E. J. SIMPSON.

CARBURETER.

APPLICATION FILED NOV. 2, 1914.

1,162,111.

Patented Nov. 30, 1915.

3 SHEETS—SHEET 1.

Fig. 1.

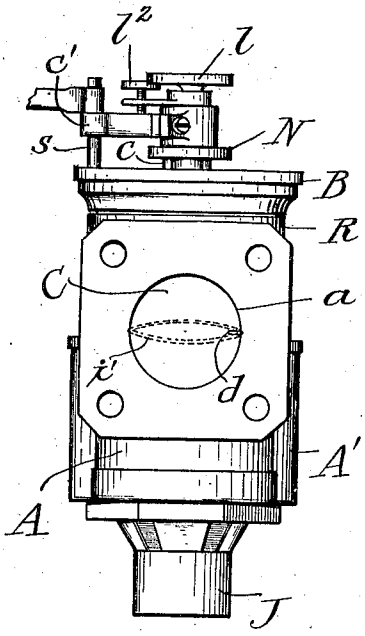


Fig. 2.

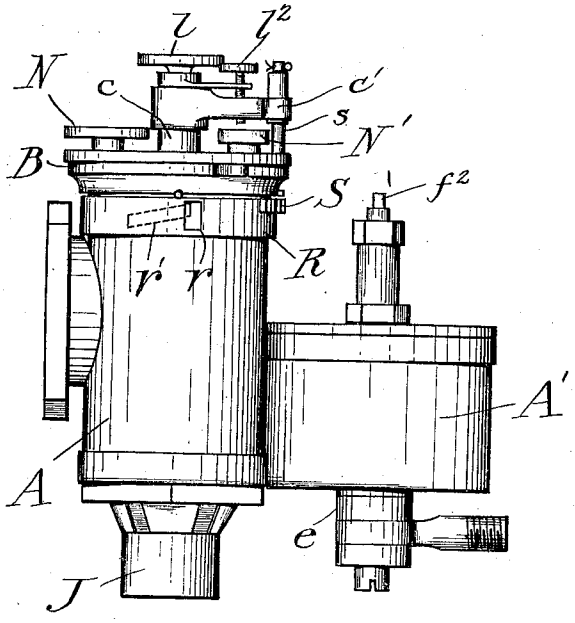
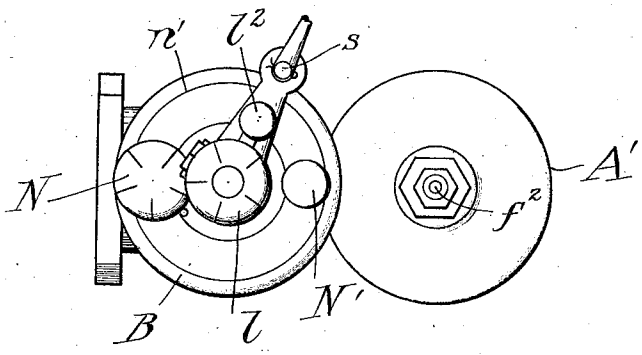


Fig. 3.



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3 SHEETS—SHEET 2.

Fig. 4.

