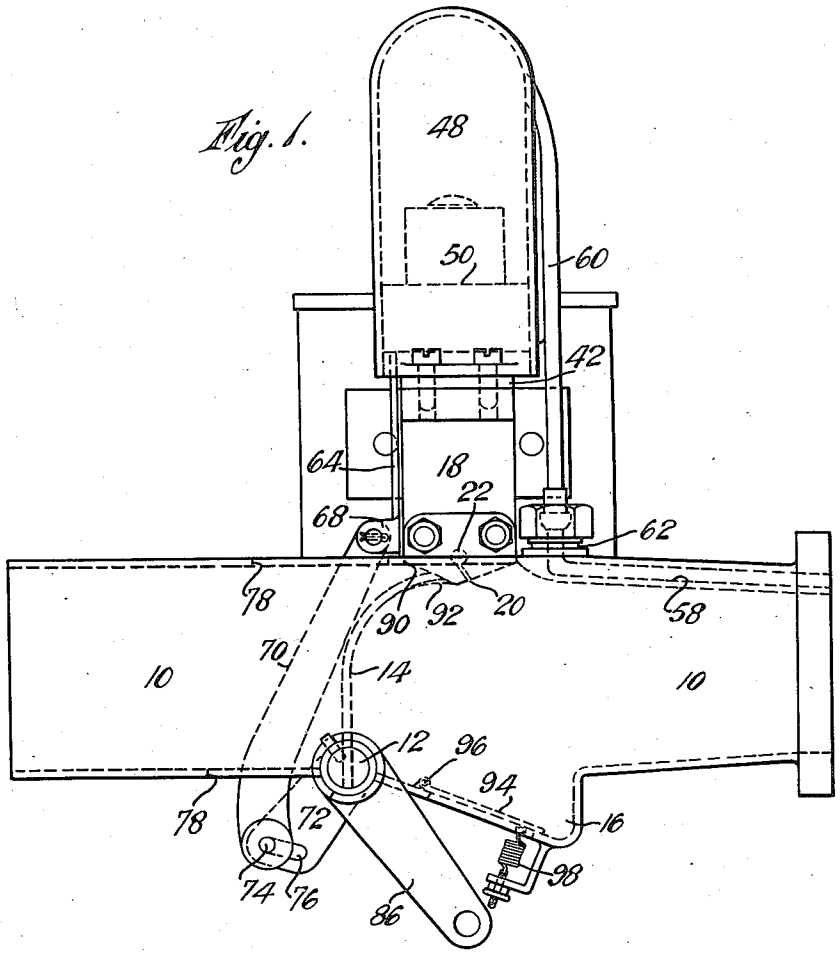
Dec. 17, 1935. C. J. GRACE 2,024,638

CARBURETOR

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Fig. 1.



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CARBURETOR

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Fig. 2.

