

July 5, 1927.

E. N. FALES

1,635,040

FLOWMETER

Filed June 9, 1923

Fig. 1.

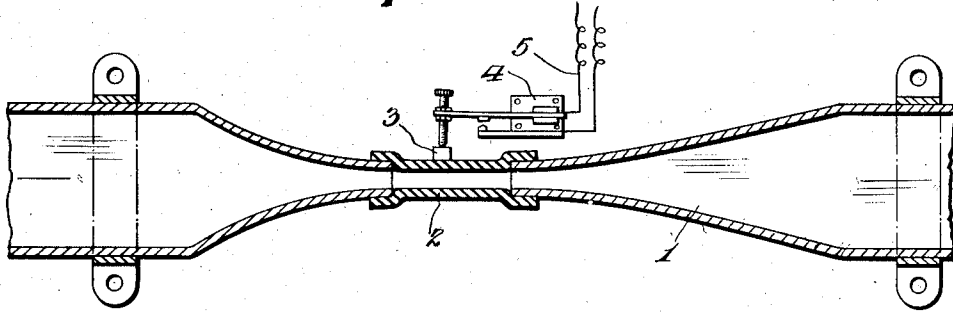


Fig. 2.

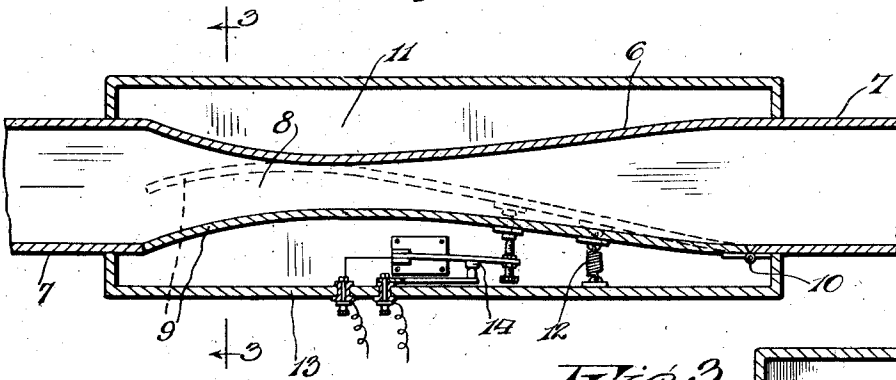


Fig. 3.

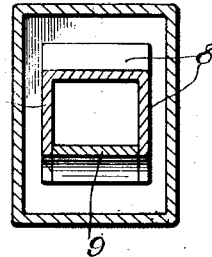


Fig. 4.

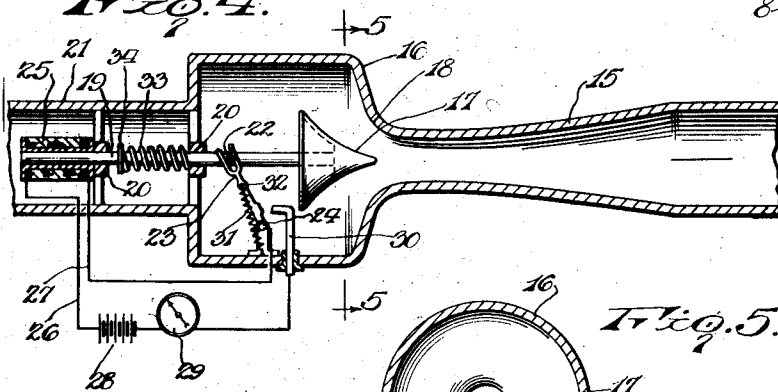
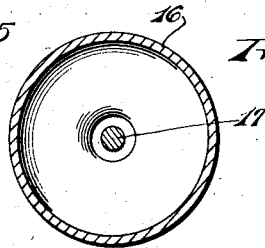


Fig. 5.



INVENTOR
E. N. Fales
BY *Robert H. Young*
ATTORNEY

UNITED STATES PATENT OFFICE.

ELISHA N. FALES, OF LAKE FOREST, ILLINOIS.

FLOW METER.

Application filed June 9, 1923. Serial No. 644,516.

This invention relates to an instrument of the type used in measuring the velocity of a fluid such as air, gasoline, or water, and is particularly adaptable as a gasoline flow-meter of an automobile or an air flowmeter for aerodynamic purposes.

The object of the invention is to provide a device of this type which will operate upon the Venturi principle in which the difference in pressure between the throat of a Venturi and the cone exhaust actuates a movable member which in turn actuates suitable recording or indicating apparatus.

Further objects will be more fully set forth in the attached specification and claims.

In the drawings:

Fig. 1 represents a sectional elevation of one form of my invention.

Fig. 2 is a sectional elevation of a second form.

Fig. 3 is a section through line 3—3 of Fig. 2.

Fig. 4 is a sectional elevation of a third form of my invention, and

Fig. 5 is a section on line 5—5 of Fig. 4.

