No. 827,094. PATENTED JULY 31, 1906.

W. W. GRANT.

CARBURETER.

APPLICATION FILED APR. 11, 1905.

FIG. 1.

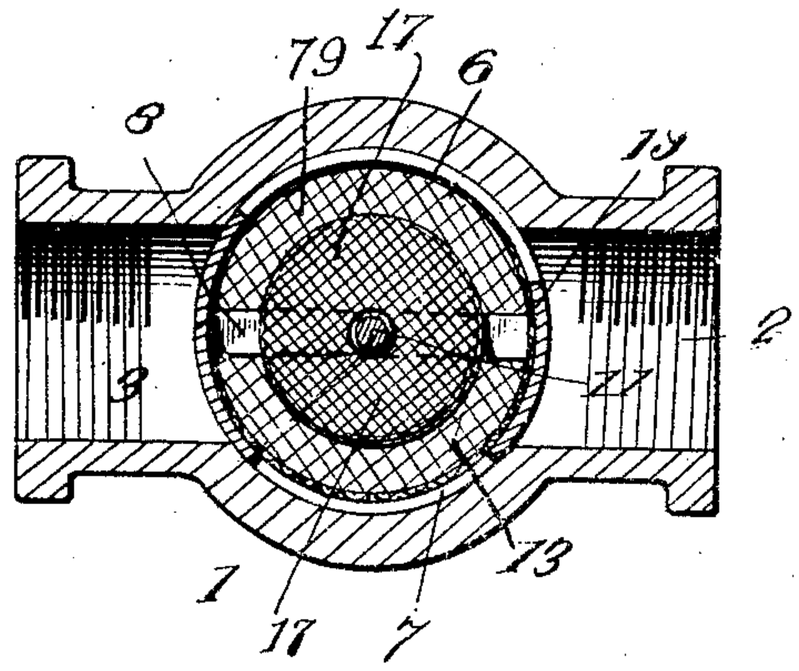


FIG. 2.

