(No Model.)

A. H. HOYT.

GALVANOMETER.

No. 497,449. Patented May 16, 1893.

Fig. 1.

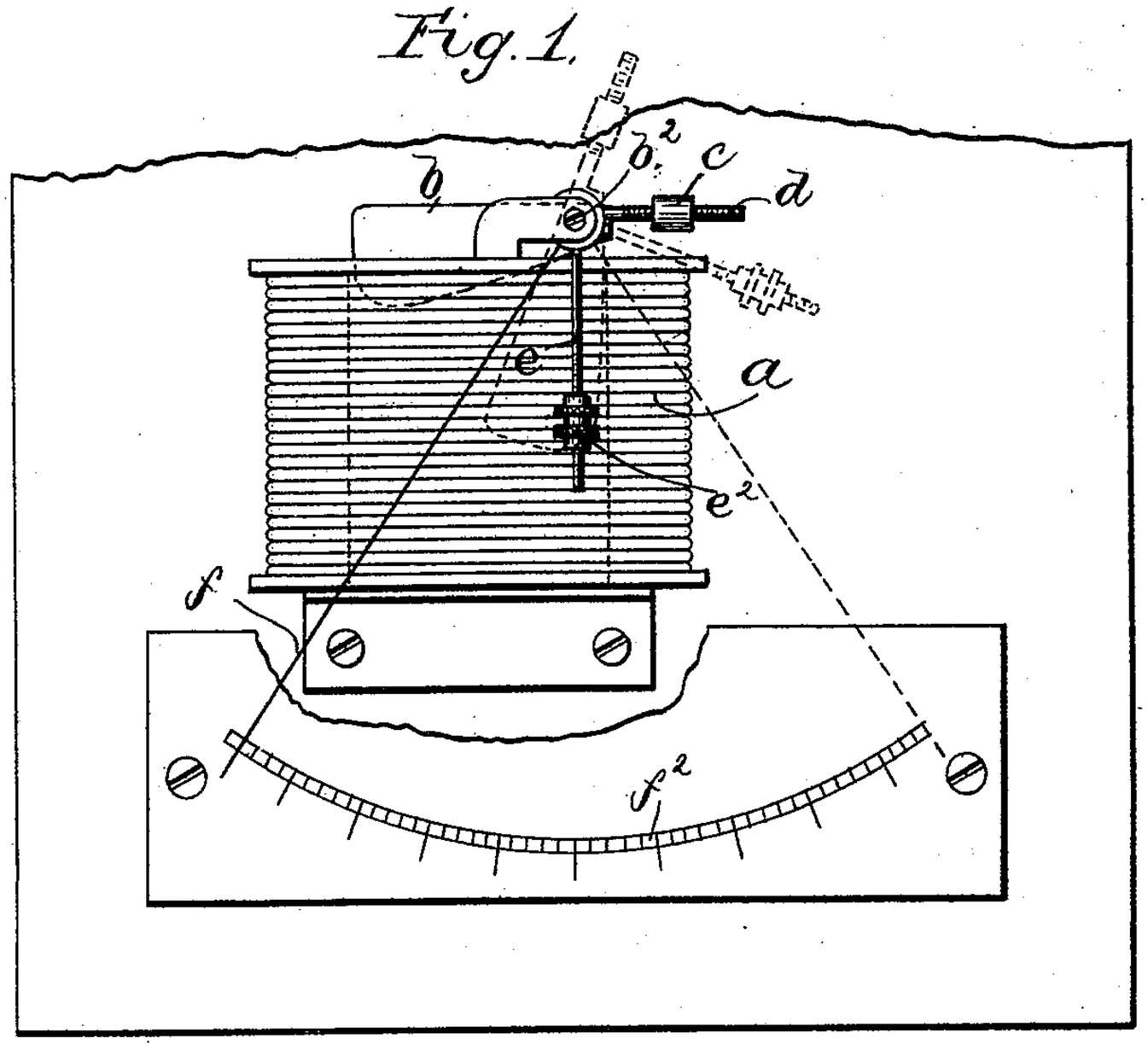
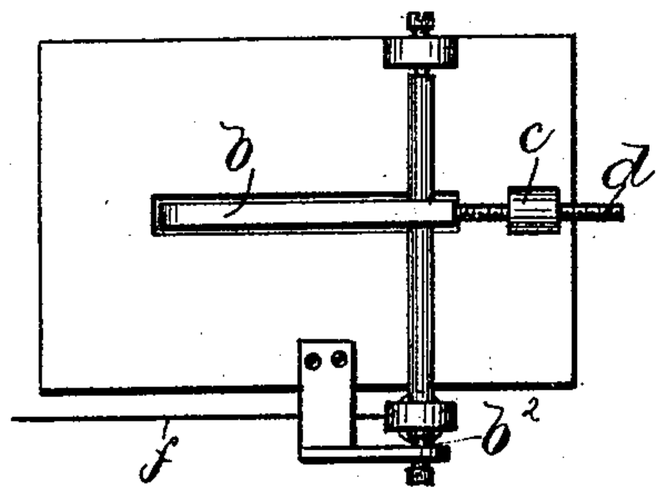


