Z. S. HOFFMAN.

CARBURETER.

APPLICATION FILED AUG. 18, 1910.

1,010,051.

Patented Nov. 28, 1911.

3 SHEETS—SHEET 1.

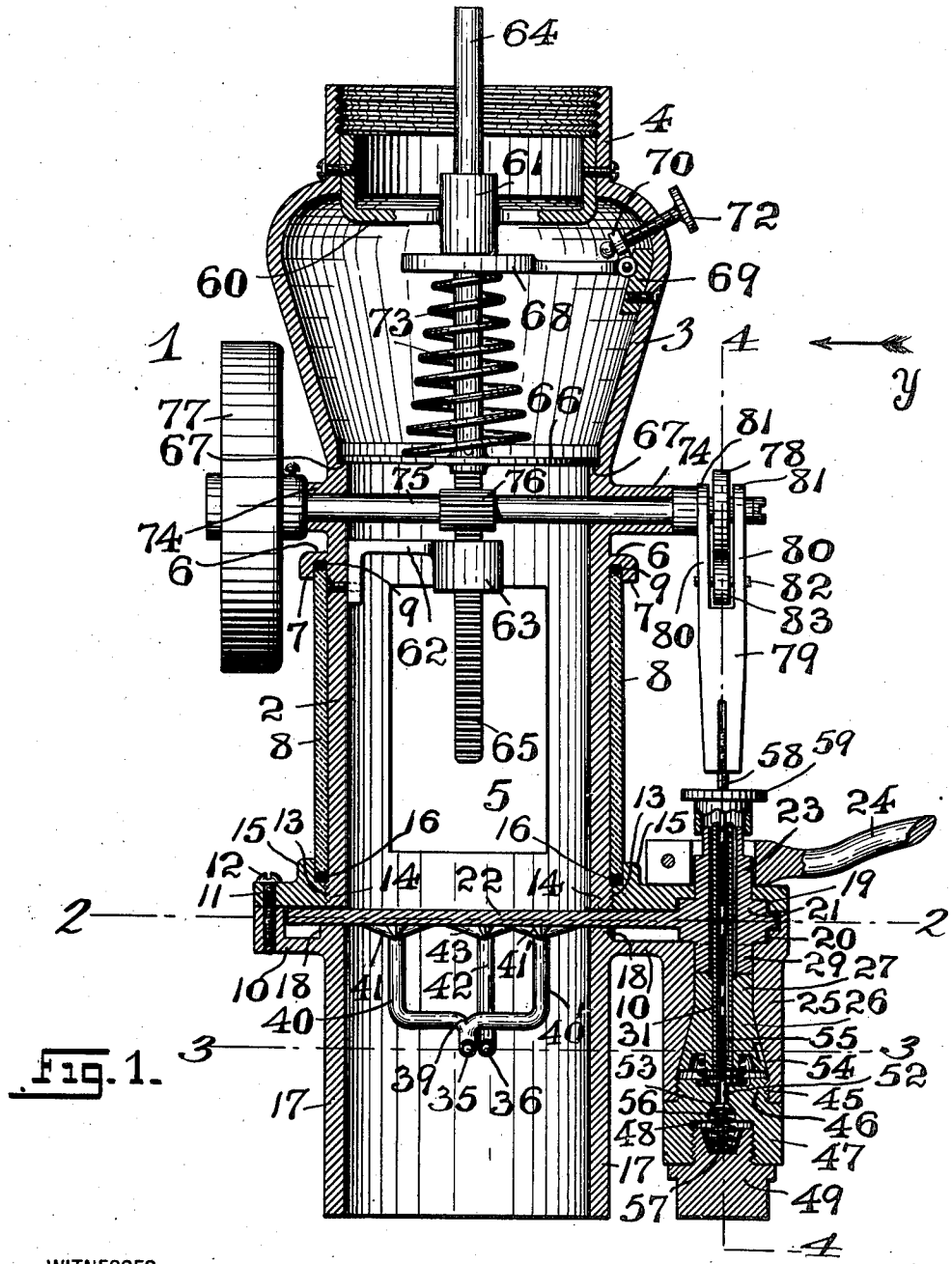

Fig. 1.

