Feb. 16, 1932. C. G. KEIL 1,845,668

CARBURETOR

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Fig. 1.

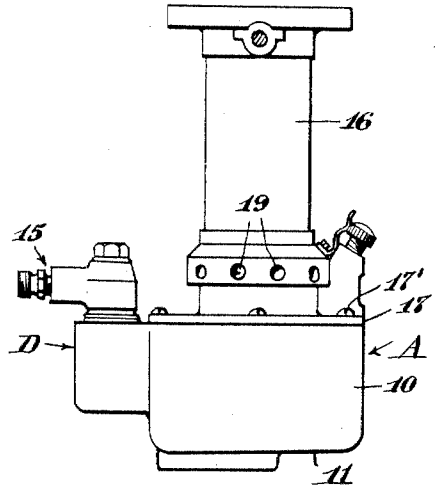
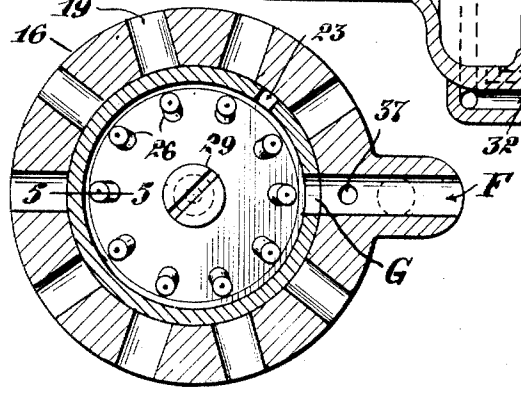


Fig. 2.

Fig. 3.



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Fig. 4.

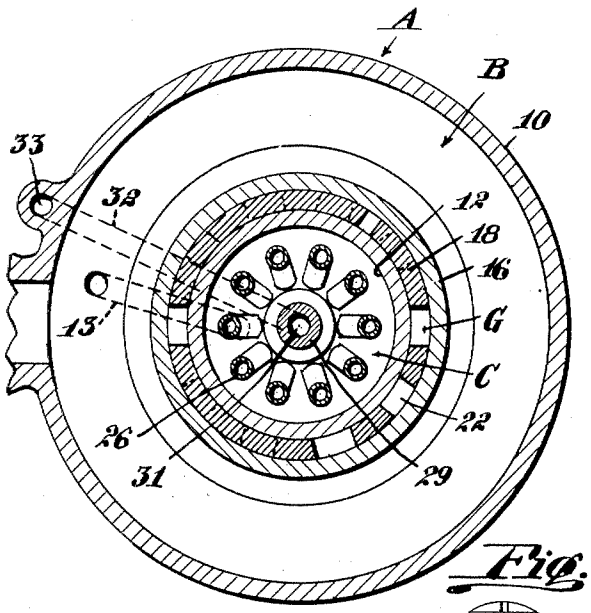


Fig. 5.

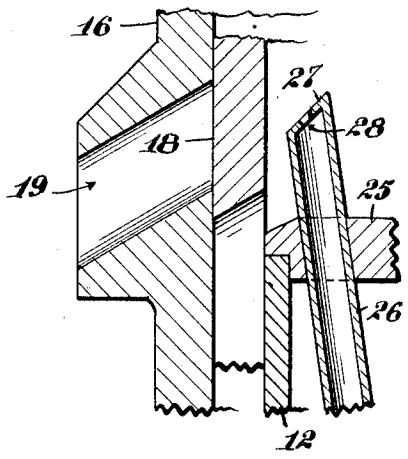


Fig. 8.

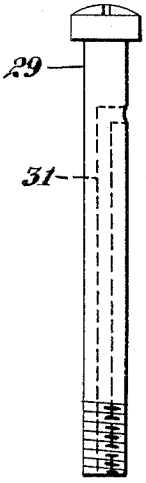


Fig. 9.

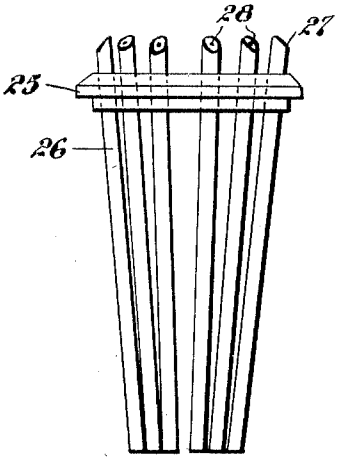


Fig. 6.