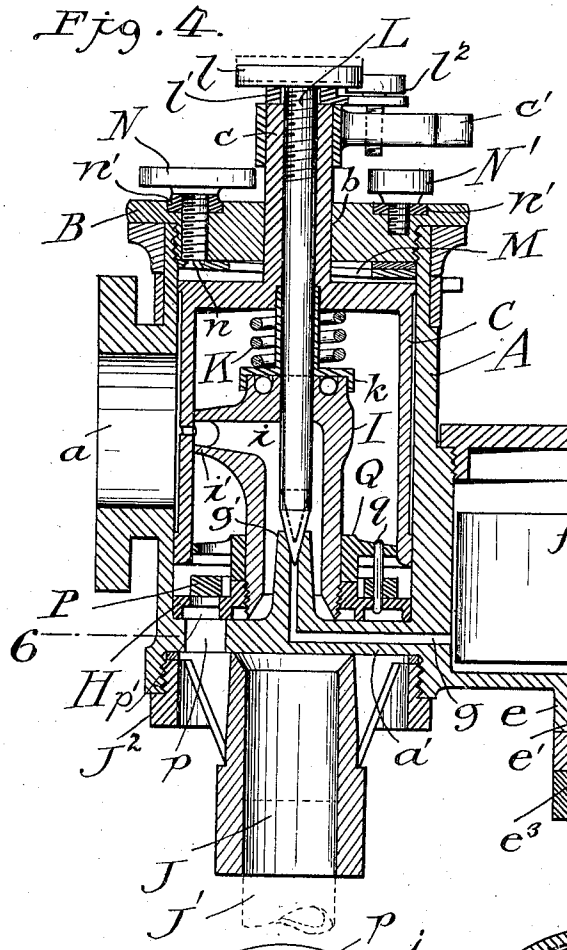
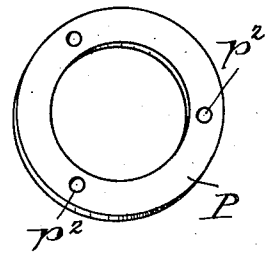


Fig. 5.



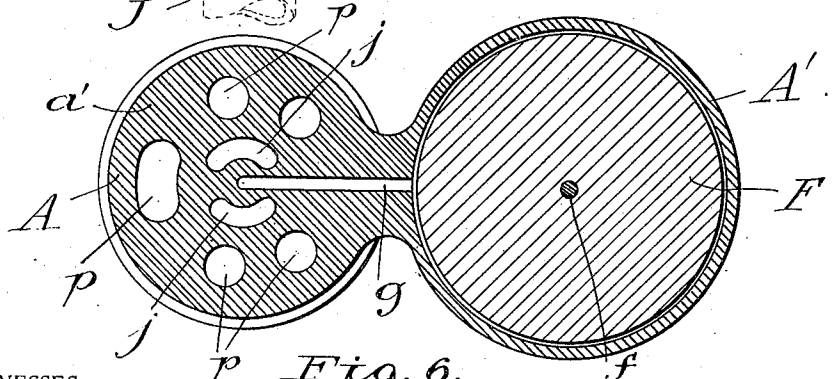


Fig. 6.

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3 SHEETS—SHEET 3.

Fig. 7.

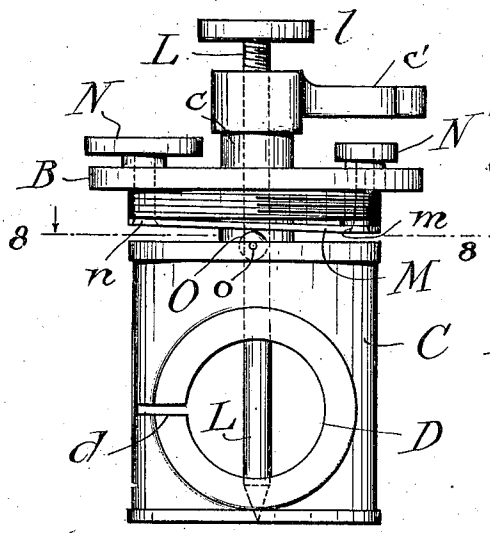
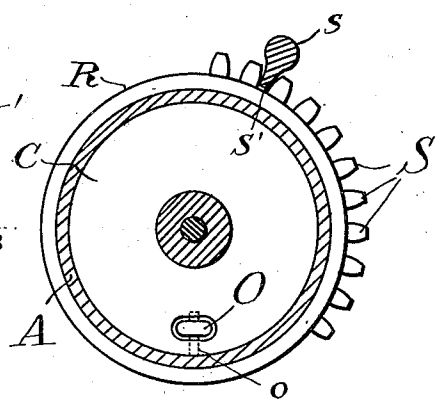


Fig. 8.



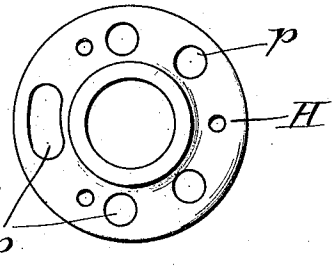


Fig. 9.