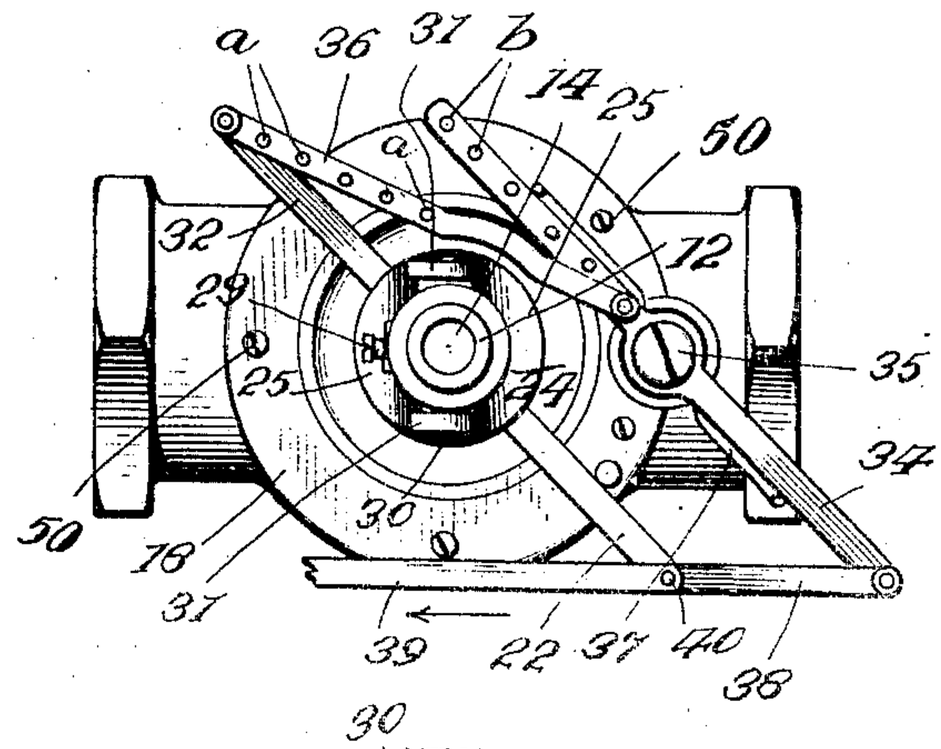
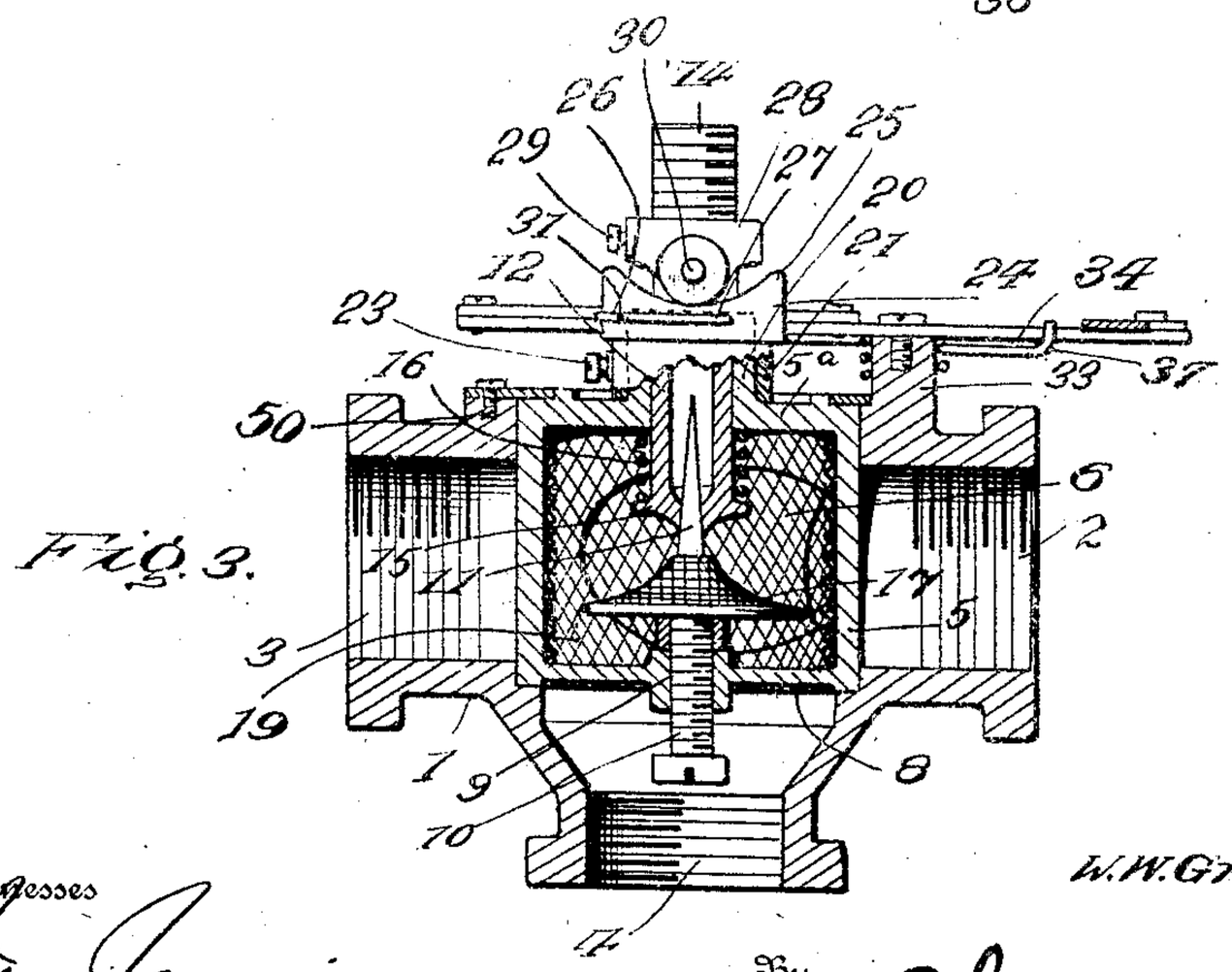


FIG. 3.



