E. S. SMITH.

THROTTLING DEVICE FOR CARBURETERS.

APPLICATION FILED MAY 17, 1915.

1,178,960.

Patented Apr. 11, 1916.

2 SHEETS—SHEET 1.

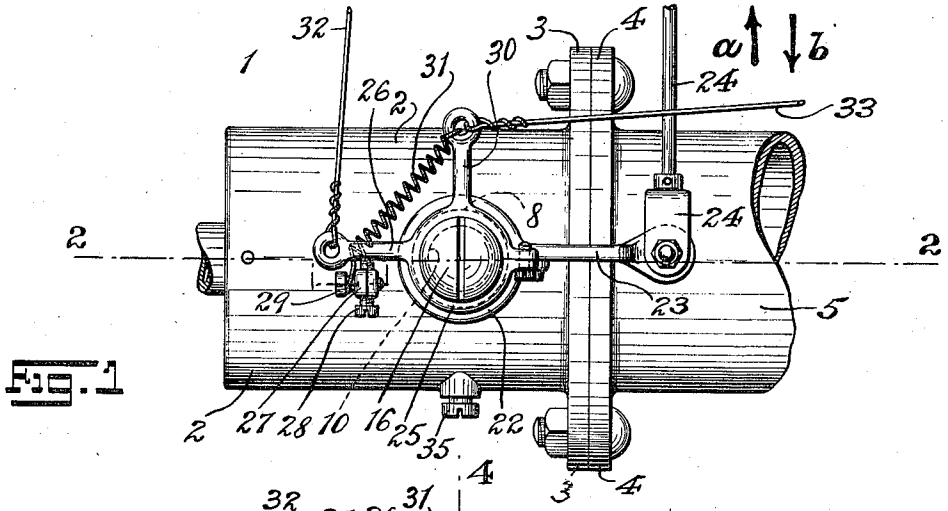

Fig. 1

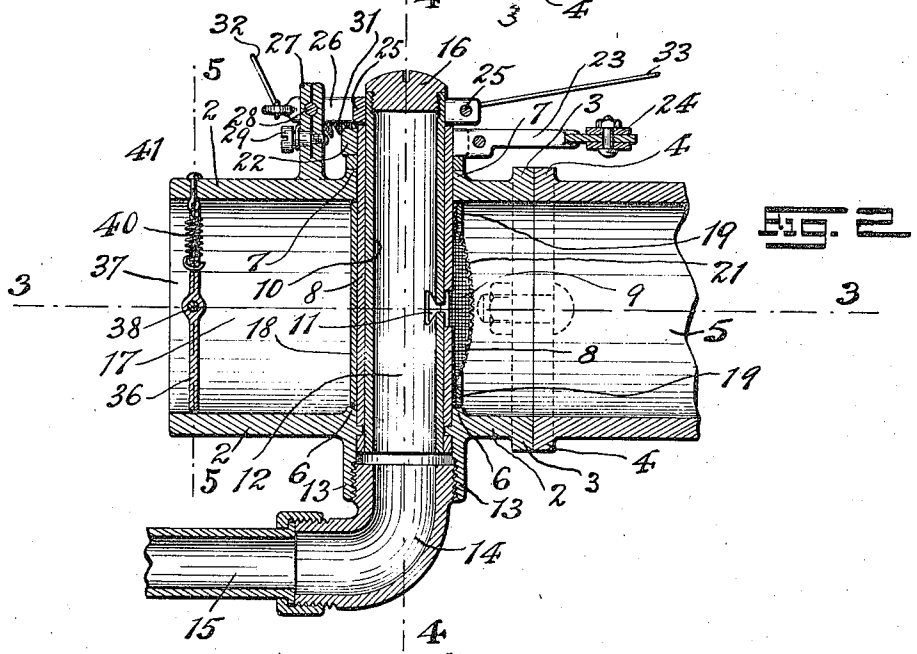

Fig. 2

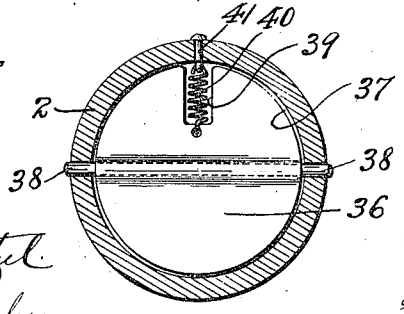

Fig. 5

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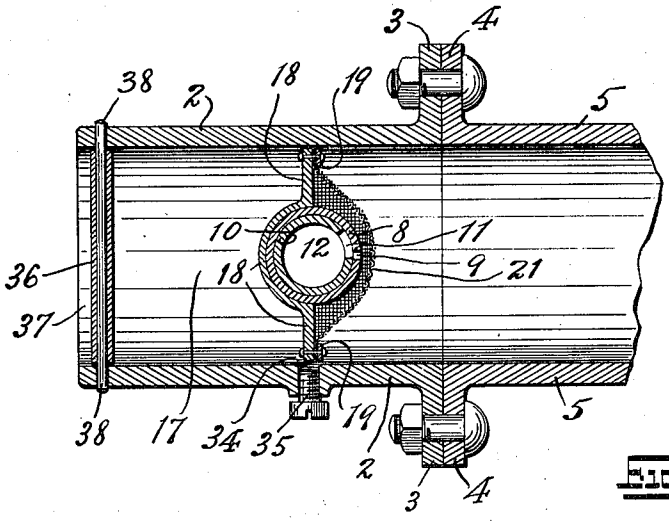

Fig. 3

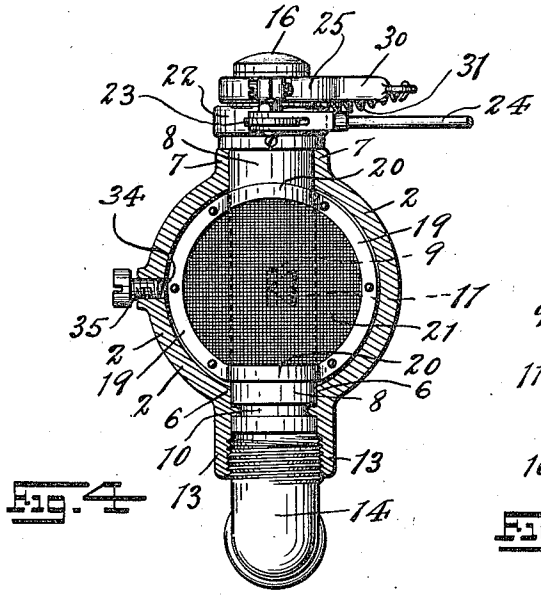

Fig. 4

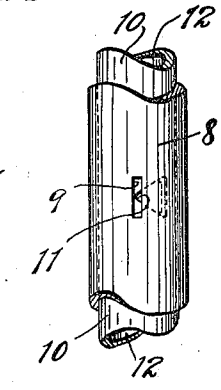

Fig. 6

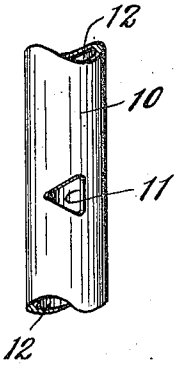

Fig. 7

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UNITED STATES PATENT OFFICE.

ELMER S. SMITH, OF NEWARK, NEW JERSEY.

THROTTLING DEVICE FOR CARBURETERS.

1,178,960. Specification of Letters Patent. Patented Apr. 11, 1916.

Application filed May 17, 1915. Serial No. 28,551.

To all whom it may concern:

Be it known that I, ELMER S. SMITH, 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 Throttling Devices for 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 relates, generally, to improvements in throttling and controlling mechanism for use in connection with carbureters, and especially adapted for use with carbureters of the general type patented by me in Letters Patent No. 1,141,276, dated June 1, 1915, of which the present application is, in part, a division.

The present invention has for its principal object to provide a simple and novel construction of throttling and controlling means for carbureters, whereby the mixture of air and gas delivered by the latter may be throttled and controlled prior to its delivery to the cylinders of a hydrocarbon engine, the said throttling and controlling apparatus providing a novel means for modifying the mixture of air and gas by the addition thereto of more or less air through auxiliary air passages, and at the same time providing means which serves both to further mix the air and gas as it passes to the engine cylinders, and to protect the delivery ports of the apparatus against the entrance of any back-fire from the engine cylinders.