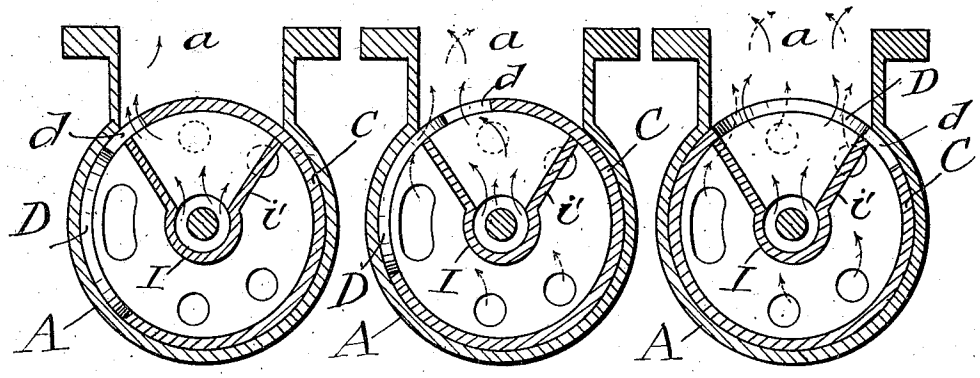


Fig. 10. Fig. 11. Fig. 12.

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UNITED STATES PATENT OFFICE.

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CARBURETER.

1,162,111. Specification of Letters Patent. Patented Nov. 30, 1915.

Application filed November 2, 1914. Serial No. 869,745.

To all whom it may concern:

Be it known that I, EDWARD J. SIMPSON, a citizen of the United States, residing in the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented a certain new and useful Carbureter, of which the following is a specification.

This invention is a carbureter, and the object of the invention is to produce a uniform mixtuure of gasolene vapor and air in a simple, efficient and economical manner.

Among the salient features of the invention may be mentioned, first, the production of the explosive mixture from the liquid fuel, when the engine is running at low speed, by air heated by the exhaust of the engine; second, means for simultaneously controlling the fuel inlet valve to the carbureter and the carbureted mixture to the engine; third, automatic means for admitting additional air directly to the carbureter when the supply of heated air to the carbureter form the exhaust manifold is not sufficient in quantity to produce an efficient carbureted mixture, when the throttle of the engine is opened to such extent as to permit a substantially maximum supply of liquid fuel; fourth, an auxiliary air inlet to the carbureter mechanically controlled by mechanism connected with the throttle of the engine; fifth, a rotary valve for controlling the admission of the carbureted mixture from the carbureter to the engine, said rotary valve being controlled in an improved manner, and, sixth, the improved formation and positioning of the carbureting chamber whereby the carbureted mixture, in passing from the carbureter, flows uninterruptedly, without change of direction, directly into the intake manifold of the engine, so that the condensation heretofore prevalent in carbureters is obviated.

Features of the invention, other than those specified, will be apparent from the hereinafter detailed description taken in conjunction with the accompanying drawings and appended claims.

In the accompanying drawings, I have illustrated one practical embodiment of the present invention, but the construction shown therein is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is an elevation of a carbureter constructed according to the present invention, said elevation being viewed from the outlet side thereof. Fig. 2 is a side elevation of the carbureter. Fig. 3 is a plan view thereof. Fig. 4 is a central, vertical section through the carbureter. Fig. 5 is a detail perspective of the gravity valve which I employ. Fig. 6 is a transverse section taken on line 6—6 of Fig. 4. Fig. 7 is an elevation of a rotary valve embodied in the carbureter, said valve with its operating parts being shown detached from the remainder of the carbureter. Fig. 8 is a sectional view taken on line 8—8 of Fig. 7, showing some parts, in plan, which are not included in Fig. 7. Fig. 9 is a detail view, in plan, of the valve seat for the valve illustrated in Fig. 5, and Figs. 10, 11, and 12 are diagrammatic sections illustrating the supply of fuel to the intake mainfold of the engine in the different positions of the outlet controlling valve.

