F. L. KINGSTON.

CARBURETER.

APPLICATION FILED MAR. 4, 1914.

1,194,297. Patented Aug. 8, 1916.

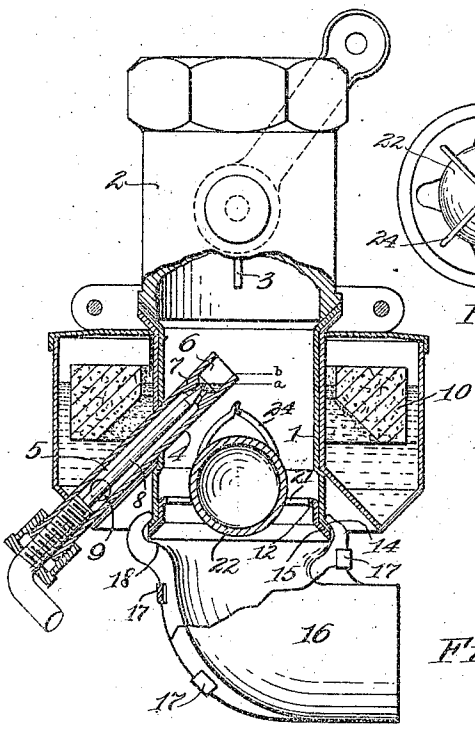


FIG. 1.

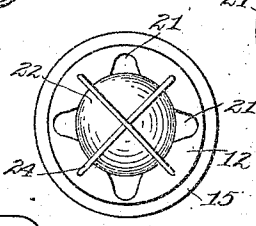


FIG. 2.

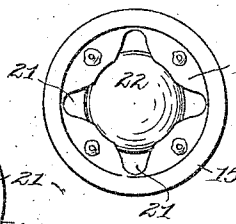


FIG. 3.

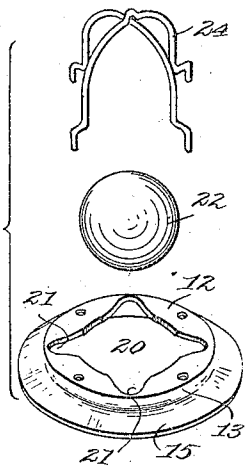


FIG. 10.

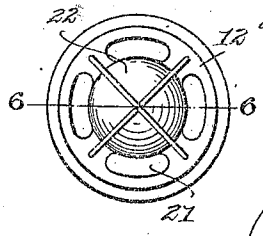


FIG. 4.

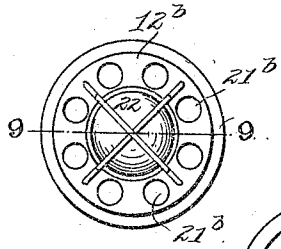


FIG. 7.

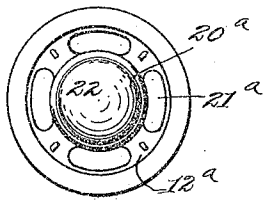


FIG. 5

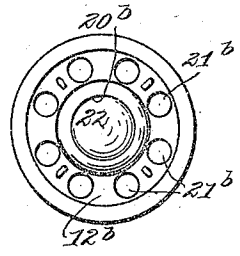


FIG. 8.

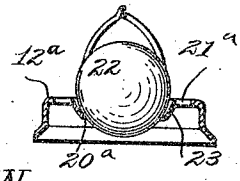


FIG. 6.

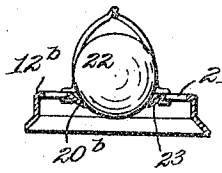


FIG. 9.

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CARBURETER.

1,194,297. Specification of Letters Patent. Patented Aug. 8, 1916.

Application filed March 4, 1914. Serial No. 822,266.

To all whom it may concern:

Be it known that I, FRANK L. KINGSTON, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Carbureters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to carbureters and has for its general object the provision of a carbureter of greater efficiency than previous devices of this character, together with a decided decrease in complexity and cost of manufacture.

