

March 26, 1935.

P. SCHÜTTLER

1,995,587

CARBURETOR

Filed March 16, 1932

2 Sheets-Sheet 1

Fig. 1.

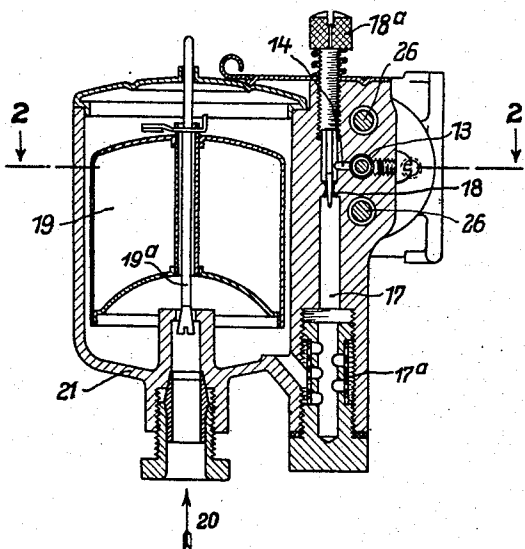


Fig. 2.

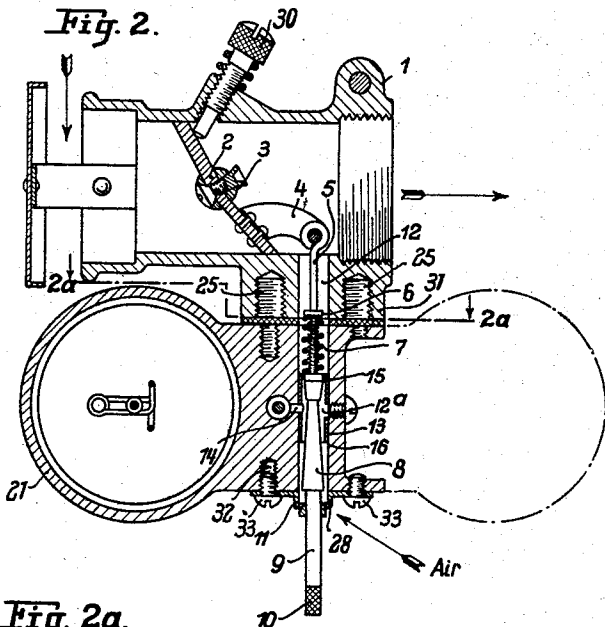
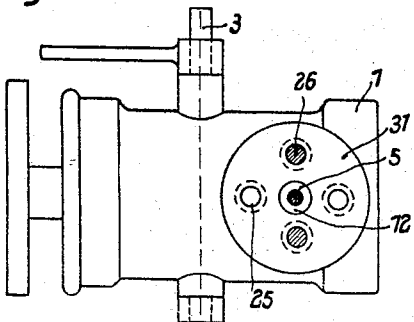


Fig. 2a.



Inventor:
Paul Schüttler
By *James P. Jones*
Attorney

March 26, 1935.

