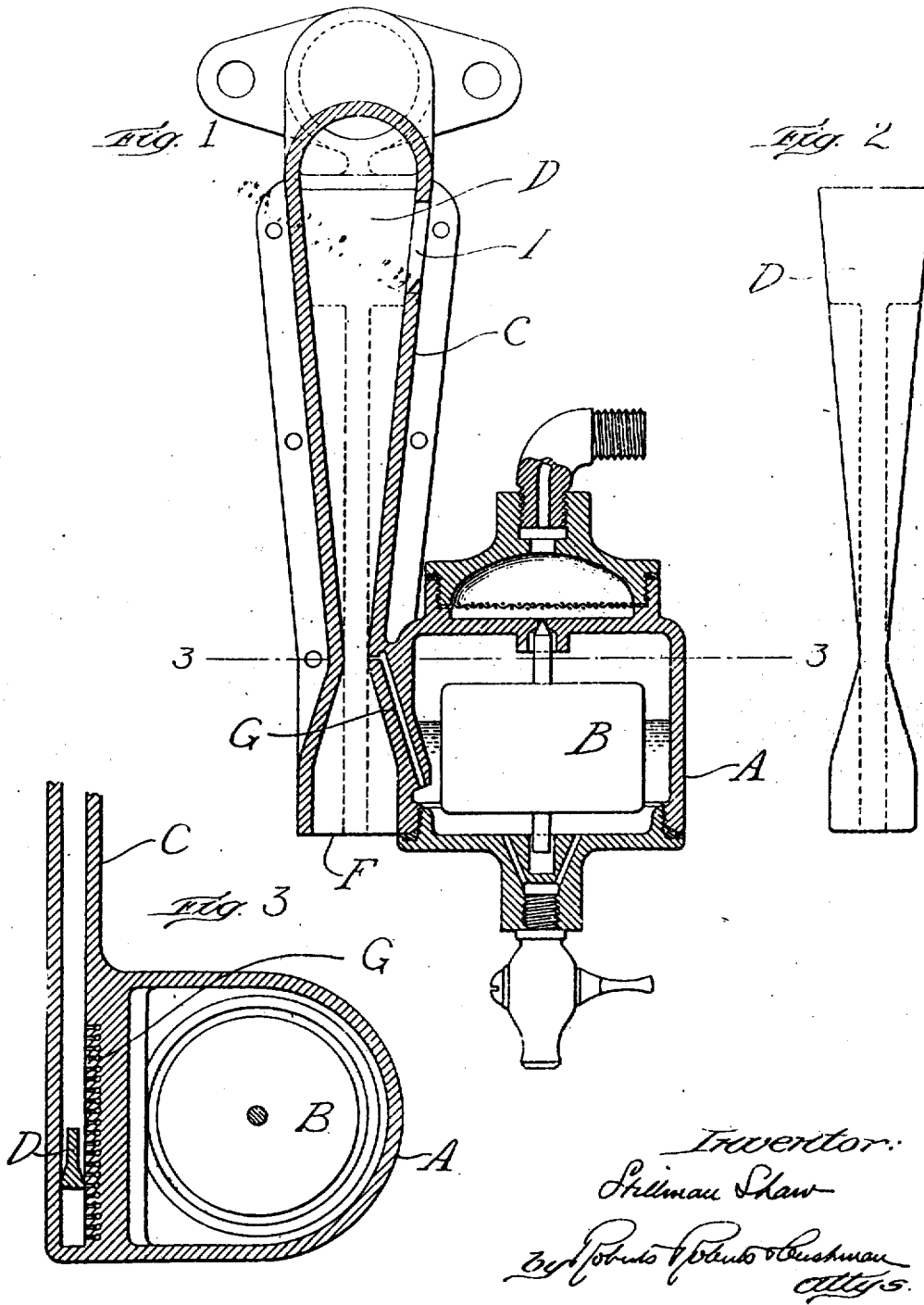


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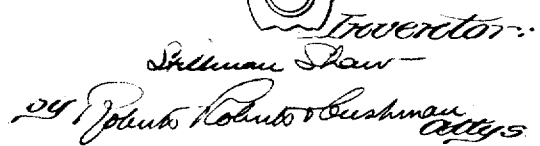
Patented Mar. 5, 1918.
2 SHEETS—SHEET 1.