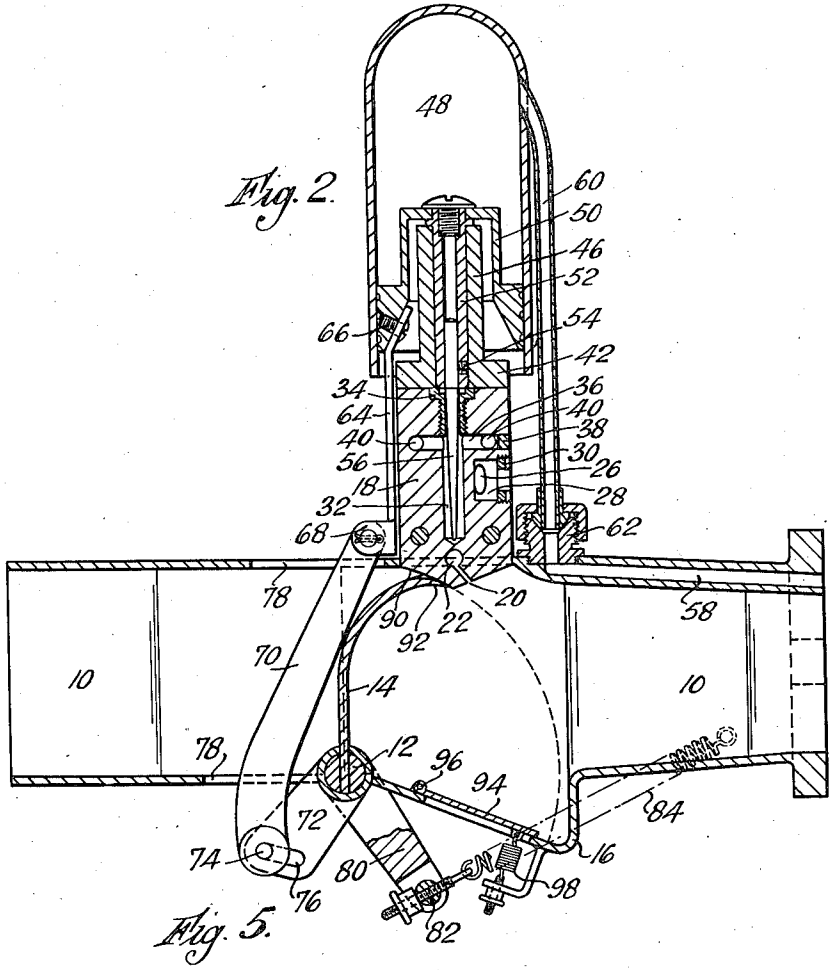


Fig. 5.

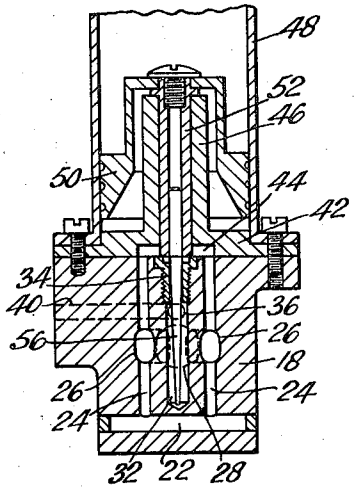
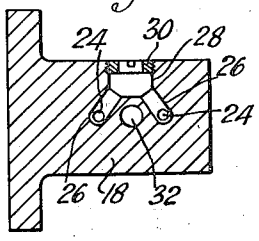


Fig. 6.