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Harry E. Pfiffer

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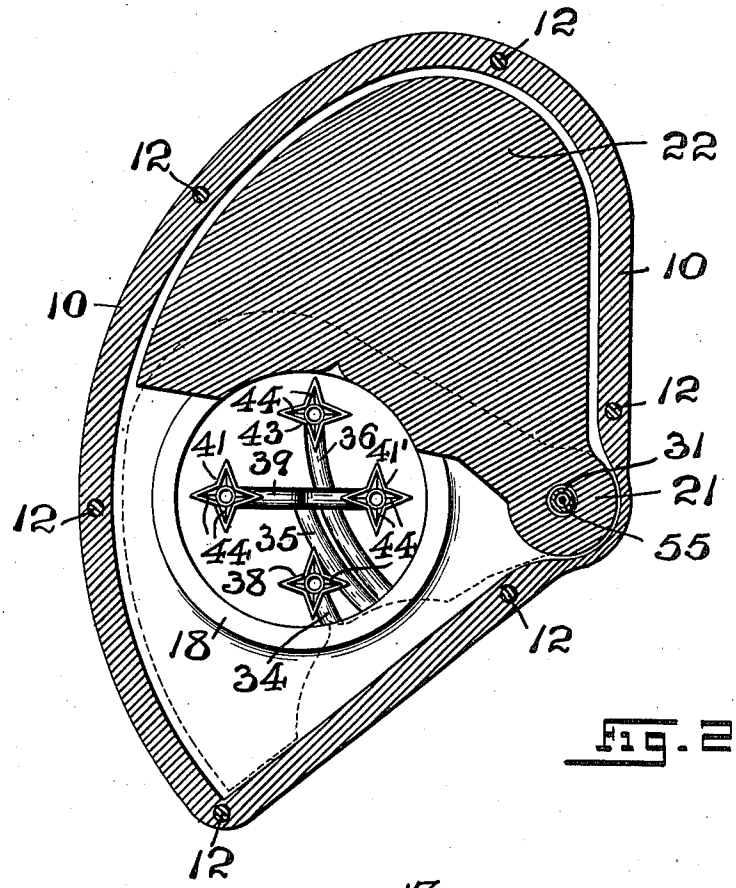

Fig. 2.

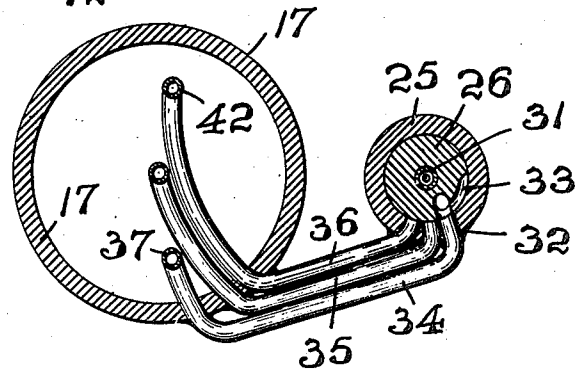

Fig. 3.

