Nov. 6, 1923.

1,473,113

W. R. McCULLA

CARBURETOR

Filed Nov. 2, 1916

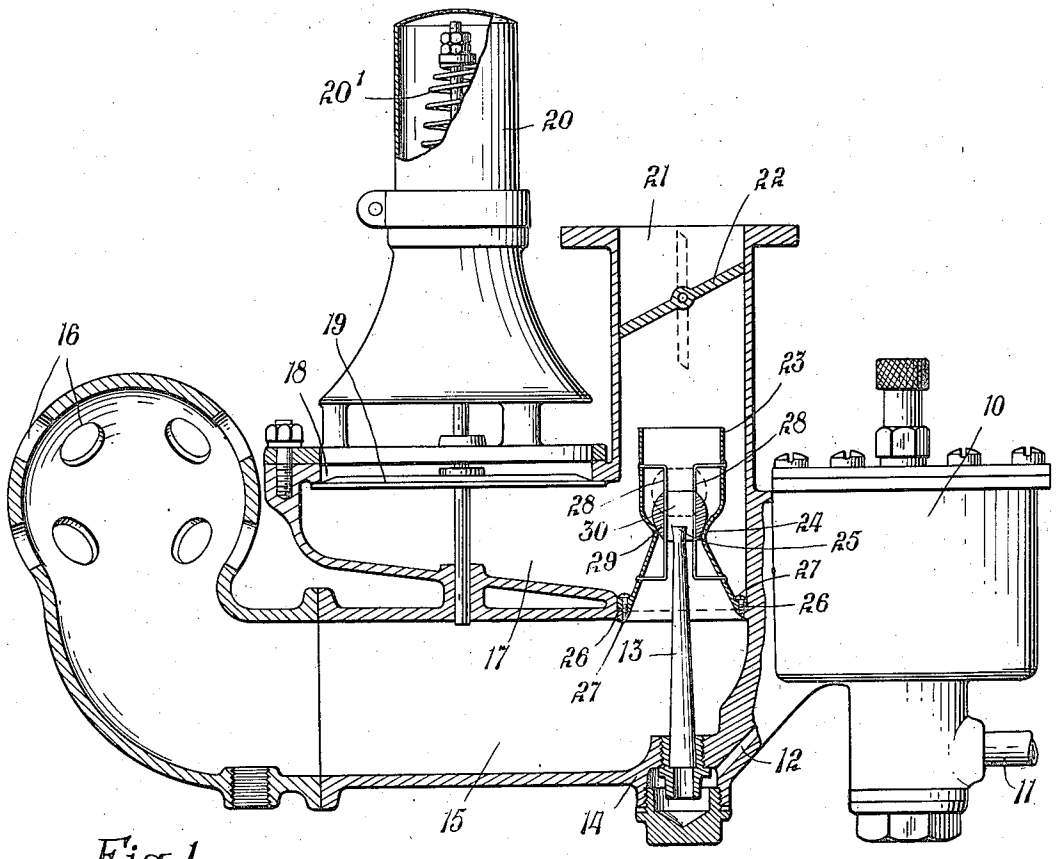


Fig. 1.

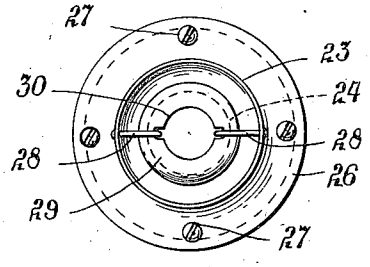


Fig. 2.

Witness:

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UNITED STATES PATENT OFFICE.

WILLIAM R. McCULLA, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

CARBURETOR.

Application filed November 2, 1916. Serial No. 129,151.

To all whom it may concern:

Be it known that I, WILLIAM R. McCULLA, a citizen of the United States, and resident of Detroit, Wayne County, State of Michigan, have invented certain new and useful Improvements in Carburetors, of which the following is a specification.

This invention relates to hydrocarbon motors and particularly to carburetors for use in such motors.

One of the objects of this invention is to provide means for automatically regulating the relative proportions of air and liquid fuel drawn through the carburetor of a hydrocarbon motor at various speeds of the motor.