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CARBURETOR

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Fig. 3

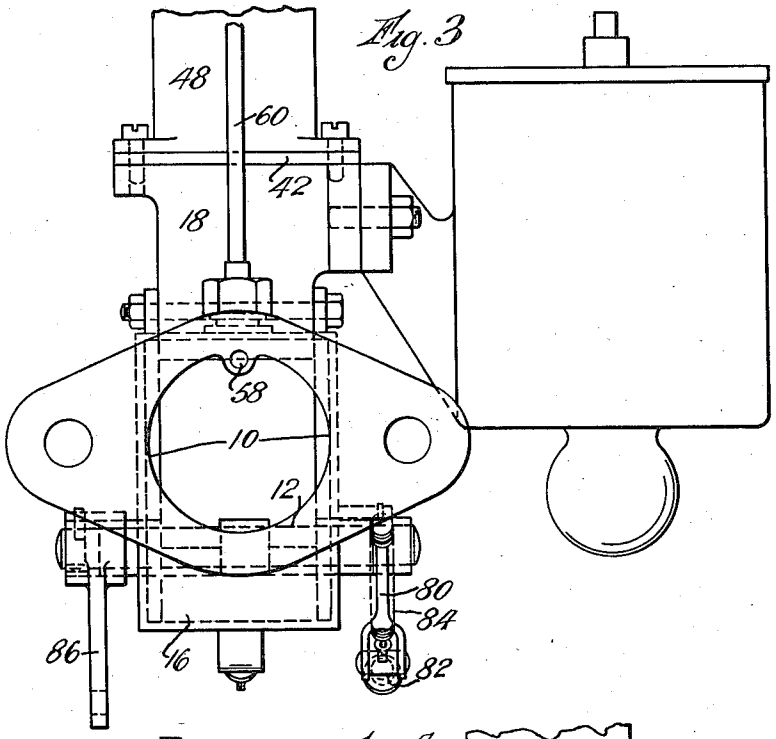
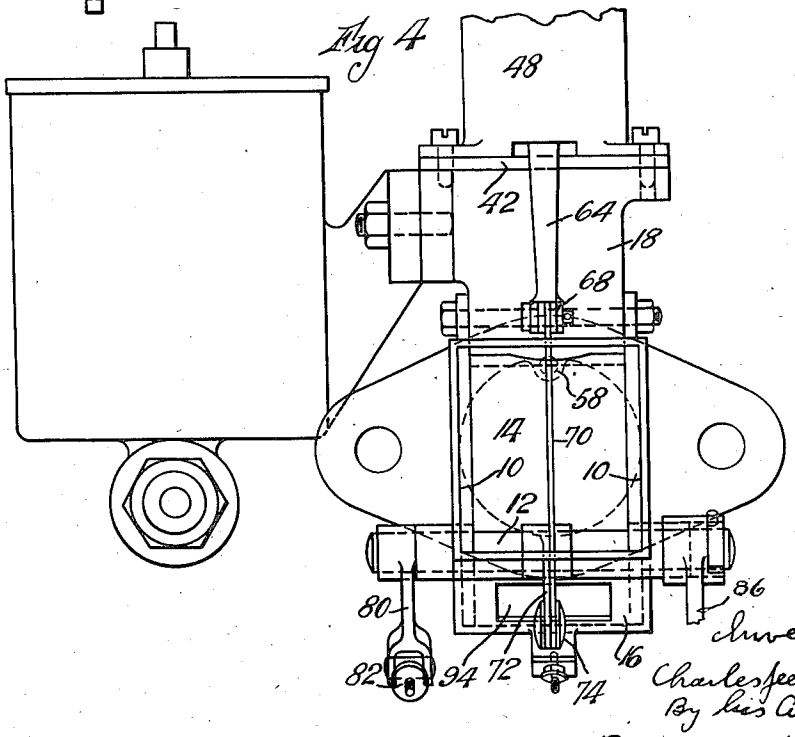


Fig 4



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UNITED STATES PATENT OFFICE

2,024,638

CARBURETOR

Charles Jeens Grace, London, England

Application November 28, 1933, Serial No. 700,133
In Great Britain January 11, 1933

5 Claims. (Cl. 261—50)

This invention relates to carburetors for use with internal combustion engines and more particularly to carburetors of the type in which the fuel inlet is located between the throttle valve and the engine intake manifold.

In the present specification, as in my co-pending specification No. 643,250, filed November 18, 1932, the carburetor described is of the type wherein the jets or fuel orifices for the supply of petrol are located on the engine or suction side of an air throttle valve as distinct from the more common type of carburetor wherein a mixture throttle valve is located on the engine or suction side of the fuel orifices. The appended claims therefore are intended to define carburetors wherein the throttle valve controls air intake as distinct from the more usual carburetors wherein the throttle valve controls the flow of fuel-air mixture to the engine.

The present invention has for its main object to provide improvements in carburetors as disclosed in my said specification. As will be seen from the description which follows, the present invention provides improved carburetors wherein a suction opened air throttle valve, which is the only throttle valve in the carburetor, and the opening of which is manually limited, is so arranged as to act not only as an unbalanced throttle valve as set forth in my copending specification hereinbefore referred to, but also as the moving member of what is in effect an automatically varying choke.

One form of construction of carburetor in accordance with the present invention is illustrated in the accompanying drawings in which Figure 1 is a side elevation; Figure 2 is a sectional elevation taken through the centre line of the air intake tube; Figure 3 is an end elevation of the arrangement shown in Figures 1 and 2 and showing the carburetor as regarded from the engine end; Figure 4 is an end elevation of the carburetor regarded from the air intake end and Figures 5 and 6 are sectional detail views.