Referring to the drawings, A designates the casing of the carbureter, which is preferably cylindrical in form. Casing A is provided with a flanged outlet *a* at one side thereof, which outlet is adapted to be positioned in alinement with the intake manifold of the engine.

The upper end of casing A is interiorly threaded to receive a plug B provided with a centrally disposed aperture *b*, through which extends the stem *c* of a rotary valve C. Rotary valve C is cylindrical in shape and is positioned within casing A with its outer circumference in engagement with the interior wall of casing A. Fixed on stem *c* of rotary valve C, exteriorly of casing A, is an arm *c'*, and the swinging of this arm by stem *c* serves to rotate said stem, with the result that rotary valve C is turned within casing A.

Rotary valve C is provided with a port D substantially the same in size and contour as outlet *a* of the carbureter, and, from one side of port D, extends a slot *d*. Thus, arm *c'* serves as a throttle arm and may be swung to turn rotary valve C to bring port D into alinement with outlet *a*. When port D coincides with outlet *a*, the throttle is opened to its full extent, but, by revolving rotary valve C, the throttle may be closed to any desired extent, or, when a very small amount of carbureted mixture is desired, rotary valve C may be turned so that only slot *d*, or a small portion thereof, is in alinement with outlet *a*.

Gasolene or other hydrocarbon fuel is fed to casing A from a float chamber A′, which I preferably cast integral with casing A, at one side thereof. From the bottom of float chamber A′ depends a centrally disposed boss *e*, having a longitudinally extending passage *e′*, intermediate the ends of which is a shoulder e^2 with which coöperates a valve E normally seated against shoulder e^2 by a spring e^3. Liquid fuel is fed from the supply tank through a duct E′, which is in communication with passage *e′* in boss *e*. Within the float chamber proper is positioned a float F, which may be of any suitable material, such as cork, or a hollow metallic cylinder. Through the center of float F passes a rod *f*, integral with which is a threaded plug *f′*, adapted to be screwed into float F. Rod *f* protrudes beyond the bottom of float F into the longitudinal passage *e′* at the bottom of the float chamber, and the extent to which rod *f* depends from said float is governed by the threaded plug *f′*. When a predetermined amount of liquil fuel is in the float chamber, the float is raised by reason of its buoyancy to the upper part of said float chamber, but, when the fuel recedes beyond such predetermined point, the lower end of stem *f* engages with the point of needle valve E and, because of the weight of float F, will depress said needle valve against the tension of spring e^3. It will be manifest that, by this arrangement, the amount of fuel which it is desired to maintain within float chamber A′ may be readily governed by adjusting plug *f′*. When the fuel rises in chamber A′ beyond the desired point, spring e^3 automatically closes valve E and precludes the inlet of further liquid until the float is lowered beyond the desired point. On top of float chamber A′, and in alinement with rod *f*, is a spring-retained pin f^2 which serves as a tickler to operate rod *f* manually, if desired.

Liquid fuel is delivered into casing A of the carbureter through a duct *g*, which has an outlet through a nozzle *g′* positioned in the central, longitudinal axis of rotation of rotary valve C. Nozzle *g′* is mounted on, or formed integral with, a partition *a′* near the lower end of casing A, and duct *g* passes through this partition to the outlet end of the nozzle.

Positioned within casing A and adapted to rest upon the upper face of partition *a′* is a flanged annular plate H, provided with a central, threaded aperture, into which is adapted to be screwed the threaded shank of a carbureting member I, provided with an interior passage *i*. Near the upper end, and at one side, member I is formed with an outwardly flaring mouth *i′*, which is in width substantially equal to outlet *a* of casing A, but much narrower in height, see Fig. 1. Member I is so positioned within casing A that mouth *i′* is in alinement or juxtaposition with outlet *a*. Moreover, that part of member I adjacent mouth *i′* is shaped to conform to the inner contour of rotary valve C and is adapted to engage therewith in a fairly tight joint. The parts referred to are so assembled within casing A that nozzle *g′* extends upwardly in passage *i* within member I, and thus the liquid fuel fed from float chamber A′, through duct *g*, to nozzle *g′*, escapes from said nozzle into passage *i*. The air which is desired to mix with and vaporize this liquid fuel must, therefore, be passed through passage *i*.