Other objects of the present invention, not at this time more particularly enumerated, will be clearly understood 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 construction of throttling and controlling device for use in connection with carbureters hereinafter set forth; and, furthermore, this invention consists in the novel arrangements and combinations of the various 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 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 top or plan view of said novel throttling and controlling means, made according to and embodying the principles of the present invention. Fig. 2 is a vertical section of the same, taken on line 2—2 in said Fig. 1. Fig. 3 is a horizontal section of the same, taken on line 3—3 in said Fig. 2. Fig. 4 is a transverse section of the same, taken on line 4—4 in said Fig. 2, the internal parts of the mechanism being illustrated in elevation. Fig. 5 is a detail transverse section, taken on line 5—5 in said Fig. 2. Fig. 6 is a detail elevation of the throttling tubes provided with the control ports from which the mixture of air and gas is discharged; and Fig. 7 is a detail elevation of the inner of the two throttling tubes.

Similar characters of reference are employed in all of the hereinabove described views to indicate corresponding parts.

Referring now to the said drawings the reference character 1 indicates the complete novel construction of throttling and controlling device for carbureters, made according to and embodying the principles of my present invention, the same comprising a casing 2 open throughout its length, and provided at one end with a flange 3, adapted to be registered with and secured to the flange 4 of the free end of a manifold 5 leading to the cylinders of an internal combustion engine. Extending transversely through said casing 2, and journaled in bearing portions 6 and 7 provided in the sides of said casing is an outer throttling-tube 8, provided with a discharge port 9, the latter being preferably in the form of an elongated opening or comparatively narrow slot. Extending through said outer throttling-tube 8, so as to be journaled therein to rotate against the inner sides thereof, is an inner throttling-tube 10, the same having a throttling-port 11, said throttling-port 11 being preferably of triangular form, so that as it is rotated in registration with said discharge-port 9 it will open up a greater or less area of the latter to communication with the tubular-passage 12 of said inner throttling-tube at the will of the operator. It will of course be understood, however, that the arrangement and shape of the respective ports 8 and 11

may be variously modified, so long as in operating the throttling-tubes a variable port area may be obtained. The free end of said bearing-portion 6 is provided with an outwardly extending interiorly threaded portion 13 for receiving an elbow 14, or other union device, whereby a gas delivery conduit 15 leading from a carbureter may be connected with said throttling and controlling device so as to deliver the fuel mixture of air and gas from the main carbureting apparatus to said interior or tubular-passage 12 of said inner throttling-tube 10, which is open at its lower end. The upper end of said inner throttling-tube 10 being closed against the escape of the mixture of air and gas or gaseous fuel therefrom by means of a suitable plug or closing-member 16, suitably secured within the said upper end of said inner throttling-tube 10.