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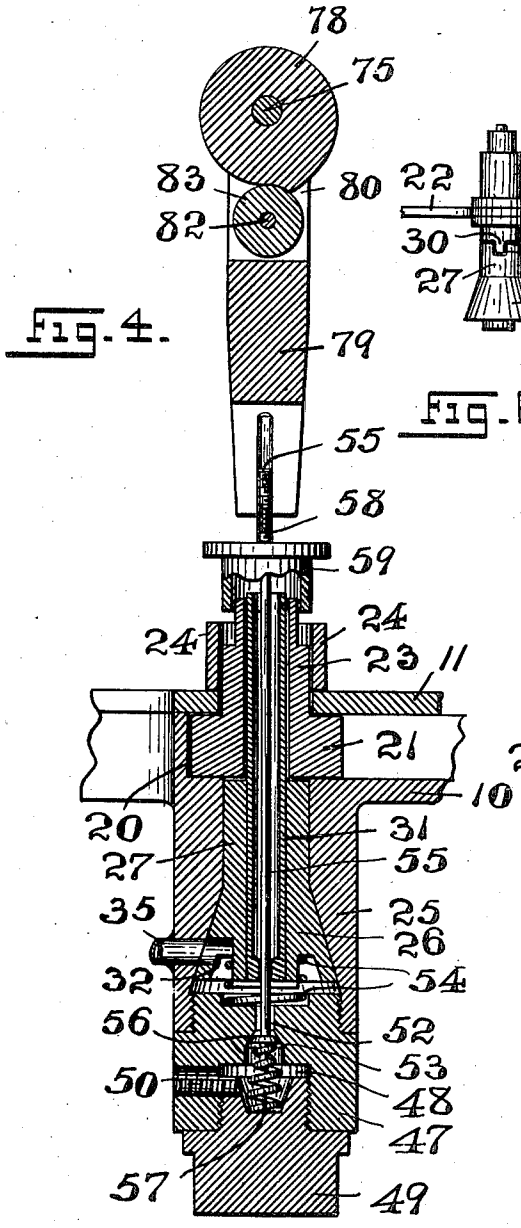

Fig. 4.

Fig. 6.

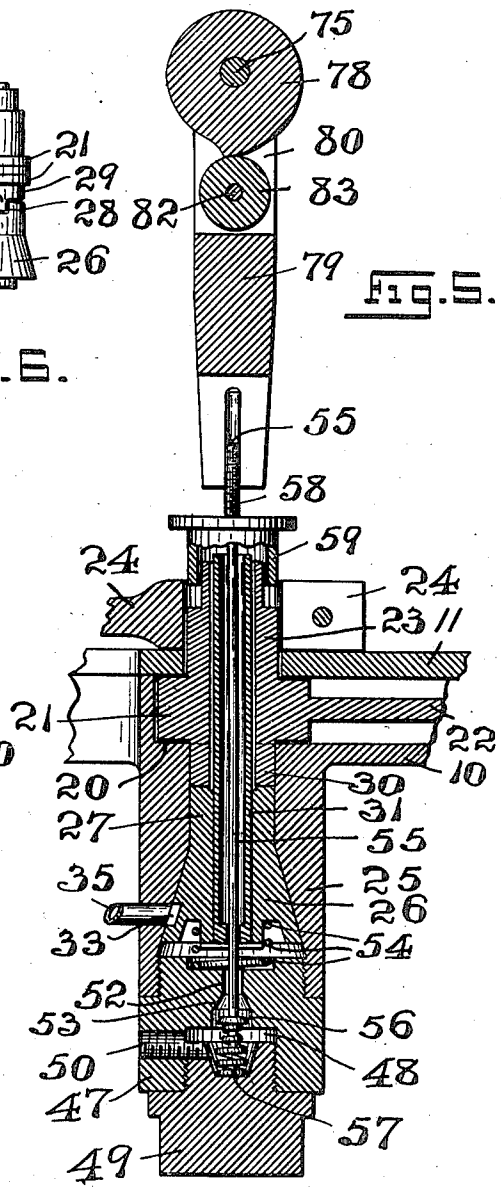

Fig. 5.

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UNITED STATES PATENT OFFICE.

ZACHARIAH S. HOFFMAN, OF NEWARK, NEW JERSEY, ASSIGNOR OF ONE-HALF TO WARREN T. FREY, OF IRVINGTON, NEW JERSEY.

CARBURETER.

1,010,051. Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed August 18, 1910. Serial No. 577,856.

To all whom it may concern:

Be it known that I, ZACHARIAH S. HOFFMAN, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Carbureters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention has reference, generally, to improvements in carbureters for internal combustion motors; and, the present invention has for its principal object to provide a novel and simply constructed apparatus or device by means of which a perfect admixture of the gasolene with air is obtained to produce the explosive gas which is to be passed into the cylinder of the combustion motor.