Referring to the drawings an air intake tube 10 of rectangular cross-section over the major portion of its length has pivotally mounted about an axis 12 lying in one wall of said tube 10 a throttle vane 14 of rectangular outline and in section curved over towards the engine as shown. With the throttle valve arranged in this way, it will be seen that there is always a well defined "throat" or "choke" formed between the curved surface of the throttle vane and the upper side of the tube 10. The wall of the tube adjacent the pivot 12 is recessed as shown at 16 to receive the curved portion of the vane 14 when the throttle is in the fully open position so that in this position the throttle vane offers substantially no restriction to the flow of air through the tube.

The fuel spraying orifice is formed in a block 18 mounted in the top wall of the tube 10 and consists of a narrow transverse slit 20 communicating with a transversely drilled passage 22 plugged at each end as shown in Figure 5. Drilled vertically through the block is a pair of passages 24 which communicate with the passage 22 and these passages 24 communicate with the atmosphere through air-bleed ducts 26 which open into a horizontal drilling 28 which is partially closed by means of an annular plug 30 whose internal diameter determines the amount of air bleed. A central vertical passage 32 has screwed into the upper end thereof a fuel jet 34 and a horizontal drilling 36 plugged at 38 passes through the passage 32 and communicates with fuel ducts 40.

Surmounting the block 18 is a cap member 42 recessed as shown at 44 and having an upwardly extending portion 46. On the top of the cap member 42 is secured a cylinder 48 by means of screws which serve also to retain in position the cap 42. Within the cylinder 48 is arranged a recessed piston 50 to which is secured a hollow sleeve 52 which is a working fit in a central boring in the upwardly extending portion 46 of the cap 42. This sleeve is of such length that when the piston is near the bottom of the cylinder 48 the end of the sleeve 52 makes contact with the rim of the jet 34 thus effectively cutting off communication between the passage 32 and the passage 24 via the recess 44. Clamped within the sleeve 52 by means of a grub-screw 54 is a modulating pin 56 which, as the piston rises and falls within the cylinder (as described later) controls the effective area of the fuel jet 34. The upper end of cylinder 48 is put into communication with the induction pipe at any point (not shown) on the engine side of the throttle by means of a passage 58 formed in the wall of the tube 10 and a pipe 60 which is coupled to a nipple 62 screwed into said wall of the tube 10, as shown.

The cylinder 48 slightly overhangs the block 18 in side view (see Figure 2) (thus allowing access of air to the underside of piston 50) and a vertical push-rod 64 attached to the piston, as shown, by a screw 66 passes between the cylinder and block at the rear side and terminates in a fork 68 by means of which it is coupled through a link 70 to an arm 72 fast on the

throttle vane spindle. The link 70 is hinged to the arm 72 by means of a pin 74 which can be adjusted in a slot 76 in the arm 72. The link 70 passes through narrow slots 78 formed in the upper and lower walls of the tube 10.

The throttle vane spindle carries at one end thereof an arm 80 rigidly secured thereto, and to which is attached by means of a tensioning device 82 one end of a spring 84 the other end of which is anchored to the body of the carburetor. On the other end of the throttle vane spindle is mounted a control lever 86 which is so arranged that the degree to which the throttle vane is free to open, is determined by the position of said control lever, as set forth in the parent specification i. e. the control lever can operate positively to close the throttle but not to open it.

The lower face of the block 18 which projects into the tube 10 is approximately wedge shaped, as shown, the surface 90 being radiused about the axis 12 as centre, so that the initial movement of the throttle has no effect as regards admission of air. A slight depression 92 is formed in the upper edge of the vane 14 to permit a small flow of air for slow running.

A relief valve, consisting of a flap 94 hinged at 96 and held closed by means of a spring 98, is located in the recessed portion 16 of the tube 10.