I have found, through experiment, that, when an engine is running at low speed and using but very little fuel, the best results are obtained when said gasolene is carbureted by air heated above atmospheric temperature, and I therefore provide means, in the carbureter of the present invention, for utilizing the exhaust or spent gases from the engine in their heated state for atomizing the hydrocarbon liquid. To this end, a tubular plug J is positioned with its upper end in contact with the lower face of partition *a′*, and is held in this position by a threaded bushing J^2 screwed into the interiorly threaded, lower portion of casing A. The interior of this plug is, by means of any suitable conduit J′, placed in connection with the exhaust from the engine. To allow of the passage of heated air through conduit J′, plug J, and to passage *i*, a plurality of apertures *j* are provided in partition *a′*, see Fig. 6. Thus, as suction in the cylinder of the engine with which the carbureter of the present invention is associated, is produced, the air from the exhaust of the engine will be drawn through conduit J′, etc., and outlet *a* to the engine. In passing nozzle *g′*, however, the globule of gasolene or other hydrocarbon fuel being fed therefrom is picked up by the current, the speed of which breaks up said globule into atoms, and thereby carburets the same.

It may be well to state, at this point, that, in the carbureter of the present invention, it is desired, when the engine is running at low speed, *i. e.*, the throttle opened only very little, that the carburizing of the motive fluid be accomplished by heated air only, or by heated air in the main, since the best results are obtained in this manner. However, as the throttle is opened still farther and the capacity of the engine increased, much more air is needed, and, at this stage, it is preferred to introduce air at atmospheric temperature in order to provide all the air necessary for a maximum degree of efficiency in the engine. It may be stated, however, that all of the carbureting, *i. e.*, the breaking up of the liquid fuel into atoms, is performed entirely by heated air, and any air at atmospheric temperature, which

enters the intake manifold of the engine, is mixed with the heated air after the same has atomized the liquid fuel. A carbureter operating on this principle I have found to be far more efficient than one wherein cold air, or air at atmospheric temperature, is employed to atomize the liquid fuel. The operation of atomizing the liquid fuel will next be described, and the manner in which air at atmospheric temperature is mixed with a fuel vapor explained.

Assuming that the throttle arm c' is in such position as to close throttle port D entirely, so that the only communication between outlet mouth i' and carbureter outlet a is through a small portion of slot d, as shown in Fig. 10, these positions of the parts are prevalent when the engine is running at substantially lowest speed. When the suction from the engine is communicated through the intake manifold to outlet a, a partial vacuum is caused within passage i of member I. It will be remembered that member I fits quite tightly at its outlet mouth within rotary valve C, and it is because of this that a vacuum is produced in passage i, and not within the whole interior of casing A. When a partial vacuum takes place within passage i, the heated air from the exhaust of the engine rushes through conduit J', plug J, and, through apertures j, into passage i, thence through slot d in rotary valve C, and through outlet a to the intake manifold of the engine. The velocity of this current is very great and, as it passes nozzle g', it takes up the globule of liquid fuel emanating therefrom and immediately breaks up the same into mist, whereby an explosive mixture is formed before the heated air is passed through slot d.

The proper amount of motive fuel fed from nozzle g' is regulated by a needle valve L, the stem of which extends upwardly and is threaded through stem c of rotary valve C. A finger-piece l, at the upper end of needle valve stem L, allows of the adjustment of said needle valve relative to nozzle g'. A locking collar l', with which coöperates a thumb screws l^2, is adapted to lock valve stem L in its adjusted position within stem c. It will, therefore, be manifest that, in the normal operation of rotary valve C, needle valve L is rigidly secured thereto and partakes of all movements imparted to rotary valve C.

