T. J. HART.

CARBURETER.

APPLICATION FILED NOV. 26, 1909.

**1,001,950.** **Patented Aug. 29, 1911.**

2 SHEETS—SHEET 1.

Fig. 1.

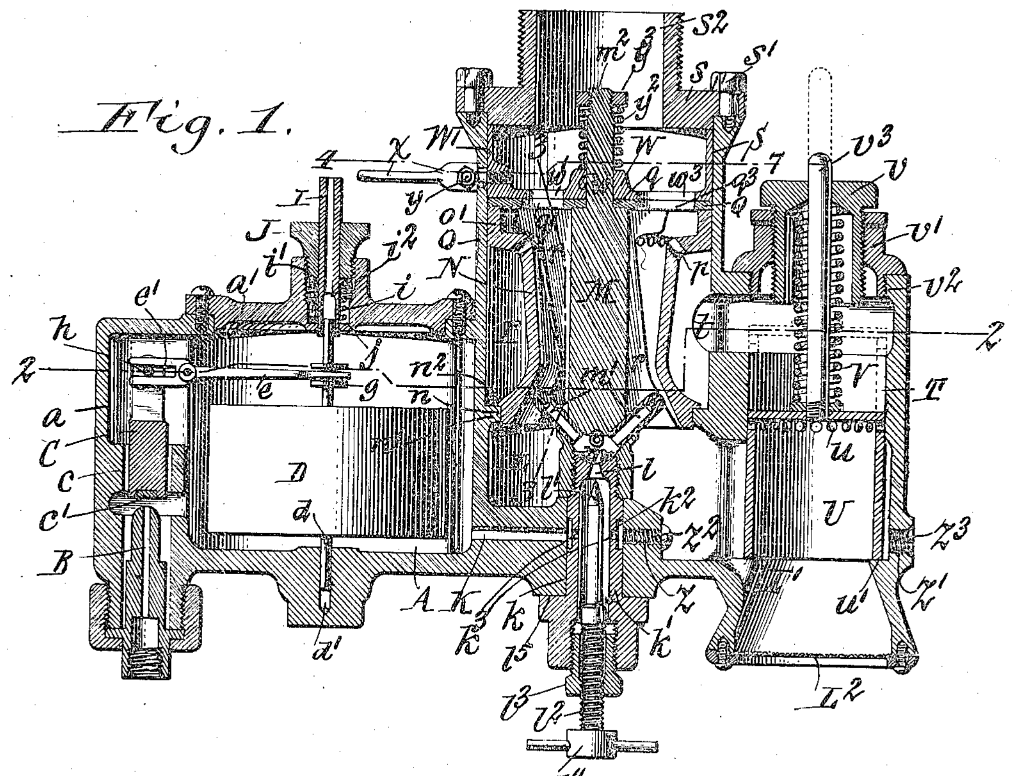
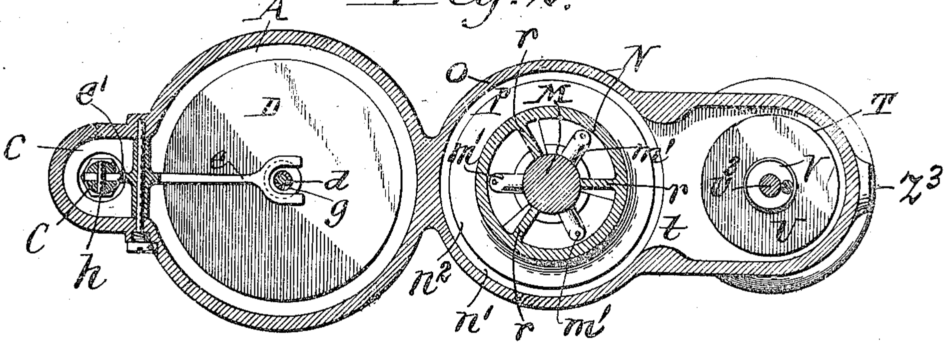


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

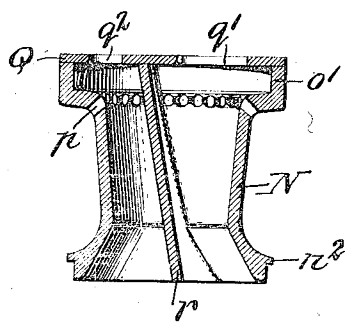



Fig. 4.