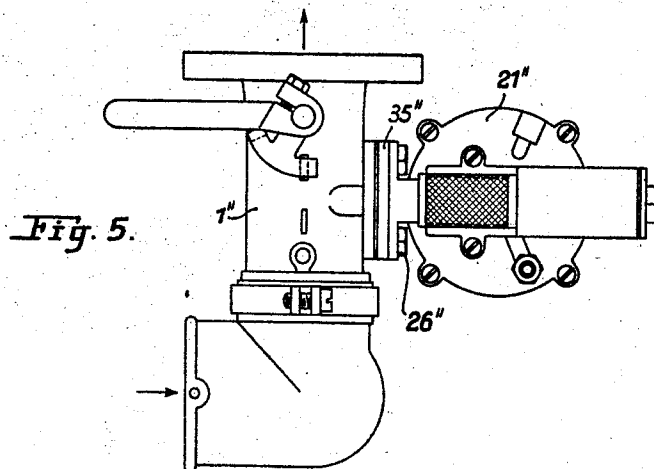
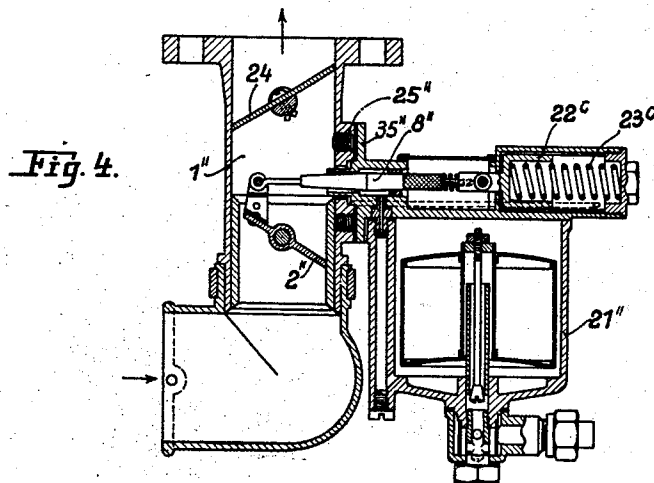
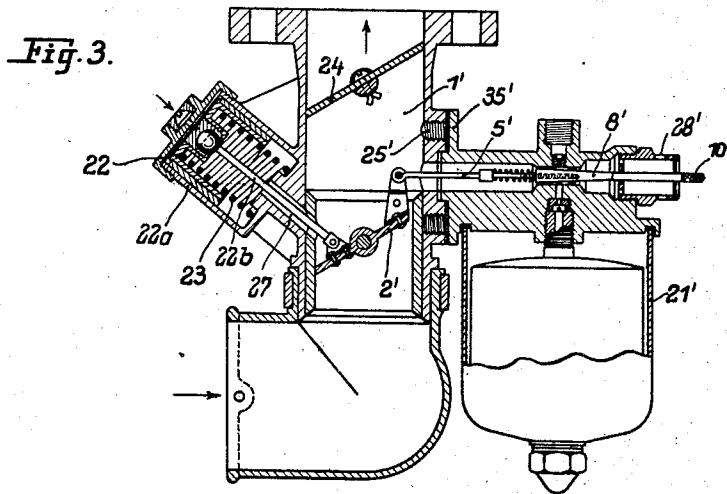
P. SCHÜTTLER

1,995,587

CARBURETOR

Filed March 16, 1932

2 Sheets-Sheet 2



Inventor:

Paul Schüttler

By [Signature] Attorney.

UNITED STATES PATENT OFFICE

1,995,587

CARBURETOR

Paul Schüttler, Berlin-Halensee, Germany, assignor to Pallas Apparate-Gesellschaft m. b. H., Berlin, Germany

Application March 16, 1932, Serial No. 599,277
In Germany March 20, 1931

12 Claims. (Cl. 261—50)

It is known that with all carburetors difficulties are encountered as regards the accommodation of the supplied fuel to the amount of air sucked in at the various outputs of the engine. The ratio of the amount of fuel which ought to be admixed to the air at the various outputs of the engine in order to attain an unobjectionable service can be represented by a curve which might be called the ideal rule curve. This curve is a continually extending curve which has a certain similarity with the performance curve of the engine. With the carburetor systems that have become known up to now the rule curve corresponds practically to the ideal curve only with a greater or lesser approximation; the chief defect is this that the practical rule curve is composed of several curve pieces which join one another in an unsteady manner. This is due to the reason that the approximation to the ideal rule curve can be attained only with the aid of auxiliary devices, as for instance a compensation fuel nozzle, or a device for the control of the correction or additional air supply, or the like, the respective auxiliary device becoming active only within a certain distinct range of the output. Such an additional device renders the construction of the carburetor difficult, and great practical difficulties are also caused by accommodating the respective additional or auxiliary device provided for acting upon the rule curve in every individual case to the particularities or peculiarities of the respective engine.

The present invention relates to a carburetor which permits to attain any desired rule curve with comparatively simple means and which is so designed that said curve can be easily changed and can be accommodated to the existing conditions. With this improved carburetor the desired rule curve can be attained by means of only one movable member whereby the further advantage is attained that the curve in question is changed in a continuous or steady manner along its entire length.

