Feb. 23, 1932. E. T. BUSH ET AL 1,846,789

CARBURETOR

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Fig. 1.

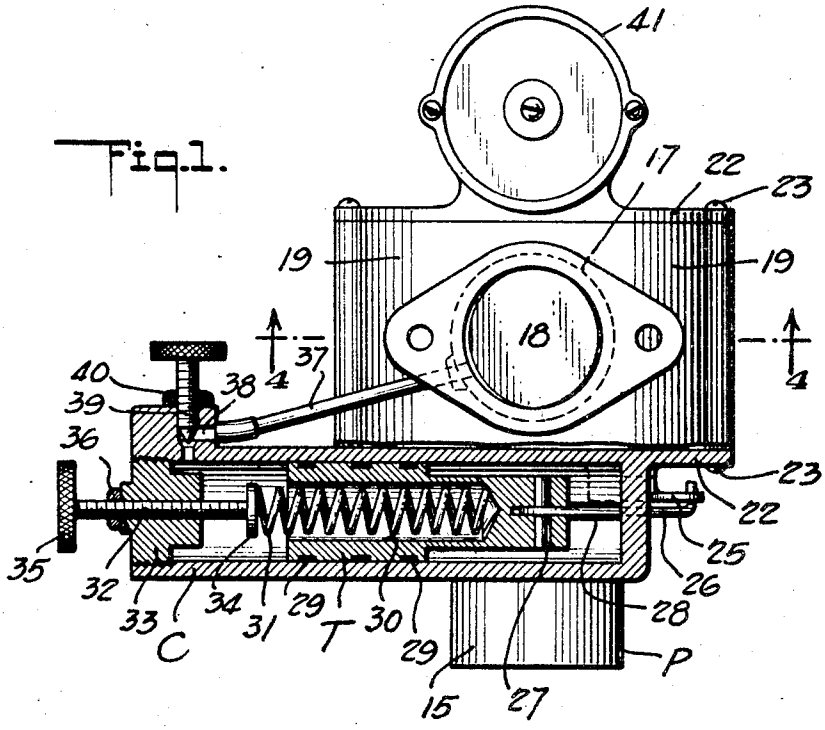
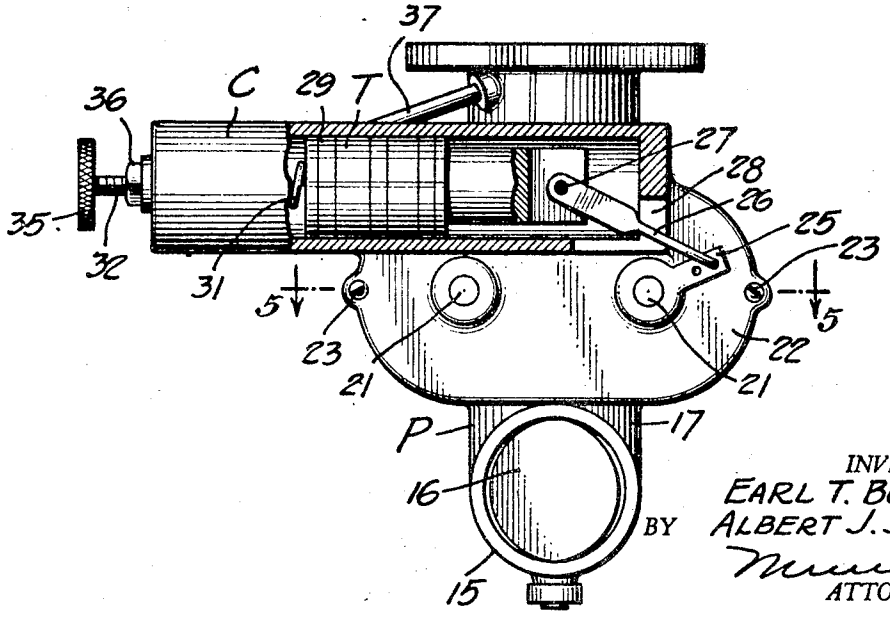


Fig. 2.



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Fig. 3.