It is proposed to utilize the principle of the Venturi tube in a novel manner. When fluid passes through a Venturi tube, a suction is created at the throat on the walls of the tube. If then, the throat is made yielding, this suction will constrict the throat until the opposite walls of the same touch, and the flow then stops. Immediately the pressure in the throat rises again and the elastic portions of the throat return to the normal position. This cycle is repeated a number of times in quick succession, depending upon the speed of the fluid through the Venturi tube. In Figure 1, a Venturi designated generally by the numeral 1, is provided with an elastic throat member 2 of rubber or other suitable material and a projection 3 on the rubber portion 2 is so arranged in relation to a contact breaker 4 that an electric current flowing through the breaker 4 and wires 5 will be interrupted every time the throat is constricted and returns to its normal position. The interruptions of this electric circuit may be used to operate a pawl mechanism or any other suitable indicator.

In Figure 2, a rectangular Venturi 6 is constructed of end portions 7 and three stationary side walls 8, together with a wall 9 hinged at 10, these walls 8 and 9 being so

shaped as to provide a rectangular Venturi having a throat portion at 11. A fluid flowing through the Venturi in the direction of the arrow creates a suction at the throat 11 which causes the bottom wall 9 to move inward about its pivot and close the Venturi. A spring 12 is attached to this wall 9 and to an outer casing 13 which surrounds the Venturi proper and this spring will immediately retract the wall 9 after the Venturi passage has been closed and the partial vacuum at the throat is relieved. The casing 13 is provided to permit the outside of the walls to be maintained at the normal pressure, that is, the pressure of the external fluid. A contact point 14 is made and broken during each cycle of the operation of the wall 9.

In Figures 4 and 5 are shown a third form in which a tapering tube 15, which in this instance is of circular cross section, is connected to a casing 16 within which is mounted a flared member 17, the flare 17 coacting with the flared portion 18 of the tube 15 to form a Venturi-shaped orifice having a throat portion at 18. This flared member 17 is mounted upon a rod 19 which is held in bearings 20 in a tube 21 in such a manner that it may slide longitudinally of the bearings and tube in order to close the Venturi throat, when the partial vacuum is created in the throat by the passage of the liquid therethrough. A pin 22 on the rod 19 is straddled by a fork 23 pivoted at 24 to a suitable support on the casing 16. A solenoid 25 surrounds a part of the rod 19 and this solenoid is connected to wires 26 and 27 which are connected as shown through battery 28, recording instrument 29, contact point 30 and fork 23, so that when the movable portion 17 of the Venturi is drawn to the right to close the throat, contact will then be made through fork 23 and contact point 30 to energize the solenoid 25 which will exert a withdrawing force on the rod 19 so as to return the movable part of the Venturi to its normal position. The cycle will then be immediately repeated.

In order that the moving parts above mentioned may travel the full distance, completely shutting off the flow of fluid, a trip spring 31 attached to point 32 on the fork 23 at one end and fixed at its other end at a point below the pivot 24 of the fork, may be provided in place of the solenoid. This spring 31, which operates under compression at all times, exerts a withdrawing force upon

the movable parts 17 when the Venturi throat is closed, tending to open the same and also exerts a closing force in its position as shown in the figure due to the manner in which it is mounted. A spring 33 operating against a stop 34 on the rod 19 may also be provided to supplement or take the place of the solenoid as a means for opening the throat of the Venturi, this spring 10 normally urging the flared member 17 and with it the spring 31 toward the left as shown in the figure. The momentum of the movable parts are ordinarily sufficient to maintain the intermittent motion of the Venturi and prevent a partial closing of the Venturi and an exact balancing of the springs 15 and the suction created in the throat without the need of a solenoid but the solenoid will provide a positive closure and prevent a possibility of this point of balance ever 20 being obtained.

It will be understood that the rate at which the closing and opening of the Venturi throat takes place will be dependent 25 upon the rate of flow of the liquid or fluid through the apparatus, which will be indicated upon a properly calibrated indicating gauge or which could be recorded optically or otherwise by any suitable device.

30 I claim:

1. A flowmeter comprising a fluid passage having normally a Venturi shape and having a yielding wall permitting collapse of the passage as the flow increases.
- 35 2. A flowmeter comprising a fluid passage having normally a Venturi shape, said fluid

passage including a movable portion operable to constrict the throat of the passage, and means for urging the movable portion to its normal position. 40

3. A flowmeter comprising a fluid passage having normally a Venturi shape, said fluid passage including a movable portion operable to constrict the reduced portion of the passage as the flow through the passage in- 45 creases, means for returning said movable portion to its normal position whereby an intermittent flow through the passage is obtained, indicating mechanism and means for actuating said indicating mechanism depend- 50 ent upon the movements of the said movable portion.

4. A flowmeter comprising a fluid passage having normally a Venturi shape, said fluid passage including a movable portion oper- 55 able to constrict the reduced portion of the passage as the flow through the passage increases, means for returning said movable portion to its normal position whereby an intermittent flow through the passage is ob- 60 tained, an electrical circuit including an indicating mechanism, and means for making and breaking the electric circuit for each cycle of operation of the movable portion to indicate the velocity of the fluid. 65

5. A flowmeter as set forth in claim 1 together with an indicating mechanism, and means operated by the movements of said wall for actuating said indicating means to indicate the flow through the flowmeter. 70

In testimony whereof I affix my signature.
ELISHA N. FALES.