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CARBURETER.

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Application filed April 11, 1905. Serial No. 254,951.

To all whom it may concern:

Be it known that I, WILLIAM W. GRANT, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Carbureters, of which the following is a specification.

This invention consists of a novel form of carbureter of the type commonly employed for use in connection with explosive-engines or motors of a similar nature.

The invention resides, essentially, in the provision of a peculiar form of air-valve designed to regulate the feed of air, to throttle the supply when necessary, and of such a structure as to form a mixing-chamber wherein the air commingles with the liquid fuel supplied to the carbureter.

The invention includes, further, special valve means governing the liquid-fuel inlet which leads into the mixing-chamber and peculiar connections whereby the air-valve and the valve means for the liquid-fuel inlet are simultaneously operated, whereby operation of the valve means aforesaid may be regulated so as to increase or decrease the power of the gas or charge generated by compounding of the fluids mixed in the mixing-chamber, enabling the determination of the necessary ratio between the quantities of the various ingredients compounded within.

For a full description of the invention and the merits thereof and also to acquire a knowledge of the details of construction of the means for effecting the result reference is to be had to the following description and accompanying drawings, in which—

Figure 1 is a horizontal sectional view through a carbureter embodying the invention. Fig. 2 is a side elevation of the invention. Fig. 3 is a vertical sectional view bringing out more clearly the interior structure of the mechanism, certain parts being illustrated in elevation.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

In the drawings the numeral 1 indicates a casing having air-inlet ports 2 and 3 leading into opposite ends thereof and having the outlet-port 4 leading from a point about intermediate its ends. The casing 1 is preferably comprised of a coupling or union admitting of connecting pipes therewith at the inlets and outlets, portions adjacent said inlets or outlets being threaded for this purpose. In practical use either one of the ports 2, 3, and 4 may lead to the cylinder or chamber in which the charge carbureted by the device is to be exploded. The construction of the casing 1 forms a central space within the body thereof in which is mounted the air-valve 5, the latter being of hollow cylindrical formation, closed at one end, as shown at 5^a, and open at its opposite end. The valve 5 is provided with inlet-ports 6 and 7, leading through the sides thereof, said ports being adapted to register with the inlets 2 and 3 under various conditions of service in order to regulate the flow of air or fluid into or from the interior or hollow portion of the valve, which latter comprises the mixing-chamber, as will be seen hereinafter. The ports 6 and 7 are of different sizes and permit effecting of different conditions upon and about the mixing-chamber. The open end of the valve 5 is spanned by a cross-bar 8, having a central threaded aperture 9, in which is mounted the threaded stem 10 of a needle-valve 11 or the fuel-inlet-valve means. The needle-valve 11 is arranged for coöperation with a nozzle 12, which extends into the mixing-chamber or hollow portion of the valve 5, said nozzle 12 adapted to have pipe connection made therewith and forming an inlet for and upon the mixing-chamber through which the liquid fuel enters, which is gasolene ordinarily, but which may be any hydrocarbon or derivatives therefrom or thereof within the contemplation of the invention. The nozzle 12 is a longitudinally-movable element and forms a part of the valve means governing the flow of the gasolene into the mixing-chamber, which is designated at 13, and the valve enters the nozzle at one end thereof in its coöperation therewith in opening and closing the gasolene-inlet 14. The nozzle 12 passes through an opening in the closed end 5^a of the valve 5 and is provided with a shoulder 15 near its innermost extremity, between which shoulder and the adjacent closed end 5^a of the valve 5 is interposed a coil-spring 16. The coil-spring 16 coöperates with the nozzle 12 to normally hold the valve means for gasolene-inlet closed.