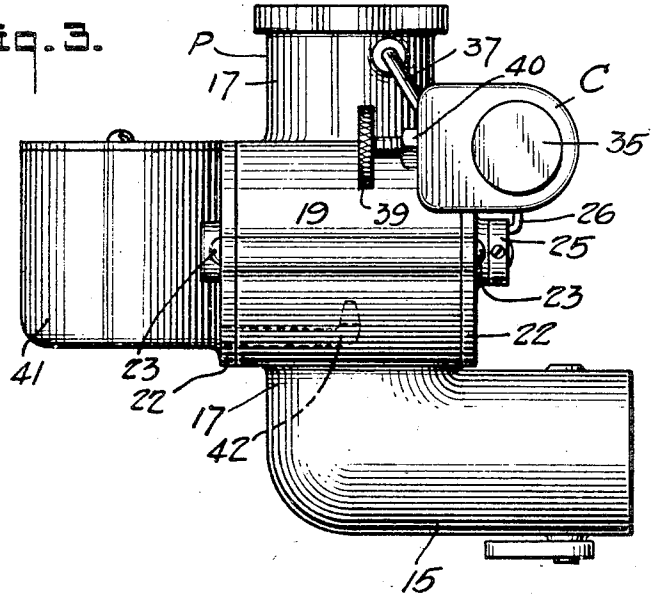


Fig. 4.

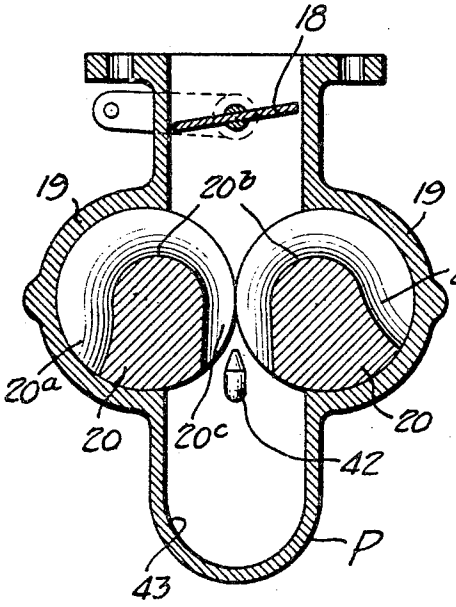
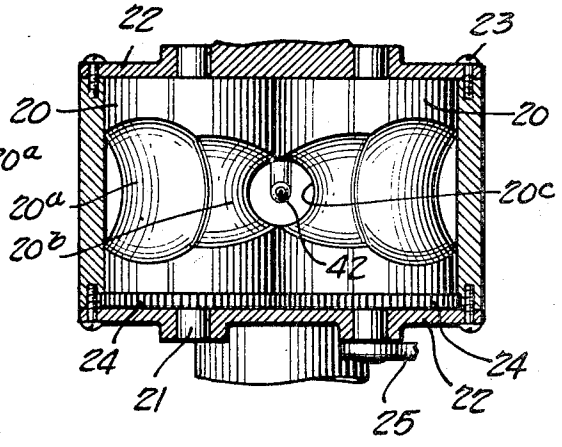


Fig. 5.



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UNITED STATES PATENT OFFICE

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CARBURETOR

Application filed May 2, 1930. Serial No. 449,265.

Our invention relates to carbureters and particularly to that type of carbureter having a Venturi tube which is adjustable or variable as to size for the purpose of controlling the air flow through the carbureting chamber, and hence, the degree of richness of the fuel mixture delivered to the engine. The adjustable Venturi tube is operable by the engine with which it is associated and through the medium of a centrifuge so as to be variable in size in accordance with the engine speed.

Carbureters of this type, although providing many advantages over the fixed or non-variable Venturi tube, are not wholly efficient for the reason that the Venturi tube being variable in size in direct accordance with the variation in engine speed, causes the carbureter to emit the richest mixture of which it is capable when the engine is operating at a low speed. It is appreciated that such a mode of operation is of value when starting a cold motor, as well as when the engine is operating at a relatively low speed and under heavy load, but when the engine is operating at its proper temperature and at an idling or low speed, an extremely rich mixture is delivered to the engine which results in undue heating of the engine, unnecessary consumption of fuel, and the emission of unburnt gases rich in carbon monoxide and hence highly injurious to human life. Further, by employing a driving connection to operate the Venturi tube in accordance with the engine speed, mechanical and lubricating difficulties are presented, aside from the expense of manufacture and installation.