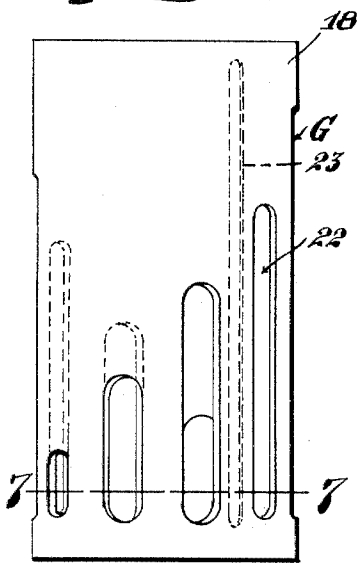
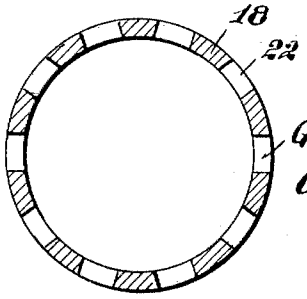


Fig. 7.



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UNITED STATES PATENT OFFICE

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CARBURETOR

Application filed February 26, 1930. Serial No. 431,368.

This invention relates to a carburetor for use in forming an explosive mixture of hydrocarbon vapors and air in the operation of internal combustion engines and more particularly pertains to carburetors of the type in which a hydrocarbon fuel is delivered to a mixing chamber from one or more of a series of jets according to various speeds of operation of the engine and in which the delivery of fuel to the mixing chamber through one or more of the jets is controlled by a sleeve valve actuated by varying negative pressure or partial vacuums induced in the mixing chamber.

An object of the invention is to provide a construction in carburetors of the above-named type whereby flooding of the carburetor will be effectively prevented, and whereby the proper delivery of fuel to the carburetor from a source of supply will be insured throughout varying conditions of operation of the carburetor.

Another object is to provide a carburetor of the above character in which the parts are so formed and arranged as to facilitate their assemblage and to enable their ready removal and replacement.

A further object is to provide a simple construction for affording a counterbalancing of pressures between a pair of fuel-receiving chambers in the carburetor.

With the foregoing objects in view, together with such other objects and advantages as may subsequently appear, the invention resides in the parts and in the combination, construction and arrangement of parts hereinafter described and claimed and illustrated by way of example in the accompanying drawings, in which:—

Fig. 1 is a view of the carburetor as seen in side elevation;

Fig. 2 is a view of the carburetor as seen in vertical section, partly in elevation;

Fig. 3 is a detail in horizontal section and plan as seen on the line 3—3 of Fig. 2;

Fig. 4 is a detail in horizontal section taken on the line 4—4 of Fig. 2 with parts removed;

Fig. 5 is an enlarged fragmentary detail as seen on the line 5—5 of Fig. 3;

Fig. 6 is a view in elevation of the sleeve valve;

Fig. 7 is a view in cross section as seen on the line 7—7 of Fig. 6;

Fig. 8 is a view in elevation of a specially formed bolt employed in the carburetor;

Fig. 9 is a view in elevation illustrating the assemblage of the fuel-feeding jets.

Referring to the drawings more specifically, A indicates generally a carburetor bowl which includes an annular side wall 10, a bottom wall 11 and an upstanding open ended cylinder 12 erected from the bottom wall 11 and spaced inwardly from the wall 10; the upper end of the cylinder 12 terminating on a plane spaced above the upper margin of the side wall 10. The space between the side wall 10 and cylinder 12 constitutes a float chamber B and the space encircled by the cylinder 12 constitutes a well chamber C which is in open communication with the float chamber B through one or more passages 13 formed in the bottom wall 11 and opening at its ends to the chambers B and C.

Arranged in the chamber B is the usual float 14 for controlling the feed of fuel to the float chamber through the usual valve arranged in a housing D on the carburetor bowl constructed and operated in the manner common in carburetors; the fuel being delivered to the valve from a suitable source of supply through a connection 15.

Surrounding the cylinder 12 is a demountable cylinder 16, the lower end of which seats on the bottom wall 11 and the upper end portion of which projects a suitable distance above the upper end of the cylinder 12 and forms interiorly thereof a mixing chamber E. A flange 17 is formed on the cylinder 16 which seats on the upper margin of the wall 10 and forms a cover for the float chamber B; the flange 17 being secured to the wall 10 by screws 17′ whereby the cylinder 16 is affixed to the bowl. The inner peripheral portion of the cylinder 16 surrounding the cylinder 12 is spaced concentric with the outer periphery of the latter and interposed between the cylinders 12 and 16 is a vertically reciprocal and non-rotating sleeve valve 18, the lower end of which normally seats on the bot-

tom wall 11 and the upper end portion of which projects above the upper end of the cylinder 12 and terminates in spaced relation to the upper end portion of the cylinder 16. The inner and outer surfaces of the sleeve valve 18 slidably contact the outer and inner surfaces of the cylinders 12 and 16 respectively.