A sprayer 17 is mounted upon the needle-valve 11 adjacent the mouth of the nozzle 12. Said sprayer is preferably of somewhat conical form consisting of a ring to which a body of gauze or foraminous material is attached,

the sprayer having a central opening through which the needle-valve is adapted to pass in order to properly support the sprayer at the discharge end of the nozzle 12. The sprayer 17 may be readily removed whenever it is desired, according to working conditions. The valve 5 is prevented from displacement from the casing 1 by means of an approximately circular plate 18, which is attached to the upper portion of the casing by suitable fastenings and which partially overlaps the closed end portion of the valve, holding the latter securely in the casing or fitting 1 aforesaid. Arranged in the mixing-chamber 13 is a cylindrical body 19, of gauze, said body snugly fitting in the hollow portion of the valve 5 in such a manner as to extend across the inlet-ports 6 and 7 and the open end of the valve through which the carbureted gas may pass to the engine or exploding chamber. The gauze body 19 may be open at the end adjacent the closed end 5^a of the valve for obvious reasons, and side portions of said body may be cut or divided in order that the same may be slipped into the valve and clear the cross-bar 8, which spans the open end of the mixing-chamber, as before described.

The means for operating the valve means 11 and 12 for the gasolene-inlet and the actuating means for the air-valve constitute an essential feature of this invention. Extending from the closed end of the valve 5 is a short tubular valve-neck 20, about which is fitted an adjustable ring 21, from which extends an arm 22. The nozzle 12 passes through the neck 20, being arranged for slidable movement with relation thereto. The ring 21 is secured to the part 20 by means of a set-screw 23, which admits of adjustment of the valve 5 within the ring to a position that its service may require. The arm 22 is formed with ring 21 and is arranged to be actuated in order to impart movement to the valve 5 upon inlets 2 and 3. Arranged above the ring 21 and loosely mounted upon the neck 20 is a collar 24, the upper portion of which is cut away to form a plurality of cams 25. The collar 24 is loosely held in place by means of pins 26, which project from the upper extremity of the neck 20 through slots 27 formed in the sides of the collar aforesaid. Attached to the nozzle 12 of the inlet 14 is a sleeve 28, arranged above the collar 24 and secured to the nozzle by means of a set-screw 29, which admits of adjustment of the position of the sleeve 28. Studs 30 project from the sleeve 28, having rollers 31 mounted thereon, said rollers being arranged to travel along the cams 25 of the collar 24 as said collar has rotary movement imparted thereto. Extending from the collar 24 is an arm 32, whereby said collar is actuated. A boss 33 projects upwardly from the casing 1 near an end thereof, preferably, and said boss has a lever 34 pivoted thereto at a point between its ends by a screw 35 or otherwise. A link 36 is connected at one end with the outer end of the arm 32, the opposite end of the link being connected with an adjacent inner portion of the lever 34. The link 36 is provided with a plurality of openings *a* at one end portion, and the lever 34 is formed with a plurality of openings *b* along a part thereof, the several openings *a* and *b* permitting of adjustment of the connections between the link 36 and the members 32 and 34, so as to vary or effect the degree of movement required to be imparted to the member 32 by means of the connection between said member and the lever 34. A spring 37, suitably attached to the casing 1 engaging the lever 34, is arranged to hold said lever in a normal position, as well as the parts connected therewith. The extremity of the lever 34 opposite the end portion adapted for adjustable connection with the link 36 is connected by means of a member 38 with the adjacent extremity of the arm 22, by which the valve 5 is operated, and any suitable means, such as a rod 39 or cord or connection of a similar nature, is connected with the parts 22 and 38, as shown at 40, the member 39 being designed to impart movement to the lever 34, the arm 22, and the several parts connected therewith.

The member 39 is connected with the means by which the carbureter mechanism is operated, and it will be noted that upon actuation of the member 39 in the direction of the arrow (see Fig. 2) the arm 22 and the lever 34 will be moved, the member 22 opening the valve 5, and the connection 36 between the lever 34 and the arm 32 will simultaneously impart rotary movement to the collar 24, whereupon the rollers 31 will ride up a certain distance on the cam 25, and since the sleeve 28 is secured to the nozzle 12 it will be seen that said nozzle will be raised a certain distance. When the nozzle 12 is raised by the actuation of the collar 24, the gasolene-inlet 14 will be opened upon the chamber 13, and the gasolene will discharge into said chamber and commingle with the air entering the same as the valve 5 is opened. The construction of the valve, the provision of the adjustable members 21 and 28, and the arrangement of the connection 36 give rise to immense advantage in securing accurate adjustment of the several parts of the carbureter to vary the quantities of the fluids to be mixed, so that the operation of the mechanism may be determined to a nicety. The various adjustments are not described; but to instance certain of these it will be apparent that by connecting the inner extremity of the link 36 with the lever 34 at the innermost of the openings *b*, the outer extremity of the link at its outermost opening *a* being connected with the outer extremity of the arm 32, as shown, actuation of the lever 34 will

