

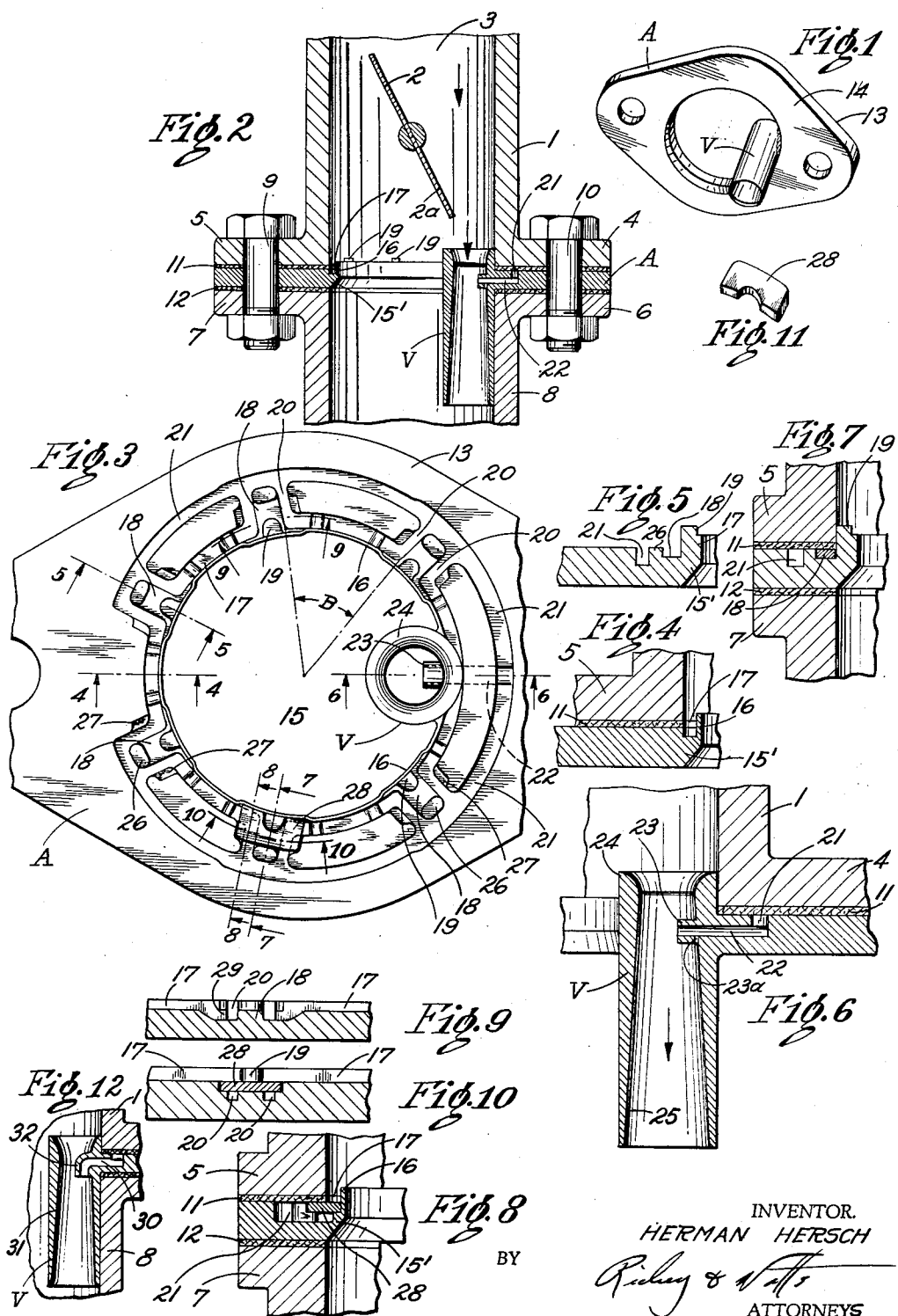
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CARBURETING DEVICE

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CARBURETING DEVICE

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This invention relates to internal combustion engines and more particularly to means for improving the performance and economy of engines in which the liquid fuel is mixed with air in a carburetor and the mixture conveyed to the cylinders by a suitable conduit or manifold.