The cylinder 16 is formed with a series of spaced air inlet openings 19 which open to the interior of the cylinder 16 in cylindrical alignment. The openings 19 lead from the exterior of the cylinder to the interior thereof in an upwardly inclined direction, and are arranged with their inner ends opening on a plane slightly above the upper end of the cylinder 12. The air inlet openings 19 are normally closed by the sleeve valve 18 excepting one of the air inlet openings, indicated at F, which is at all times in open communication with the interior of the sleeve valve through a longitudinally extending slot G formed in the latter.

A valve 21 is provided for adjusting the size of the air intake opening F to regulate the volume of air delivered therethrough; the valve 21 being here shown as in the form of a threaded stem screwed into the wall of the openings F with its inner end projecting into said opening transversely thereof.

The cylindrical sleeve valve 18 is formed with a series of longitudinally extending slots 22 including the slot G which slots terminate at their lower ends on a common plane contiguous the lower margin of the sleeve valve and terminate at their upper ends in stepped relation, there being a slot 22 provided in the sleeve valve for cooperation with each of the air intake openings 19 and being arranged so that as the sleeve valve moves longitudinally within the cylinder 16 successive opening and closing of the air intake openings 19 will be effected according to the length of travel and direction of movement of the sleeve valve.

As a means for holding the sleeve valve 18 against rotation relatively to the cylinder 16 to maintain the openings 22 therein in vertical alignment with the openings 19 in the cylinder, the valve 18 is formed with a longitudinally extending slot 23 into which projects the inner end of a pin or screw 24 carried by the cylinder 16.

Seating on the upper end of the cylinder 12 is a disk 25 which affords a closure for the well chamber C and carried by the disk 25 and projecting upwardly therethrough is a series of tubes 26, the lower ends of which extend to a plane contiguous the bottom of the well chamber C and open to the latter. The upper ends of the tubes 26 project slightly above the upper face of the disk 25 and terminate in inclined end walls 27 presented toward the inner ends of the openings 19; the tubes 26 corresponding in number to the openings 19 and the opening 22 in the sleeve valve 18; there thus being a tube 26 extending in radial alignment with the openings 19 and 22. The upper end 27 of each tube is formed with an aperture 28 constituting a discharge jet.

The disk 25 is held in place on the cylinder 12 by means of a bolt 29 which is passed through a central opening in the disk 25 and is screwed into engagement with an internally threaded recess 30 in the bottom wall 11.

In carrying out the present invention, the bolt 29 is formed with a longitudinally extending passage 31 leading from the lower end of the bolt where it communicates with the recess 30 and which opens at its upper end through the side of the bolt at a point near the disk 25; the passage 31 thus communicating at its upper end with the well chamber C. Formed in the bottom wall 11 and leading from the recess 30 is a passage 32 which communicates with a passage 33 formed in the side wall 10 and opening to the float chamber B adjacent the top wall 17 of the latter. The passages 31, 32 and 33 provide an open communication between the upper portions of the chambers B and C which communication serves as a means for affording counter-balancing or equalizing the pressures in the chambers B and C. This communication constitutes an important feature of the present invention in that it serves as a means for preventing flooding of the carburetor.

The bottom wall 11 is formed with a plurality of openings 34 leading from atmosphere and opening to the space between the cylinders 12 and 16 directly beneath the lower margin of the sleeve valve 18 whereby atmospheric pressure may be imposed on the lower end of the sleeve valve. The openings 34 are fitted with upwardly opening ball-check valves 35 which normally close the openings 34 except as to by-pass channels 36 formed in the valve seat.

A vent aperture 37 is formed in the flange 17 to lead from the upper portion of the float chamber B to the air intake opening F.

The upper end of the cylinder 16 is adapted to be connected to the intake manifold of an internal combustion engine and is fitted with a throttle valve 38 in an ordinary manner.

In the operation of the invention, a hydrocarbon fuel is delivered to the chamber B in the bowl of the carburetor in the usual manner under the control of the float 14; a portion of the fuel being delivered to the well chamber C through the passage 13.