impart the maximum movement which may be given the arm 32 and its collar 24 by the maximum movement of the arm 22 and the valve 5, connected therewith; but this maximum movement of the arm 32 and collar 24 will be but a fraction of the maximum movement made by the arm 22 and valve 5. In other words, the assemblance of the parts as in Fig. 2 will cause the valve means for the fuel-inlet to be opened to a maximum as the valve 5 is opened to its greatest extent. Connect the link 36 at its innermost opening *a* with the outer extremity of the arm 32 and connect the inner extremity of said link with the lever 34 at the outermost opening *b* and the maximum movement of the arm 32 and collar 24 will equal the maximum of the arm 22 and valve 5—that is, if the movement and rotation, for instance, of arm 22 and valve 5 be ninety degrees the movement and rotation of the arm 32 and collar 24 will also be ninety degrees, and it will be obvious that various ratios of movement of the nozzle 12 may be secured by adjusting the connection 36. It will be clear that the valve 5 may be so disposed as to entirely cut off the inlet 3, as shown in Fig. 1 of the drawings, that the port 6 in this instance is still partially opened with reference to the inlet 2, establishing communication between this inlet and the mixing-chamber 13 and inlet 4, and the position of the ports of the valve with reference to the inlets in the casing 1 may be varied by adjustment of the ring 21, having arm 22 projecting therefrom.

The form of the valve 5, wherein the same is provided with a plurality of ports 6 and 7, affords important advantages with regard to the admixture of the hydrocarbon and air in the mixing-chamber of the casing. The variation in the size of the ports 6 and 7 is such that suction or non-suction are obtainable in the mixing-chamber for governing the feed of the gasolene or hydrocarbon from the nozzle 12 in the practical use of the invention. For instance, it is well known that gravity-feed carbureters do not depend necessarily on the suction or draw of the piston of the engine connected with the carbureter to insure proper operation thereof, the hydrocarbon discharging by gravity into the mixing-chamber preparatory to being conveyed to the cylinder of the motor. In float-feed carbureters or the like, however, the suctional effect of the piston of the motor is relied upon to draw or suck the hydrocarbon from the hydrocarbon-inlet into the mixing-chamber for commingling with the air charge as it is drawn into the engine. When a carbureter such as embodied in this invention is supplied with hydrocarbon by gravity-feed, the port 3 of the casing 1 may be connected with the engine-cylinder, the port 4 closed by a suitable plug or the like, and the port 2 depended upon as the air-inlet for the mixing-chamber of the carbureter. Thus when the valve 5 is turned to the right (see Fig. 1) the port 6 will be caused to register with the port 2 and the port 7 will be caused to register with the port 3. The valve-port 7 being smaller than the port 6, however, the draw effected by the piston in the engine-cylinder through the port 3 will not tend to create a vacuum in the mixing-chamber sufficient to cause suction on the gasolene-inlet, for the reason that freer passage through the port 6 is afforded for the air than through the port 7, due to the fact that the area of the air-inlet of the mixing-chamber is larger than that of the outlet to the engine-cylinder. An opposite condition is created when the port 2 is connected with the engine-cylinder while the port 3 is left open to admit the air. In this instance actuation of the valve 5, turning same to the right, will cause registration of the several ports in such a way that the air supplied to the mixing-chamber through the port 7 is not sufficient to supply the passage to the cylinder without tending to create such a vacuum in the mixing-chamber as to exert suction on the gasolene-inlet to an extent which will materially affect the feeding of the gasolene from said inlet to the said mixing-chamber. This suction on the gasolene-inlet is desirable and necessary when the action of the carbureter is dependent upon a float-feed, as hereinbefore mentioned.

