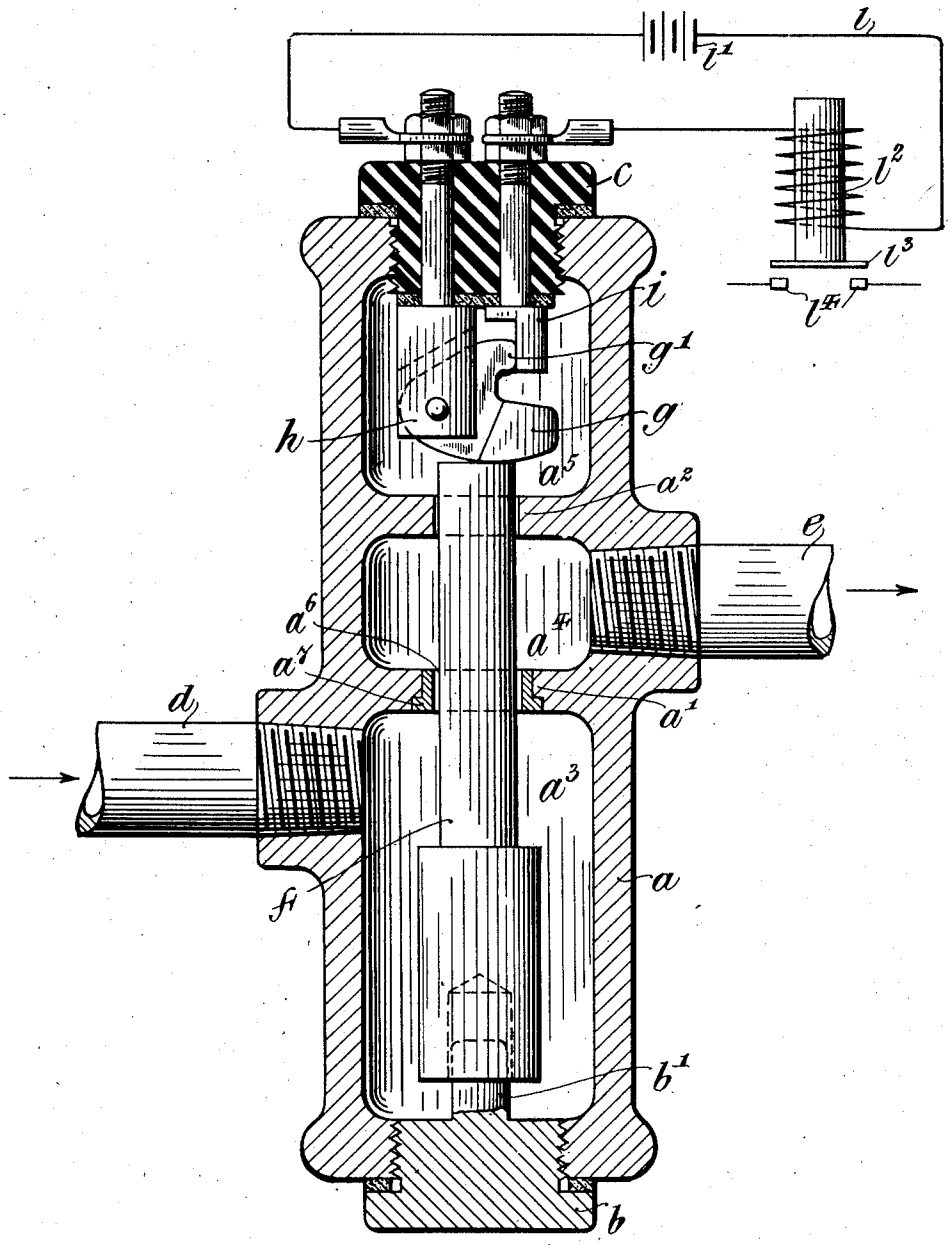
Oct. 16, 1928. 1,687,627

W. L. MARDEN

DEVICE FOR INDICATING VARIATION IN FLOW OF LIQUIDS

Filed April 24. 1926



INVENTOR

William L. Marden

BY

Redding, Greeley, O'Shea & Campbell

ATTORNEYS

Patented Oct. 16, 1928. 1,687,627

UNITED STATES PATENT OFFICE.

WILLIAM L. MARDEN, OF NEW YORK, N. Y., ASSIGNOR TO NEPTUNE METER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

DEVICE FOR INDICATING VARIATION IN FLOW OF LIQUIDS.

Application filed April 24, 1926. Serial No. 104,435.

In the operation of high power radio transmitters it is necessary to water-jacket the vacuum tubes and to maintain, during operation, a constant and uniform circulation of water in order that the vacuum tubes may be kept constantly cool. Any substantial reduction in the circulation of the cooling water results in destruction of the vacuum tubes. The object of the present invention is to provide reliable means whereby any substantial reduction in the flow of water, under such circumstances, shall be indicated, or shall be made to operate a signal of some sort, or, preferably, shall be made to interrupt the circuit of the vacuum tubes and so save it from destruction. The invention has been developed with particular reference to the protection of vacuum tubes in radio transmission installations, but it will be obvious that it is capable of application in various other arts, in which the diminution of the flow of a liquid is to be indicated or to effect an operation of some sort. In accordance with the invention, an operating plunger is arranged to be maintained in normal position by the hydrostatic pressure differential between an inlet chamber and an outlet chamber which communicate with each other through an aperture which, being of predetermined area, permits a predetermined flow, a variation in pressure differential due to a variation in the flow being accompanied by a movement of the plunger which effects an indication of the variation in flow or some other desired result, such as the interruption of the circuit through a vacuum tube.