The invention has for its further object to provide a means for obviating the necessity of a vacuum to lift the fuel or gasolene from the spray nozzle; and, in place thereof, providing a method whereby the air passes through the carbureter at the full normal atmospheric pressure, and at a high velocity, so that the same takes up the fuel or gasolene in passing the spray nozzle and thoroughly atomizes or mixes the said fuel or gasolene through said inrushing air. In this manner, it is possible to obtain from the air and fuel or gasolene combined, the maximum explosive effect or efficiency which produces a maximum of heat-units and a consequent increased efficiency of power.

A further object of this present invention is to provide a governor for automatically controlling the flow of fuel or gasolene to the spray-nozzles, the operation of the governor being controlled by the throttle movements, so that a proper balance in the quantity or proportion of gasolene to the amount of air, admitted to the carbureter by said throttle-shutter, is automatically maintained, thus keeping supplied to the motor-cylinders a proper admixture of air and gasolene with reference to the amount of work or power it is desired to produce in the operation of the internal combustion motor.

Other objects of this invention not at this time more particularly enumerated will be clearly evident from the following detailed description of the same.

With the various objects of the present invention in view, the said invention consists, primarily, in the novel carbureter for internal combustion motors hereinafter more fully set forth; and, furthermore, this invention consists in the novel arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, all of which will be presently more fully described and then finally embodied in the clauses of the claims which are appended to and which form an essential part of this specification.

The invention is clearly illustrated in the accompanying drawings, in which:

Figure 1 is a front elevation of a carbureter showing one embodiment of the principles of the present invention; Fig. 2 is a side elevation of the same; and Fig. 3 is a longitudinal vertical section of the same, taken on line 3—3 in said Fig. 2, looking in the direction of the arrow *x*, said Fig. 3 being drawn upon an enlarged scale. Fig. 4 is a detail horizontal section, taken on line 4—4 in said Fig. 3, looking in a downward direction; Fig. 5 is a detail horizontal section, taken on line 5—5 in said Fig. 3, also looking in a downward direction; and Fig. 6 is a detail horizontal section, taken on line 6—6 in said Fig. 3, looking in a downward direction, but illustrating the throttle-shutter of said carbureter in its completely open position. Fig. 7 is another horizontal section, taken on line 7—7 in said Fig. 3, also looking in a downward direction; Fig. 8 is a detail longitudinal vertical section, taken on line 8—8 in said Fig. 3, looking in the direction of the arrow *y*, this view being illustrated upon a still further enlarged scale; Fig. 9 is a detail longitudinal vertical section, similar to that shown in Fig. 8, but illustrating the parts shown therein in their operated positions; and Fig. 10 is a detail view of a portion of a gasolene valve showing its operative connection with the throttle-hub of the carbureter.

Similar characters of reference are employed in all of the herein-above described views, to indicate corresponding parts.

Referring now to the said drawings, the reference-character 1 indicates a complete carbureter made in accordance with the

principles of the present invention, the same comprising a cylindrical shell or body 2 provided at its upper end with an outwardly flaring enlarged portion or dome-like shell 3 from which extends upwardly an internally screw-threaded connecting pipe 4 forming the outlet of said carbureter. The said cylindrical shell or body 2 is provided in its walls with oppositely facing rectangular openings 5, and said shell or body 2 is further provided, at a point above said openings 5, with an annular shoulder 6 having a downwardly depending flange 7, said shoulder and flange forming a seat which is adapted to receive one end of a cylindrical body 8, preferably of glass, and adapted to fit over said cylindrical shell or body 2 to close its said openings 5, a gasket 9 being arranged in said seat so as to provide a tight joint or connection between the said body 8 with said shell or body 2. The said body 8 being, as has been stated, preferably made of glass, is transparent so that a view of a portion of the interior of said carbureter may be had, while the same is in operation, to readily ascertain that the parts of the device and the carbureter are properly fulfilling their functions.