The arrangement of the ports 6 and 7 is peculiar and is essential in securing the best results, so far as the suction and non-suction feature of the invention is concerned. The action of the air-valve is shown somewhat in Fig. 1, wherein it will be noted that the port 6 is so arranged that it is partially open to the port 2 of the casing, while the port 7 is not in registration with the port 3 whatever. The differential area of the air-inlet and mixture-outlet ports of the mixing-chamber is apparent when it is noted that slight rotation of the valve 5 to the right from the position shown in Fig. 1 will cause registration of port 7 with port 3; but the area of the registering portions of ports 6 and 2 will be greater than the area of the registering portions of the ports 7 and 3, and the differential area will be proportionate throughout the movement of the valve 5 until the ports 6 and 7 are in full registration with the ports 3 and 2. The interchangeability of the ports 6 and 7 with regard to the ports 2 and 3, whichever may be used as the inlet-port of the casing, governs the suction and non-suction on the hydrocarbon-inlet nozzle.

It is obvious that when it is not desired to create a suction on the gasolene-inlet both the ports 4 and 2 may be left open, so that the area of the inlets for the air relative to the area of the outlet to the engine-cylinder will be such as to obviate likelihood of and pull being created on the gasolene-inlet. It is

not necessary, however, to change the connection on engine of the carbureter to secure a change from the suction to the non-suction feature, or vice versa, since by merely unsetting the screw 23 and giving the air-valve a half-turn in either direction and thereupon resetting screw 23 will bring and secure the ports 6 and 7 to a position the opposite of what they were before.

The preferred construction of the device embodying the invention is illustrated and described hereinbefore; but various non-essential details may be changed and departed from within the broader contemplation of the invention.

A special advantageous feature of the invention resides in the manner of connecting the lever 34, the several arms which actuate the cam-collar and the air-valve, and adjacent and contiguous parts, the connections admitting of removal of these parts entire as soon as the pivot of the lever 34 and fastening holding-plate 18 are displaced. To remove the air-valve and the elements mounted thereon and formed and connected therewith out of the containing casing, it is only necessary to release the plate and lever pivotally secured at the upper portion of the casing, and said valve, with embraced mountings, may be bodily lifted from the casing in a manner readily apparent. The above facilitates attachment and detachment of the parts, reducing the complications of the structure materially.

Having thus described the invention, what is claimed as new is—

1. In a carbureter, the combination of a casing, an air-valve therein, a fuel-inlet nozzle, a needle-valve carried by the air-valve to close the nozzle, and means for simultaneously actuating the air-valve and moving the nozzle.

2. In a carbureter, the combination of a casing, a hollow air-valve arranged therein, a fuel-inlet nozzle extending into the air-valve, a needle-valve arranged in the air-valve, and means for simultaneously actuating the air-valve and moving the nozzle to govern the supply of hydrocarbon through said nozzle.

3. In a carbureter, the combination of a casing embodying a mixing-chamber, air and fuel inlets therefor, an air-valve, fuel-inlet-valve means including a longitudinally-movable element, means for actuating the air-valve, and a cam-collar surrounding the longitudinally-movable element of the fuel-valve means and movable simultaneously with the air-valve for actuating said longitudinally-movable element as specified, to govern the supply of hydrocarbon to the mixing-chamber.

4. In a carbureter, the combination of a casing, a hollow air-valve mounted therein, a fuel-inlet nozzle extending into the hollow portion of the air-valve, a needle-valve coacting with the nozzle and adapted to close the same, a spring engaging at one end with the air-valve and bearing against the nozzle at the other end to hold the nozzle in a predetermined position, and means for simultaneously actuating the air-valve and moving the nozzle.