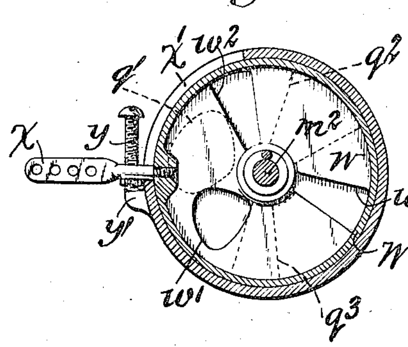



Fig. 5.

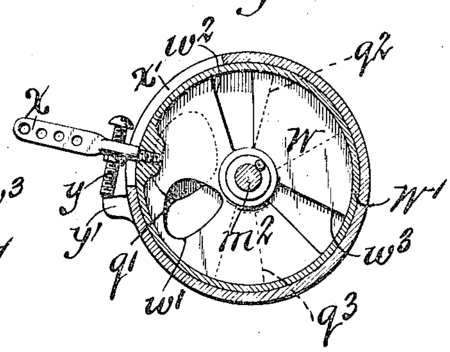



Fig. 6.

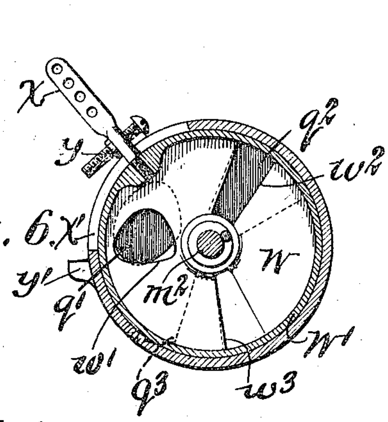
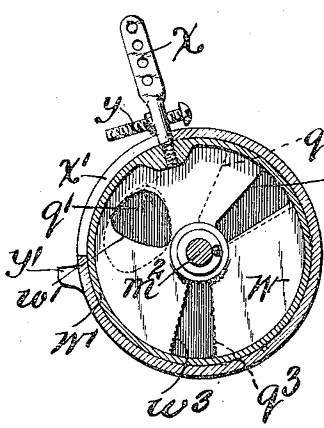



Fig. 7.

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# UNITED STATES PATENT OFFICE.

THOMAS J. HART, OF JEWETTVILLE, NEW YORK, ASSIGNOR TO SHERWOOD MANUFACTURING COMPANY, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

## CARBURETER.

1,001,950. Specification of Letters Patent. Patented Aug. 29, 1911.

Application filed November 26, 1909. Serial No. 529,854.

*To all whom it may concern:*

Be it known that I, THOMAS J. HART, a citizen of the United States, residing at Jewettville, in the county of Erie and State of New York, have invented new and useful Improvements in Carbureters, of which the following is a specification.

This invention relates more particularly to that class of carbureters in which the main supply of the gasolene or other liquid fuel is controlled by means of a float-operated valve and in which the gasolene is delivered into the air by means of a plurality of jets or nozzles, and the air supply is controlled or regulated by the variation in the suction of the engine with which the carbureter is connected.

It is the object of this invention to provide a carbureter of this character which permits of obtaining a more intimate mixture of the air and gasolene, which permits of conveniently and reliably regulating the volume of mixture supplied to the engine and to provide improved means for regulating the air supply of the carbureter.

In the accompanying drawings consisting of 2 sheets: Figure 1 is a vertical longitudinal section of a carbureter embodying my improvements. Fig. 2 is a horizontal section of the same in line 2—2, Fig. 1. Fig. 3 is a detached sectional elevation of the mixing tube, the section being taken in line 3—3, Fig. 1. Figs. 4–7 are horizontal sections taken in line 4—7, Fig. 1, showing different positions of the throttle-valve.