In the usual internal combustion engine of the type used in automobiles the carburetor is disposed either below the riser pipe of the manifold in "up-draft" relation, or above the riser or connecting pipe to the manifold "down-draft" relation. In each of these arrangements difficulty is frequently experienced in properly mixing the gasoline in atomized or vapor form with the stream of air and the efficiency and performance of the engine are interfered with by incomplete and improper formation of the mixture. The mixture outlet of the carburetor and the riser of the manifold to which the carburetor is attached constitute a pipe or mixture conduit leading to the manifold header. One of the principal causes of inefficient or improper operation of the engine is due to the fact that liquid gasoline collects on the wall of this conduit and flows along this wall in liquid form instead of being drawn along with the mixture.

It is among the objects of my invention to provide means for collecting this liquid gasoline and effectively reintroducing it into the mixture stream in such a manner that it will be vaporized or atomized and re-introduced into the main mixture stream in proper form for efficient combustion in the cylinders. Other objects of my invention are the provision of a device of the type described which has no moving parts, is susceptible to economical production and which may be readily installed in present day automobiles without the use of special tools or fittings of any kind; the provision of means for increasing the gasoline mileage and both high and low speed performance of automotive vehicles; the provision of means for collecting a liquid from the walls of a conduit conveying a mixture of liquid and a gas and reintroducing the collected liquid in atomized or vapor form into the moving stream of mixture. I am aware that prior attempts have been made to solve the problem of liquid flowing along the walls of a mixture conduit, and it is a further object of my invention to overcome the defects of these prior efforts.

The above and other objects of my invention will appear from the following description of a preferred embodiment thereof, reference being had to the accompanying drawing, in which—

Figure 1 is a perspective view of my economizer

device, looking at the down-stream side thereof.

Figure 2 is a fragmentary cross-sectional view illustrating a mixture conduit having a throttle valve therein and my economizer inserted in the conduit in proper relation to the throttle valve.

Figure 3 is a fragmentary plan view of my economizer looking at the up-stream side thereof.

Figure 4 is a fragmentary cross-sectional view taken on line 4—4 of Figure 3 and including a portion of the carburetor wall.

Figure 5 is a cross-sectional view taken on line 5—5 of Figure 3.

Figure 6 is a cross-sectional view taken on line 6—6 of Figure 3 and also illustrating a portion of the carburetor wall.

Figure 7 is a cross-sectional view taken on line 7—7 of Figure 3 and including portions of both the carburetor and manifold sections of the mixture conduit.

Figure 8 is a cross-sectional view similar to Figure 7 but taken on line 8—8 of Figure 3.

Figure 9 is a cross-sectional view taken on line 9—9 of Figure 3.

Figure 10 is a cross-sectional view taken on line 10—10 of Figure 3.

Figure 11 is a detached perspective view of one of the small cover plate members for the liquid collecting passages.

Figure 12 is a view similar to Figure 6 but showing another form of Venturi inlet.

I have illustrated, and will describe, my economizer device as disposed between the flange of the carburetor mixture outlet and the corresponding flange of the manifold riser. It will be understood that my economizer might be inserted at any other place in the mixture conduit system where there is a tendency for liquid to collect on and move along the wall of the conduit. The device shown and described is a separate article adapted to be inserted between the carburetor and manifold of the usual automobile engine but it will also be understood that the device might be built into the carburetor structure or the manifold structure without departing from the spirit of my invention.

The carburetor proper is not illustrated and may be of any suitable form. A down-draft arrangement is shown in the drawing in which the carburetor mixture outlet 1 is provided with the usual butterfly type throttle valve 2. Up-draft connections may, of course, be used if desired. This valve extends across the mixture conduit 3 and is rotatable to increase or decrease the area of the passage through the conduit. The mixture flow is in the direction of the arrow

in Figure 2 and, to close the throttle and reduce the flow of mixture, the valve 2 is rotated in counter-clockwise direction while to increase the flow and open the throttle it is moved in clockwise direction. In normal operation the butterfly valve 2 is always disposed in slanting relation to the axis of the conduit 3 and the down-stream portion 2^a of the throttle valve tends to direct the mixture toward the right hand side of the conduit 3 (Fig. 2). It will be understood that the maximum mixture velocity will occur at the point of greatest reduction in area, i. e., adjacent the portion 2^a of the throttle valve.