Another object of the invention is to automatically vary the size of the air passage of the carburetor in relation to the fuel nozzle.

Another object of the invention is to provide a carburetor with a Venturi tube having means for varying the size of the effective interior at its throat, to thereby vary the richness of the mixture formed by the carburetor.

Other objects of the invention will appear from the description taken in connection with the drawings which form a part of this specification, and in which:

Fig. 1 is a vertical sectional view through a carburetor embodying this invention; and

Fig. 2 is an enlarged plan view of the Venturi tube which forms a part of the carburetor shown in Fig. 1.

Referring to the drawings, 10 represents the usual float chamber of a carburetor, liquid fuel being fed to this chamber as by pipe 11, and the float and valve (not shown) in this chamber being adapted to hold the liquid in the chamber at a constant level. The liquid fuel is fed from the chamber through channel 12 to a nozzle 13, which is suitably mounted in the main body part 14 of the carburetor shown in Fig. 1. This body part of the carburetor comprises a main air intake passage 15, having inlet openings 16, and an auxiliary air passage 17 above the main passage and provided with an opening 18 controlled by a spring closed valve 19 of the usual poppet type. The springs 20′ for this valve are housed within a cover 20 and are of usual construction. The auxiliary air passage 17 leads into a mixing chamber 21 in which there is a throttle valve 22, and it will be understood that this chamber 21 is adapted to be placed in communication with the intake manifold of the hydrocarbon motor and the passage of the mixture to the motor is controlled by said throttle valve.

Connecting the passages 15 and 17 and controlling communication between them is a Venturi tube 23 which also surrounds nozzle 13 and has its throat 24 substantially in a horizontal plane with the outlet or mouth 25 of said nozzle. The lower flanged end 26 of the Venturi tube is secured to the body of the carburetor by any suitable means, such as screws 27.

It will be understood that, with the construction so far described, suction in the mixing chamber 21 produced by the operation of the motor will draw air primarily through the passage 15 and the Venturi tube 23 past the fuel nozzle 13, thus creating a suction or a partial vacuum over the mouth of said fuel nozzle, and drawing some of the gasoline or other fuel through said nozzle into the air passing through the tube. If the suction is sufficient to open the valve 19, additional air will also be drawn through the passage 17 and this additional air will mix with the fuel-loaded air in the mixing chamber 21 and thin the mixture accordingly. The tension of the springs 20′ controlling the valve 19 can usually be set to give a correct mixture of air and liquid fuel for a fairly wide range of speeds and loads of the motor, but it is found in practice that, with the demands that are now being made upon motors for a still wider range of speeds and loads, the best results cannot be obtained with a Venturi tube of unvarying internal throat diameter. The present invention, therefore, contemplates automatically varying the effective throat diameter of the Venturi tube preferably in relation to the suction present in the tube, and one form of device for accomplishing this purpose is shown in the drawings.

In the tube 23 are arranged a pair of guides 28 which extend above and below the throat 24 of the tube and a device 29 is arranged in the tube and slides on these guides. In the form shown, this device 29 is substantially spherical and is a little larger than the interior of the throat 24 so that, in its lowered or normal position, it rests on the walls of said throat, as shown

in full lines in Fig. 1. This device or ball 29 has a vertical opening 30 therethrough, this opening being substantially in alinement with the vertical axis of the tube 23 and it is of sufficient size to freely surround the upper end or mouth 25 of the nozzle. It will be seen, therefore, that when the device 29 is in its lowered position, it restricts the size of the passage through the tube 23, that is, it restricts the size of the throat 24, and leaves a smaller air passage past the mouth 25 of the nozzle. Consequently, the air will pass the nozzle under a given suction more rapidly with the device 29 in place in the throat 24 than with the device omitted. Also, it will be evident that, at a predetermined suction, depending upon the size and weight of the ball 29, the latter will be raised from its seat on the throat 24 to the position shown in dotted lines. This will permit the passage of air not only through the ball 29 but also around the outside of it and as the ball will not then restrict the throat of the Venturi tube, a much freer passage for the air around the nozzle 13 will be permitted.

