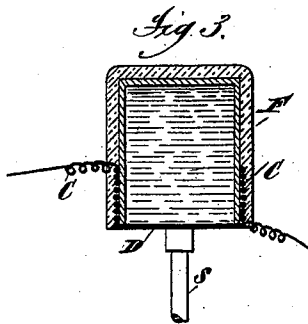
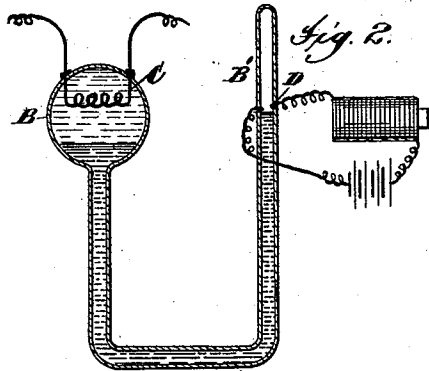
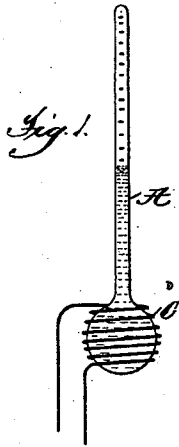


(No Model.)

E. THOMSON.
ELECTRO EXPANSION DEVICE.

No. 523,695.

Patented July 31, 1894.



Attest:
Geo. H. Lott
J. M. Capel

Inventor:
Elihu Thomson.

By *Journal* and *Geo. M. P. Adams*

Atty.

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

ELECTRO-EXPANSION DEVICE.

SPECIFICATION forming part of Letters Patent No. 523,695, dated July 31, 1894.

Application filed November 25, 1887. Serial No. 256,154. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Electro-Expansion Device, of which the following is a specification.

My invention relates to certain novel devices for indicating the strength of an electric current or operating a valve or other device, and consists in the novel combinations of apparatus and features of construction hereinafter described wherein the heating effects of a current of electricity upon a confined body of an expansible fluid, such as mercury, ether, alcohol or similar fluid, are utilized.

The particular features forming my invention will be first described in connection with the accompanying drawings and then specified in the claims.

In the accompanying drawings forming a part of this specification, Figure 1, illustrates a form of apparatus in which the movement of expansion is utilized to indicate directly the strength of the heating current. Fig. 2, illustrates an apparatus in which the movement of the liquid or fluid under the expansive action of the heating coil closes an electric circuit thereby operating directly as a switch. Fig. 3, illustrates a form of apparatus in which the receptacle is completely filled with the expansive fluid which, upon the application of heat, causes one of the yielding sides of the receptacle to bulge outward carrying with it suitable devices to open or close a circuit, open or close a valve, or for other purposes.

In Fig. 1, the confined body of expansible fluid is shown as placed in an ordinary thermometer bulb provided with the usual graduations on its sides. A heating coil C, forming part of an electric circuit is shown in this instance as placed around the exterior of the bulb. It will be understood of course that the coil might be placed within the interior of the bulb as illustrated in Fig. 2, the only condition of the invention in this respect being that the coil shall be in heating proximity to the fluid. Upon the passage of the current the heat developed in the coil serves to expand the confined fluid in the bulb causing

it to rise into the vertical tube. The reading on the tube will indicate the strength of the heating current.

In Fig. 2, I have shown a U shaped tube one of the legs of which is provided with a bulb shaped terminus B, as shown. The tube is partly filled with a heavy conducting fluid such as mercury and the bulb is completely filled with a comparatively light expansive fluid such as alcohol or oil or even air resting on the surface of the heavier fluid. The coil C, is shown as immersed in the alcohol or oil in the bulb B. When the current is passed through the coil, the heat developed causes an expansion of the oil or alcohol or air which pressing downward forces up the mercury column in the other leg B', until it closes a contact at D, formed by sealing wires into the glass in the ordinary way.

In Fig. 3, is shown a closed receptacle entirely filled with the expansible fluid. One side of this receptacle, as the bottom D, is fitted with a diaphragm or other yielding part which is pressed outward by the expansion of the fluid, caused by the passage of the current through the coil C, carrying with it a rod S, or other suitable device which may serve either directly or indirectly to register the extent of the movement of said diaphragm and the strength of the heating current, or to open or close an electric switch or to operate a valve, or to effectuate a variety of other similar purposes.

The coil may be placed in any position so that it is in heating proximity to the fluid or liquid, but in this form of device I prefer to arrange it around the box, the box with its surrounding coil being then inclosed in a thick layer of material which is a non-conductor of heat. The movement of an expansible liquid in this case is practically irresistible and may be made to give a multiplied movement by a lever system or may be utilized in a variety of ways as will be readily apparent.

I do not claim in this application any devices depending upon the movement of a confined body of liquid due to the evaporation of that liquid by the heating effects of an electric current.

What I claim as my invention is—

1. The combination with a closed receptacle

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containing a body of expansible fluid, of a heating coil or conductor forming the path of an electric current and applied so as to cause heating and expansion of such liquid, and a
5 non-conducting case or cover inclosing the receptacle and conductor, substantially as specified.

2. The combination of a closed receptacle entirely filled with expansible fluid and provided with a yielding wall or side, a heating
10 coil arranged around the exterior of said receptacle, and means actuated by said yielding wall or side to open or close a valve, switch, or equivalent device, substantially as specified.
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3. The combination of a closed receptacle entirely filled with expansible liquid, and provided with a yielding wall or side, a heating coil arranged around the exterior of said receptacle, and a non-conducting case or cover
20 inclosing said receptacle and its surrounding coil, substantially as specified.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 12th day of November, A. D. 1887.

ELIHU THOMSON.

Witnesses:

J. W. GIBBONEY,
OTIS K. STUART.