In Figure 2 my economizer is indicated generally by the reference character A and it will be seen that the body of the device is clamped between the flanges 4 and 5 of the carburetor and the flanges 6 and 7 of the manifold mixture conduit or riser 8 by means of bolts 9 and 10. Gaskets 11 and 12 of suitable, preferably resilient, material form a tight seal between the top face 13 of the economizer A and the flanges 4 and 5 of the carburetor and the bottom face 14 of the economizer A and the flanges 6 and 7 of the manifold.

The carburetor mixture conduit 3 is usually circular in cross-section and, in order to collect liquid which may be traveling along the walls of the conduit, I include in my device A a body portion having an opening 15 therethrough and a radially inwardly extending portion 15' having a flange or wall 16 extending into the opening 15 in an up-stream direction to form a generally annular collecting trough or groove 17. The wall 16 is preferably very thin and the radial width of the trough or groove 17 is relatively small, being merely sufficient to collect any liquid which is running along the inner walls of the conduit 3. The outer edge of this trough or groove 17 is flush with the wall of the conduit 3 and the trough is divided into a plurality of segmental portions, one of which is indicated at B on Figure 3 by baffle walls or dams 18 which extend radially outwardly from the lip or flange 16. Locating or centering lugs 19 project upwardly from the dams 18 adjacent the inner flange 16. These lugs, as seen in Figure 2, extend upwardly somewhat above the top of the flange 16 and extend radially outwardly therefrom to a point substantially at the outer circumference of the groove 17 and the inner diameter of the mixture conduit 3. These lugs provide means whereby, when they are inserted into the bore of the mixture pipe, the device will be centered therein and the groove 17 will extend uniformly into the mixture path around the circumference of the conduit 3.

Each of the segmental sections of the groove 17 is connected by radially extending grooves 20 to the outer circumferential groove or passage 21. This passage does not extend entirely around the full circumference but, as is seen in Figure 3, is broken directly opposite from the Venturi member V. It does, however, form a continuous connection for liquid which is collected in the sections of the trough 17 which extend into the mixture path. Liquid so collected passes through the various radial grooves 20 into the outer groove 21. A connection 22 is provided from this groove 21 into the passage through the Venturi tube generally indicated at V. The boss 23 carries the passage 22 to a point removed from the wall of the venturi and a small liquid outlet 23^a is preferably provided extending from the passage 22 into the interior of the venturi in a down-stream direction. The venturi may be of any usual and

suitable form and has its enlarged up-stream end 24 extending upwardly into the bore of the carburetor outlet pipe (see Figs. 2 and 6). The bottom elongated discharge end 25 of the venturi extends in down-stream direction into the manifold 8. Although the usual circular cross-section venturi is illustrated it will be seen that any means for increasing the velocity and decreasing the pressure of a portion of the mixture passing through the conduit may be embodied in my device.

Projections 26 extend up from the dams 18 and depressions 27 are formed in the face 13 of the economizer device. These bosses and depressions serve to locate and retain in position the small cover plates 28 which are shown in detached view in Figure 11. In Figure 3 one of these cover plates is shown in position although, for purposes of clearer illustration, the cover plates are not shown on the other dams 18. It will be understood, however, that when the device is installed these cover plates 28 will be positioned on each of the dams 18 before the gasket 11 is placed on top of the face 13 of the economizer.

Referring particularly to Figure 9 it will be observed that the collecting groove 17 has a deeper portion 29 adjacent the radial grooves 20. The plates 28 co-act with the deeper portions of the groove 17 to form protected portions of the collecting groove 17 which facilitate the flow of liquid from the groove 17 out through the passages 20 into the outer groove 21. The arrangement of these parts will be clearly seen from the various cross-sectional views.