There are already known carburetors in which the proper proportions of the components of the mixture at the several performances of the engine are obtained by regulating the amount of the supplied fuel in dependency of the amount of air sucked in. With those known carburetors there is, for instance, the sectional area of the passage for the fuel in the fuel nozzle varied, by means of a movable pointed needle, so that the amount of the liquid fuel sucked in is acted on in a direct way. Owing to the small size of the

sectional area of said passage that manner of regulating entails extraordinarily great difficulties; the differences in the diameter of the regulating needle are so slight that a proper regulation can hardly be expected. In contradistinction thereto the carburetor designed according to this invention is based upon the idea to act upon the fuel nozzle in an indirect manner, viz with the aid of an aperture of invariable size through which the fuel is sucked into an auxiliary mixing chamber, in which a pressure below atmospheric pressure is regulated in dependency of the amount of air streaming through the main mixing chamber. The amount of the fuel conveyed is, thus, varied in accordance with the pressure below atmospheric pressure existing in said auxiliary mixing chamber, and the respective amount of the fuel forms for every individual case the proper mixture together with the air of the main mixing chamber, in that the amount of air sucked through the auxiliary mixing chamber is so slight that a variation thereof does not change the conditions. The variation of the pressure below the atmospheric pressure in the auxiliary mixing chamber is effected preferably with the aid of an axially shiftable regulating body of variable sectional area, this member controlling either only the sectional area of the passage leading from the auxiliary mixing chamber to the main mixing chamber, or, besides, also the sectional area of the passage leading into said auxiliary chamber. The sectional areas to be regulated with this arrangement are often times just as large as those provided for the regulation of the passage for the pure fuel, in consequence whereof it is not difficult to give the regulating member any desired shape and to master the conditions with very great accuracy, so that any desired approximation to the ideal rule curve can be easily attained.

Another advantage presented by the employment of an auxiliary mixing chamber with axially shiftable regulating member consists therein that one and the same carburetor can be used with either a horizontal or a vertical mixing chamber, and with the float chamber arranged either on the right-hand side or on the left-hand side of said chamber, the device being then made in two parts which are composed, and connected with one another, in the one or the other manner.

The invention is illustrated diagrammatically and by way of example on the accompanying drawings on which Figure 1 is a vertical section through a constructional form of a carburetor designed according to this invention in which a

horizontal main mixing chamber is provided. Figure 2 is a horizontal section through the same constructional form. Figure 2a is a side view of the upper part of Figure 2 on line 2a—2a thereof in the direction of the arrows. Figure 3 is a vertical section through a modification having also a vertical main mixing chamber. Figure 4 is a view similar to Fig. 3 and shows another modification, and Figure 5 is a side-view of this second modification.

Referring to Figs. 1 and 2, 1 denotes the carburetor casing which forms or contains the main mixing chamber. In this chamber is the throttle flap 2 which is turnable on an axle 3 and can be turned by means of an arm 4 extending forth from it and being connected by a rod 5 with the regulating member 8. A pivot-like extension 9 of this member is movable in a guide member 11 having air-inlet openings 28; at the outer end of said extension 9 is a handle 10 by means of which it can be turned for the purpose of adjusting thereby the regulating member 8. This latter is designed as a rotational body and is connected with the rod 5 by means of screw-threads, and a helical spring 7 encompassing the rod 5 and abutting at its one end against a collar of this rod and at its other end against the inner end of the regulating member 8 serves as brake against unintentional turning of the regulating member during the service.

The member 8 lies freely within a sleeve 13 located in the bore 12^a of the float casing and being, perhaps, exchangeable, if desired. The frontal faces 15 and 16 of said sleeve serve as control faces relatively to the diameter of said bore at the two ends of the said sleeve. At one side of this latter is an aperture lying normally just opposite a bore 14 which communicates with the fuel nozzle 18 that can be regulated by means of the needle valve 18^a. The nozzle 18 communicates also with the bore 17 and, by the intermediary thereof, with the float chamber 21 which encloses the float 19. This latter is provided with a valve 19^a co-operating with the channel 20 through which the fuel enters into said chamber 21. The level of the liquid fuel is kept normally at about the height of the lower portion of the nozzle 18.

The bore 12 of the carburetor casing 1 and the bore 12^a of the float casing 21 (this latter bore forming a continuation of the first-mentioned bore) form together the auxiliary mixing chamber in which the pressure below the atmospheric pressure is regulated by means of the regulating body 8 in dependence of the position of the throttle valve 2.