Further and more specifically stated, the objects of this invention are the provision of a device of this character wherein the carbureting chamber is formed without pockets or chambers in which any excess of combustible liquid can become lodged and temporarily escape evaporation; the provision of new and improved expedients for directing the inflowing air upon the liquid discharge nozzle; the provision of new and improved expedients for permitting an increase in the amount of air admitted upon an increase in speed of the engine; the provision of new and simplified means for securing together the parts of the carbureter whereby the construction is cheapened; while further objects and advantages of the invention will become apparent as the description proceeds.

In previous carbureters it has been suggested to provide the carbureting chamber with certain air admission apertures which shall remain open at all times and with other air admission apertures arranged to be opened upon an increase in the speed of the engine so as to permit the admission of an excess of air. These sets of apertures have frequently been separated to a greater or less degree by walls or partitions within the carbureting chamber, and it has been found that in some instances an excess of gasolene injected into the chamber would become trapped in one of these pockets where it would not be dislodged or evaporated during the normal running of the engine, but would become available as soon as the excess air apertures were opened; the result being that instead of a further decrease in the richness of the charge as would be expected and desired, there would be a sudden very great enrichment of the same with the result that the engine would operate unevenly. According to my present invention I avoid this difficulty by avoiding all such walls or partitions, substituting other means for concentrating the air stream upon the end of the fluid nozzle, the means here shown consisting of a rounded, or spherical body about which the air current may flow, and which also, in the preferable embodiment, forms the valve whereby excess air is admitted at high speed. This construction also gives rise to certain additional very marked advantages as will hereafter be pointed out.

In the drawings accompanying and forming a part of this application, and in which one embodiment of my invention is illustrated, Figure 1 is a vertical, central, cross-sectional view through my improved carbureter; Fig. 2 is a top plan view of the preferred form of closure member for the bottom of the carbureting chamber; Fig. 3 is a bottom plan view of the same; Fig. 4 is a top plan view similar to Fig. 2 showing a modified form of closure member; Fig. 5 is a bottom plan view of the devices shown in Fig. 4; Fig. 6 is a vertical, cross-sectional view taken on the line 6—6 of Fig. 4; Fig. 7 is a top plan view of a third form of closure device; Fig. 8 is a bottom plan view of the parts shown in Fig. 7; Fig. 9 is a vertical, cross-sectional view taken on the line 9—9 of Fig. 7; and Fig. 10 is a perspective view of the parts of the preferred type of closure member, the same being shown separated from each other.

Describing the parts by reference characters, my improved carbureter comprises a cylindrical carbureting chamber 1, preferably supported in an upright position and having at its upper end a suitable fitting 2 whereby it may be connected to the inlet manifold of an internal combustion engine in the usual manner, this fitting being preferably provided with a throttle valve 3 which may be of the butterfly type as shown. Projecting into the side of this carbureting chamber and preferably at an oblique angle is a nozzle tube 4 which is preferably formed with an enlarged bore at each end as indicated at 5 and 6 respectively, there being a constricted portion 7 between these bores, such constricted portion being preferably spaced from the discharge end of the tube by a distance equal to substantially the tube's diameter. Also the length of the constricted portion is preferably made very short so as to diminish as much as possible

the frictional opposition to the passage of the liquid therethrough. Adjustably mounted in the outer end of the tube 4 is a suitable needle valve 8, arranged to seat upon the constriction 7 to close the fuel supply. So far as the operation of the carbureter is concerned the relative shape of the needle valve and constriction is immaterial, but preferably the end of the needle valve and the portion of the constriction upon which it seats are ground to the same angle so as to minimize the possibility of sticking or deformation.

The bore 5 of the tube communicates with the fuel receptacle by means of a suitable aperture 9. The nozzle tube is mounted at an angle partly to cause the bore 6 at its inner end to form a kind of cup, and partly to afford a communication between the inner end and the liquid in the receptacle, and partly because the oblique arrangement of the opening at the end of the tube seems to facilitate the carburation of the air.

