

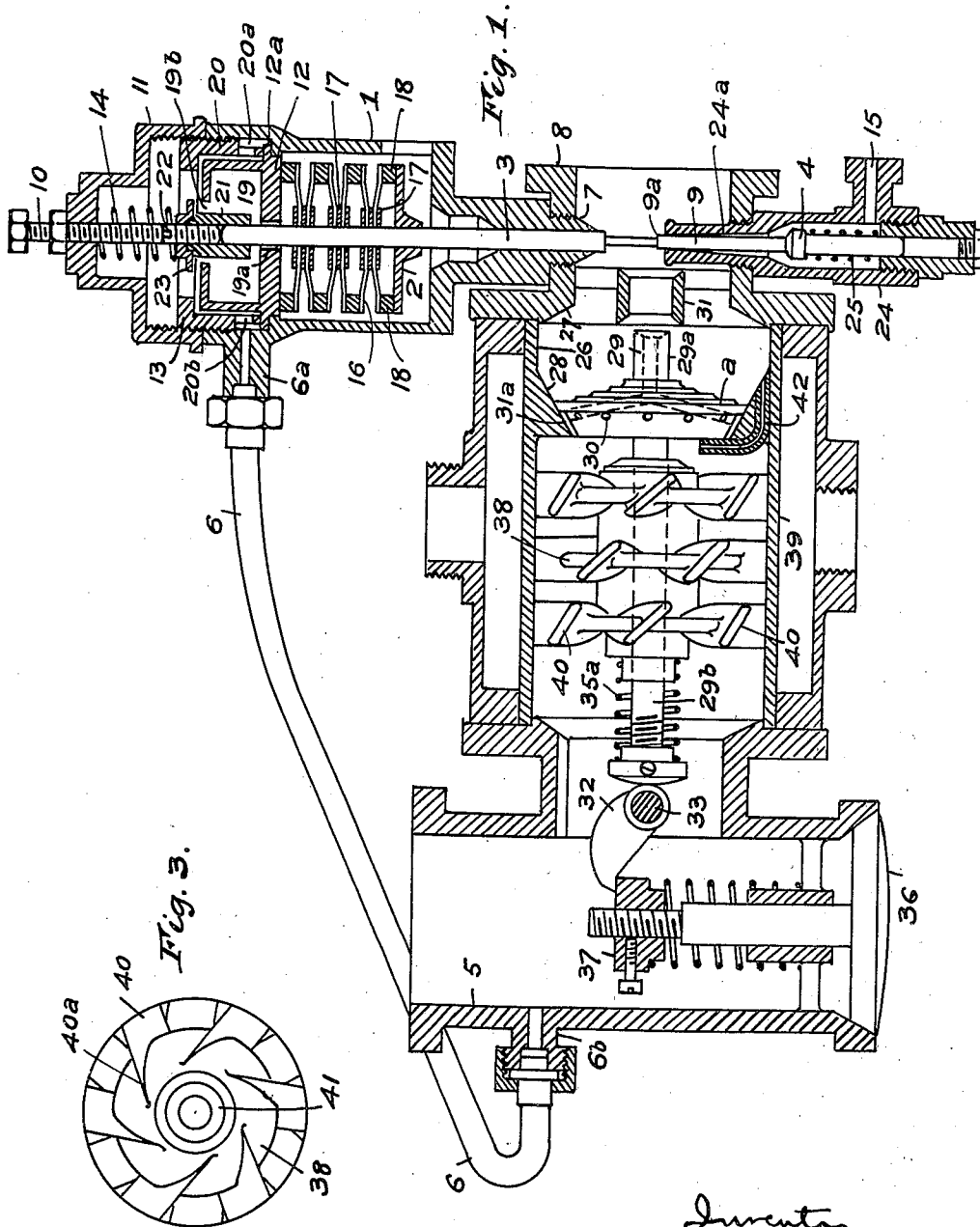
J. BYROM.
CARBURETER.

APPLICATION FILED JUNE 3, 1912.

1,065,503.

Patented June 24, 1913.