Stem c of rotary valve C is slidably mounted for longitudinal movement within plug B, and a spring K is positioned coaxially of the valve stem L, with its upper end against the interior wall of the rotary valve, and its lower end resting on an anti-friction bearing k, positioned on the upper end of member I. Spring K operates to normally lift rotary valve C to its uppermost position, which position is determined by a cam surface provided on the bottom face of plug B. This cam surface is produced by a spring ring M rigidly secured by screws m at one side of plug B. Diametrically opposite the point of rigid security of spring ring M, an adjusting screw N is threaded through plug B and engages with spring ring M at n. By turning screw N, the free side of spring ring M is moved outwardly or away from plug B. On the lower face of spring ring M rides a roller O, secured by pins o to rotary valve C. It will thus be manifest that, if rotary valve C is turned, spring K will maintain roller O in engagement with the under surface of spring ring M, which surface may be varied by adjusting screw N. It will appear from Fig. 7 that, if rotary valve C is turned in clockwise direction, spring K will operate to lift valve C, as roller O traverses ring M, or, if said valve is moved in counter-clockwise direction, the valve will be forced downwardly against the tension of spring K by the coöperative action between ring M and roller O. Moreover, in view of the fact, as heretofore stated, that needle valve L is normally locked to, and partakes of the movements of rotary valve C, when rotary valve C is elevated, needle valve L will likewise be elevated, and vice versa. It will thus be manifest that, when rotary valve C is turned to open throttle port D, the direction of rotation of said valve being in clockwise direction to produce this result, the rotation of said valve simultaneously lifts needle valve L, with the result that nozzle g' is opened more and more, as rotary valve C is turned to open the throttle. On the other hand, as rotary valve C is turned to close the throttle, it is depressed and simultaneously depresses needle valve L to shut off the supply of liquid fuel. The amount of throw required to properly adjust the needle valve to the different speeds of the engine may, manifestly, be regulated by manipulating thumb screw N to vary the angle of inclination of spring ring M. Adjusting screw N is adapted to be locked in any of its positions by a spring washer n', through an aperture in which the stem of thumb screw N extends. Diametrically opposite from the thumb screw N another aperture is formed in the spring washer n', through which extends the stem of binding screw N', adapted to thread into plug B. When binding screw N' is screwed down tightly upon the spring washer, it will be manifest that the adjusting screw N will be locked against rotation, but, when it is desired to regulate said adjusting screw, binding screw N' is loosened to relax the tension on spring washer n'. This will allow of the ready manipulation of said adjusting screw N. However, when the regulation of said screw is completed, the screwing up of binding screw N' will again

place the spring washer under tension, thereby tightly locking the thumb screw N against movement.

With the foregoing in mind, assuming that rotary valve C is turned from the position illustrated in Fig. 10 to that shown in Fig. 11, the passage of air from the exhaust of the engine through passage *i* and slot *d*, will continue as hereinbefore described, but, at the same time, the rotary valve will have been turned to such extent as to allow a portion of port D to be alined with outlet *a*. This is for the reason that, as the engine gains speed, more carbureted mixture is required and more air necessary to produce the proper mixture. Therefore, besides the warm air drawn through passage *i*, it is desirable to add further air at atmospheric temperature. This air must be drawn from the interior of casing A, and air is allowed to enter said casing through apertures *p* in partition *a'* thereof. The intake of air is, however, governed by a drop valve P, which coöperates with valve openings *p'* in plate H, hereinbefore referred to. Valve P is guided in its movements by pins *q*, which are rigidly secured in the spider Q fitted around member I. Pins *q* project downwardly and fit loosely in apertures p^2 in valve P. Valve P is normally maintained seated by gravity, but, when the suction from the engine cylinder becomes so great that not enough warm air can be drawn through passage *i*, said valve is automatically lifted to allow the intake of air into casing A, whence it is drawn through outlet *a*, as shown by the dotted arrows in Fig. 11. It will be noted, from an inspection of Fig. 11, and particularly the arrows thereof, that the air at atmospheric temperature does not pass into the vaporizing chamber, but directly into outlet *a* of the carbureter. Thus, the liquid fuel is carbureted by warm air and mixed with the requisite amount of additional air after leaving the carbureting chamber and passing through the intake manifold of the engine. This arrangement I have found to give highly meritorious results.