Similar letters of reference indicate corresponding parts throughout the several views.

A represents the gasolene supply or float chamber provided with a lateral extension *a* on one side thereof and having an opening in its top which is normally closed by a detachable cover $a^1$.

B represents a gasolene supply nozzle which opens at its upper end into the lower end of the gasolene chamber extension while its lower end is adapted to be connected in any suitable manner with the gasolene supply tank. The upper end of the supply nozzle forms a valve-seat and the discharge of gasolene from this nozzle into the gasolene chamber is controlled by means of a vertically movable valve C guided in a bracket *c* above the nozzle and provided on its lower end with a packing $c^1$ of cork or similar material which is adapted to engage with the upper end of the nozzle and close the passage thereof. The opening and closing of the gasolene valve C is effected automatically so as to maintain the gasolene substantially at the same level within the gasolene-chamber, this being preferably effected by means of a vertically-movable float D arranged in the gasolene chamber and provided centrally with a guide rod *d* extending with its upper and lower ends above the top and bottom of the float, and a vertically-swinging rock lever pivoted on the adjacent part of the gasolene chamber and provided with a forked inner arm *e* which engages with an annularly grooved collar *g* on the upper end of the float rod and a bifurcated or forked outer arm $e^1$ which engages with a horizontal pin *h* on the upper end of the gasolene valve C. When the level of the gasolene in the gasolene chamber drops below normal, the descent of the float causes the gasolene valve C to be raised and permit gasolene to flow from the nozzle into said chamber and when sufficient gasolene has been admitted to the chamber to bring the level of the same again up to normal, the rising of the float by means of the rock lever $e$, $e^1$ operates to depress the main gasolene valve and close the supply nozzle. The float is preferably guided in its vertical movement by engaging the lower end of its rod with a vertical guideway $d^1$ on the bottom of the float chamber while the upper end of its rod projects into the lower end of a tubular priming and vent tube I, the interior of which communicates at its lower end with the top of the float chamber while its upper end opens into the atmosphere. The lower end of this priming and vent tube is guided in the lower part of the cover of the float chamber while its upper end is guided in a plug J having a screw connection at its lower end with a recess or pocket *j* formed in the cover $a^1$ around the priming tube. The latter is yieldingly held in its uppermost position by means of a spring *i* surrounding the priming tube and bearing with its ends against the bottom of the recess $j$ and the underside of a collar or flange $i^1$ on the priming tube, the upward movement of the latter under the action of the spring $i$ being limited by engagement of the flange $i^1$ with the underside of the screw plug J, as shown in Fig. 1. The lower part of the bore of the priming tube is enlarged so as to form a downwardly-facing internal shoulder $i^2$ which normally is arranged above the upper end of the float rod a sufficient distance to permit the float and the parts connected therewith to freely rise and fall for automatically maintaining the level of the gasolene in the float chamber. When it is desired to prime or flood the carbureter this is effected by depressing the priming tube I so that its internal shoulder $i^2$ engages with the upper end of the float rod and depresses the latter together with the float, thereby causing the level of the gasolene to rise for the purpose mentioned. Upon releasing the downward pressure on the priming tube, the same will be automatically returned to its elevated position by means of the spring $i$.