The invention will be explained more fully hereinafter with reference to the accompanying drawing, the single figure of which is a view partly in elevation and partly in vertical section of a convenient embodiment of the invention in association with an electrical circuit.

In the embodiment of the invention illustrated, a substantially cylindrical shell a is provided interiorly with diaphragms a' and a^2 which form an inlet chamber a^3, an outlet chamber a^4, and an operating chamber a^5. For convenience in manufacture, one end of the shell is fitted with a removable plug b and the other end of the shell is fitted with a plug c, which is also removable and, in the present instance, is shown as made of insulating material as a carrier for circuit terminals to be referred to. The cooling water or the liquid, the flow of which is to be maintained, is delivered to the chamber a^3 through a suitable connection d and is conducted away from the chamber a^4 through a suitable connection e, and the two chambers a^3 and a^4 communicate through an aperture a^6 which, in this instance, is shown as axial, and is of predetermined area. As shown, the aperture a^6 is provided with a bushing a^7 which may be replaced for the purpose of securing the proper area of the aperture.

Within the shell a is placed a plunger f which is movable axially and is guided at its lower end upon a pin b' projecting from the plug b, and at its upper end, with a close working fit, in an aperture in the diaphragm a^2. In this instance the plunger passes through the aperture a^6 with a free space about it, such space forming the controlling opening between the two chambers a^3 and a^4 through which the liquid must flow in its movement.

In the construction shown, the normal rate of flow, under given conditions of supply, is such that the hydrostatic pressure differential between the inlet chamber a^3 and the outlet chamber a^4, determined by the measured aperture a^6, maintains the plunger f in an elevated position, while under a diminution of flow, resulting in a decrease of the pressure differential between the two chambers, the plunger falls.

The movement of the plunger under a variation of the pressure differential between the two chambers can be taken advantage of in various ways, either to indicate a diminution of flow or to effect some operation, such as the opening of the circuit of a vacuum tube. In the application of the invention illustrated in the drawing, the upper end of the plunger f, within the chamber a^5, (into which no appreciable quantity of liquid enters, the closure at the upper end being air-tight) coacts with a circuit breaker g, which is weighted and pivoted in the end of a binding post h and has a contact point g' adapted for contact with the end of another binding post i, but held normally out of contact therewith by the plunger f when the latter is in its elevated position. In the arrangement shown, the two binding posts have connected thereto the terminals of a circuit l, which includes a source of energy l' and an electro-magnetic device l^2 which may carry a bridge piece l^3 to close the gap between two terminals l^4 of the circuit, for example, of the vacuum

tube to be protected. So long as the flow is normal and the plunger f is held in its elevated position, the circuit l is broken at the point g' and the bridge piece l^3 closes the gap between the terminals l^4, but if the flow suffers a diminution sufficient to permit the plunger f to drop, the circuit l will be completed at the point g' and the bridge piece l^3 will open the gap between the terminals l^4. It will be understood that the electro-magnetic device l^2 may itself serve as one form of indicator or it may have a function such as that of opening a circuit. In any case, the operation which is the primary purpose of the movement of the plunger under a variation in flow is effected by the movement of the plunger itself.

It will be understood that various changes in details of construction and arrangement can be made to suit different conditions of use and that, except as pointed out in the claims, the invention is not restricted to the particular construction shown and described herein.

I claim as my invention:

1. A device for indicating variation in flow of moving liquids comprising a shell with an inlet chamber and an outlet chamber, a constant measured aperture connecting the two through which the liquid flows continuously, a connection from the source of liquid supply to the inlet chamber, a discharge connection from the outlet chamber, and a plunger movable in the shell under the influence of a differential of hydrostatic pressure between the two chambers.

2. A device for indicating variation in flow of liquids comprising a shell with an inlet chamber, an outlet chamber communicating with the inlet chamber through a measured aperture and an operating chamber, a connection from the source of liquid supply to the inlet chamber, a discharge connection from the outlet chamber, and a plunger having one end in the inlet chamber and the other end in the operating chamber and movable under the influence of a differential of hydrostatic pressure between the two chambers.

3. A device for indicating variation in flow of liquids comprising a shell with an apertured diaphragm forming an inlet chamber and an outlet chamber, a connection from the source of liquid supply to the inlet chamber, a discharge connection from the outlet chamber, and a plunger movable through the apertured diaphragm under the influence of a differential of hydrostatic pressure between the two chambers.

4. A device for indicating variation in flow of liquids comprising a shell with two apertured diaphragms forming an inlet chamber, an outlet chamber and an operating chamber, a connection from the source of liquid supply to the inlet chamber, a discharge connection from the outlet chamber, and a plunger movable through the apertures of the diaphragms under the influence of a differential of hydrostatic pressure between the inlet chamber and the outlet chamber.

5. A device for indicating variation in flow of liquids comprising a shell with an inlet chamber and an outlet chamber communicating through a constant measured aperture, a connection from the source of liquid supply to the inlet chamber, a discharge connection from the outlet chamber, a plunger movable in the shell under the influence of a differential of hydrostatic pressure due to the flow of liquid between the two chambers, and devices operated by the movement of the plunger to indicate a variation in the pressure differential and a variation in the flow from the inlet to the outlet.

6. A device for indicating variation in flow of liquids comprising a shell with an inlet chamber and an outlet chamber communicating through a measured aperture, a connection from the source of liquid supply to the inlet chamber, a discharge connection from the outlet chamber, a plunger movable in the shell under the influence of a differential of hydrostatic pressure between the two chambers, insulated circuit terminals carried by the shell, and a contact breaker in operative relation with the plunger and adapted to make and break the circuit between said terminals.

This specification signed this 22 day of April, A. D. 1926.

WILLIAM L. MARDEN.