Secured exteriorly upon the outer surface of said outer throttling-tube 8, so as to turn therewith, and so as to extend transversely within the main passage 17 of said casing 2, is a disk or butterfly valve member 18, and secured to said disk or butterfly valve member by means of a ring-member 19, which registers with the periphery of said disk or butterfly valve member, and portions 20 of which provide strap-members for binding said disk or butterfly valve member upon said outer throttling-tube, is a gauze-screen member 21 which extends around that portion of said outer throttling-tube 8 in which said discharge-port 9 is located so as to register over or cover said discharge-port 9, thereby serving to guard said discharge-port 9 against the entrance of any chance back-fire therethrough which may emanate from the engine-cylinders and pass into the manifold 5, and at the same time serving to further "break-up" or mix the constituents of the gaseous fuel discharged through said discharge-port 9 into the manifold 5 for delivery to the engine cylinders. The said outer throttling-tube 8 extends outwardly through said bearing-portion 7, so as to project exteriorly therefrom, and secured to said exteriorly projecting end of said outer throttling-tube 8 is a split-collar 22 from which extends an operating lever-arm 23, to the free end of which is pivotally connected a connecting-rod 24 through which the operating power for rotating said outer throttling-tube is transmitted. The closed end of said inner throttling-tube 10 projects exteriorly from the outwardly projecting end of said outer throttling-tube 8, and secured to said exteriorly projecting end of said inner throttling-tube 10 is a split-collar 25 from which extends an arm 26. Connected with said casing 2 so as to project outwardly therefrom is a stop-post 27 the upper end of which is split or bifurcated. Extending through the split or bifurcated portion of said stop-post 27 is an adjustable stop-screw 28 against which said arm 26 is brought to rest to establish a normal position of said inner throttling-tube 10 for the purpose of fixing the normal position of said throttling-port 11 thereof. A locking screw 29 is connected with the said stop-post 27 for the purpose of drawing together its split or bifurcated portions to cause the same to bind frictionally upon said adjustable stop-screw 28 to retain the same in the desired adjusted position. Also radiating or extending from said split-collar 25 is another arm 30 to the free end of which is connected one end of a pull-spring 31, the opposite end of which is anchored upon the shank of said locking-screw 29, said pull-spring tending to maintain and return said arm 26 in stopped contact with said stop-screw 28. A pull-wire 32, or other equivalent device, is connected with the free end of said arm 26, whereby the same may be oscillated to rotate said inner throttling-tube 10 to shift the position of the throttling-port 11 formed therein, said pull-wire extending to the steering-wheel or adjacent to the driver's seat, when the apparatus is serving the internal combustion engine of an automobile, motor boat or other means of locomotion. In like manner a pull-wire 33, or its equivalent, is connected with the free end of said arm 30, whereby said arm 30 may also be used to rotate said inner throttling-tube 10 to shift the position of its throttling-port 11, said pull-wire extending to a point adjacent to the hand cranking means of the internal combustion engine served by the controlling and throttling device, so that certain manipulations of the latter may be conveniently accomplished while cranking or starting the engine.

Formed in the side of said casing 2 is an internally screw-threaded opening 34, located in alinement with the edge of said butterfly valve member 18 when the latter is in its closed position, said opening 34 being slightly greater in diameter than the width of said valve member 18, whereby a by-pass for air may be provided when said valve member 18 is closed. An adjusting screw 35 arranged in said opening 34 may be manipulated to regulate the amount of opening to increase or decrease to the desired degree the amount of air permitted to by-pass said closed valve member 18.

The reference character 36 indicates a valve-member located at the air intake end 37 of the casing 2. This valve-member 36 is pivoted upon a transversely extending journal pin 38 mounted in said casing 2. The periphery of said valve-member 36 is provided with a cutaway portion 39 providing both as a means for rendering the valve-member unbalanced so that it will yield and

open under the influence of suction and as a receiving space for a pull-spring 40, one end of which is secured to said valve-member 36, and the opposite end of which is anchored upon an anchor-hook 41 affixed in the wall of said casing 2, opposite the edge of said valve-member 36 when the same is in closed position. Said pull-spring 40 normally maintains said valve-member 36 in closed position to the air intake end opening of said casing 2, but yieldable to the influence of suction within said casing 2 so as to permit the same to swing open to admit air into the interior of said casing 2.