The fluid receptacle is here shown as surrounding the chamber 1, although so far as concerns my present invention any suitable or convenient type of receptacle could be employed. However an annular receptacle with the nozzle tube exactly at its center is the preferred arrangement because of the fact that the liquid level at the nozzle can be rendered independent of the inclination of the carbureter. Whatever the nature of the receptacle the same is provided with a float valve or other liquid controlling device whereby a liquid level is maintained substantially at but not above the level of the lower edge of the cup 6. In the present embodiment the float is indicated at 10 and is adjusted to maintain the level of liquid at a point not lower than *a* nor higher than *b* and preferably at the lower of these levels. This causes a small quantity of the fuel to remain inside the cup while the engine is still, and forms a priming charge to aid in starting. Also this arrangement appears to afford a double atomizing action, the first taking place at the end of the bore 7 and the second at the lip of the cup 6. It will be understood that when the engine is running the cup 6 is empty of liquid, the swirling of the air stream about the lip of the cup serving to break up the liquid into spray at the instant of its issuance from the orifice 7. This spray is subdivided again by the air stream blowing past the lip of the cup.

The lower end of the carbureting chamber is provided with a closure member arranged to vary the amount of air admitted depending upon the engine suction, and also to distribute this entering air throughout the whole carbureter chamber so as to sweep the entire interior thereof. In its preferred form this closure member consists of a thin circular sheet metal plate 12 having a flange 13 whereby it may be steadied within the chamber. In the embodiment shown in Fig. 1, the wall of the chamber is flared at its lower end as shown at 14 and the margin of the flange 13 similarly flared as shown at 15, these flaring portions being held in place by having a suitable clamping member secured thereover.

In the present embodiment I have shown an elbow member 16 formed from sheet metal into longitudinal separable halves, adapted to be secured together by means of flexible tongues 17, one end of this elbow being interiorly grooved or embossed as at 18 so as to embrace the portions 14 and 15. This elbow can be turned in any direction to receive the air or for the connection of an air supply pipe.

The central portion of the plate 12 is formed with an aperture 20, and the web of the plate with additional apertures or passageways 21. In the embodiment shown in Figs. 1, 2, 3 and 10 the apertures or passageways 21 are formed as branches of the central aperture and the reason for this will be pointed out hereafter. Seated upon the edges of the aperture 20 is a ball valve 22, whose size and weight are determined by considerations hereinafter set forth, while a suitable cage 24 is provided for preventing the too great displacement of the ball 22. With this construction it will be found that, due to the thinness of the plate 12 a very great quantity of air will pass through the apertures or passageways 21 owing to the smallness of the friction upon the edges of the openings. Immediately after passing this plate the air expands markedly, also following around the curvature of the ball 22 so as to sweep the entire chamber, but with slightly greater velocity along the axis of the chamber than at the walls thereof. The rapid passage of the air stream past the ball 22 causes a region of low pressure immediately above the ball, which region persists up the axis of the carbureting chamber for a considerable distance. This axial low-pressure region causes the air passing through the chamber to converge toward the axis for a distance, and then expand again, and the spray nozzle is located so as to touch this axial low-pressure region, preferably at the point of greatest convergence of the air stream. It is a well known physical fact that the point of highest velocity and of lowest pressure are always the same, wherefore the location of the nozzle at this point permits the highest aspirating and atomizing effect upon the liquid and its most thorough mixing with the air. In case the speed of the engine shall increase, the degree and extent of this low pressure region will also increase, thus increasing the flow both of air and fuel, and with a proper choice of ball valve as to weight and size

the same will be lifted so as to uncover more or less of the aperture 20. With this increase of vacuum surrounding the nozzle an increasingly rapid fuel flow is secured, but it is also found that this increasing vacuum serves to deflect the air stream more sharply about the ball, thus rendering the point of maximum convergence of the air stream substantially stationary within the carbureting chamber throughout a considerable range of movement of the ball. So long as the ball is forced to remain within the proper range of movement, this point of maximum convergence may be maintained substantially at the lower lip of the nozzle, which is the most favorable condition; the position of the plate 12 within the chamber is adjusted to define one limit of this movement and the height of the cage 24 to define the other limit of this movement, and the variation of air and fuel supply obtainable within this range of movement is sufficient for the needs of any one make of engine. The location of this plate 12 along the axis of the chamber must be made with great accuracy since a change of 1-64th inch in either direction from the position of highest efficiency will injure greatly the operation of the device. Inasmuch as this location depends upon the diameter of the chamber, the size of the openings, the position of the spray nozzle, and the character of the engine, it is impossible to give any direction that will apply to all conditions but it is possible to make an adjustable plate and set it experimentally to the point where the engine runs most efficiently (which can be very easily determined) and when this has been done all other carbureters when made to the same measurement will be found to operate with equal accuracy with engines of the same make and type, so that no adjustment of the plate is necessary in any carbureter except the first.

