June 26, 1923. 1,459,961

L. H. WHEELER

VARIABLE VENTURI FOR SUCTION FEED SYSTEMS

Filed April 14, 1922

Fig. 1

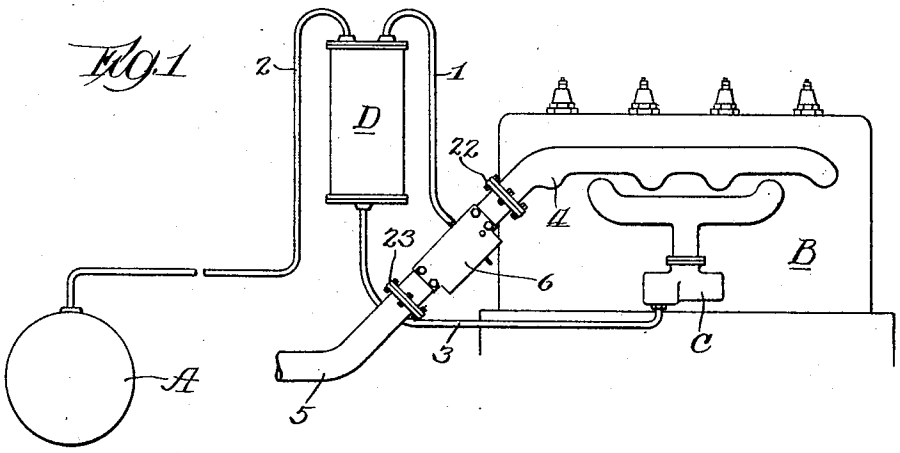


Fig. 2

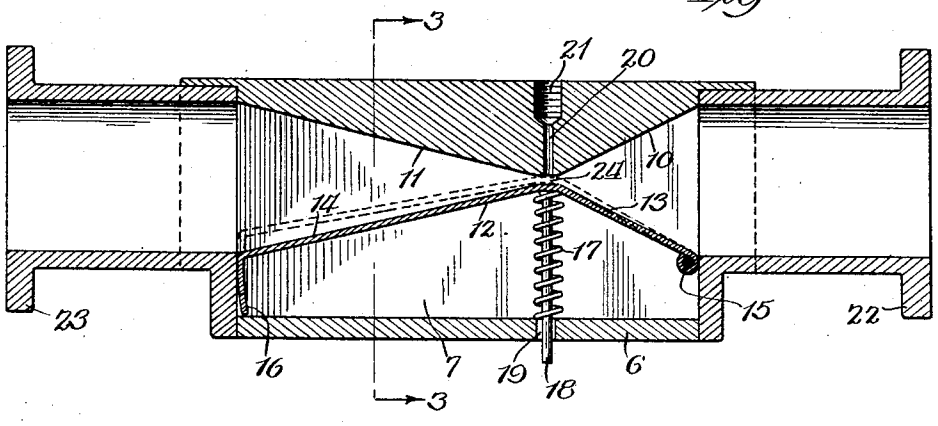
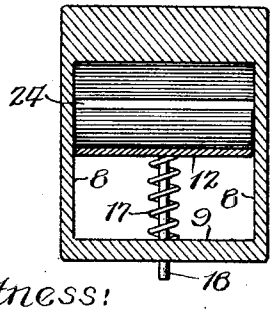


Fig. 3



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UNITED STATES PATENT OFFICE.

LEONARD H. WHEELER, OF CHICAGO, ILLINOIS, ASSIGNOR TO STEWART-WARNER SPEEDOMETER CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION OF VIRGINIA.

VARIABLE VENTURI FOR SUCTION FEED SYSTEMS.

Application filed April 14, 1922. Serial No. 552,806.

To all whom it may concern:

Be it known that I, LEONARD H. WHEELER, a citizen of the United States, residing in the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Variable Venturi for Suction Feed Systems, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to liquid feeding apparatus of the type commonly known as the "vacuum feed," and its purpose is to provide a construction associated with the exhaust pipe or conduit of an engine for utilizing the flow of the exhaust to produce suction or vacuum for operating the feed device. It consists of certain features of construction hereinafter described and shown in the drawings, as indicated by the claims.

In the drawings:—

Figure 1 is a diagrammatic side elevation of a liquid feed system applied to an engine having a suction producing device in the exhaust pipe constructed in accordance with this invention.

Figure 2 is a vertical axial section of the suction producing device itself.

Figure 3 is a transverse section taken as indicated at line, 3—3, on Figure 2.

The liquid feed system shown in the drawings comprises the usual low level supply tank, A, which, as illustrated, may be understood as the fuel supply tank for an internal combustion engine shown at B, and having the carbureter, C, to which the fuel is fed by a vacuum feed tank, D, of well understood construction, such as that shown in Jay Patent No. 1,125,549, dated January 19, 1915. As commonly installed at the present time, such a vacuum feed device depends for its suction upon the partial vacuum produced in the intake manifold of the engine. However the suction is derived, the apparatus must include a suction line or pipe, 1, a liquid supply pipe, 2, leading from the low level tank, A, to the vacuum tank, D, and a feed pipe, 3, leading from the tank, D, to the carbureter, C.