From the lower end of the gasolene chamber opposite the main gasolene valve C, the gasolene passes horizontally and laterally through a conduit or passage K formed in the bottom of a main air supply chamber L. On the side of the main air supply chamber opposite to the float chamber, the former is provided with an inlet port or passage $L^1$ which extends laterally and downwardly and is preferably covered by a screen $L^2$ of wire or similar material so as to prevent any large impurities in the air from being carried into the carbureter. Arranged vertically within a cylindrical opening $k$ formed in the bottom of this main air supply chamber is an upright cylindrical coupling tube $k^1$ which is provided on its periphery opposite the outlet end of the conduit K with an annularly reduced portion forming an annular passage $k^2$ for gasolene between the bore of the opening $k$ and the periphery of the coupling tube. The bottom of this annular passage and the bore of the coupling tube are connected by a plurality of radial ports or passages $k^3$, as shown in Fig. 1, whereby the gasolene from the float chamber is permitted to pass into the coupling tube. At its upper end the coupling tube is provided with an outlet valve port or opening $l$ which is preferably conical and forms the seat for a conical needle regulating valve $l^1$ arranged in the coupling tube below the valve seat and movable toward and from the latter for varying the amount of gasolene which may pass through the conical seat $l$. The regulating valve is arranged upon the upper end of a stem $l^2$ the lower part of which is screw threaded externally and works in a screw plug $l^3$ which is secured in the lower end of the coupling tube. Upon turning the valve stem in one direction, its needle valve moves toward the seat of the opening $l$ and reduces the flow of gasolene through the same, while upon turning the stem in the opposite direction this valve will be moved away from its seat and permit an increase of flow of gasolene through the opening $l$, this turning of the stem being effected by means of an external handle or thumb piece $l^4$ secured to the lower end thereof. The coupling tube is preferably held in place by means of a collar or shoulder $l^5$ at its lower end engaging with the underside of the bottom of the main air chamber and an upright post M connected by a screw joint at its lower end with the upper end of the coupling tube and bearing against the upper side of said bottom. Immediately above the oulet or port of the needle regulating valve the post M is provided with a gasolene distributing chamber $m$ which communicates with said port $l$ and is provided with a plurality of laterally and upwardly-projecting inclined gasolene delivery jets or nozzles $m^1$, three of such nozzles being shown for example, and being arranged equidistant annularly around the lower part of the post.

N represents an air and gasolene mixing tube which surrounds the central part of the upright post M and which is contracted between its lower inlet end and its upper outlet end and flares both downwardly and upwardly from said contracted part. The lower or inlet end of the mixing tube projects downwardly through an opening $n$ in the top $n^1$ of the main air supply chamber and communicates with the latter, the mixing tube being supported on the top of this chamber by means of an external annular flange $n^2$ formed on the lower part of this tube and engaging with the top of the main air chamber around the opening $n$ thereof. The outer ends of the gasolene delivery nozzles $m^1$ project into the lower downwardly flaring inlet portion of the mixing tube and terminate comparatively close to the bore of this portion of the mixing tube.

Extending upwardly from the top of the main air supply chamber is a cylindrical shell O the bore of which is engaged about midway of its height by a cylindrical enlargement $o^1$ at the upper end of the mixing tube, thereby forming between this shell and the periphery of the mixing tube an auxiliary air supply chamber P which communicates with the upper part of the upwardly-flaring outlet part of the mixing tube by means of upwardly and inwardly-inclined auxiliary air passages $p$ extending through the mixing tube immediately below the enlarged upper end thereof.

The upper end of the mixing tube is covered by a head Q which is preferably made separate therefrom and engages its periphery with the bore of the shell and is provided with a central opening $q$ which receives the upper reduced part or shank $m^2$ on the post M. The mixing tube and its head are preferably held frictionally in place within the shell but if desired additional means may be employed for this purpose.

The annular space between the mixing tube and the post is divided into a plurality of longitudinal mixing passages by means of a plurality of radial longitudinal partitions or wings $r$, $r$, $r$ which are arranged equidistant annularly in the space between the mixing tube and the post and extend from the bore of the mixing tube to the post. These partitions or wings are preferably formed integrally with the mixing tube and fit closely at their inner edges against the periphery of the post but these parts may be otherwise constructed, if desired. Each of the partitions is also arranged spirally or inclined with reference to the axis of the post and mixing tube. Into the lower end of each of the mixing passages which are formed by these partitions one of the gasolene delivery nozzles projects. The head of the mixing tube is also provided with a plurality of mixture outlet openings or ports $q^1$, $q^2$, $q^3$ one for each of the mixing passages of the mixing tube.

Above the mixing tube and within the upper part of the shell O is arranged a mixture outlet chamber S the top $s$ of which is secured by bolts $s^1$ or otherwise to the upper edge of the shell O. From the mixture outlet chamber the mixture of gasolene and air is delivered to the conduit leading to the engine by means of a delivery nozzle $s^2$ arranged centrally on the top $s$ of the outlet chamber.