The size of the ball may be varied within reasonable limits without affecting materially the operation of the carbureter, and this property taken in connection with the possibility of obtaining balls of different weights (as by making them with walls of differing thickness or alloys) renders it possible to choose a ball which will rise from its seat at the proper speed increase and regulate at all times the rate of air admission. This, also, can be found only by experiment but the determination is not difficult. It will be understood that the size of the ball is determined by the size of the chamber and the size of the apertures 21. The weight of the ball must be adjusted without materially varying the size which is best done by making same hollow with its walls of varying thickness, care being taken to keep such thickness uniform so that the ball will be balanced. The best plan is to form the ball of sheet metal by the use of suitable punches and dies.

In case the ball 22 be lifted from its seat, the air entering through the central aperture 20 will also tend to follow the circumference of the ball and will likewise be discharged mainly along the axis of the carbureting chamber. Thus, whether the air enters only through the marginal apertures or through both marginal and central apertures, the main force of the stream is confined to the center of the chamber and without the employment of walls or partitions whereby any part of the fluid fuel may be entrapped or by which uniformity of discharge can be destroyed. In addition the convergence of these upwardly moving streams of air sets up a marked swirling movement in the air column thus serving to atomize and break up the liquid fuel with great efficiency, and to mix all portions of the charge thoroughly together so that a very uniform mixture is obtained.

In Figs. 4, 5 and 6 I have illustrated a modified form of closure member in which the marginal apertures 21^a are distinct from the central aperture 20^a, and are of accurate form, following the circumference of the ball 22.

In Figs. 7, 8 and 9 I have illustrated another form of closure member in which the marginal apertures 21^b are distinct from the central aperture 20^b, but are of circular form, a larger number being employed to obtain the requisite area. In both of these modifications the central portion of the plate between the apertures 21^a or 21^b and the corresponding central aperture 20^a or 20^b is depressed as shown at 23 so as to bring the upper face of the plate 12^a or 12^b more nearly to the plane of the center of the ball valve and thus to cause the air entering these apertures to pass tangentially by the ball. In case a flat plate is used the device, though still operative, will be found less efficient than before, apparently because of the fact that the air expands too far beneath the ball and the latter, instead of operating to converge the air stream, serves to spread and confuse it. The same difficulty is encountered if the ball is made too large. On the other hand if the ball be made too small its effect will also be decreased, although with less detriment to the operation than in case the ball be made too large.

The size and total area of the apertures 21 will vary for different engines and no definite rule can be laid down except that an engine of high suction requires a larger aperture area. Also the size of the aperture 20 and the weight of the ball 22 will depend upon the size of the apertures 21 and the peculiarities of the engine which cause it to require excess air at a higher or lower speed. Owing to the great diversity among engines

and the impossibility of forecasting their performance it is impossible to state the conditions to be provided, but it is entirely feasible to find the various dimensions, relations, and adjustments by experiment as is always done with carbureters and hence will be well understood by those skilled in the art.

The only advantage of the closure member illustrated in Figs. 1, 2, 3 and 10 over those shown in Figs. 4 to 9 inclusive lies in the more uniform regulation which the former device appears to permit. In case the marginal apertures are distinct from the central aperture, the ball 22 will not rise until the engine suction has reached a comparatively high point and will then rise with a sudden jump, making a very sudden change in the mixture; conversely, however, when the engine is slowed down the ball will not subside to its seat until the suction has fallen to a much lower point than that at which it rose. In case the marginal apertures are made as branches of the central aperture, as in Figs. 1, 2, 3 and 10 hereof, the ball rises at a much earlier point in the operation of the engine and the dilution of the mixture is much more gradual. As regards the concentration of the air upon the fuel nozzle and the vortical effect along the axis of the carbureting chamber, all of the modifications here shown exhibit the same effect.