The reference-character 10 indicates a throttle-casing, the same being provided with a cover or plate 11 which is secured thereto by means of screws 12, or any other suitable fastening means. The said cover or plate 11 is provided with a screw-threaded opening 13 adapted to receive the lower screw-threaded end 14 of said cylindrical shell or body 2 for the purpose of operatively joining the same with said cover-plate 11 and said throttle-casing 10. Located adjacent to the marginal circumference of said screw-threaded opening 13 of the cover-plate 11 is an upwardly extending concentric flange 15 adapted to form a receiving socket in which is seated the lower end of the said body 8. Said receiving socket may be provided with a gasket 16 so as to produce a tight joint or connection between said body 8 and said cover-plate 11. Said throttle-casing 10 is provided with a downwardly extending cylindrical portion 17 forming an air-inlet in registration with said screw-threaded opening 13 of the cover-plate 11 and the opening of said cylindrical shell or body 2. Said throttle-casing 10 is further provided with seat, as 18, arranged within the same and registering with said screw-threaded opening 13 of the cover-plate 11 and the opening of said cylindrical shell or body 2, said seat 18 being adapted to form a proper contact with a throttle-shutter when it is desired to completely or partially close the air-inlet of said carbureter. Pivotally mounted in bearing-portions or receiving sockets 19 and 20 located, respectively, in the said cover-plate 11 and the said throttle-casing 10, is the hub-portion 21 of a throttle-shutter 22 which is adapted to swing or slide within said throttle-casing 10. The said hub-portion 21 is provided with an upwardly extending part 23, which extends through and above said cover-plate 11, and to which may be secured, in a suitable manner, a lever or arm 24, by means of which said throttle-shutter can be operated so as to produce its opening and closing movements.

The throttle-casing 10 is further provided with a downwardly extending valve-casing 25, preferably forming an integral part thereof, and arranged so as to turn within said casing 25 is a gasolene or fuel-regulating valve 26, the same being adapted to increase or decrease the flow of gasolene or fuel in proportion to the size or area of the opening of said throttle shutter 22; and, hence operating simultaneously with the movement of said throttle-shutter. To this end, said regulating-valve 26 is provided with an upwardly extending shank 27, provided, in turn, at its upper end with a female clutch-member 28, and the hub-portion 21 of the throttle-shutter 22 is provided with a downwardly extending portion 29 having at its lower end a male clutch-member 30 adapted to engage with said female clutch-member 28, so that said valve 26 is operated or moved when the throttle-shutter is operated or moved. Said regulating valve 26 is provided with a centrally disposed tubular member 31 which extends longitudinally through the valve-casing and upwardly through a suitable opening in the hub-portions 21 of the throttle shutter 22, the said member 31 presenting its upper end from an opening in the part 23 above said cover-plate 11. The said regulating valve 26 is also provided with an opening or gasolene-passage 32 which extends from its under side and leads into a horizontally disposed channel or passage 33 in the side of said valve 26. Suitably connected with and extending from the said valve-casing 25 are a plurality of gasolene-conveying ducts or pipes, preferably three in number, which are respectively indicated by the reference-numerals 34, 35 and 36. The intake ends of said ducts or pipes are adapted to be brought into registration with said horizontal channel or passage 33 upon the movement of said regulating valve 26. Said ducts or pipes 34, 35 and 36 extend outwardly from said valve-casing 25 and pass through the wall of the cylindrical portion 17 forming the air-inlet of said carbureter, and penetrate into the same, the said duct or pipe 34 being provided with an upwardly extending portion 37 which terminates in a spray-nozzle 38 which is located in such a manner that it is in contact with the under side of the throttle-shutter 22 and is closed thereby, when