As rotary valve C is still further shifted to its entirely open position, illustrated in Fig. 12, the operation of the carbureter will be exactly the same as that described with reference to Fig. 11, except that more air at atmospheric temperature will be used. The path of the air currents, when the throttle is wide open, is indicated by arrows in Fig. 12, the path of the heated air being shown in full arrows, whereas the path of the air currents at atmospheric temperature are shown in dotted arrows.

In producing a carbureter, it has always been a big problem to provide means for furnishing the proper amount of air for engines of different capacities and makes, and, in many cases, carbureters made for one type of engine are absolutely useless on engines of other types. Accordingly, it has long been sought to provide means whereby the proper amount of air fed by the carbureter may be regulated for different types of engines and the various speeds thereof. A simple method of producing this result is incorporated in the present invention. Casing A is provided with a port *r'*, normally closed by a ring or band R, which is also provided with a port *r*. Band R is mounted exteriorly of casing A and is adapted to be rotated for the purpose of bringing port *r* into registration with ports *r'*. Throttle arm *c'* is provided with a depending stem *s*, having at its lower end a finger *s'* adapted to engage with projections S on band R, see Fig. 8. With this arrangement, the swinging of throttle arm *c'* automatically rotates band R, and the registration of port *r* with port *r'* may be timed, depending upon which of the projections S the finger *s'* is in engagement with—*e. g.*, if the parts are arranged as shown in Fig. 8, port *r* will register with port *r'*, when the throttle has been opened but little, whereas, if band R were shifted so that finger *s'* would engage with projections S farther around the band, the registration of the ports would take place at a later stage. This auxiliary inlet of air may be thus regulated at will, to suit the various needs. The air entering through ports *r* and *r'* finds its way to carbureter outlet *a*, between the upper circumference of rotary valve C and the inner circumference of casing A, said rotary valve being of less diameter intermediate its ends to allow of this. At each end of rotary valve C, however, said valve is of increased diameter substantially equal to the interior diameter of casing A, whereby proper bearing surfaces for said rotary valve are provided.

It will be manifest, from the foregoing description, that the carbureter of the present invention is extremely simple and, yet, possesses great merit. The intake of air and the intake of liquid fuel are simultaneously governed and, at the same time, the auxiliary air inlet is operated. When the carbureter is in proper adjustment, the simple rotation of the throttle arm entirely controls all of the parts thereof to produce maximum efficiency, and the parts are so constructed and assembled that all clogging of the ducts, etc., is precluded and it is practically impossible for the carbureter to get out of order.

Having thus fully described the invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. In a carbureter, a casing having an outlet adapted to register with the intake manifold of an engine, a sleeve, provided with a port adapted to register with the out-

let of the casing, positioned within said casing for simultaneous rotation and longitudinal movement, a carbureting chamber interior of the sleeve, an outlet for motive fluid interior of the carbureting chamber, and a stem on the sleeve extending through the wall of the carbureting chamber and provided with means for rotating said sleeve, in combination with a valve arranged coaxially with the sleeve and secured for rotation therewith, which valve, when seated, operates to preclude the entrance of motive fluid into the carbureting chamber, means for normally maintaining the valve and sleeve in a position wherein the valve is unseated, a spring ring positioned on the interior of the casing and in concentric relation with the sleeve, said sleeve being maintained, at all times, in engagement with said spring ring, an adjusting member threaded through the casing and secured to said spring ring for the purpose of warping the spring ring out of a true plane to present a cam surface to the portion of the sleeve in engagement therewith, whereby the rotation of said sleeve serves to shift said sleeve longitudinally of its axis of rotation to seat the valve and simultaneously close the outlet of the carbureter, and vice versa, and means for locking the spring ring adjusting member in adjusted position.