Another feature of my invention that I consider novel and important is the admission of the normal air supply at a point outside of the excess air supply, whereby two important objects are attained: first, that the convergence and mingling of these streams upon the fuel nozzle produces a more complete and uniform carburation, and second that the walls of the chamber are always kept dry and free from fuel. In addition the combined action of the air admission devices here disclosed and the peculiar form of fuel nozzle illustrated produce better results than with any other type of nozzle with which I am familiar. It is possible to substitute other types of nozzle and still operate the carbureter with a considerable degree of success, but the peculiar air condition obtained in this carbureter first causes the fuel liquid to be broken up into spray immediately upon its issuing from the constriction 7 and the rush of the air stream past the lip of the nozzle causes a second atomizing of this spray. This action is totally independent of the shape of the needle or the needle seat or the length of the needle, and, in addition, the presence of the cup 6 prevents flooding while still affording an excess of fuel for starting purposes. The only essential requirement is that the nozzle (in case this cup nozzle be employed) must be located obliquely to the air stream, in which case the double atomizing above explained will be obtained.

It will be apparent that a great many changes in design, shape, arrangement, construction and proportion of parts can be made without departing from my inventive idea or sacrificing the advantages or mode of operation of my improved carbureter, and all such modifications I esteem within the purview of my patent rights.

Having thus described my invention, what I claim is:—

1. In a carbureter, the combination, with a cylindrical carbureting chamber, and a fluid fuel supply nozzle projecting into said chamber and communicating with a source of fluid fuel supply, said chamber communicating at one side with an inlet fitting, of a closure traversing said chamber at the opposite side of said nozzle from said fitting, said closure having a central high-suction air-inlet and also having a plurality of low-suction air-inlets surrounding said central inlet, and means located in the center of said chamber and spaced from the wall thereof for concentrating upon said nozzle the air entering through all of said inlets.

2. In a carbureter, the combination, with a carbureting chamber and a nozzle tube projecting into said chamber, of a rounded body supported at one side of said nozzle, and means for admitting air to said chamber at the sides of said body whereby such entering air will follow the curvature of said body and be concentrated upon said nozzle.

3. In a carbureter, the combination, with a carbureting chamber having an air inlet and a mixture outlet at opposite points, and a nozzle tube projecting into said chamber between said inlet and outlet, of a rounded body located in said chamber between said inlet and said nozzle tube and having a diameter greater than that of the nozzle tube, whereby the entering air will follow the curvature of said body and be concentrated upon said nozzle.

4. In a carbureter, the combination, with a fluid fuel receptacle and a carbureting chamber, of a nozzle tube communicating with such receptacle and projecting into said carbureting chamber, a plate supported transversely of the lower end of said chamber and having a plurality of air-inlet apertures arranged around its periphery, and means located inside said chamber between said plate and said nozzle for concentrating upon the discharge end of said nozzle the air entering through all of said apertures.

5. In a carbureter, the combination, with a fluid fuel receptacle and an upright carbureting chamber, of a nozzle tube communicating with such receptacle and projecting into said carbureting chamber, between its upper and lower ends a plate sup-

ported transversely of the lower end of said chamber and having a plurality of air-inlet apertures arranged around its periphery, and a rounded smooth-surfaced body supported in said chamber between said plate and said nozzle and having a diameter substantially equal to the diameter of the circle inscribed within said apertures, whereby the air entering through said apertures may be deflected around the surface of said body and concentrated upon said nozzle.

6. In a carbureter, the combination, with a carbureting chamber and a fluid fuel nozzle projecting into said chamber and communicating with a source of fluid fuel supply, said chamber communicating at one end with an inlet fitting, of a plate traversing said chamber at the opposite side of said nozzle from said inlet fitting, said plate having a central seating portion and a plurality of circularly arranged air-inlet apertures surrounding said seating portion, and a smooth-surfaced spherical body located in said seating portion, the diameter of said body being such that the air entering said apertures will pass tangentially thereof so as to be concentrated upon said nozzle tube.