From the above description, it will be seen that when the throttle 22 is only slightly open, as for idling the motor or running at slow speeds or light loads, there will be comparatively small suction in the tube 23 and the ball 29 will remain on its seat. Under these conditions, the size of the passage through the tube 23 will be small, which is desirable for light running of this kind and the correct mixture will be obtained. When throttle 22 is opened wider and a greater suction prevails, the ball 29 will be raised from its seat and the Venturi opening will thereby be increased considerably. Under these conditions, the amount of air will be increased and the proportionate amount of fuel decreased so that the correct mixture for higher speeds or heavier loads will still be produced.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. In a carburetor, the combination with a fuel nozzle and a Venturi tube surrounding said nozzle, of a device having an air passage and adapted in one position to surround the outlet end of said nozzle and close the throat of said tube except for the air passage of said device and in another position to permit direct co-operation of said nozzle with said Venturi tube and allow the passage of air both through and around said device.

2. In a carburetor, the combination with a fuel nozzle and a Venturi tube surrounding said nozzle to permit said Venturi tube to cooperate directly with said nozzle in drawing fuel therefrom, of a device having a fixed air passage slightly larger than the nozzle outlet end and adapted in one position to close the throat of said tube with the nozzle end in said fixed air passage and in another position to be free of said throat allowing the passage of air both through and around the device.

3. In a carburetor, the combination with a fuel nozzle and a Venturi tube surrounding the nozzle, of a valve in said tube movable relatively to both the nozzle and tube, said valve having a vertical passage therethrough slightly larger than the outlet end of said nozzle and smaller than the throat of said tube, said valve in one position closing said throat except for said vertical passage and in another position permitting free passage of air through and around it.

4. In a carburetor, the combination with a fuel nozzle, of a Venturi tube surrounding said nozzle, guides mounted in said tube, and a substantially spherical device on said guides having a passage therethrough, said device surrounding the mouth of said nozzle when in normal position.

5. In a carburetor, the combination with a fuel nozzle and an air tube surrounding the nozzle, of a movable valve co-operating with said nozzle and tube to provide a freer passage of air around the nozzle as the suction in the tube increases, said valve having an opening to receive the end of the nozzle when the valve is in position otherwise closing the throat of said tube, and said valve being movable to a position wholly above the outlet of said nozzle and permitting the passage of air both through said opening and around the valve.

6. In a carburetor, the combination with an air tube and a fixed fuel nozzle in said tube, of a movable spherical device having a vertical opening therethrough resting on the wall of said air tube and surrounding and spaced from the upper end or mouth of said nozzle to vary the size of the air passage past the said mouth.

7. In a carburetor, the combination with a fuel nozzle, of a Venturi tube surrounding said nozzle, means disposed vertically and carried by said tube, and controlled by the suction of air through said tube, for determining the amount of air passing through said tube and means carried by said tube for guiding said last named means.

8. In a carburetor, a fuel nozzle, a primary air tube surrounding said nozzle, means forming a secondary air passage surrounding said tube, a valve having an air passage therethrough positioned in said primary air tube and adapted in one position to close the passage through said tube, except for the passage through said valve, and in another position to permit the free passage of air through and around said valve.

9. In a carburetor, a fuel nozzle, a Venturi tube surrounding said nozzle, a primary air

passage means leading to said tube, means forming a secondary air passage surrounding said tube, a suction operated spherical valve vertically reciprocable in said tube and surrounding said nozzle, said valve being adapted to limit the amount of air passing through said Venturi tube.

10. In a carburetor, the combination with a fixed fuel nozzle and a fixed Venturi air tube surrounding the nozzle, said nozzle having an outlet opening adapted to directly cooperate with the contracted part of said Venturi tube, of a valve device having an opening therethrough and mounted to reciprocate in said tube, said device adapted in one position to surround the outlet opening of said nozzle and restrict the passage of air through said tube and in another position to provide a freer passage of air around said nozzle opening and through said tube.

In testimony whereof I affix my signature.

WILLIAM R. McCULLA.