It is a purpose of our invention to provide in a carbureter having a variable Venturi tube, a mechanism for automatically adjusting the Venturi tube by and in accordance with the suction produced in the intake manifold of the engine and whereby, the functional and structural disadvantages attendant a mechanism operating the Venturi tube in accordance with engine speed, are eliminated while the advantages thereof are retained and augmented by a different mode of operation.

We will describe only one form of carburetor embodying our invention, and will then point out the novel features thereof in claims.

In the accompanying drawings:

Fig. 1 is a view showing in top plan and partly in section, one form of carbureter embodying our invention.

Fig. 2 is a view showing the carbureter in end elevation and partly in section.

Fig. 3 is a view showing the carbureter in side elevation.

Fig. 4 is a vertical sectional view taken on the line 4—4 and looking in the direction of the arrows.

Fig. 5 is a horizontal sectional view taken on the line 5—5 of Fig. 2 and looking in the direction of the arrows.

In carrying out our invention, we provide a carbureter, which includes an L-shaped pipe P, the horizontal portion 15 of which, constitutes an air inlet and contains a conventional form of choke valve 16. The vertical portion 17 of the pipe is adapted for connection at its upper end to the intake manifold of an internal combustion engine (not shown), and this portion of the pipe contains a conventional throttle valve 18 for controlling the discharge of the gaseous mixture from the carbureter and into the manifold. Below the throttle valve, the pipe P is formed with lateral enlargements 19 in which an adjustable Venturi tube is mounted. This tube consists, in the present instance, of two cylindrical parts 20 having stub shafts 21 at their ends journaled in plates 22 secured by means of screws 23 to opposite sides of the pipe, and by means of which stub shafts the tube parts 20 are mounted for rotational movements. The positioning of the tube parts 20 are such that their peripheries contact with each other, and these peripheries are recessed at two points, indicated at 20^a and 20^b, to provide a throat 20^c between the parts which in reality constitutes the Venturi tube. The diameter of this throat 20^c is variable by rotation of the parts 20, and in consequence, such adjustment is operable to vary the amount of air flowing through the pipe P.

The preceding description of the Venturi tube is believed to suffice for the purpose, as its specific construction forms no part of our invention other than it should be adjustable to vary the air flow through the carbureter.

The two parts 20 are adapted to be rotated simultaneously and in opposite directions by means of gears 24 formed on one end of the parts as best illustrated in Fig. 5. One stub axle 21 has secured thereto an arm 25, and through the medium of a connecting rod 26 this arm is operatively connected to a piston T of what may be termed a vacuum pump. As shown in Figs. 1 and 2, the rod 26 extends into the bifurcated end of the piston T where it is secured by means of a transverse pin 27. The piston T operates in a cylinder C which is preferably cast integral with the adjacent plate 22, and by reference to Fig. 2 it will be seen that one end of the cylinder is provided with an opening 28 through which the connecting rod 26 extends for connection with the piston T.

The piston T is provided with rings 29 in order to effect an air-tight seal, and it is recessed to provide a pocket 30 in which an expansible spring 31 is received. The effective tension of this spring can be varied by means of a screw 32 threaded in a head 33 closing one end of the cylinder, and the screw having on its inner end a flat head 34 engaging the spring 30 and on its outer end a knurled handle 35 by which the screw can be rotated in one direction or the other to advance or retract the head 34 to increase or decrease tension of the spring 30. A lock nut 36 maintains any adjustment of the screw 32, and it will be noted that the head 33 is threaded in the end of the cylinder to permit assembling and disassembling of the parts received by the cylinder.

Under the action of the spring 30, the piston T is yieldably urged to the right as when viewed in Fig. 1 in order to yieldingly maintain the Venturi tube in its smallest position of adjustment in which the throat is of the smallest diameter. To move the tube to larger positions of adjustment in order to increase the diameter of the throat, we utilize the suction produced in the pipe P as a result of the air drawn therethrough when the carbureter is associated with the intake manifold of an engine. For this purpose we provide a pipe 37 connected at one end to a passage 38 formed in the cylinder C and communicating with the interior thereof at the spring side of the piston T. The opposite end of the pipe 37 extends into the pipe P at a point above the Venturi tube and preferably, although not necessarily, above the throttle valve 18. Thus, the air drawn through the pipe P produces a negative air pressure in the cylinder C at the spring side of the piston T, and when this negative pressure is sufficiently low, it will operate to move the piston to the left and against the tension of the spring 30. The intensity of the negative pressure or suction induced in the cylinder C may be regulated by means of a valve 39 threaded in the cylinder and controlling the passage of air through the passage 38. This valve may be secured in adjusted position by means of a nut 40.