7. In a carbureter, the combination, with a carbureting chamber and a fluid fuel nozzle projecting into said chamber and communicating with a source of fluid fuel supply, said chamber communicating at one end with an inlet fitting, of a plate traversing said chamber at the opposite side of said nozzle from said inlet fitting, said plate having a central seating portion and a plurality of peripherally arranged air-inlet apertures surrounding said seating portion, the center of said seating portion being cut away to form an aperture, and a spherical valve member located above said seating portion and arranged to seat upon the edges of said last-named aperture, the diameter of said member being such that the air entering through said first-named apertures will pass tangentially thereof and be concentrated upon said nozzle tube, and the weight of such valve member being such as to permit it to be displaced upon the occurrence of a predetermined difference of pressure within and without said chamber whereby the amount of air admitted may be increased.

8. In a carbureter, the combination, with a substantially upright carbureting chamber and a fluid fuel nozzle projecting thereinto and communicating with a source of fluid fuel supply, the upper end of said chamber being in communication with an inlet fitting, of a closure member for the lower end of said chamber and having a central aperture and a plurality of circumferential apertures arranged therearound, and a spherical valve member located within said chamber upon said closure member and adapted to cover said central aperture to close the same, the diameter of said valve member being such that the air entering said circumferential apertures will pass by the same substantially tangentially and thereby be converged upon said nozzle tube.

9. In a carbureter, the combination, with a substantially upright carbureting chamber and a fluid fuel nozzle projecting thereinto and communicating with a source of fluid fuel supply, the upper end of said chamber being in communication with an inlet fitting, of a closure member for the lower end of said chamber and having a central aperture and a plurality of circumferential apertures grouped around the same, a spherical valve member located within said chamber upon said closure member and adapted to rest upon said central aperture to close the same, the diameter of said valve member being such that the air entering said circumferential apertures will pass by the same substantially tangentially and thereby be converged upon said nozzle tube, and a skeleton cage secured to said closure member and arranged to limit the displacement of said valve member from its seat.

10. In a carbureter, the combination, with a tubular member defining a carbureting chamber, the lowermost portion of said tubular member being flared outwardly, of a closure member adapted for insertion into the lower end of said tubular member and having a flaring portion arranged to contact with said first flaring portion, and a channeled connecting member adapted to embrace said flared portions and hold the same together.

11. In a carbureter, the combination, with a tubular member defining a carbureting chamber, the lowermost portion of said tubular member being flared outwardly, of a closure member adapted for insertion into the lower end of said tubular member and having a flaring portion arranged to contact said first flaring portion, and an elbow member split into two longitudinal halves and having at one end an internal peripheral groove arranged to be disposed around said flared portions whereby the same may be held together.

12. In a carbureter, the combination, with an upright carbureting chamber and a fluid fuel nozzle projecting thereinto from one of the side walls thereof and making an oblique angle with the chamber axis, said nozzle terminating in an obliquely opening cup located substantially in the axis of said chamber, the upper end of said chamber being arranged for connection to the inlet pipe of an engine, of a closure traversing the lower end of said chamber and having high-suction and low-suction, air-admission openings, and means for directing the air

entering through all said openings closely past the edge of said cup.

13. In a carbureter, the combination, with an upright carbureting chamber and a fluid fuel nozzle projecting thereinto from one of its side walls and communicating with a source of liquid fuel supply, said nozzle terminating in a cup located substantially in the axis of said chamber and having a restricted inlet at a point lower than its lip, of a closure traversing the lower end of said chamber and having high-suction and low-suction air-admission openings, and means for directing the air entering through all of said openings closely past the lip of said cup, the plane of said lip making an oblique angle with the direction of the air stream.