5. In a carbureter, the combination of a casing, air and fuel inlets therefor, a hollow air-valve, fuel-inlet-valve means including a longitudinally-movable member extending into the hollow portion of the air-valve, a spring coacting with said longitudinally-movable member, actuating means for the air-valve, and a cam member operable by said actuating means and coacting with the longitudinally-movable member aforesaid to actuate the same simultaneously with the air-valve and operate the fuel-inlet-valve means.

6. In a carbureter, the combination of a casing, an air-valve mounted therein, fuel-inlet-valve means including a needle-valve and a longitudinally-movable inlet-nozzle coacting therewith, spring means for normally holding the nozzle in a predetermined position, actuating means for the air-valve, and a cam member movable by the actuating means for the air-valve and coacting with the nozzle to vary the position thereof relative to the needle-valve.

7. In a carbureter, the combination of a casing, an air-valve arranged therein, a fuel-inlet nozzle, a needle-valve carried by the air-valve and coacting with the nozzle, a sprayer mounted on the needle-valve, and means for simultaneously actuating the air-valve and moving the nozzle.

8. In a carbureter, the combination of a casing, an air-valve, fuel-inlet-valve means embodying a relatively movable needle-valve and nozzle, means for actuating the air-valve, means including means operable simultaneously with the air-valve for varying the relative positions of the nozzle and needle-valve aforesaid, and a spring bearing against the air-valve and the nozzle and normally tending to hold the nozzle in such a position that the needle-valve closes the mouth thereof.

9. In a carbureter, the combination of a casing, an air-valve comprising a tubular body forming a mixing-chamber, fuel-inlet-valve means embodying a needle-valve adjustably mounted on the air-valve and a nozzle coacting with the needle-valve and normally closed thereby, said nozzle extending into the body of the air-valve and forming a fuel-inlet, rollers attached to the nozzle, a collar provided with cams arranged to coact with the rollers aforesaid, and means for simultaneously actuating the air-valve and the cam-collar aforesaid for the purpose specified.

10. In a carbureter, the combination of a

casing, an air-valve comprising a tubular body forming a mixing-chamber, fuel-inlet-valve means embodying a needle-valve adjustably mounted on the air-valve, a nozzle coacting with the needle-valve and normally closed thereby, said nozzle extending into the body of the air-valve and forming a fuel-inlet, rollers attached to the nozzle, a collar provided with cams arranged to coact with the rollers aforesaid, means for simultaneously actuating the air-valve and the cam-collar aforesaid for the purpose specified, a detachable sprayer mounted on the needle-valve adjacent the mouth of the nozzle, and a spring surrounding the nozzle and bearing at one end against the air-valve and at its opposite end against the nozzle to normally hold the latter closed.

11. In a carbureter, the combination of a casing, an air-valve comprising a tubular body forming a mixing-chamber, fuel-inlet-valve means embodying a needle-valve adjustably mounted on the air-valve, a nozzle coacting with the needle-valve and normally closed thereby, said nozzle extending into the body of the air-valve and forming a fuel-inlet, rollers attached to the nozzle, a collar provided with cams arranged to coact with the rollers aforesaid, means for simultaneously actuating the air-valve and the cam-collar aforesaid for the purpose specified, and means for adjusting the position of the cam-collar.

12. In a carbureter, the combination of a casing, a rotatable air-valve mounted therein and comprising a hollow body forming a mixing-chamber, a fuel-inlet nozzle leading into the mixing-chamber and movable longitudinally of the axis of the air-valve, a needle-valve mounted on the air-valve and adapted to normally close the nozzle aforesaid, means for adjusting the position of the needle-valve, an arm adjustably attached to the air-valve for actuation thereof, a collar surrounding the nozzle and provided with cams, a sleeve attached to the nozzle and having wheels adapted to ride along the cams of the collar, and means for actuating the cam-collar operably connected with the arm of the air-valve for causing simultaneous movement of the air-valve and the cam-collar.