The vent aperture 37 affords a means for the passage of air to and from the float chamber B to maintain atmospheric pressure in the latter, and the communication between the chambers B and C afforded by the passages 31, 32 and 33 in equalizing the pres-

sures in these chambers causes the liquid fuel to seek common levels in said chambers. The lower ends of the tubes 26 in terminating adjacent the bottom wall 11 are normally submerged in the liquid fuel in the well chamber C; the supply of the fuel to the chamber B beng such as to maintain the fuel level in the chambers B and C above the lower ends of the tubes 26.

During idling of the engine with which the carburetor is associated a suction is induced in the mixing chamber E which causes air to flow inwardly through the air inlet opening F; a stream of air being thus caused to pass through the opening F and slot G over the end of the jet arranged opposite the slot G. The stream of air passing over the jet acts to induct fuel therethrough from the well chamber C in sufficient quantity as to form a mixture of fuel vapors and air in the mixing chamber D sufficient to effect idling operation of the engine. Upon accelerating the speed of the engine an increased suction is created in the mixing chamber which in forming a negative pressure above the sleeve valve 18 will cause the latter to move upwardly by reason of atmospheric pressure being imposed on the lower end thereof; air then passing through the openings 34 and effecting opening of the check valves 35. As the sleeve valve elevates, the openings 22 therein successively uncover other of the air inlet openings 19 thereby admitting streams of air therethrough which will act on their associated jets to increase the quantity of fuel delivered to the mixing chamber from the well chamber. The number of jets thus placed in operation will vary according to the speed of the engine operation. When the engine is operating at high or maximum speed the sleeve valve will be elevated to such a point as to uncover all the openings 19 and thereby place all the jets in operation.

On deceleration of the engine, reduction in the negative pressure in the chamber E takes place whereupon the sleeve valve gravitates downwardly and effects successive closing of the air intake openings 19 and thereby reduces the number of jets in effective operation and, accordingly, diminishes the supply of fuel to the mixing chamber. Downward movement of the sleeve valve is retarded by reason of air being entrapped therebeneath by the check valves 35 which entrapped air, however, will escape through the by-pass channels 36 so as to permit downward movement of the sleeve valve during the operation.

In the invention as above described the fuel delivered from the well chamber C is replaced by fuel which enters the well chamber C from the float chamber B through the passage 13. Any suitable number of passages 13 are provided to insure proper replenishing of the fuel supply in the well chamber. By the provision of the pressure equalizing passages 31, 32 and 33 the flow of fuel from the float chamber to the well chamber is insured and flooding of the carburetor is obviated as the levels of the fuel in the chambers B and C will correspond. This constitutes an important feature of the present invention as it prevents excessive filling of the well chamber relatively to the filling of the float chamber as might occur on effecting sudden acceleration of the engine which would create a negative pressure in the well chamber and thereby cause an inrush of fuel from the float chamber by reason of atmospheric pressure in the latter thereby causing rapid lowering of the level of liquid in the float chamber and consequent opening of the float control valve and a consequent inrush of fuel from the source of supply to the chamber B. Should this occur deceleration of the engine would cause the column of liquid in the well chamber to flow back into the float chamber and thereby flood the latter.

While I have shown and described the specific embodiment of my invention, I do not limit myself to the exact details of construction and arrangement shown but may employ such modifications and changes in their parts and arrangement as come within the meaning and scope of the appended claims.

I claim:

1. In a carburetor, a bowl having a side wall and a bottom wall, said bowl forming a float chamber, a cylinder erected from said bottom wall forming a well chamber, a passage in said bottom wall forming a communication between the lower portions of said float chamber and said well chamber, a cylinder encircling said first-named cylinder and spaced therefrom having a lower portion projecting into said float chamber and seating on said bottom wall and having an upper portion projecting above said first-named cylinder forming a mixing chamber, a series of air intake openings in said last-named cylinder, a disc closing the upper end of said first-named cylinder, a series of tubes carried by said disc leading therethrough having their lower ends terminating adjacent said bottom wall and opening to said well chamber and having their upper ends projecting above said disc and opening to said mixing chamber adjacent said air inlet opening, there being one of said tubes arranged to open opposite each of the air intake openings, and a vertically reciprocal sleeve valve interposed between said cylinders having a series of longitudinally extending slots of different lengths arranged to dispose a slot in vertical alignment with each of said air intake openings, one of said slots affording a communication between one of said air inlet openings and said mixing chamber when said sleeve valve is in its lowermost position and the remaining of said slots being ar-

ranged to effect successive opening and closing of said air inlet openings on upward and downward movement of said sleeve valve.