2 SHEETS—SHEET 1.



Witness
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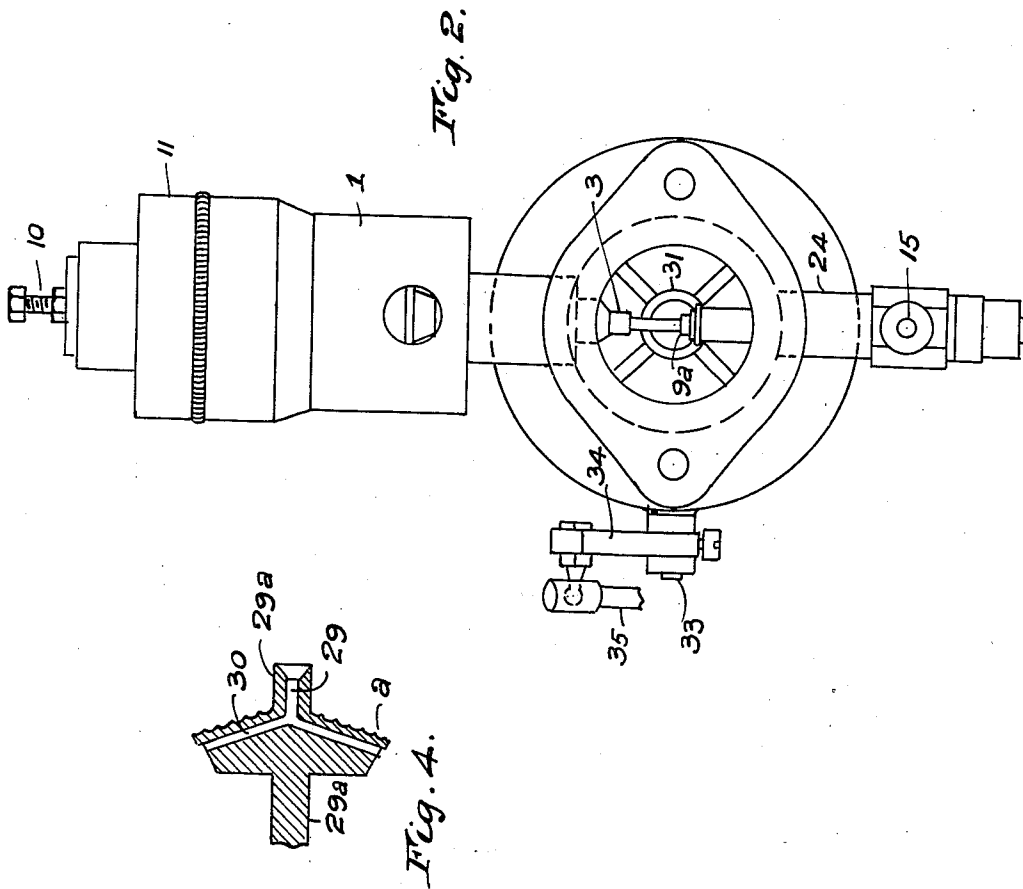
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UNITED STATES PATENT OFFICE.

JOHN BYROM, OF LIVERPOOL, ENGLAND.

CARBURETER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN BYROM, a subject of the King of Great Britain, and a resident of Liverpool, England, have invented certain new and useful Improvements in Carbureters for Internal-Combustion Engines, of which the following is a specification.

This invention relates to improvements in the method of and means for controlling the fuel admission to internal combustion engines to suit various speeds of the engine and is directed to securing an effective automatic control of the fuel supply by means of the suction action of the engine cylinder.

The invention also relates to an improved construction and arrangement of throttle valve such that the fuel may be effectively atomized.

Further features of the invention relate to the construction of the control device, for controlling the fuel admission, operated by the suction action of the engine, and to the particular construction of the baffle plates in the carbureter body.

It is found in practice that in a carbureter there is a very considerable difference in the vacuum set up on opposite sides of the throttle valve when the engine is running, and the feature of the present invention consists in the utilization of such considerable vacuum on the engine side of the throttle to control and regulate the fuel supply on the side of the throttle remote from the engine.

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

Figure 1. is a vertical section through a carbureter constructed in accordance with this invention the float chamber being omitted. Fig. 2. is an end view in elevation of Fig. 1. Fig. 3. is an end view of the baffle plates of the carbureter and Fig. 4. is a fragmentary section through the throttle valve head showing the radial ports.

Referring in the first instance to the means for controlling the fuel supply this consists broadly in providing a device comprising a piston, bellows, or other suction operated element mounted within a cylinder and carrying an operating rod, the cylinder being connected up to any suitable point on the engine side of the throttle, in such manner that a suction action is set up in the cylinder of the control device by the engine, thus causing the piston, bellows, or the like,

to be moved or collapsed, and the operating rod of the device to allow the needle of the fuel valve to close.