14. In a carbureter, the combination, with a fuel liquid receptacle and an elongated carbureting chamber, of a fluid fuel nozzle projecting thereinto from one of its side walls and communicating with said receptacle, said nozzle terminating in a cup located substantially in the axis of said chamber and having a restricted inlet at a point lower than its lip, one end of said chamber being arranged for connection to the inlet of an engine, a closure traversing the other end of said chamber and having air-admission openings, means for directing the air entering through all of said openings closely past the lip of said cup, the plane of the cup lip making an oblique angle with the direction of said air stream, and means for maintaining in said receptacle a level of fluid fuel at a point lower than said cup lip and higher than said liquid inlet.

15. In a carbureter, the combination, with a carbureting chamber having an air inlet and a mixture outlet at opposite points, and a nozzle tube projecting into said chamber between inlet and outlet, of a rounded body located in said chamber between said inlet and said nozzle tube and having a diameter greater than that of said nozzle tube, the distance between said body and said nozzle tube being such that the edge of the tube falls substantially at the point of maximum concentration of the air stream flowing around said body.

16. In a carbureter, the combination, with an upright carbureting chamber and a nozzle tube projecting into said chamber between the top and bottom of the same there being a mixture outlet at the chamber-top and an air inlet at the bottom, of a thin metal plate traversing said chamber beneath said nozzle tube and having a central aperture and a plurality of apertures surrounding the central aperture, and a spherical valve member covering said central aperture and having a diameter not greater and not materially smaller than the diameter of the circle inscribed within said surrounding apertures, the distance between said plate and said nozzle tube being such as to bring the latter into the region of maximum concentration of the air stream passing around said valve.

17. In a carbureter, an upright carbureting chamber, a nozzle tube projecting inwardly through the walls thereof, and an air inlet device beneath said nozzle tube and in the same chamber therewith, the high-suction air inlet being valved and being located directly in line with said nozzle tube, and such valve being shaped to concentrate upon said nozzle all the air entering the bottom of said chamber.

18. In a carbureter, the combination, with an upright carbureting chamber and a fluid fuel nozzle projecting into said chamber intermediate its ends, one end of said chamber being arranged for attachment to an inlet manifold and the other end having an apertured closure, of a hollow metal valve member of spherical shape within said chamber and adapted to seat upon said closure to obstruct an aperture therein, the diameter of said valve member being selected to cause the air stream to become concentrated upon said nozzle and its weight being selected to cause its obstructing effect to vary with the suction.

19. In a carbureter, the combination, with an upright carbureting chamber and a fluid fuel nozzle projecting into said chamber intermediate its ends, one end of said chamber being arranged for attachment to an inlet manifold and the other end having an apertured closure, of a hollow spherical valve member made of sheet metal and located within said chamber and arranged to seat upon said closure and obstruct the passage of air through the apertures thereof, the thickness of the walls of said valve member being everywhere the same.

20. In a carbureter, the combination, with a carbureting chamber and a fluid fuel nozzle projecting into said chamber and communicating with a source of fluid fuel supply, said chamber communicating at one end with an inlet fitting, of a closure for said chamber at the opposite side of said nozzle from said inlet fitting, said closure having a seating portion and a plurality of air inlet openings arranged around said seating portion, the center of said seating portion being cut away to form an aperture, and a hollow, metal, valve member located above said seating portion and arranged to cover said last aperture, the diameter of said member being such that the air entering said first named openings will pass closely by the same, and the thickness of its walls being such as to permit it to be elevated from its seat upon the occurrence of a predetermined difference of pressure within and without

said chamber, whereby the amount of air admitted may be rendered proportional to the engine speed.

21. A carbureter having a carbureting chamber, a liquid fuel nozzle in said chamber, there being a mixture outlet from said chamber at one side of said nozzle and a plurality of air inlets at the other side of said nozzle, certain air inlets being arranged for high suction and others for low suction, and all of said air inlets communicating with said chamber at the opposite side of said nozzle from said mixture outlet, valve means coöperating with said high suction inlets and arranged to be opened upon a predetermined increase in engine suction, and provisions for concentrating upon the mouth of said nozzle the air entering through all of said inlets.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

FRANK L. KINGSTON.

Witnesses:
HAROLD E. SMITH,
BRENNAN B. WEST.