considerable variations in the supply of fuel from the nozzles —*h*— and —2—, which condition is necessary for aviation motors.

In order to have the nozzles —2— and —*h*— supply a maximum amount of fuel, the opening —*x*— will have to be in a position facing the inflowing air as shown in Fig. 6. As a consequence, the dynamic pressure of the inflowing air will be communicated to the tank —*a*— through the passages —*x*— and —*z*—, and the resulting pressure will of course tend to assist in forcing the fuel out of the nozzles —2— and —*h*—. Also, the air extending through the orifice —*t*— will be discharged through the opening —*s*— decreasing the pressure acting on the nozzles.

When it is desired to have the nozzles eject a minimum amount of fuel, the adjusting plug is turned through 180° to the position shown in Fig. 5. In this case the pressure in tank —*a*— is materially reduced as only the static pressure within the conduit —*g*— is communicated to it. This in itself produces a material reduction in the output of the nozzles and the effect is further accentuated by virtue of the fact that the air entering through —*t*— cannot pass out through the adjusting plug —*q*— and the pressure acting against the nozzles is accordingly raised.

A wide variation in the amount of fuel supplied by the nozzles may thus be obtained by manipulation of the adjusting plug —*q*—.

The device for operation at slow speeds is composed of the tube —7—, the injector nozzle —8— and cap —9— which function in the well-known manner.

It should be understood that the forms shown in the drawing merely represent examples which are given solely as a practical

showing of the improvements concerned, it being possible to vary the form of their practical execution without departing from the scope of the concept underlying the invention taken as a whole.

Claims:

1. A carburetor comprising an air conduit, a secondary mixing chamber in said air conduit, a primary mixing chamber discharging transversely into the secondary mixing chamber and having an air inlet, a by-pass having an air inlet connected to said primary mixing chamber and also a mixture outlet discharging into said primary mixing chamber, a fuel nozzle in the by-pass, and means effecting communication between the said primary mixing chamber and the by-pass and controllably acting as an air inlet for said by-pass or a mixture outlet therefrom.

2. A carburetor comprising an air conduit, a secondary mixing chamber in said air conduit, a primary mixing chamber having an air inlet and an outlet discharging transversely into the secondary mixing chamber, a U-shaped by-pass having an air inlet opening communicating with the primary mixing chamber and a mixture outlet discharging into said primary mixing chamber, a fuel nozzle in the by-pass, a rotatable adjusting plug mounted in one end of the by-pass, said adjusting plug having a longitudinal passage extending to its lower end and having an opening in said primary mixing chamber beyond the end of the by-pass in which it is mounted.

3. A carburetor comprising an air conduit, a secondary mixing chamber in said air conduit, a primary mixing chamber having an air inlet and outlet discharging transversely into the secondary mixing chamber, a U-shaped by-pass having an air inlet opening communicating with the primary mixing chamber and a mixture outlet discharging into said primary mixing chamber, a fuel nozzle in the by-pass, a rotatable adjusting plug mounted in one end of the by-pass, and a constant level tank closed to the atmosphere, said adjusting plug having spaced longitudinal passages provided with diametrically oppositely disposed openings at points above the end of the by-pass in which it is mounted, both of said openings communicating with said primary mixing chamber, one of said passages extending to the bottom of the plug and the other of said passages communicating with the constant level tank at a point above the liquid surface therein.

GUIDO TACCONI.