In the form of the control device illustrated in Fig. 1. the device comprises a short cylinder containing a bellows the lower disk element 2 of which is fixed to and carries the operating rod 3 which projects through the lower end of the cylinder 1 and bears against and operates the rod 9 of the needle valve 4 controlling the fuel admission from the branch 15 connected up to any suitable type of float chamber or other source of petrol supply. The cylinder 1 is closed at the upper end above the bellows and is connected to the induction pipe 5 at the other end of the carbureter and on the engine side of the throttle valve *a*, such connection being by means of a pipe 6 detachably connected by two branches 6^a, 6^b, on the cylinder 1 of the control device and the induction pipe respectively. The cylinder is provided with a screwed nipple 7 at one end whereby it is attached to the carbureter inlet 8 through which nipple the actuating rod or spindle 3 passes and bears directly on the end of the needle valve rod 9, or the rod may actuate the needle valve 4 through the intervention of suitable levers as desired.

The bellows are constructed from a series of leather disks 16 which are coupled together in pairs at their inner parts between three superimposed eyelets 17, the three eyelets connecting each pair of disks being screwed together by set screws, or they may be otherwise coupled so as to rigidly hold the disks centrally in pairs. The peripheral edges of the disks of each pair are then connected together by leather rings 18, steeped in shellac, or the rings may be of fiber or metal. These rings act as distancing pieces to prevent the disks in each cell of the bellows from closing together under the suction action of the engine, and thus maintain a constant area upon which the air pressure may act as the bellows collapse. The eyelets 17 form a guide to centralize the bellows about the operating rod 3 which slides freely in the eyelets, and the upper element 12 of the bellows which is anchored to the cylinder is provided with a chamber 19 through which the operating rod 3 passes. This chamber has an annular flange 12^a which is made to fit tightly on a shoulder formed in the inclosing cylinder, thus isolat-

ing that portion of the cylinder inclosing the bellows and below the shoulder from the remaining part of the cylinder which is connected up to the engine suction. A screwed ferrule 20 threaded into the cylinder engages and bears upon the flange 12^a of the chamber and holds it firmly on the shoulder. In order to put the interior of the screwed ferrule and consequently the chamber 19 in communication with the engine suction, the lower part of the screw thread of the sleeve is cut off as shown so as to form an annulus 20^a with the cylinder, and this lower part of the sleeve forming the inner wall of the annulus is perforated at 20^b. The engine suction acting at the induction pipe 5 is, therefore, exerted by way of the pipe 6 and bore of the branch 6^a through the perforation 20^b, interior of the chamber 19 and clearance 19^a around the rod 3 to the interior of the elements of the bellows, the slight clearance between the rod 3 and the eyelets 17 enabling the suction to act throughout the bellows.

The interior of the bellows is filled with oil or other fluid, the object of which is to damp the vibrations of the bellows and render the control of the fuel valve of a more even character, the chamber 19 forming an overflow for the oil when the bellows are collapsing. The top of the chamber is inclosed by a diaphragm provided with a central orifice 19^b within which works an adjustable sleeve 21 the lower end of which fits slidably over the end of the operating rod. This sleeve is internally threaded at its upper end and fitted with a regulating screw 22 provided with a locking ring 23 whereby the screw may be axially adjusted in the sleeve; a compression spring 14 is mounted in the end of the cylinder so as to bear against the adjustable ring 23, and is held between the latter and the end of an inclosing cap 11 which screws on to the projecting edge of the screwed ferrule 20. An adjusting screw 10 threaded in the end of the cap 11 and bearing against the screw 22 serves to limit the inward movement of the operating rod under the suction action of the engine, and the sleeve 21 being threaded on the screw 22 and adjustable axially thereon, the compression of the spring 14 may be graduated as desired, the downward movement of the sleeve being limited by its engagement with the floor 12 of the chamber 19, the movement of the operating rod being thereby positively limited in two directions.

It is found that by constructing the bellows with an upper overflow chamber in the way described and filling the bellows with oil or other fluid, a very effective and even control is maintained on the operating rod and consequently on the fuel valve. The bellows may however be used without an oil filling.