When the engine is in operation, its piston during the suction stroke draws the external air upwardly through the main air inlet $L^1$, main air chamber, the several mixing passages, outlet ports $q^1$, $q^2$, $q^3$ mixture outlet chamber S, and delivery nozzle $s^2$ to the engine cylinder and as the air passes the gasolene delivery nozzles within the mixing tube the gasolene is withdrawn from the same and carried forward with the air. The gasolene issuing from these nozzles upon striking the lower downwardly-flaring part of the mixing tube is deflected and divided finely so that it is in a good condition to become mixed with the air which is moving forwardly with the same. As the air and gasolene move together through the several mixing passages, the spiral or inclined partitions of the latter impart a spiral whirling motion to the air and gasolene vapors, thereby further commingling the elements of this mixture. Owing to the division of the mixing tube into a plurality of passages, each of which receives a part of the air and the gasolene to be mixed, the operation of mixing these ingredients is apportioned between the several mixing members and causes a thorough mixture of the entire volume before the same is delivered to the engine, thereby increasing the efficiency of the mixture and insuring more complete combustion of the same.

Means are provided which automatically increase the supply of air to the gasolene at the lower or inlet end of the mixing tube to suit the speed of the engine at low speeds and which also operate to provide an additional supply of air through the auxiliary air ports of the mixing tube above the gasolene nozzles when the engine is running at or near its maximum speed. The preferred means for this purpose which are shown in the drawings are constructed as follows: T represents an upright cylindrical guideway which opens at its lower end into the side of the air inlet $L^1$ of the main air supply chamber while its upper end communicates by a lateral passage $t$ with the side of the auxiliary air supply chamber. Sliding vertically in this cylindrical guideway is an inverted cup-shaped cylindrical air valve U which opens downwardly and is provided near its closed top with an annular row of air ports or openings $u$ extending from the bore to the periphery thereof. In its lowermost position this valve projects partway across the inlet $L^1$ of the main air supply passage, its movement in this direction being limited by a shoulder or stop $u^1$ formed on the interior of the main air inlet and adapted to be engaged by the lower edge of the air valve. The latter is yieldingly held in this position by means of a spiral spring V bearing with its lower end against the upper side of the air valve while its upper end bears against the underside of a screw plug $v$ working in a screw cap $v^1$ which closes an opening $v^2$ in the top of the lateral passage $t$. The air valve U is passed through the opening $v^2$ in assembling the parts or dismembering the same for repairs. The spring V is preferably confined in place by means of a guide rod $v^3$ arranged within the spring and secured at its lower end to the top of the air valve while its upper end passes through an opening in the screw plug $v$.

Upon starting the engine, the air valve is in its lowermost position in which a minimum supply of air is admitted to the gasolene nozzles and mixing tube. As the engine acquires speed, the exhaustion of air from the space above the air valve through the auxiliary air ports which connect the same with the suction space of the engine cause the air valve to be gradually raised in the same measure as the engine gathers speed and the suction of its piston increases, thereby uncovering or clearing the inlet $L^1$ of the main air supply chamber to a corresponding extent and permitting an increased amount of air to pass the gasolene nozzles and through the lower end of the mixing tube to meet the increasing needs of the engine. When the speed of the engine is very high, the suction of its piston becomes sufficiently strong to raise the air valve U up to a point where its auxiliary air ports are arranged within a branch passage $u$, as shown by dotted lines in Fig. 1, thereby causing air to pass not only from the main air supply chamber to the lower end of the mixing tube, but also through the ports $u$ of the main valve, the auxiliary air supply chamber P and ports $p$ into the upper part or outlet end of the mixing tube, thereby adjusting the air supply and adapting the mixture of air and gasolene to suit the requirements of the engine at this time. When the speed of the engine again decreases and its suction is reduced, the spring V pushes the air valve downwardly so that its ports $u$ are covered by the solid part of the valve guideway T, whereby the air supply for the carbureter is again confined to the lower end of the mixing tube.