the throttle-shutter is in its closed position; but, it is so arranged that it is the first spray-nozzle to be passed and put in operation by the first or partial opening movement of said throttle-shutter 22. In like manner, the said duct or pipe 35 is provided with a forked portion 39 providing two upwardly extending portions 40 and 40′ terminating in spray nozzles 41 and 41′ which are located so as to be in closed contact with the throttle-shutter when the latter is closed or partially opened; but, are arranged so that they are put in operation after the spray-nozzle 38, above described, is passed which occurs upon a further opening movement of said throttle-shutter 22. In like manner, the said duct or pipe 36 is provided with an upwardly extending portion 42 terminating in a spray-nozzle 43 which is the last to be put in operation upon the complete or full opening movement of the throttle-shutter 22, all of which will be readily understood from an inspection of Figs. 6 and 7 of the accompanying drawings. The respective spray-nozzles 38, 41, 41′ and 43 are constructed preferably in the form of star-shaped shells of any desirable number of points or extensions, forming outwardly inclined channels 44 terminating at the ends of the respective points. This novel form of spray-nozzle distributes the gasolene or fuel over a comparatively large area and rim-periphery, and thereby exposes a maximum quantity of the gasolene or fuel to the atomizing or absorbing effect of the air rushing past said spray-nozzles and into the carbureter, whereby an explosive gas of maximum efficiency is obtained. The lower end of said valve-casing 25 is provided with a screw-threaded opening 45 adapted to receive the screw-threaded boss 46 of a gasolene intake-member 47, the same being provided with a chambered portion 48 and a closure or cap 49 which is arranged to close the bottom thereof. The said gasolene intake-member 47 is provided with a suitably located screw-threaded opening 50 in the wall thereof with which is connected the end of a gasolene supply pipe 51. Said gasolene intake-member 47 is further provided with a centrally disposed and longitudinally extending duct or gasolene passage 52 having an enlarged portion at its lower end forming a conical valve-seat 53, and arranged between said gasolene intake-member 47 and the lower end of said regulating valve 26 is a coiled spring 54 which tends to hold up said valve 26 in its operative position with relation to its casing 25 and to the hub-portion 21 of said throttle-shutter 22. Slidably arranged in said tubular member 31 of said regulating valve 26 is a valve-stem 55, the same extending downwardly through said gasolene duct or passage 52; said valve-stem being provided with a shut-off valve-member 56 adapted to be seated upon said valve-seat 53 arranged in the duct or passage 52. A coil-spring 57 is arranged between said cap or closure 49 and said shut-off valve-member 56 so as to maintain the latter normally in its closing or shut position. The upper free end of said valve-stem 55 passes upwardly out of said tubular member 31, and is provided with screw-threads 58. Arranged in connection with the upper free end of said valve-stem 55, and secured upon its screw-threads 58, is a cap-like member 59 adapted to slidably contact with and inclose a portion of said upwardly extending portion 23 of the hub-portion 21 of said throttle-shutter 22.

Arranged, preferably, in connection with said connecting pipe 4, and within the same, is a bracket 60 which is provided with a centrally disposed bearing-portion 61. In like manner, there is secured in a suitable location within said cylindrical shell or body 2 another bracket 62 also having a bearing-portion 63. Slidably supported in the respective bearing-portions 61 and 63, and extending longitudinally within said cylindrical shell or body 2 and its dome-like shell 3, is a rod 64 which is provided at its lower portion with a plurality of gear-teeth or a rack 65. Suitably secured upon said rod 64 is a governor, preferably in the form of a disk 66, the peripheral edges of which normally rest upon a shoulder 67 formed within said cylindrical shell or body 2 and preferably at a point where the same is joined by its dome-like shell 3. Arranged within said dome-like shell 3, so as to extend beneath said bearing-portion 61, is a spring-like tension regulator, the same comprising a forked arm 68 which straddles said rod 64, said forked arm being pivotally secured in a suitable manner to a fulcrum-block 69, which in turn is suitably secured to the inner side of the wall of the dome-like shell 3. Said forked arm is provided, at or near its fulcrum, with an operating arm 70, the said arm being engaged by the grooved end 71 of an operating screw 72 mounted in the walls of said dome-like-shell 3. Arranged between the said forked arm 68 and the upper side of said governor-disk 66 is a governor-spring 73, preferably in the form of a tapering spiral, said spring being broader at its base where it contacts with the governor-disk 66, than at its top. The purpose of this tapering construction is to provide a governor-spring which will offer less resistance to the operation of said governor-disk 66 at the beginning of its movement, but which will increase said resistance as the movement of the governor-disk increases; and, furthermore, said form of spring permits a collapse or compression of said spring into a less space than the ordinarily coiled spring, as will be clearly evident. Mounted