Control devices operated by the vacuum on the engine side of the throttle valve have been previously used for regulating the fuel supply, but they have operated to cause an increase or decrease in the petrol supply as the speed of the engine increased or decreased respectively, whereas by the present invention the considerable vacuum on the engine side of the throttle is used to control the fuel supply in such manner that should the engine speed increase the increased vacuum set up is adapted to close the fuel valve, while conversely should the engine slow down due, say, to an overload, such slowing down causing a decrease in the vacuum will act to open the fuel valve. The fuel valve therefore according to this invention functions in the manner of a governor to the engine.

The casing 24 of the petrol inlet valve is screwed into the carbureter inlet as shown, the bore of the neck 24^a being made slightly tapered and the needle 9 cylindrical so that the valve action on the fuel supply is obtained by the relative position of the shoulder 9^a in the conical bore. A light spring 25 tends normally to keep the valve needle 9 against the end of the control rod 3.

In conjunction with the method of controlling the fuel supply by the suction of the engine it is preferred to utilize a carbureter operating as follows: In the body of the carbureter is located a throttle valve *a* constructed like the usual puppet valves common to internal combustion engines, but differing therefrom in the construction of the head, and also in the outer or top side. The valve operates in a chamber which is formed of two cones or their equivalent, the fuel inlet end of the chamber forming a diverging cone 27 while the outlet end of the chamber forms a converging cone 28, the latter cone forming the valve seating. These two cones are separated by a short parallel bore 26, the length of this parallel portion varying according to the size of valve it is to receive, but being of such a size as not to restrict the flow of mixture passing therethrough. The head of the valve is annularly ridged so that it forms an atomizer for the petrol before it reaches the carbureter body, the petrol entering through a central aperture 29 in the valve which communicates through holes 30 bored radially to the outer edge of the valve face, so as to cause the petrol to impinge upon the valve seating 28 where it meets the air rushing therethrough previous to entering the body of the carbureter. The central opening 29 of the valve head may be a countersunk hole, or may be the bore of a tube, as shown, which projects therefrom, and which is adapted to enter another short tube 31 which is carried in the carbureter head by arms, in such manner, that when the throttle *a* is opened the tube 29^a will enter the short

5 tube 31, thus forming a compound annulus therewith, and allowing the vaporized fuel to flow from the fuel inlet both into the central aperture 29, and also outside the central tube 29^a and thus become sprayed or diffused on to the top side of the valve head, thereby providing a large surface for atomization, the outer, or top side of the valve head being formed with a series of steps or
10 concentric rings like a stepped cone to assist the vaporization of the fuel. The tube 31 functions to concentrate the flow of air upon the nozzle of the fuel valve when the throttle is shut. The coned edge of the valve is formed with an annular step 31^a of slightly smaller size, so that when the valve is on its seat a ring or annular vent is left beneath, although closed on its outer side, through which vent the engine suction may
15 act upon the holes 30 in communication with the central aperture 29 thus forming an aspirator. These holes may be bored radially or may be at a tangent, thereby imparting a rotative motion to the mixture flowing through.

25 The valve is operated by means of a cam 32 carried on a spindle 33 passing transversely through the rear end of the carbureter and provided with an arm 34 operated in any suitable manner by the rod 35. By rotating the spindle 33 the curved face of the cam bears on the end of the spindle of the valve *a*, opening the valve and advancing the tube 29^a into the short tube 31.
30 A spring 35^a returns the valve to its closed position. Such cam may be arranged with advantage to operate another valve 36, also of the puppet type, which valve will open to the atmosphere and thus give the engine
35 cool air, thereby allowing the engine to be used as a brake when going down hill. This is attained by placing the two valves at right angles to each other, the actuating cam 32 or its equivalent being so placed that it
40 acts upon the rod end of the valve *a*, and engages with a flange or collar 37 secured to the stem of the valve 36, such stem being on the inside of the carbureter, and may be made adjustable. In this way the same direction of movement of the cam will operate
45 the two valves, for example when running slowly the throttle *a* will be nearly closed, but when the cam has been moved so as to allow the throttle to completely close, any
50 further movement of the cam in the same direction will engage the flange or collar 37, on the stem of the air valve 36 and thus cause it to open. The flange or collar 37 on the air valve is adjustable so as to take up
55 wear. The stem 29^b of the throttle valve is guided in a central tube about which are disposed a series of baffle plates in the body of the carbureter constructed as follows. The baffle plates are formed as a series of disks
60 38 Fig. 3., disposed concentrically and in

succession within the inner chamber 39 of the carbureter. These disks 38 of smaller diameter than the chamber are rigidly mounted at preferably equal distances apart with respect to each other, and are provided
65 with blades or fins 40 projecting from the circumferential edges of the disks and extending to the inner wall of the cylindrical chamber 39, and fitted accurately therein so as to centralize the bore of the disks. The
70 fins are arranged somewhat tangentially to the disks, as shown, and helically, so that they form a series of fixed impeller or deflector blades projecting across the annulus left between the circumferential edges of the
75 disks and the wall of the carbureter. These fins are continued inwardly at 40° along the disks, the continuation of the fins taking the form of ledges projecting above both sides or surfaces of the disks.