In the operation of my device, when it is installed as shown in Figure 2, all liquid which flows along the walls of the conduit 3 will be collected in the segmental portions of the groove 17 and will then flow into the radial passages 20 and thence into the annular passage 21, it being understood that when the device is installed the grooves 20 and 21 are covered by the gasket 11 forming closed liquid passages. The inlet of the venturi V is disposed immediately beyond the down-stream edge of the throttle valve 2^a at a point where the mixture velocity is at a relatively high value. Thus, a gaseous mixture, moving at high velocity, will be directed into the inlet 24 of the venturi. Due to the well understood Venturi action the velocity in the reduced section of the tube V will be increased and the pressure reduced thus creating a suction on the end of the passage 22. This suction will be effective to cause liquid which has been collected in the groove 17 to be drawn into the groove 21 and thence into the passage 22 from which it will be re-introduced and re-atomized in the mixture stream passing through the Venturi throat.

Figure 12 illustrates a form of my invention in which the tube or conduit 30 for conveying liquid into the venturi 31 has its outlet end curved downwardly in the direction of flow through the venturi. Thus, the projecting elbow section 32 of the liquid conduit has its opening toward the down-stream end of the venturi 31 and it has been found that this arrangement assists in causing a free flow of liquid into the material passing through the venturi.

I have found that by providing the auxiliary outside liquid passage 21 and breaking up the collecting groove 17 into a plurality of separated segmental portions I am able to overcome difficulties previously experienced in getting liquid collected in a projecting groove to pass into a Venturi throat. The tendency, where my im-

proved liquid passage is not employed, is for the pressure of the mixture against the liquid in the trough which projects into the mixture passage to prevent the liquid from consistently and effectively being conveyed to the venturi. By inserting the dams 18 across the collecting groove 17 circulation of liquid around the groove 17 for any material distance is prevented and the liquid is caused immediately to pass into the closed groove 21 where it is subjected directly to the suction caused by the flow of the mixture through the venturi V.

Another important feature of my invention is the location of the venturi V directly below the down-stream edge of the butterfly throttle valve. Thus, the venturi is placed in the zone of greatest mixture velocity and, by virtue of the high velocity of the gaseous mixture directed into the venturi, a sufficient suction is created in the liquid passages 22 and 21 to cause the collected liquid to be drawn promptly and effectively into the Venturi throat and re-mixed with the portion of the mixture which is passing therethrough. Of course, the mixture which emerges from the exit end 25 of the venturi may be somewhat richer than that which does not pass through the venturi but, as a well atomized and vaporized mixture is obtained in the venturi V, diffusion will promptly take place and the resultant mixture stream into the manifold below the outlet of the venturi will be homogenous and free from large particles of liquid which might collect on the walls resulting in uneven distribution and poor fuel economy.

Although I have described the illustrated embodiment of my invention in considerable detail it will be understood that numerous variations and modifications may be made without departing from the spirit of my invention. As noted above, the principles of my invention might be incorporated in an integral structure with a carburetor or a manifold. A down-draft carburetor has been illustrated but the principle of my invention is equally adaptable to up-draft arrangements. Furthermore, although I have described the invention as applied to mixtures of air and gasoline, it will be understood that it might be applied to any conduit conveying a mixture of gas and liquid or vapors. Furthermore, the device can be installed not only between a carburetor and a manifold but might also be installed between the manifold branches and the cylinders adjacent the valves or at any other point where difficulty with liquid on the walls of a conduit is experienced. I do not, therefore, wish to be limited to the particular form of my invention herein illustrated and described, but claim as my invention all embodiments thereof coming within the scope of the appended claims.

I claim:

1. In apparatus of the type described, a conduit for conveying a mixture of gas and liquid, a trough extending into said conduit and adapted to intercept and collect liquid moving along the wall of said conduit in the direction of mixture flow therethrough, means in said conduit adapted to create a zone of greater mixture velocity at one side of the conduit, means, disposed in said zone of greater mixture velocity, for increasing the velocity and reducing the pressure of a portion of the mixture, and means for conveying liquid from said trough to said pressure reducing means and introducing said liquid into said portion of the mixture having increased velocity and reduced pressure.