When in normal relation to each other the said outer and inner throttling-tubes 8 and 10 are so positioned relatively to each other, that the discharge-port 9 of the outer throttling-tube is registered with the constricted portion or apex of the throttling-port 11 of the inner throttling-tube, and under such minimum port opening a minimum quantity of gaseous fuel is discharged into the manifold 5, and also under such circumstances the butterfly valve member 18 is in its closed position. The inner throttling-tube 10 being maintained in normal position by the spring 31, which holds its oscillating arm 26 in contact with the stop-screw 28 as adjusted in the stop-post 27. The said stop-screw 28 being adjustable may be regulated to adjust the stopped position of said inner throttling-tube 10, so that the desired amount of opening of the normally registered ports 9 and 11 may be fixed. When an increased amount of gaseous fuel is desired together with an additional amount of air to be intermixed therewith, the connecting-rod 24 is pulled in the direction of the arrow —*a*— (shown in Fig. 1) thereby oscillating the arm 23 controlling the movement of the outer throttling-tube 8, which being rotated in the direction of the arrow —*a*— moves the discharge-port 9 in relation to the throttling-port 11 so as to bring in registration with the former a wider portion of the latter, thereby increasing the amount of total opening of the combined ports, and consequently permitting an increased suction influence through the apparatus to the main carbureting device with which it is connected, and the consequent increase of volume of the gaseous fuel discharged through said port openings into the manifold 5 for delivery to the engine cylinders, at the same time this rotation of the outer throttling tube 8 turns simultaneously the butterfly valve member 18 to open the same and thereby permit an additional or auxiliary amount of air to be drawn through the passage 17 of the casing 2, which will be intermixed with the gaseous fuel being discharged through the port openings of the throttling-tubes. In this manner increased fuel supply may be delivered to the engine cylinders for high speed or heavy work demands. If, however, it is desired to increase the amount or volume of the gaseous fuel, without adding thereto any additional or auxiliary air, thereby obtaining a gas of rich quality, the outer throttling-tube 8 is maintained in its normal initial position, thus keeping closed the butterfly valve member 18 against the admittance of air through the passage 17 of the casing 2, then by operating the pull-wire 32 to oscillate the arm 26, the inner throttling-tube 10 is rotated to expose in registration with said discharge port 9 of the said throttling-tube 8 an increased proportion or amount of the throttling port 11, thereby increasing the size of the discharge orifice formed by the registered ports 9 and 11, which result in an increase of suction influence and the consequent increase in the volume of gaseous fuel discharged into the manifold 5 for delivery to the engine cylinders without dilution by additional air, so that the full richness of the gaseous fuel is maintained. The same operations and results may be obtained by pulling the pull-wire 33, which is above described, extends to a point adjacent to the cranking mechanism of the engine, so that a rich primary fuel charge may be delivered to the engine cylinders for starting purposes. The pull-wire 33 being released after the engine is running, so that the spring 31 may return said throttling tube 10 and its port 11 to normal initial position. Of course, where a self-starter is used in connection with the engine, the throttling-tube 10 may be rotated at starting by means of the pull-wire 32 and arm 26 from the operator's seat, thereby accomplishing the same result, to wit, the provision of a rich primary fuel charge to the cylinders of the engine when starting.

Another advantage of the novel controlling and throttling device above described lies in the fact that, it is possible to shut off the supply of gaseous fuel entirely, and at the same time admit air to the engine cylinders, the compression of which serves to check the engine from racing, in other words acting as a brake, and at the same time serving to cool the engine cylinders; thus when the engine is serving as the motive power of an automobile, and the automobile is traveling down grade, the fuel supply may be cut off, thereby economizing the same, and at the same time the braking function and cooling action of the air admitted to the cylinders of the engine is accomplished as above noted. This result is attained by pushing the connecting-rod 24 in the direction of the arrow —*b*— (shown in Fig. 1) to oscillate the arm 23 and rotate the throttling-tube 8 in the direction of the said arrow —*b*—, thereby carrying said discharge port 9 entirely out of regis-

tration with the throttling-port 11 of said inner throttling-tube 10 whereby the gas is entirely shut off, and at the same time this rotation of the outer throttling-tube 8 opens said butterfly valve member 18, so that air is admitted through the passage 17 of the casing 2 to the manifold 5, and thence to the engine cylinders.

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 of the same, without departing from the scope of the present invention as set forth in the foregoing specification, and as defined in the claims appended thereto. 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. A control and throttling mechanism for gaseous fuel discharged from a carbureter comprising, a casing providing an auxiliary air passage having an air intake at its outer end, a pair of nested throttling-tubes provided with port openings adapted to be variously positioned with relation to each other to increase or decrease the combined port opening, said throttling-tubes being mounted to extend transversely through said casing and being independently rotatable, means for connecting the inner of said throttling tubes with a carbureter, independent means for operating or rotating each throttling-tube, an auxiliary air control valve located in the air passage of said casing and connected with the outer of said throttling tubes and operated by the rotation thereof, a stop-means engageable by the operating means of said inner throttling-tube for fixing the normal initial position of same, and spring means for maintaining said inner throttling-tube in said normal initial position.