Inventor:
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By Robert F. P. P. & Cushman
attys.

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2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

STILLMAN SHAW, OF NATICK, MASSACHUSETTS, ASSIGNOR TO MULTITUNE CARBURETOR COMPANY, A CORPORATION OF MAINE.

CARBURETER.

1,258,153.

Specification of Letters Patent.

Patented Mar. 5, 1918.

Application filed December 6, 1915. Serial No. 65,234.

To all whom it may concern:

Be it known that I, STILLMAN SHAW, a citizen of the United States, and resident of Natick, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Carbureters, of which the following is a specification.

My invention relates to carbureters for internal combustion engines, and has for its main object the provision of properly regulated proportions of fuel and air to the engine through all degrees of rate of supply between the minimum and maximum limits of carbureter capacity. Other objects of my invention are the elimination of the mechanical complications which accompany the use of springs, valves, and other sensitive moving parts, and the obtaining of efficiency and economy by the aid of simple, structurally strong, and positively actuated moving parts.

The cardinal characteristics of my improved carbureter are: a box-like conduit, with two opposite sides which approach each other from a relatively wide primary air inlet to a point of minimum interior width of the conduit, and recede angularly from each other from said point of minimum interior width toward the delivery end of the conduit, the elements of these double-tapered sides being parallel with each other in the direction at right angles to the axis of the conduit, which extends from the primary air inlet to the delivery end; a piston member, fitting between the double tapered sides of the conduit and extending to a substantial distance on either side of the point of minimum interior width of the conduit, and sliding between and in contact with the double tapered sides, in a direction at right angles with the axis of the conduit; a lineally extended liquid fuel inlet which enters the conduit at or close to the point of minimum width thereof, and which is controlled as to extent of opening by the movable piston member.

The piston member is mounted on and controlled by a rigidly connected piston rod, so that simple, positive connection with said rod or bar suffices to move the piston member in the conduit, to increase or decrease its capacity. The shape and extent of the conduit, and that of the piston member are such that, at whatever position of the piston, the conduit constitutes a regularly tapered duct,

of *vena contracta* form, of such extent in its axial direction that the said *vena contracta* form is not interrupted or vitiated, and so that the stream of gaseous mixture components flows smoothly through the entire length of the conduit, without eddy disturbance.

Preferably also, there is provided an auxiliary air inlet, lineally extended in the direction of the piston movement, in the side of the conduit and within the surface against which the piston makes sliding fit, and as near as is practicable to the end of the conduit, so as to disturb and qualify as little as possible the regular *vena contracta* shape of the conduit as a whole.

The only necessary moving member of the carbureter is the piston-like member above generally described. The air and fuel inlets will extend in a direction parallel or substantially so, with the movement of the piston-like member, so that by movement of said member the exposed and effective areas of the three inlets (two for air and one for fuel) are simultaneously increased or diminished. The configuration of the mixing chamber or duct will be such, that its principal longitudinal section, i. e. in the direction of flow of fluids, is substantially uniform and unchanged in its essential contour at all positions of the moving member. The fuel inlet should, for the best effects, be placed between the primary air inlet and the secondary or auxiliary air inlet and at the throat or narrowest part of the conduit.

In the drawings hereto annexed, which exemplify in specific form the invention more generally described above,—

Figure 1 is a vertical cross section of a carbureter;

Fig. 2 is an end elevation of the piston-like member of the carbureter.