The manner of operation of this constructional form of the improved carburetor is as follows:

When the engine is started while the throttle valve is kept closed, a pressure below atmospheric pressure arises in the carburetor and is propagated across the space 12 and the annular gap 15 to the aperture 14, and is reduced by means of fresh air entering through the annular gap 16 to that measure which is sufficient to provide through the nozzle 18 that amount of fuel which is required for running without load, and to conduct the respective amount of the mixture from the aperture 14 across the annular gap 15 to the carburetor.

The shape of the regulating body is so chosen that at any desired position of the throttle valve either the sectional area of the passage at the control edge 15 is, or the two sectional areas of the passages at the control edges 15 and 16 are,

so varied that the pressure below the atmospheric pressure at the aperture 14 has that height which is the proper one at the time being, that is to say, that height, at which an amount of fuel is escaping that is in the proper ratio to the amount of air sucked into the main mixing chamber.

There is thus attained for the open position of the throttle valve, and corresponding to the increased amount of fuel required, the largest sectional area of the passage for the mixture at the control edge 15, and the smallest sectional area for the air at the control edge 16.

To adjust such a carburetor normally nothing else is requisite but to determine the proper sectional area of the fuel nozzle 18 for only one opening position of the air throttle valve 2, whereas any further adjustment becomes superfluous by reason of the positive control of the members provided for the mixture.

In order to provide also for a fine-regulation, the regulating member 8 which influences the formation of the mixture can be easily adjusted from the outside by means of the handle 10.

The abutment screw 30 serves for adjusting the throttle flap when the engine is running without load.

The superiority of this improved carburetor over the many known ones appears particularly distinctly in cases in which the carburetor chosen for a certain distinct engine is, in fact, too large. In such a case any of the known carburetors would either prove to be entirely useless, or it would be indispensably requisite to subject it to a circumstantial regulation of all those parts which influence the formation of the mixture. If, however, the engine is provided with the improved carburetor constituting the subject-matter of the present invention, the wrong size of the same would not matter because nothing else is necessary than to adjust the carburetor for the corresponding amount of air by means of the throttle valve.

The regulating body 8, the diameter of which increases from its middle portion towards both ends, may have any desired shape as requisite with consideration to the rule curve that is the proper one for the respective engine.

In the constructional form illustrated in Figs. 1 and 2 the throttle valve 2 is to be manually adjusted. In the modifications shown in Figs. 3-5 said valve is adjusted automatically. The reference numerals in these figures correspond with those used in Figs. 1 and 2, but in Fig. 3 the index ' has been added to the respective numerals, and in Figs. 4 and 5 the indices '' have been added to them.

In Fig. 3 the throttle flap 2' is adjusted by means of a piston 22 which is movable in a cylinder 22^a and is movably connected with said valve by means of the piston rod 22^b. Within said cylinder the pressure below the atmospheric pressure is the same as in the carburetor casing 1', as the bore 29 establishes a communication with the space behind the valve 2'. The higher, thus, the pressure below the atmospheric pressure in the carburetor casing is, the farther will the piston 22 be moved counter to the action of the spring 23, and the more will the throttle valve be opened, whereby the control member 8' in the auxiliary mixing chamber will be moved correspondingly by the intermediary of the rod 5'. For the rest, the device operates accurately as that shown in the Figs. 1 and 2.

This is in general true also of the further modification shown in Figs. 4 and 5, in which,

however, the throttle valve 2" is not directly connected with the automatic control, but is connected only with the control member 8' which at its outer end is movably connected with the piston 22° that is subjected to the pressure of the helical compression spring 23°.

In the constructional forms shown in Fig. 3 and in Figs. 4 and 5, there is provided, besides the throttle valves 2' and 2'', a second valve 24 which is also located in the carburetor casing and the object of which is to shut off the carburetor completely.