2. A control and throttling mechanism for gaseous fuel discharged from a carbureter comprising, a casing providing an auxiliary air passage having an air intake at its outer end, a pair of nested throttling-tubes provided with port openings adapted to be variously positioned with relation to each other to increase or decrease the combined port opening, said throttling-tubes being mounted to extend transversely through said casing and being independently rotatable, means for connecting the inner of said throttling tubes with a carbureter, independent means for operating or rotating each throttling-tube, an auxiliary air control valve located in the air passage of said casing and connected with the outer of said throttling-tubes and operated by the rotation thereof, a stop means engageable by the operating means of said inner throttling-tube for fixing the normal initial position of the same, spring-means for maintaining said inner throttling-tube in said normal initial position, and a guaze screen adapted to extend over the combined port-opening of said throttling-tubes.

3. A control and throttling mechanism for gaseous fuel discharged from a carbureter comprising, a casing providing an auxiliary air passage having an air intake at its outer end, a pair of nested throttling-tubes provided with port openings adapted to be variously positioned with relation to each other to increase or decrease the combined port opening, said throttling-tubes being mounted to extend transversely through said casing and being independently rotatable, means for connecting the inner of said throttling tubes with said carbureter device, independent means for operating or rotating each throttling-tube, an auxiliary air control valve located in the air passage of said casing and connected with the outer of said throttling-tubes and operated by the rotation thereof, a stop-means engageable by the operating means of said inner throttling-tube for fixing the normal initial position of the same, spring-means for maintaining said inner throttling-tube in said normal initial position, a guaze screen adapted to extend over the combined port-opening of said throttling-tube, and an adjustable by-pass air passage located in said casing for determining the intake of a fixed volume of auxiliary air.

4. In a device of the kind described a pair of throttling-tubes one mounted within the other and independently rotatable, each throttling-tube having a port opening, said port-openings being adapted to be registered one with the other in various positions by the rotation of said throttling-tubes so as to increase or decrease at will the amount of the combined discharge opening formed thereby, a casing in which said throttling-tubes are mounted and into which their ports discharge, said casing having an auxiliary air intake opening, and an auxiliary air control valve located in said casing and connected with the outer of said throttling-tubes and operated by the rotation thereof.

5. In a device of the kind described a pair of throttling-tubes one mounted within the other and independently rotatable, each throttling-tube having a port opening, said port-openings being adapted to be registered one with the other in various positions by the rotation of said throttling-tubes so as to increase or decrease at will the amount of the combined discharge opening formed thereby, a casing in which said throttling-

tubes are mounted and into which their ports discharge, said casing having an auxiliary air intake opening, an auxiliary air control valve located in said casing and connected with the outer of said throttling-tubes and operated by the rotation thereof, and a valve member yieldable to the influence of suction within said casing, said valve-member normally closing said auxiliary air intake opening of said casing.

6. In a device of the kind described a pair of throttling-tubes one mounted within the other and independently rotatable, each throttling-tube having a port opening, said port-openings being adapted to be registered one with the other in various positions by the rotation of said throttling-tubes so as to increase or decrease at will the amount of the combined discharge opening formed thereby, a casing in which said throttling-tubes are mounted and into which their ports discharge, said casing having an auxiliary air intake opening, an auxiliary air control valve located in said casing and connected with the outer of said throttling-tubes and operated by the rotation thereof, and a pivoted valve member mounted in the air intake opening of said casing, a pull-spring secured by one end to said valve-member and by the other to said casing for normally holding said valve-member closed but yieldable to the influence of suction within said casing.