80 The series of blades in each succeeding disk is staggered, see Fig. 3, with respect to the adjacent disks so that no direct passage through the annulus is left for the vapor laden air when the baffles are in place in the
85 carbureter. The axial flow of vapor laden air through the carbureter annulus results therefore in a whirling action being set up which throws the gaseous mixture centrifugally against the heated wall of the carbureter resulting in a more efficient gasification thereof. The baffle disks are bored to receive a hollow axial tube 41 which functions as the guide for the throttle valve spindle 29^a, the spaces between the baffle disks
90 providing a series of expansion or mixing chambers between each pair of disks which permits the explosive mixture to become more thoroughly atomized in its passage through the carbureter.

95 In order to facilitate starting of the engine, especially during cold weather, it is advantageous to provide a communication from the outer side of the throttle valve seating to the interior of the carbureter. In
100 starting, and after the carbureter has been flooded, a small quantity of petrol will lodge in the lower part of the short parallel bore 26 of the carbureter body. By boring a hole through the converging conical part
105 28 of the carbureter body a vent is provided giving access to the interior of the carbureter, such vent being located at the lower or flooded portion and into such vent is fitted a short bent tube 42, or its equivalent,
110 of very small bore, the inner end of which extends radially toward the center of the chamber containing the baffle plates, and is so disposed, that the liquid fuel entering through such tube will be sprayed directly
115 out to the baffle plates inside the carbureter. It will be seen therefore, that when starting up, the carbureter having been flooded, the fuel will pass through the tube and will
120 meet and mingle with the mixture flowing
125 130

through the central aperture 29 and radial holes 30 of the throttle valve head *a*, whereby the engine may be started with the throttle valve in the normally closed position.

- 5 The small tube 42 or its equivalent may be either soldered in position, screwed, or clamped, so as to give facility for detaching it for cleaning or repairs.

I claim—

- 10 1. In a carbureter: a throttle valve, a fuel supply valve located on the side of the throttle valve remote from the engine, a collapsible bellows comprising a series of disks eyeleted centrally together in pairs and peripherally coupled by rings; an operating
15 rod fixed to one element of the bellows; an adjustable sleeve on the end of the rod serving to limit the movement of the rod in both directions; a compression spring engaging the sleeve and normally acting to
20 open the petrol valve against the suction action of the engine, and a communication from the bellows interior to the engine side of the throttle valve.
- 25 2. In a carbureter: a throttle valve, a central aperture in the valve; radial ports leading to the seating of the valve; a step in the valve face; a tube adapted when the throttle valve is fully opened to form with the central
30 aperture a compound annulus; annular ridges on the throttle valve head; a small bore tube communicating with both sides of the throttle valve; a fuel supply valve located on the side of the throttle valve re-

mote from the engine, fluid pressure means 35 controlling said fuel supply valve, and a communication between the fuel valve controlling means and the engine side of the throttle valve.

3. In a carbureter: a series of baffle plates 40 disposed centrally in the carbureter body so as to form an annulus therewith, helical fins or ledges on the baffle plates extending across the annulus; a central tube in the baffle plates forming a guide for a throttle valve 45 spindle, a throttle valve, a fuel supply valve located on the side of the throttle valve remote from the engine, fluid pressure means controlling said fuel supply valve, and a
50 communication between the fuel valve controlling means and the engine side of the throttle valve.

4. In a carbureter: a throttle valve, a fuel supply valve located on the side of the throttle valve remote from the engine, means con- 55 trolling said fuel supply valve, a communication between the fuel valve controlling means and the engine side of the throttle valve, a third valve; an adjustable flange on the stem of said third valve; and a cam 60 mounted in the carbureter adapted to operate both the throttle and said third valve.

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

JOHN BYROM.

Witnesses:

A. J. DAVIES,
B. KNIGHT.