Formed integral with or secured to one of the plates 22 is a float chamber 41 from which extends a fuel nozzle 42 so that the outlet end thereof is disposed within a carbureting chamber 43 provided in the vertical portion of the pipe P below the parts of the Venturi tube. The nozzle 42 is positioned directly below the throat of the Venturi tube, so that air drawn upwardly through the pipe P will cause fuel to be discharged from the nozzle for intermixing with the air to produce the combustible mixture.

The operation of the carbureter is as follows: With the carbureter associated with the intake manifold of an engine, and the throttle valve 18 closed so that the engine is operating at an idling speed, the suction produced in the pipe 37 is at a maximum. In consequence, the negative pressure produced in the cylinder C is at a maximum and therefore the piston T is pulled to its extreme position at the left and against the tension of the spring 30 to open the Venturi tube to its largest position of adjustment, that is, a position in which the diameter of the throat 20° is the largest. As a result of this opening of the Venturi tube, a relatively lean mixture is supplied to the engine, but one sufficient to maintain the engine operating at an idling speed. With opening of the throttle valve 18 to accelerate the speed of the engine, the suction produced in the pipe 37 naturally decreases so that under the action of the spring 30 the piston T begins to move to the right, as when viewed in Fig. 1, thereby operating the parts of the Venturi tube to reduce the diameter of the throat 20°. Thus, the volume of air flow through the carbureting chamber decreases with opening of the throttle valve and, as a consequence, the fuel mixture increases in richness. However, this condition does not exist throughout the entire speed range of the engine for it will be understood that as the speed of the engine increases through opening of the throttle valve, the suction produced in the intake manifold likewise increases. This increase in suction acts through the pipe 37 to move the piston T again to the left, and as a consequence, the Venturi tube now begins to open so that with the engine operating at a relatively high speed a relatively lean mixture is supplied to the engine.

From the preceding operation, it should be manifest that adjustment of the Venturi tube is effected and controlled by the intensity of the suction produced in the pipe 37

and not by the speed of the engine, for it will be understood that when the engine is operating under a heavy load and the throttle wide open, the speed of the engine may be relatively low and yet the effective suction in respect to the pump is sufficient to produce a minimum adjustment of the Venturi tube to allow a maximum supply of fuel to the engine and thus insure the operation of the engine under a heavy load.

Although we have herein shown and described only one form of carbureter embodying our invention, it is to be understood that various changes and modifications may be made therein without departing from the spirit of the invention and the spirit and scope of the appended claims.

We claim as our invention:

1. In a carbureter, a carbureting chamber through which air is adapted to flow in response to suction produced in the intake manifold, a Venturi tube having two parts relatively rotatable to occupy one extreme position in which the effective cross sectional area of the tube is reduced and another extreme position in which said area is enlarged, means tending to rotate said parts to the first extreme position, and means responsive to suction produced in the intake manifold for rotating said parts to the other extreme position and to intermediate positions.

2. In a carbureter, a carbureting chamber, a Venturi tube adjustable to vary the amount of air flowing through the carbureting chamber, urging means tending to close the tube, a pump for opening the tube, a throttle valve in the carbureting chamber, and a connection between the pump and the carbureting chamber beyond the throttle valve by which a suction can be produced in the cylinder of the pump in consequence of air flowing through the chamber to actuate the pump.

3. In a carbureter as embodied in claim 2 wherein the urging means comprises a spring engaging the piston, and a member adjustable in the cylinder to vary the effective tension of the spring in respect to the piston.

4. In a carbureter, a carbureting chamber, a Venturi tube adjustable to vary the amount of air flowing through the carbureting chamber, a pump including a cylinder and a piston movable in the cylinder and operatively connected to said tube so as to effect adjustment of the latter to open or close the tube according as the piston is moved in one direction or the other, yieldable and adjustable means for urging the piston in one direction to close said tube, comprising a spring engaging and having a part extending into the piston, and a screw threaded in the cylinder and engaging the spring for varying the tension of the spring, and a connection between the cylinder and the carbureting chamber for permitting the air flow through the chamber to produce a suction in the cylinder for moving the piston against the action of said urging means to open the tube.

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