2. In a carburetor, a bowl having a side wall and a bottom wall, said bowl forming a float chamber, a cylinder erected from said bottom wall forming a well chamber, a passage in said bottom wall forming a communication between the lower portions of said float chamber and said well chamber, a cylinder encircling said first-named cylinder and spaced therefrom having a lower portion projecting into said float chamber and seating on said bottom wall and having an upper portion projecting above said first-named cylinder forming a mixing chamber, a series of air intake openings in said last-named cylinder, a disc closing the upper end of said first-named cylinder, a series of tubes carried by said disc leading therethrough having their lower ends terminating adjacent said bottom wall and opening to said well chamber and having their upper ends projecting above said disc and opening to said mixing chamber adjacent said air inlet opening, there being one of said tubes arranged to open opposite each of said air intake openings, a vertically reciprocal sleeve valve interposed between said cylinders having a series of longitudinally extending slots of different lengths arranged to dispose a slot in vertical alignment with each of said air intake openings, one of said slots affording a communication between one of said air inlet openings and said mixing chamber when said sleeve valve is in its lowermost position and the remaining of said slots being arranged to effect successive opening and closing of said air inlet openings on upward and downward movement of said sleeve valve, and means for equalizing pressures in said float chamber and well chamber.

3. In a carburetor, a bowl having a side wall and a bottom wall, said bowl forming a float chamber, a cylinder erected from said bottom wall forming a well chamber, a passage in said bottom wall forming a communication between the lower portions of said float chamber and said well chamber, a cylinder encircling said first-named cylinder and spaced therefrom having a lower portion projecting into said float chamber and seating on said bottom wall and having an upper portion projecting above said first-named cylinder forming a mixing chamber, a series of air intake openings in said last-named cylinder, a disc closing the upper end of said first-named cylinder, a series of tubes carried by said disc leading therethrough having their lower ends terminating adjacent said bottom wall and opening to said well chamber and having their upper ends projecting above said disc and opening to said mixing chamber adjacent said air inlet opening, there being one of said tubes arranged to open opposite each of said air intake openings, a vertically reciprocal sleeve valve interposed between said cylinders having a series of longitudinally extending slots of different lengths arranged to dispose a slot in vertical alignment with each of said air intake openings, one of said slots affording a communication between one of said air inlet openings and said mixing chamber when said sleeve valve is in its lowermost position and the remaining of said slots being arranged to effect successive opening and closing of said air inlet openings on upward and downward movement of said sleeve valve, a bolt connecting said disc to said bottom wall having a passage leading longitudinally therethrough and opening to the upper portion of said well chamber, and a passage formed in said bowl affording a communication between the passage in said bolt and the upper portion of said mixing chamber.

4. In a carburetor, a bowl forming a float chamber, said bowl including a bottom wall and a side wall, a cylinder erected from said bottom wall forming a well chamber, a passage in said bottom wall affording a communication between the lower portions of said float chamber and said well chamber, a disc seating on the upper end of said cylinder, a bolt extending between said disc and said bottom wall within said well chamber having a longitudinal passage opening to the upper portion of said well chamber, a passage leading from the lower end of the passage in said bolt opening to the upper portion of the float chamber, and means through which fuel may be inducted from said well chamber through said disc.

5. In a carburetor, a bowl forming a float chamber, a cylinder in said bowl forming a well chamber, a fuel communication between the lower ends of said chambers, a disc seating on the upper end of said cylinder, a series of tubes extending through said disc arranged with their lower ends opening adjacent the bottom of said well chamber and having their upper ends projecting above said disc, a cylinder encircling said first-named cylinder and extending thereabove to form a mixing chamber and formed with a series of air intake openings disposed with the inner end of each opening opposite the upper end of one of said tubes, a vertically reciprocal sleeve valve interposed between said cylinders having a longitudinally extending slot the upper portion of which affords a communication between one of said air inlet openings and said mixing chamber when said sleeve valve is in its lowermost position, and a series of stepped longitudinally extending slots in said sleeve valve arranged to successively uncover said air inlet openings as said sleeve valve moves upwardly; the upper ends of said tubes having inclined walls presented towards the inner

ends of said air inlet openings formed with jet apertures.

6. In a carburetor having a float chamber, a well chamber surrounded by said float chamber, a fuel communication between the lower portions of said chambers, a mixing chamber arranged above said well chamber, a multiple of jets affording a communication between said mixing chamber and said well chamber for delivering liquid fuel from said well chamber to said mixing chamber on suction being induced in the latter, means controlled by variations of negative pressure created in said mixing chamber for rendering a number of said jets effective or ineffective; and a communication between the upper portions of said float chamber and said well chamber for equalizing pressures therein.

In witness whereof, I hereunto affix my signature.

CHARLES G. KEIL.