In operation, assuming the control lever to be in the fully open position, the throttle vane is free to take up any position between the fully open and fully closed positions as determined by conditions of air flow or engine suction. The position of the throttle vane is determined not only by air flow past it acting directly upon it but also by the degree of suction acting upon the top of piston 50. The piston 50 sliding in cylinder 48 will act as a dash-pot so long as the force acting directly on the throttle valve and tending to open it against the pull of spring 84 is greater than the force exerted due to suction acting on the top of the piston 50 but the bore of the passage 58 or the pipe 60 leading thereto and the area of the piston 50 are such that a point is reached when the piston and cylinder act not as a dash-pot but as a device for assisting opening of the throttle valve in dependence upon suction.

It will be seen that as the piston 50 rises and falls within the cylinder 48 in dependence upon throttle opening the effective area of jet 34 is varied by the modulating pin 56. Petrol or fuel entering the carburetor via duct 40, passes into passage 36; through the jet 34; through the recess 44; down the passages 24; and into the passage 22.

In cases where the fuel is supplied to the fuel jet 34 under a steady positive head (this is not the case in the carburetor illustrated) and a full so-called dribble jet effect is required the air-bleed ducts 26 are made of such size that substantially atmospheric pressure is maintained upon the fuel passing to the jet and the flow through the jet 34 is thus made practically independent of the suction effect in the tube 10 for any degree of throttle opening. In such cases, the arrangement of the ducts 26 is exactly the same as shown in the accompanying drawings, with the exception that the cross sectional area of the ducts is slightly larger than as shown in the drawings. Of course, if desired a partial or modified dribble effect may be obtained, i. e. the air bleeds may be made of such size that the fuel flow is affected substantially by suction on the jet. In any event the air bleeds 26 are made sufficiently large that if excessive suction is developed in the induction pipe (e. g. if the engine runs fast with light load) that excessive suction will act in the main upon the air supply through the bleeds rather than on the petrol supply and thus undesired and unnecessary enriching of the mixture under light load conditions will be avoided. Where the dribble jet effect is not employed the air bleeds may be of such size relative to the jet area that a desired fuel flow is obtained from the jet as a result of suction thereon. The curving of the throttle vane and the position of the fuel spraying orifice, as shown, ensures that fuel always enters the tube 10 at a point of approximately maximum air velocity.

If the engine is running fast and it is desired to close the throttle suddenly the suction on the engine side of the throttle vane may render it difficult to actuate the throttle lever and the relief valve spring is so adjusted that if an excessive suction force occurs the flap 94 will open and permit reduction of the suction force tending to hold the throttle open.

The carburetor illustrated in the drawings is shown as being provided with a float chamber so positioned as to give no head at the jet. The provision of a float chamber is however optional. In the illustrated carburetor petrol is positively shut off in the closed position of the throttle by means of the sleeve 52 seating on the rim of the jet 34.

The float chamber, when provided, is bolted on to the side of the block 18, as shown.

In operation, suction in the right hand end of the tube 10 causes the throttle valve 14 to open, air then flowing through the tube from left to right, as viewed in Figure 2. Air also will enter through the apertured plug 30 and will flow through the drilling 28, the ducts 26, the passages 24, the passage 22 and the slit 20 to the interior of the tube 10. Opening movement of the throttle valve having lifted the sleeve 52 off the rim of the jet 34, fuel will enter through the duct 40 and will flow upwardly through the jet 34, horizontally through the recess 44, downwardly through the passages 24 into the passage 22 and thence out through the slit 20 into the tube 10.

What I claim is:—

1. In a carburetor, the combination of a suction-responsive throttle valve pivotally mounted about an axis which is closely adjacent one edge of said valve so that the suction effect on said valve tends to open it and substantially all occurs on one side of said axis so that air admitted past said valve must substantially all pass on one side thereof, said valve being so shaped as to be convex on the side facing towards incoming air and being the only throttle valve in the carburetor, a manually adjustable stop member for limiting the degree of opening of said valve, at least one fuel orifice located to admit fuel into the air stream passed by said throttle valve, said orifice being also so located as to be in a position of high velocity air flow past said throttle whereby said throttle valve acts not only as an unbalanced throttle valve but also as the moving member of what is in effect an automatically varying choke, a cylinder, and a piston therein, said piston being operatively associated with the throttle valve, and said cylinder having a conduit leading from above the piston and adapted to

communicate with the intake manifold of an associated engine at a point of low pressure between said throttle valve and said engine.