2. In a combination with a conduit for mixtures of liquids and gases, a butterfly type throttle valve disposed in said conduit, the downstream portion of said valve being normally disposed in angular relation to the longitudinal axis of said conduit, a liquid collecting trough extending around the wall of said conduit and projecting thereinto, said trough being situated in said conduit downstream from said throttle valve, means, in said conduit and disposed adjacent the downstream edge of said throttle valve, for increasing the velocity and reducing the pressure of a portion of the mixture passing through said conduit, and means for conveying liquid from said trough to said pressure reducing means and introducing said liquid into said portion of the mixture having increased velocity and reduced pressure.

3. In combination a mixture conducting conduit, a butterfly valve therein, a trough disposed downstream from said valve and extending into said conduit, a Venturi tube member disposed in said conduit and having its entering or upstream end disposed on the same side of said conduit as the downstream portion of said butterfly valve and its downstream or outlet end disposed in said conduit, and liquid conveying connections between said trough and the throat portion of said venturi.

4. In a device of the type described, a body, an aperture extending through said body, walls defining a trough extending around said aperture, said body having an outer groove extending generally parallel to said trough and disposed radially outwardly therefrom, and said body also having connecting grooves extending from said trough to said outer groove, dam walls adjacent said connecting grooves and extending transversely across said trough and dividing said trough into a plurality of sections, a Venturi type tubular member secured to said body at the edge of said aperture and having its Venturi passage extending substantially parallel to the axis of said aperture, and a fluid conducting means from said outer groove to the throat portion of said Venturi member.

5. In a device of the type described, a body, an aperture extending through said body, walls defining a trough extending around said aperture, said body having an outer groove extending generally parallel to said trough and disposed radially outwardly therefrom, and said body also having connecting grooves extending from said trough to said outer groove, dam walls adjacent said connecting grooves and extending transversely across said trough and dividing said trough into a plurality of sections, a Venturi type tubular member secured to said body at the edge of said aperture and having its Venturi passage extending substantially parallel to the axis of said aperture, fluid conducting means from said outer groove to the throat portion of said Venturi member, and cover plates supported on said dams and providing closed sections of said trough and said connecting grooves adjacent said dams.

6. In a device of the type described, a body, an aperture extending through said body, walls defining a trough extending around said aperture, said body having an outer groove extending generally parallel to said trough and disposed radially outwardly therefrom, and said body also having connecting grooves extending from said trough to said outer groove, dam walls adja-

cent said connecting grooves and extending transversely across said trough and dividing said trough into a plurality of sections, a Venturi type tubular member secured to said body at the edge of said aperture and having its Venturi passage extending substantially parallel to the axis of said aperture, fluid conducting means from said outer groove to the throat portion of said Venturi member, and centering lugs spaced around said aperture adjacent the inner edge of said trough.

7. In apparatus of the type described, a conduit having an aperture therethrough, a trough extending around said aperture, a Venturi member disposed adjacent the wall of said conduit in said aperture, liquid conducting means extending from said trough to said Venturi member, and means in said conduit upstream of said Venturi member for directing the flow of fluid through said conduit toward said Venturi member.

8. In combination, a mixture conducting conduit, a butterfly valve therein, a trough extending around and into said conduit, a Venturi member disposed in said conduit and having its entering or up-stream end disposed on the same side of said conduit as the down-stream portion of said butterfly valve and its down-stream or outlet end disposed in said conduit, and liquid conveying connections between said trough and the throat portion of said venturi.

9. In a device of the type described, a body adapted to be supported in a fluid conveying conduit and having an aperture corresponding to the passage through the conduit, said body having a trough portion extending around said aperture, a Venturi member disposed adjacent to said body at the side of said aperture, liquid conducting means for conveying liquid from said trough to said Venturi member, and a liquid conduit extending into said Venturi member and having its discharge opening directed toward the downstream end of said Venturi member, said liquid conduit being connected to said liquid conducting means.

10. In a device of the type described, a body having an aperture extending therethrough, walls defining a trough extending around said aperture, said body having an outer groove extending generally parallel to said trough and disposed radially outwardly therefrom, and said body also having a connecting groove extending from said trough to said outer groove, a Venturi-type tubular member secured to said body at the edge of said aperture and having its Venturi passage extending substantially parallel to the axis of said aperture, and fluid conducting means from said outer groove to said Venturi member.

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