Fig. 3 is a horizontal section at the line 3--3, Fig. 1; and

Fig. 4 is a vertical longitudinal section through the mixture chamber or duct of the carbureter, showing the movable piston member in side elevation.

The casing of the carbureter comprises the float chamber A and the mixture chamber C. A float B, in the float chamber, is provided to control the supply of volatile fuel in the usual manner.

The mixture chamber or duct C consists of a box, having a cross section of *vena*

contracta form, the sides of the box being parallel to the direction of movement of the piston member D. This box is open at the bottom at F, and communicates at the top with a conduit H, which leads to the engine.

Fitting between the sides of the box C and extending from the air inlet to the delivery end thereof, the movable piston member D is mounted to slide back and forth in the box C. The piston member D thus conforms in contour and extent to the longitudinal section of the box, (*i. e.* section in the direction of flow) or mixture duct C. To enable the piston member D to slide smoothly without chattering or sticking, it is provided with an extension D' which acts like the cross head of a piston rod, sliding on the inner surfaces of the mixture duct or box C, as on slideways. A bar D², provided with rack teeth D³, is secured to the piston member D, and may be actuated by means of a toothed segment E and control rod E'. The primary air inlet is at F, the secondary or auxiliary air inlet is at I. The latter is a slot or aperture in one of the sides of the box C.

The fuel inlet consists of a number of individual ducts G, each of which communicates with the liquid volatile fuel in the float chamber A. The apertures of these ducts lie in a line preferably in the plane of minimum cross sectional area of the mixture conduit, so as to be subjected to a maximum inductive influence by the stream of air flowing through the mixture duct C.

The operation of the carbureter above described is as follows: The extension D' of the piston D, when the piston is at its extreme position of closure, serves to close the pipe H against ingress of any gas. The initial movement (to the left as viewed in Fig. 4) of the piston member D simultaneously unmasks one of the liquid fuel inlets G, and an initial area of the primary air inlet F. This position of the piston member D should be appropriate to the minimum supply of combustible mixture which suffices to turn the engine while idle. Further movement of the piston member D progressively unmasks more and more of the primary air inlet F, more and more the fuel inlets G, and also (after the first stage of opening is passed) more and more of the secondary or auxiliary air inlet I.

In the carbureter shown in the drawings, the sides of the primary and secondary air inlet apertures are parallel, and the fuel apertures G are all of the same size, so that the three inlet areas increase or diminish in direct arithmetical ratio with the movement of the piston member D. Experiment with carbureters of this character, under practical engine conditions, has led to the adoption by me of this preservation of direct ratio as, on the whole, productive of the best results. Possibly under conditions outside of my personal experience, it may be found advisable to change these ratios by changing the shape of the three inlets, or of some or more of them. It will be observed, that variation in capacity of the mixture duct C takes place without substantial variation in the shape of the duct in the direction of flow. An effective contour being adopted, the beneficial results therefrom persist through all variations in capacity.

I claim:

1. In a carbureter, a conduit having sides the elements of which are parallel in a direction transverse to its axis, and tapering to a throat from the air inlet end and mixture delivery end, forming a duct of regularly tapered *vena contracta* form, a piston member substantially corresponding in contour and extent to the entire *vena contracta* conduit, and movable transversely to the axis of said conduit, the conduit provided with a fuel inlet at the throat, lineally extended in the direction of movement of the piston member.

2. In a carbureter, a conduit having sides the elements of which are parallel in a direction transverse to its axis, and tapering to a throat from the air inlet end and mixture delivery end, forming a duct of regularly tapered *vena contracta* form, a piston member substantially corresponding in contour and extent to the entire *vena contracta* conduit, and movable transversely to the axis of said conduit, the conduit provided with a fuel inlet at the throat, lineally extended in the direction of movement of the piston member, and with an auxiliary air inlet, adjacent to the delivery end of the conduit and controlled by the piston member.

Signed by me at Boston, Massachusetts, this 26th day of November, 1915.

STILLMAN SHAW.