2. In a carbureter, a casing having an outlet adapted to register with the intake manifold of an engine, a stationary tubular member, the interior of which forms the carbureting chamber, positioned interiorly of the casing, said tubular member having a stationary outlet mouth fixed relatively to the stationary tubular member and the outlet of the casing, and extending to within close proximity of the interior wall of the casing, and in juxtaposition with the outlet of the casing, a rotatable sleeve interiorly of the casing and exteriorly of the carbureting chamber, and adapted to contact with the end of the stationary outlet mouth, whereby said sleeve normally serves to seal the outlet mouth, said sleeve being provided with a port adapted to simultaneously register with said outlet mouth and the outlet of the casing when the sleeve is rotated to a predetermined position, means for introducing motive fluid into the carbureting chamber, and means for rotating the sleeve.

3. In a carbureter, a casing having an inlet and an outlet, the latter of which is adapted to register with the intake manifold of an engine, a stationary tubular member, the interior of which forms the carbureting chamber, positioned within the casing with one of its ends in alinement with the inlet of the casing and the other end in alinement with the outlet of the casing, whereby the carbureted mixture passes unobstructedly from the inlet of the carbureting chamber to its outlet through a continuous passage directly into the intake manifold of the engine, thereby precluding condensation with the carbureter, in combination with a rotatable sleeve interiorly of the casing and exteriorly of the carbureting chamber, and adapted to contact with the stationary outlet end of the latter, whereby said sleeve normally serves to seal said outlet end, said sleeve being provided with a port adapted to simultaneously register with said outlet end of the carbureting chamber and the outlet of the casing when the sleeve is rotated to a predetermined position, means for introducing motive fluid into the carbureting chamber, and means for rotating the sleeve.

4. In a carbureter, a casing, a rotatable sleeve therein, and means for rotating said sleeve, in combination with a spring ring secured to the interior of the casing at one point in the circumference thereof, a member positioned on the sleeve and adapted to constantly engage said spring ring, means for holding said member in engagement with said spring ring, an adjusting screw threaded through the wall of the casing and secured to the spring ring at a point substantially diametrically opposite from the point of attachment of said ring to the casing, whereby said adjusting screw is adapted to warp the spring ring out of a true plane for the purpose of presenting a cam surface to that portion of the sleeve which contacts therewith, a spring washer positioned on the exterior of said casing and provided with an aperture through which the adjusting member extends, and means for placing said washer under tension to lock the adjusting screw against rotation.

5. In a carbureter, a casing, a rotatable sleeve therein, and means for rotating said sleeve, in combination with a spring ring secured to the interior of the casing at one point in the circumference thereof, a member positioned on the sleeve and adapted to constantly engage said spring ring, means for holding said member in engagement with said spring ring, adjusting means cooperating with the wall of the casing and secured to the spring ring at a point substantially diametrically opposite from the point of attachment of said ring to the casing, said adjusting means being adapted for longitudinal movement whereby said adjusting means is adapted to warp the spring ring out of a true plane for the purpose of presenting a cam surface to that portion of the sleeve which contacts therewith, and means for locking the adjusting means against longitudinal movement.

6. In a carbureter, the combination of a casing provided with an outlet, a rotary valve positioned within said casing and provided with a port adapted to coöperate with

the outlet of the casing, means for rotating said valve, a carbureting chamber positioned within the casing, means for introducing liquid fuel into the carbureting chamber, means for permitting the passage of air to the carbureting chamber and from said carbureting chamber through the outlet of the casing, for the purpose of carbureting the liquid fuel, means for regulating the flow of liquid fuel to the carbureting chamber, auxiliary means for admitting air at atmospheric temperature into the outlet of the casing to be mixed with the explosive mixture subsequently to the carbureting thereof, said liquid fuel controlling means and auxiliary air inlet being movable with the rotary valve, and a sleeve mounted exteriorly of the casing and provided with a port adapted to coöperate with a port in the casing, said sleeve being operatively connected with the means for rotating the valve, whereby the port in the sleeve and the port in the casing are brought into registration at a predetermined time in the operation of the carbureter for the purpose of supplying additional air to the carbureter when required by the engine with which said carbureter is associated.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD J. SIMPSON.

Witnesses:
CORNELIUS ZABRISKIE,
F. S. FITZSIMONS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."