The engine exhaust manifold is indicated at 4, connected with an exhaust pipe, 5, and the suction producing device embodying this invention is shown as a fitting, 6, interposed between the manifold, 4, and the exhaust discharge passage, 5. The fitting is shown as a metallic box of rectangular cross section having a chamber, 7, formed with parallel side walls, 8, 8, and a straight bottom wall, 9. The top wall of the chamber, 7, includes longitudinally and oppositely inclined portions, 10 and 11, and between the side walls, 8, there is mounted a movable partition, 12, having oppositely inclined portions, 13 and 14, respectively. Said partition, 12, is preferably rendered movable by a hinged or pivotal mounting, 15, at one end, and is formed at the other end with a stop lip, 16, which rests upon the bottom wall, 9, of the fitting, 6, at one limit of adjustment of the partition, 12.

The partition, 12, co-operates with the inclined faces, 10 and 11, to form a Venturi passage for the exhaust gas from the engine, B, the portions, 10 and 13, and side walls, 8, defining the narrowing part of the passage while the surfaces, 11 and 14, co-operate with the side walls to form the divergent or expanding section. At any convenient position a spring, 17, is mounted to re-act between the partition, 12, and the bottom wall, 9, being preferably provided with a guide pin, 18, accommodated for movement through an opening, 19, in said wall, 9. The top wall of the fitting, 6, is formed with a suction port, 20, counterbored and tapped at 21, for connection with the suction pipe, 1, leading to the vacuum tank, D, and for convenience of mounting the fitting in the exhaust passage, it may be formed with end flanges, 22 and 23, as shown.

The flow of exhaust gas through the Venturi throat formed by the converging surfaces, 10 and 13, and the diverging surfaces, 11 and 14, will thus produce a suction which is of maximum value substantially at the point of greatest constriction of the venturi indicated at 24, and the vacuum tank, D, communicating with this constricted part, 24, through the pipe, 1, and port, 20, will thus be operated to lift liquid from the tank, A, and discharge it through the feed pipe, 3, in a well understood manner.

It is desirable to maintain the value of the suction in the pipe, 1, fairly uniform, whereas the velocity and pressure of the exhaust gases in the manifold, 4, may vary with engine speed and other conditions.

As shown on Figure 2, the hinged partition, 12, is disposed at the limit of its range which provides a maximum cross section for the constriction, 24; but the spring, 17, will be made of such strength that as the exhaust pressure in the manifold, 4, decreases, the spring will move the partition, 12, toward the opposite wall and toward a limit indicated in dotted lines in Figure 2, for reducing the constriction, 24. This adjustment by increasing the velocity of the exhaust at the constriction, 24, will tend to maintain a uniform suction at the port, 20, and in the pipe, 1, as desired.

I claim:

1. In combination with an internal combustion engine having an exhaust passage and liquid fuel feeding means employing suction for moving the fuel for distribution to the engine, a suction producing device comprising a Venturi tube constituting a part of the engine exhaust passage, and having an inlet leading to its constricted portion from the fuel feeding means for producing a suction effect thereon, said Venturi tube being variable in shape for regulating such suction effect.

2. In the combination defined in claim 1, said Venturi tube being variable in shape to modify the cross-sectional area of its constricted portion.

3. In the combination defined in claim 2, yielding means tending to maintain the shape of the venturi with said cross-sectional area at a minimum, but adapted to yield automatically to an increase in pressure of the exhaust gas in the passage.

4. In combination with an internal combustion engine having an exhaust passage and liquid fuel feeding means employing suction for moving the fuel for distribution to the engine, a suction-producing device comprising a Venturi tube constituting a part of the engine exhaust passage, and having an inlet to its constricted portion leading from said fuel feeding means for transmitting suction effect thereto, said Venturi tube being variable in shape for modifying said suction effect, and means adapting the venturi to respond automatically to variations in the exhaust pressure in the passage to maintain a substantially uniform suction effect.

5. In the combination defined in claim 1, said Venturi tube comprising two fixed parallel walls and a movable wall extending between them adjustable transversely of the direction of flow of exhaust gas through the passage for modifying the cross-sectional area of the venturi.

6. In the combination defined in claim 5, yielding means tending to hold said movable wall in position to produce a minimum cross-sectional area.

7. In the combination defined in claim 5, said transversely movable wall having oppositely inclined portions extending respectively in opposite directions from the constricted part of the venturi, and a fixed wall opposing said movable wall with corresponding inclined portions meeting at the constricted part of the venturi.

8. In the combination defined in claim 5, said movable wall being hinged at one end at a distance from the constricted part of the venturi for swinging both toward and from an opposite fixed wall.

9. In the combination defined in claim 8, said hinged wall having a transversely extending lip at the end remote from its hinge formed to engage the edge of the adjacent part of the exhaust passage throughout the range of movement of the hinged wall.

10. In combination with an internal combustion engine having an exhaust passage and liquid fuel feeding means operated by suction, a suction-producing device including a venturi inserted in the exhaust passage and comprising a fitting of interiorly rectangular cross-section with two parallel side walls and a fixed transverse wall having oppositely inclined portions which meet at the constricted part of the Venturi throat, together with a second transverse wall having oppositely inclined portions corresponding to those of said fixed wall, and also meeting at the constricted part of the venturi, provided with means for guiding said second wall for movement toward and from the fixed wall, said wall being adapted to yield away from the fixed wall upon increase of the pressure in the exhaust passage, and an inlet leading to the constricted part of said venturi from the fuel feeding means for operating the latter by suction.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 11th day of April, 1922.

LEONARD H. WHEELER.