in bearing-portions 74, formed in said cylindrical shell or body 2, so as to extend laterally through and project beyond the walls of the same, is a shaft 75, the said shaft 75 being provided with a pinion or gear 76 which meshes with said gear teeth or rack 65 of the rod 64 carrying said governor-disk 66. Said shaft 75 extends outwardly upon one side of said cylindrical shell or body 2 and has connected therewith, in any suitable manner, a balance-wheel 77; and, in like manner, said shaft 75 extends outwardly upon the other side of said cylindrical shell or body 2 and has connected therewith, in any suitable manner, a cam-member 78. Adjustably connected with the screw-threaded upper end of said valve-stem 55 is a yoke-member 79 which is provided with upwardly extending arms 80, the upper ends of which are forked, as at 81, so that said arms 80 may straddle said shaft 75, preferably, one on either side of said cam-member 78. Mounted upon a pintle 82, suitably supported by said arms 80, is a roller 83 which is in rolling contact with the under side of said cam-member 78.

The operation of the novel construction of carbureter, constructed as set forth in the detailed description thereof and hereinabove contained, briefly is as follows: When it is desired to start an interval combustion engine with which the carbureter is connected, the throttle-lever or arm 24 is operated to partially open the throttle-shutter 22, which permit the air to be taken in through said air-inlet. When the throttle is first partially opened, only the spray-nozzle 38 of the gasolene passage or duct 34 is exposed to the action of the air. The air which is taken in or sucked through the small throttle-opening passes said nozzle 38 and takes up the gasolene from the peripheral edges of said spray-nozzle 38, thus providing a sufficient mixture to readily operate the engine, so that the same starts easily. At the minute that the air rushes into the carbureter it operates upon the governor-disk 66 and raises the same against the tension of said governor-spring 73, the air mixed with gasolene passing around said governor-disk and through the dome-like shell 3 and out of the carbureter-outlet. It is impossible for the air to pass said governor-disk 66 without moving the same. With the throttle-shutter 22 partially opened the carbureter properly supplies to the engine sufficient gas for easily starting the same and for light running; but, upon further opening the throttle, an increased air-passage is obtained, thus exposing successively the various spray-nozzles, so as to increase the supply of gasolene-distributing surface with the increase of air. The opening of said throttle-shutter is accompanied simultaneously with the operation of the regulating valve 26 which is arranged to always maintain the open relation of the duct or pipe 34, but which, when the throttle is closed, shuts off the ducts or pipes 35 and 36. As the throttle-shutter opens the said valve 26 twists in its casing, thereby causing the horizontal channel 33 to successively communicate with the respective ducts or pipes 35 and 36, whereby an increased supply of gasolene is allowed to be carried to the spray-nozzles connected therewith. No matter at what position, however, said throttle-shutter is maintained, the governor-disk 66 is operated by the inrushing air, and the upward movement of the disk 66 being communicated to said rod 64 and its rack 65, the latter causes a revolution of the shaft 75 and its cam-member 78. Said cam-member 78, when thus revolved, presses upon the roller 83 whereby said yoke-member 79 and the valve-stem 55 are moved downwardly. This movement tends to unseat the valve-member 56 and thus opens the passage 52, whereby a supply of gasolene passes through said regulating valve 26 into said pipes or ducts 34, 35 and 36, as hereinabove described. Thus the opening and closing of said shut-off valve 56 is operated by the governor-disk 66, which in turn is operated by the inrushing air; and, hence, the supply of gasolene is always in proper proportion to the amount of air entering said carbureter, and the supply is automatically regulated and controlled according to the needs of the engine. The balance-wheel 77 tends to steady the operation of the governor-disk, and prevents any sudden or erratic movements of the same, and prevents said disk from springing suddenly up to its full extent. The said balance wheel also tends to offer enough friction or resistance at the first movement of said disk so as to prevent sudden jumps or vibrations; and, at the same time it permits of an acceleration of the movement of the disk when its resistance is partially overcome. It will thus be understood, that at the first suction-stroke of the engine, the governor-disk rises and the fuel begins to flow. The minute the engine stops, the governor-disk falls thereby automatically shutting off the fuel, and hence no reservoir with regulating float or other similar devices is necessary with my novel carbureter.

The governor-disk has no connection with the throttle, but works entirely by the suction which causes the air to rush against the same, no matter whether the throttle is partially or fully open.