2. In a carburetor, the combination of a suction-responsive throttle valve pivotally mounted about an axis which is closely adjacent one edge of said valve so that the suction effect on said valve tends to open it and substantially all occurs on one side of said axis so that air admitted past said valve must substantially all pass on one side thereof, said valve being so shaped as to be convex on the side facing towards incoming air and being the only throttle valve in the carburetor, a manually adjustable stop member for limiting the degree of opening of said valve, at least one fuel orifice located to admit fuel into the air stream passed by said throttle valve, said orifice being also so located as to be in a position of high velocity air flow past said throttle whereby said throttle valve acts not only as an unbalanced throttle valve but also as the moving member of what is in effect an automatically varying choke, means for automatically controlling the supply of fuel to the fuel orifice in dependence upon the degree of opening of the throttle valve, means for applying substantially atmospheric pressure to fuel passing to said orifice, and means for supplying fuel to said orifice under steady positive head whereby a so-called dribble jet effect is obtained.

3. In a carburetor, the combination of a suction-responsive throttle valve pivotally mounted about an axis which is closely adjacent one edge of said valve so that the suction effect on said valve tends to open it and substantially all occurs on one side of said axis so that air admitted past said valve must substantially all pass on one side thereof, said valve being so shaped as to be convex on the side facing towards incoming air and being the only throttle valve in the carburetor, a manually adjustable stop member for limiting the degree of opening of said valve, at least one fuel orifice located to admit fuel into the air stream passed by said throttle valve, said orifice being also so located as to be in a position of high velocity air flow past said throttle whereby said throttle valve acts not only as an unbalanced throttle valve but also as the moving member of what is in effect an automatically varying choke, means for automatically controlling the supply of fuel to the fuel orifice in dependence upon the degree of opening of the throttle valve, and at least one air bleeding duct communicating with a fuel duct or ducts between the automatic fuel supply controlling means and said fuel orifice.

4. In a carburetor, the combination of a suction-responsive throttle valve pivotally mounted about an axis which is closely adjacent one edge of said valve so that the suction effect on said valve tends to open it and substantially all occurs on one side of said axis so that air admitted past said valve must substantially all pass on one side thereof, said valve being so shaped as to be convex on the side facing towards incoming air and being the only throttle valve in the carburetor, a manually adjustable stop member for limiting the degree of opening of said valve, a single fuel orifice comprising a narrow slit extending transversely of the air intake tube of the carburetor adjacent one side of the tube, said orifice being also so located as to be in a position of high velocity air flow past said throttle whereby said throttle valve acts not only as an unbalanced throttle valve but also as the moving member of what is in effect an automatically varying choke, and means for automatically controlling the supply of fuel to the fuel orifice in dependence upon the degree of opening of the throttle valve.

5. In a carburetor, the combination of a suction-responsive throttle valve pivotally mounted about an axis which is closely adjacent one edge of said valve so that the suction effect on said valve tends to open it and substantially all occurs on one side of said axis so that air admitted past said valve must substantially all pass on one side thereof, said valve being so shaped as to be convex on the side facing towards incoming air and being the only throttle valve in the carburetor, a manually adjustable stop member for limiting the degree of opening of said valve, at least one fuel orifice located to admit fuel into the air stream passed by said throttle valve, said orifice being also so located as to be in a position of high velocity air flow past said throttle whereby said throttle valve acts not only as an unbalanced throttle valve but also as the moving member of what is in effect an automatically varying choke, means for automatically controlling the supply of fuel to the fuel orifice in dependence upon the degree of opening of the throttle valve, and suction-operated auxiliary air inlet valve means adapted to admit air to the carburetor at a point on the engine side of said throttle valve if a suction exceeding a predetermined amount is built up on the engine side of said throttle valve.

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