For the purpose of permitting of throttling the carbureter and varying the volume of mixture which is delivered to the engine according to the speed which is desired, or other conditions, means are provided whereby the mixture from one or more of the gasolene nozzles and mixing passages may be delivered to the engine. The preferred means for this purpose as shown in the drawings are constructed as follows: W represents a disk-shaped throttle-valve engaging its underside with a seat on the upper side of the head of the mixing tube and pivotally supported so as to be capable of rotary movement relatively thereto concentric with the post and the mixture outlet chamber, this being preferably effected by means of an upwardly-projecting annular flange $W^1$ arranged at the outer edge of the throttle-valve disk and engaging with the bore of the mixture outlet chamber, and an opening $w$ formed in the hub of this valve and fitting over the shank $m^2$ at the upper end of the post. The disk of this valve is provided with a plurality of ports $w^1$, $w^2$, $w^3$ corresponding in number to the ports in the head of the mixing tube. The relative construction and arrangement of the ports $w^1$, $w^2$, $w^3$ of the throttle valve and the ports $q^1$, $q^2$, $q^3$ in the head of the mixing tube is such that when the throttle valve is turned to its extreme backward position, as shown in Fig. 4, all of the corresponding pairs of ports of the throttle valve and mixing tube will be completely out of register in which position of the parts the carbureter is entirely shut off. Upon turning the throttle valve forwardly or in the direction of the arrow in Figs. 4–7, its port $w^1$ will register with or partly overlap the port $q^1$ on the head of the mixing tube and therefore permit air and gasolene to pass upwardly only through the corresponding mixing passage, as shown in Fig. 5. Upon continuing to turn the throttle valve another step in the same direction the ports $w^1$, $q^1$ will increase the area of their registration and the port $w^2$ of the throttle valve will be moved into register with the port $q^2$ of the mixing tube head, as shown in Fig. 6, thereby causing air and gasolene to be also drawn through an additional or second mixing passage. Upon moving the throttle valve to its foremost position, as shown in Fig. 7, the port $w^3$ of the throttle valve will also be moved into register with the port $q^3$ of the mixing tube head and thereby add the third mixing passage to the other two passages, and thus obtain the maximum capacity of the carbureter. This turning of the throttle valve may be effected in various ways, the means for this purpose shown in the drawings consisting of an arm $x$ projecting laterally from this valve through a segmental slot $x^1$ in the adjacent part of the shell O. The front end of this slot preferably operates as a front stop which is engaged by the arm $x$ for limiting the forward movement of the throttle valve. For the purpose of permitting the backward movement of this valve to be arrested at different points for varying the minimum amount of fuel mixture which is supplied to the engine and also to prevent the fuel supply from being entirely cut off, an adjustable stop device is provided which preferably consists of a screw $y$ arranged on the shifting arm $x$ and adapted to engage with a lug $y^1$ on the adjacent part of the shell O, as shown in Fig. 7. When in use the stop screw $y$ is preferably so adjusted that it arrests the backward movement of the valve disk W before the ports $q^1$, $w^1$ are entirely closed, which permits the operator to slow down the engine by throwing the valve disk W back as far as it will go without exercising any care for this purpose and still avoiding shutting off the supply of fuel entirely and stopping the engine, as shown in Fig. 5. The throttle valve is preferably held yieldingly against its seat on the upper side of the mixing tube head by means of a spring $y^2$ surrounding the reduced part of the shank of the post and bearing at its lower end against the hub of the throttle valve while its upper end bears against a screw nut $y^3$ on said shank, as shown in Fig. 1.

For the purpose of rendering the passage K and ports $k^3$ accessible for cleaning, these two ports are arranged in line with the passage K, the bottom of the air supply chamber L is provided with a radial opening $z$ arranged diametrically opposite the passage K and above the upper side of said bottom and the outer wall of the main air inlet $L^1$ is also provided with an opening $z^1$ arranged in line with the opening $z$, ports $k^3$ and passage K. Normally the openings $z$, $z^1$ are closed by screws $z^2$, $z^3$ but when the ports $k^3$ and passage K require cleaning, these screws are removed, the air valve is raised and the needle valve is lowered so as to permit a wire or other cleaning device to be passed successively through the openings $z^1$, $z$, ports $k^3$ and passage K for removing any obstruction within this passage and the ports.