7. A control and throttling mechanism for gaseous fuel discharged from a carbureter comprising, a casing providing an auxiliary air passage having an air intake at its outer end, a pair of nested throttling-tubes provided with port openings adapted to be variously positioned with relation to each other to increase or decrease the combined port opening, said throttling-tubes being mounted to extend transversely through said casing and being independently rotatable, means for connecting the inner of said throttling-tubes with a carbureter, independent means for operating or rotating each throttling-tube, an auxiliary air control valve located in the air passage of said casing and connected with the outer of said throttling tubes and operated by the rotation thereof, a stop-means engageable by the operating means of said inner throttling-tube for fixing the normal initial position of the same, and spring means for maintaining said inner throttling-tube in said normal initial position, and a pivoted valve member mounted in the air intake opening of said casing, a pull-spring secured by one end to said valve-member and by the other to said casing for normally holding said valve-member closed but yieldable to the influence of suction within said casing.

8. A control and throttling mechanism for gaseous fuel discharged from a carbureter comprising, a casing providing an auxiliary air passage having an air intake at its outer end, a pair of nested throttling-tubes provided with port openings adapted to be variously positioned with relation to each other to increase or decrease the combined port opening, said throttling-tubes being mounted to extend transversely through said casing and being independently rotatable, means for connecting the inner of said throttling tubes with said carbureter device, independent means for operating or rotating each throttling-tube, an auxiliary air control valve located in the air passage of said casing and connected with the outer of said throttling-tubes and operated by the rotation thereof, a stop-means engageable by the operating means of said inner throttling-tube for fixing the normal initial position of the same, spring-means for maintaining said inner throttling-tube in said normal initial position, a gauze screen adapted to extend over the combined port-opening of said throttling-tube, and an adjustable by-pass air passage located in said casing for determining the intake of a fixed volume of auxiliary air, and a pivoted valve member mounted in the air intake opening of said casing, a pull-spring secured by one end to said valve-member and by the other to said casing for normally holding said valve-member closed but yieldable to the influence of suction within said casing.

9. In a device of the kind described a casing providing an auxiliary air passage having an air intake at its outer end, rotatable throttling-tubes mounted one within the other and journaled to extend through said casing, said throttling-tubes having registrable ports so arranged that by rotation of either the inner or outer throttling-tube the combined port opening formed thereby may be increased, decreased, or shut off, an auxiliary air control valve in said casing, and means interconnecting said auxiliary air control valve with said throttling tubes for simultaneously opening said valve proportionally to the variation of the combined port opening of said throttling-tubes, and also for opening said valve when said combined port opening of said throttling-tube is closed.

10. In a device of the kind described a pair of nested throttling-tubes one with the other, each throttling-tube having a port-opening, said port-openings being adapted to be registered one with the other in various positions, so as to increase or decrease at will the amount of the combined discharge opening formed thereby, means for rotating said outer throttling-tube in opposite directions whereby rotation of the same in one direction will vary the size of said

combined port-opening and rotation in the opposite direction will close said combined port opening, a casing in which said throttling-tubes are mounted and into which the combined port opening of the same discharge, an auxiliary air control valve located in said casing and connected with said outer throttling-tube, and operated by the rotation of said outer throttling-tube in one direction to open proportionately to the increase of said combined port opening, and operated by the rotation of said outer throttling-tube in the opposite direction to open when said combined port opening closes.

11. In a device of the kind described a pair of nested throttling-tubes one with the other, each throttling-tube having a port-opening, said port-openings being adapted to be registered one with the other in various positions, so as to increase or decrease at will the amount of the combined discharge opening formed thereby, means for rotating said outer throttling-tube in opposite directions whereby rotation of the same in one direction will vary the size of said combined port-opening and rotation in the opposite direction will close said combined port opening, a casing in which said throttling-tubes are mounted and into which the combined port opening of the same discharge, an auxiliary air control valve located in said casing and connected with said outer throttling-tube, and operated by the rotation of said outer throttling-tube in one direction to open proportionately to the increase of said combined port opening, and operated by the rotation of said outer throttling-tube in the opposite direction to open when said combined port opening closes, said casing having an air intake opening at its outer end, and a pivoted valve-member mounted in said air intake opening, a pull-spring secured by one end to said valve-member and by the other to said casing for normally holding said valve-member closed but yieldable to the influence of suction within said casing.

In testimony, that I claim the invention set forth above I have hereunto set my hand this 13th day of May, 1915.

ELMER S. SMITH.

Witnesses:
GEORGE D. RICHARDS,
FRED'K C. FRAENTZEL.