The tension of the governor-spring is regulatable, so as to properly adjust the action of the governor-disk which is controlled by said spring to the needs of the specific engine to which the carbureter may be attached. Once regulated it needs little attention.

I am aware that some changes may be made in the general arrangements and combinations of the various devices and parts, as well as in the details of the construction thereof, without departing from the scope of my present invention as set forth in the foregoing specification, and as defined in the clauses of the claim which are appended to the same. Hence, I do not limit my invention to the exact arrangements and combinations of the devices and parts as described in the said specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

I claim:

1. In a carbureter, the combination with a shell or body, provided in its lower end with an air-inlet, of a throttle-shutter adapted to open and close said air-inlet, a plurality of gasolene-ducts or pipes provided with spray-nozzle arranged within the air-inlet of said shell or body beneath said throttle-shutter, a regulating valve connected so as to operate simultaneously with said throttle-shutter to regulate the flow of gasolene in said gasolene ducts or pipes, a gasolene shut-off valve, and means for automatically opening and shutting said shut-off valve, substantially as and for the purposes set forth.

2. In a carbureter, the combination with a shell or body provided in its lower end with an air-inlet, of a throttle-shutter adapted to open and close said air-inlet, a plurality of gasolene-ducts or pipes provided with spray-nozzles arranged within the air-inlet of said shell or body beneath said throttle-shutter, a regulating valve connected so as to operate simultaneously with said throttle shutter to regulate the flow of gasolene in said gasolene ducts or pipes, a gasolene shut-off valve, means for operating said shut-off valve, and a governor arranged within said shell or body for automatically operating said shut-off valve-operating means, substantially as and for the purposes set forth.

3. In a carbureter, the combination with a shell or body provided in its lower end with an air-inlet, of a throttle shutter adapted to open and close said air-inlet, a plurality of gasolene-ducts or pipes provided with spray-nozzles arranged within the air-inlet of said shell or body beneath said throttle-shutter, a regulating valve connected so as to operate simultaneously with said throttle-shutter to regulate the flow of gasolene in said gasolene ducts or pipes, a gasolene shut-off valve, a spring for normally maintaining said shut-off valve in its closed position, a valve-stem connected with the movable member of said shut-off valve, a yoke-member connected with the upper free end of said valve-stem, said yoke-member carrying a roller, a governor arranged within said shell or body, and a cam-member operated by said governor to engage said roller and operate said shut-off valve, substantially as and for the purposes set forth.

4. In a carbureter, comprising a main body, gasolene-feeding means and a gasolene shut-off valve of a governor for controlling the movement of said gasolene shut-off valve, comprising a dome-like shell connected with the main body of said carbureter, a longitudinally slidable rod, a rack upon said rod, a governor-disk upon said rod adapted to move vertically in said dome-like shell, a transverse shaft extending through the main body of said carbureter, a pinion upon said shaft adapted to engage said rack, a balance-wheel upon one end of said shaft adapted to engage means connected with said shut-off valve stem to operate said shut-off valve, and a governor-spring engaging said governor-disk, substantially as and for the purposes set forth.

5. In a carbureter, comprising a main body, gasolene-feeding means and a gasolene shut-off valve of a governor for controlling the movement of said gasolene shut-off valve, comprising a dome-like shell connected with the main body of said carbureter, a longitudinally slidable rod, a rack upon said rod, a governor-disk upon said rod adapted to move vertically in said dome-like shell, a transverse shaft extending through the main body of said carbureter, a pinion upon said shaft adapted to engage said rack, a balance-wheel upon one end of said shaft, a cam-member upon the other end of said shaft adapted to engage means connected with said shut off valve-stem to operate said shut off valve, a governor-spring engaging said governor-disk, and means for regulating the tension of said governor-spring, substantially as and for the purposes set forth.

In testimony, that I claim the invention set forth above I have hereunto set my hand this 13th day of August, 1910.

ZACHARIAH S. HOFFMAN.

Witnesses:

GEORGE D. RICHARDS,

FREDK. H. W. FRAENTZEL.