Owing to the particular manner in which the float casing is connected with the carburetor casing according to this invention, a particularly far-reaching applicability of this improved carburetor is warranted, and for this purpose the connecting flange 31 of the carburetor casing 1 (Figs. 1 and 2) is provided with threaded bores 25 (or 25', Fig. 3, and 25'', Figs. 4 and 5) into which fastening screws 26 (or 26' and 26'' respectively) can be screwed, these screws extending through suitable bores of the float body 21 or the flange 35' (Fig. 3) or 35'' (Figs. 4 and 5). Only two screws are employed which are located diametrically opposite to one another, there remaining two holes 25 or 25' or 25'' empty. This arrangement and combination of the parts concerned renders it possible to change a horizontal carburetor (Figs. 1 and 2) into an ordinary vertical one by transpositioning the float casing 21 or 21' or 21'' correspondingly, all parts requisite for the formation of the mixture being enclosed in said casing; besides, the vertical carburetor may be such a one into which the main amount of the air enters from below, or such a one in which the mixture is sucked in downward direction. Transpositioning the float casing is effected by turning it on the axis of the control member 8 or 8' or 8'' and putting the screws 26 into those holes which had been empty prior thereto.

It is also possible to turn the float casing relatively to the carburetor casing by 180° in order to render possible the applicability at the opposite position of the float casing.

It is, finally, also possible to design constructional forms or modifications which are symmetrical to those shown in the drawings by way of example. For this purpose the float chamber of Figs. 1 and 2, including that part of the carburetor which has the bore 12^a, is symmetrically designed, and there are at both sides like screw holes 32 for the reception of the fastening screws 33 for the guide member 11. It is, of course, necessary that in this case the guide member 11 be placed upon the opposite side of the float casing, and also the regulating member 8 must be placed into the bore 12^a in opposite position. The float casing has then the position shown in dotted lines in Fig. 2.

Owing to that extended applicability of the improved carburetor one model is sufficient to answer the requirements of a lot of possibilities of attaching the carburetor to the internal combustion engine so that in every case the place intended for the carburetor can be properly utilized.

I claim:

1. In a carburetor for internal combustion engines in combination a main mixing chamber and a member for regulating the amount of air entering therein; an auxiliary mixing chamber communicating with said main mixing chamber at a place located behind said regulating member and being designed for the passage of a

small amount of air; a fuel supply conduit terminating into said auxiliary chamber; a double-conical pin arranged centrally in said latter mixing chamber and being axially shiftable and so connected with the air regulating member of the main mixing chamber that one of the cones of said pin enlarges the sectional area of the passage leading from the auxiliary mixing chamber to the main mixing chamber and the other cone of the said pin reduces the sectional area of the passage leading into the auxiliary mixing chamber according to the increase of the amount of air entering into the main mixing chamber.

2. In a carburetor for internal combustion engines in combination a main mixing chamber and a member for regulating the amount of air entering therein; an auxiliary mixing chamber having the shape of a channel and being designed for the passage of a small amount of air; a fuel supply conduit terminating into said channel-shaped auxiliary mixing chamber; a float casing and a float therein said channel being located transversely with respect to the axis of said casing; a communication between the channel-shaped auxiliary mixing chamber and the main mixing chamber at a place located behind said air-regulating member, the direction of the channel being such that it extends perpendicularly with respect to the axis of the main mixing chamber; a pin arranged centrally in the auxiliary mixing chamber and having different sectional areas at different portions along its length, said pin being axially shiftable and so connected with the air regulating member of the main mixing chamber that to every position of this regulating member corresponds another position of said pin; and means for fastening the said main mixing chamber and the said auxiliary mixing chamber and adapted to permit connecting them with one another in different angular positions relatively to one another.

3. In a carburetor for internal combustion engines, in combination, a main mixing chamber and a member for regulating the amount of air entering therein; a float casing and a float therein; an auxiliary mixing chamber provided at said float casing in the shape of a continuous bore designed for the passage of a small amount of air; a fuel supply conduit terminating into said bore in the middle portion thereof, said bore extending transversely to the axis of the said float casing; means provided at both ends thereof for attaching said casing to the casing containing the main mixing chamber; the said auxiliary mixing chamber communicating with the main mixing chamber at a place located behind said air-regulating member, the direction of the channel being such that it extends perpendicularly with respect to the axis of the main mixing chamber; a pin arranged centrally in the auxiliary mixing chamber and having different sectional areas at different portions along its length, said pin being axially shiftable and so connected with the air regulating member of the main mixing chamber that to every position of this regulating member corresponds another position of said pin; and means for fastening the said main mixing chamber and the said auxiliary mixing chamber and adapted to permit connecting them with one another in different angular positions relatively to one another.