The construction of my improved carbureter is such that the same can be very readily dismembered and assembled for inspection, cleaning or repairs, it permits of mixing the air and gasolene with the greatest thoroughness and renders it possible to readily adjust the volume of the mixture to suit the requirements of the engine or the power which it is desired to develop, thereby not only economizing in the use of gasolene but also insuring uniformity in the operation of the engine.

I claim as my invention:

1. A carbureter comprising a mixing tube provided with a plurality of spiral partitions which divide the same into a plurality of spiral longitudinal mixing passages, and means for supplying air and gasolene to said passages.

2. A carbureter comprising an air inlet chamber provided with a gasolene supply passage in its bottom, a coupling tube extending through the bottom of the air inlet chamber and connected with said passage, a post connected with said coupling tube and provided with a plurality of gasolene delivery openings which communicate with said coupling tube, and a mixing tube surrounding said post and having a plurality of partitions whereby the same is divided into a plurality of mixing passages which communicate with said air inlet and each of which receives gasolene from one of said delivery openings.

3. A carbureter comprising an air inlet chamber provided with a gasolene supply passage in its bottom, a coupling tube extending through the bottom of the air inlet chamber and connected with said passage and provided with a main gasolene valve seat, a valve needle mounted in said coupling tube and movable toward and from said seat for regulating the supply of gasolene, a post connected with said coupling tube and provided with a plurality of laterally projecting gasolene delivery nozzles which communicate with said coupling tube, and a mixing tube surrounding said post and having a plurality of longitudinal partitions forming mixing passages which receive air from said inlet chamber and each of which receives one of said gasolene nozzles.

4. A carbureter comprising a mixing tube having a main air inlet at one end, a mixture outlet at its opposite end and an auxiliary air inlet port near the mixture outlet thereof, a main air supply chamber having an air inlet port and communicating with the inlet of said mixing tube, an auxiliary air supply chamber communicating with said auxiliary air port, and a valve extending normally partway across the inlet of said main air supply chamber and exposed to the suction of the engine through said auxiliary air port and supply chamber for moving said valve away from the inlet of the main air supply chamber.

5. A carbureter comprising a mixing tube having a main air inlet at one end, a mixture outlet at its opposite end an an auxiliary air inlet port near the mixture outlet thereof, a main air supply chamber having an air inlet port and communicating with the inlet of said mixing tube, an auxiliary air supply chamber communicating with said auxiliary air port, a valve guideway communicating at opposite ends with the inlet of the main air supply chamber and at its opposite end with the auxiliary air supply chamber, a cylindrical valve extending normally partway across said main air inlet and provided with supplemental air ports which in the depressed position of the valve are closed by the bore of said guideway but which in the elevated position of the valve open into the auxiliary air chamber and place the same in communication with the inlet of the main air supply chamber, said valve being adapted to be raised by the suction of the engine through said auxiliary port and air supply chamber, and a spring for holding said valve yieldingly in its depressed position.

6. A carbureter comprising an air supplying chamber provided at its side with an air inlet and in its bottom with an upright tube opening and provided with a horizontal gasolene supply passage connecting with one side of said opening, an inner clearing opening connecting with said tube opening diametrically opposite the gasolene supply passage and also having an outer clearing opening at the outer side of said air inlet in line with the inner clearing opening, plugs for normally closing said clearing openings, a vertical tube arranged in said tube opening and connected by ports

with said horizontal gasolene supply passage, a gasolene distributing chamber connected with the upper end of said tube and provided with a gasolene delivery nozzle, and a mixing tube opening at its lower end into said air supply chamber and inclosing said delivery nozzle.

Witness my hand this 22d day of November, 1909.

THOMAS J. HART.

Witnesses:
THEO. L. POPP,
ANNA HEIGIS.