13. In a carbureter, the combination of a casing, a rotatable air-valve mounted therein and comprising a hollow body forming a mixing-chamber, a fuel-inlet nozzle leading into the mixing-chamber and movable longitudinally of the axis of the air-valve, a needle-valve mounted on the air-valve and adapted to normally close the nozzle aforesaid, means for adjusting the position of the needle-valve, an arm adjustably attached to the air-valve for actuation thereof, a collar surrounding the nozzle and provided with cams, a sleeve attached to the nozzle and having wheels adapted to ride along the cams of the collar, and means adjustably connecting the arm of the air-valve with the cam-collar whereby the air-valve and collar will be simultaneously actuated to effect opening of the nozzle when the air-valve is open.

14. In a carbureter, the combination of a casing, a hollow air-valve mounted in the casing and having a plurality of air-ports, a gasolene-inlet nozzle through a side of the air-valve to the interior thereof, a needle-valve for said nozzle, an adjustable sleeve on the nozzle, an adjustable collar provided with cams, rollers carried by the sleeve aforesaid and arranged to engage the cams of the collar, an arm adjustably connected with the air-valve, an arm projected from the collar, means for actuating the arm of the air-valve, and adjustable connecting means between the arm of the air-valve and the arm projected from the collar aforesaid, whereby the air-valve and nozzle may be simultaneously actuated.

15. In a carbureter, the combination of a casing having air-inlet, mixture-outlet, and hydrocarbon-inlet ports, an air-valve arranged in said casing and of hollow formation to constitute a mixing-chamber, said valve having a plurality of ports to govern the ports of the casing, and means for adjusting the valve without removing the same, whereby suction or non-suction with reference to the hydrocarbon-inlet are obtainable in the mixing-chamber.

16. In a carbureter, the combination of a casing employing a mixing-chamber, a hydrocarbon-inlet therefor, air and mixture-outlet ports for the mixing-chamber, an air-valve mounted in the casing and provided with ports to register with those of the mixing-chamber, means for operating the air-valve, and means for adjusting said air-valve in the casing to vary the position thereof with reference to the air-inlet and mixture-outlet ports thereof whereby suction or non-suction on the hydrocarbon-inlet are obtainable in the mixing-chamber.

17. In a carbureter, the combination of a casing embodying a mixing-chamber, a hydrocarbon-inlet therefor, air-inlet and mixture-outlet ports for the mixing-chamber, an air-valve mounted in the casing and provided with ports of different sizes to govern and register with the air-inlet and mixture-outlet ports of the mixing-chamber, means for actuating the air-valve, and means for adjusting said air-valve to correspondingly adjust its ports with reference to the air-inlet and mixture-outlet ports aforesaid to secure suction or non-suction on the hydrocarbon-inlet according to the type of feed used.

18. In a carbureter, the combination of a casing, a rotatable hollow air-valve mounted in the casing and comprising a mixing-chamber, fuel-valve means for supplying the mixing-chamber embodying a longitudinally-slid-

ing nozzle mounted coaxially with the air-valve, a needle-valve coacting with said nozzle, and means for actuating the air-valve and nozzle.

19. In a carbureter, the combination of a casing, a rotatable hollow air-valve mounted in the casing and comprising a mixing-chamber, fuel-valve means for supplying the mixing-chamber embodying a longitudinally-sliding nozzle mounted coaxially with the air-valve, a needle-valve coacting with said nozzle, a cam-collar surrounding the nozzle and attached to the air-valve so as to move therewith, parts projecting from the nozzle to engage the cam-collar whereby actuation may be imparted to the nozzle, a spring for holding the nozzle in a predetermined position, and lever mechanism for operating the air-valve and collar applied thereto to simultaneously move the nozzle and said air-valve.

20. In a carbureter, the combination of a casing embodying a mixing-chamber having a hydrocarbon-inlet and provided with air-inlet and mixture-outlet ports leading to said chamber, and an air-valve mounted in the casing provided with ports adapted to govern the air-inlet and mixture-outlet ports of the casing and interchangeable with reference thereto, the ports of the air-valve being so arranged relatively to each other as to effect a variation between the effective areas of the air-inlet and mixture-outlet ports and thereby secure a condition of suction or non-suction on the hydrocarbon-inlet.

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

WILLIAM W. GRANT. [L. S.]

Witnesses:
HUBERT F. KELLY,
JAMES MCINTYRE.