4. In a carburetor for internal combustion engines, in combination, a main mixing chamber and a member for regulating the amount of air entering therein; an auxiliary mixing chamber

adapted to permit the passage of a small amount of air, said last-named chamber being provided with a fuel supply conduit terminating therein, having an inlet passage opening to the atmosphere and an outlet passage communicating with said main mixing chamber at a point behind said regulating member, and both passages being of less sectional area than the cross-sectional area of the last-mentioned chamber; and a member for regulating the depression in said auxiliary chamber and being connected with the air regulating member of said main mixing chamber in such a manner that the sectional area of said inlet passage diminishes the larger the amount of air entering into the main mixing chamber.

5. In a carburetor for internal combustion engines, in combination, a main mixing chamber and a member for regulating the amount of air entering thereinto; an auxiliary mixing chamber adapted to permit the passage of a small amount of air, said last-named chamber being provided with a fuel supply conduit terminating therein, having an inlet passage opening to the atmosphere and an outlet passage communicating with said main mixing chamber at a point behind said regulating member, and both passages being of less sectional area than the cross-sectional area of the last-mentioned chamber; and a member for regulating the depression in said auxiliary chamber and being connected with the air regulating member of said main mixing chamber in such a manner that the sectional area of said outlet passage increases and that of said inlet passage diminishes the larger the amount of air entering into the main mixing chamber.

6. In a carburetor for internal combustion engines, in combination, a main mixing chamber and a member for regulating the amount of air entering thereinto; an auxiliary mixing chamber with an outlet passage to the main mixing chamber communicating therewith at a point behind said regulating member and being designed for the passage of a small amount of air; a fuel supply conduit terminating into said auxiliary mixing chamber; a pin controlling said outlet passage and having different sectional areas at different portions along its length, said pin being axially shiftable and so connected with the air regulating chamber of the main mixing chamber that the sectional area of said outlet passage increases the larger the amount of air which enters into the main mixing chamber; and a member connecting the said pin with the said air regulating member and being connected at one end with the said pin by screw-threads and having at its other end an outwardly extending elongation.

7. In a carburetor for internal combustion engines, in combination, a main mixing chamber and an automatically adjusting member for regulating the amount of air entering thereinto; a throttle valve for regulating the amount of the mixture sucked from said chamber; a piston connected with said air regulating member and being so arranged as to be subjected on one of its sides to the pressure of the outer air, and on the other of its sides to the pressure below atmospheric pressure in the main mixing chamber, and a spring so arranged as to also act on the piston on that side where the pressure below atmospheric pressure is acting; an auxiliary mixing chamber for the passage of a small amount of air, said last-named chamber being provided with a fuel supply conduit terminating therein at any cross-section and having an inlet passage opening to

the atmosphere and an outlet passage communicating with said main mixing chamber at a point behind said regulating member, both passages being of less sectional area than the said cross-section of the chamber; and a member for regulating the depression in said auxiliary chamber to be displaced within this chamber, said last-named member being connected with the air regulating member of said main mixing chamber in such a manner that the sectional area of said inlet passage diminishes the larger the amount of air which enters into the main mixing chamber.

8. In a carburetor for internal combustion engines, in combination, a main mixing chamber and a member for regulating the amount of air entering thereinto; a bore in the wall of said chamber behind said regulating member and extending at right angles with respect to the axis of said chamber, and an auxiliary mixing chamber located in the axial prolongation of said bore and communicating therewith and being designed for the passage of a small amount of air, said last-named chamber being provided with a fuel supply conduit terminating therein at any cross-section and having an inlet passage opening to the atmosphere and an outlet passage communicating with said main mixing chamber at a point behind said regulating member, both passages being of less area than the said cross-section of the chamber; a pin arranged centrally in said last-named mixing chamber and having different sectional areas at different portions along its length, said pin being axially shiftable and so connected with the air regulating member of the main mixing chamber that to every position of said regulating member corresponds another position of said pin.

9. In a carburetor for internal combustion engines, in combination, a main mixing chamber and a member for regulating the amount of air entering thereinto; an auxiliary mixing chamber being provided with fuel supply conduit, said auxiliary mixing chamber having an outlet passage opening communicating with said main mixing chamber at a point behind said regulating member and a small throttle opening, this throttle opening being the only communication between the auxiliary chamber and the atmosphere and being designed for the inlet passage of an amount of air substantially less than that desired for idle running of the engine; a member shiftable along its axis within the said auxiliary chamber and controlling at least one of said openings, the ratio of the sectional passage areas of the auxiliary chamber being such that at any position of the shiftable member the area of the inlet opening remains smaller than that of the outlet opening as well as those of all the other cross-sections of this chamber; and a connecting chamber displacing the shiftable member by any movement of the said regulating member in such a manner that the sectional area of the inlet opening becomes still smaller with relation to the sectional area of the outlet opening, the larger the amount of air entering into the main mixing chamber.

10. In a carburetor for internal combustion engines, in combination, a main mixing chamber and a member for regulating the amount of air entering thereinto; an auxiliary mixing chamber being provided with a fuel supply conduit, said auxiliary mixing chamber having an outlet passage opening communicating with said main mixing chamber at a point behind said regulating

member and a small throttle opening, this throttle opening being the only communication between the auxiliary chamber and the atmosphere and being designed for the inlet passage of an amount of air substantially less than that desired for idle running of the engine; a conical pin shiftable along its axis within the said auxiliary chamber and controlling at least one of said openings, the ratio of the sectional passage areas of the auxiliary chamber being such that at any position of the shiftable member the area of the inlet opening remains smaller than that of the outlet opening as well as those of all the other cross-sections of this chamber; a connecting member displacing the shiftable member by any movement of the said regulating member in such a manner that the sectional area of the inlet opening becomes still smaller with relation to the sectional area of the outlet opening, the larger the amount of air entering into the main mixing chamber; and means combined with said connecting member adapted to permit an increase or a reduction of the length of said connection.

11. In a carburetor for internal combustion engines, in combination, a main mixing chamber and an automatic adjusting member for regulating the amount of air entering therein; a throttle valve for regulating the amount of the mixture sucked off from said chamber; an auxiliary mixing chamber provided with a fuel supply conduit, said auxiliary mixing chamber having an outlet passage opening communicating with said main mixing chamber at a point behind said regulating member and a small throttle opening, this throttle opening being the only communication between the auxiliary chamber and the atmosphere and being designed for the inlet passage of an amount of air substantially less than that desired for idle running of the engine; a member shiftable along its axis within the said auxiliary chamber and controlling at least one of the said openings, the ratio of the sectional passage areas of the auxiliary chamber being such that at any position of the shiftable member the area of the inlet opening remains smaller than that of the outlet opening as well as those of all the other cross-sections of this chamber;

and a connecting member displacing the shiftable member of any movement of the said regulating member in such a manner that the sectional area of the inlet opening becomes still smaller with relation to the sectional area of the outlet opening, the larger the amount of air entering into the main mixing chamber.

12. In a carburetor for internal combustion engines, in combination, a main mixing chamber and an automatic adjusting member for regulating the amount of air entering therein; a throttle valve for regulating the amount of the mixture sucked off from said chamber; a piston connected with said air regulating member and being so arranged as to be adjusted on one of its sides to the pressure of the outer air and on the other of its sides to the pressure below atmospheric pressure in the main mixing chamber, and a spring so arranged as to also act on the piston on the side where the pressure below atmospheric pressure is acting; an auxiliary mixing chamber provided with a fuel supply conduit, said auxiliary mixing chamber having an outlet passage opening communicating with said main mixing chamber at a point behind said regulating member and a small throttle opening, this throttle opening being the only communication between the auxiliary chamber and the atmosphere and being designed for the inlet passage of an amount of air substantially less than that desired for idle running of the engine; a member shiftable along its axis within the said auxiliary chamber and controlling at least one of the said openings, the ratio of the sectional passage areas of the auxiliary chamber being such that at any position of the shiftable member the area of the inlet opening remains smaller than that of the outlet opening as well as those of all the other cross-sections of this chamber; and a connecting member displacing the shiftable member by any movement of the said regulating member in such a manner that the sectional area of the inlet opening becomes still smaller with relation to the sectional area of the outlet opening, the larger the amount of air entering into the main mixing chamber.

PAUL SCHÜTTLER.