Fig. 2.



Witnesses
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UNITED STATES PATENT OFFICE.

ADRIAN H. HOYT, OF MANCHESTER, NEW HAMPSHIRE, ASSIGNOR TO THE WHITNEY ELECTRICAL INSTRUMENT COMPANY, OF SAME PLACE.

GALVANOMETER.

SPECIFICATION forming part of Letters Patent No. 497,449, dated May 16, 1893.

Application filed May 9, 1892. Serial No. 432,307. (No model.)

To all whom it may concern:

Be it known that I, ADRIAN H. HOYT, of Manchester, county of Hillsborough, State of New Hampshire, have invented an Improvement in Galvanometers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to a galvanometer and is shown as embodied in an instrument to be connected directly with circuits carrying strong currents such for example as those employed for lighting or power.

The instrument comprises a solenoid which is preferably flattened or oval in transverse section and an armature or pole piece supported upon a pivot near one end of the solenoid in such manner that the attraction of the current in the solenoid for the said core or armature tends to oscillate the latter both by the direct pull or attraction of the solenoid for the body or mass of the core piece and also by the tendency which the solenoid coil has to place the core piece or needle with its longitudinal axis in line with the longitudinal axis about which the solenoid coil is wound.

The invention further consists in details of construction that will be hereinafter specified.

Figure 1 is a front elevation of a galvanometer embodying this invention, and Fig. 2 a plan view of a portion thereof.

The instrument comprises a solenoid or coil *a* adapted to receive the current to be measured said coil being preferably wound upon a flat tube the open end of which is shown in Fig. 2. The said solenoid co-operates with a core piece or armature *b* pivoted at b^2 at a point near one end of the solenoid coil *a* and at one side of the axis thereof, the main body of said armature *b* being normally at one side of its axis b^2 and in line with the tubular opening of the center piece on which the coil *a* is wound. The said core *b* is preferably of the shape shown in Fig. 1, namely, wider at its end remote from the pivot than adjacent to the pivot; the widened end thus extending toward or into the tube of the solenoid. Thus there is a greater mass in the armature at the part remote from its pivot than near its pivot and the remote part of the mass is nearer the solenoid, so that the attraction of the latter has a greater effect upon the part of the armature remote from the pivot than near the pivot, and consequently tends to draw the part remote from the pivot into it and thus has a tendency to turn the said armature about its pivot or axis by the direct attraction of the solenoid or tendency of the solenoid to draw a magnetic core piece toward its middle point. Further than this after the free end of the core piece has been drawn down into the solenoid the tendency of the solenoid to bring a piece of iron into the position in which the longer axis of said piece of iron is in line with the axis about which the solenoid coil is wound, also tends to turn the said armature *b* from its normal substantially horizontal position toward the vertical position, or in other words, to produce a further movement of said core piece about its axis at b^2.

In order that the effect of the solenoid may produce different amounts of movement of said pole piece *b* when the said solenoid is supplied with currents of different strength, so that the amount of movement may be proportional to and indicative of the strength of the current, it is necessary to provide a variable resistance to said movement which may be done in various ways as is well known to those familiar with instruments of this kind. As herein shown the force of gravity is employed, the said armature *b* being normally retained in the horizontal or retracted position by means of a counterweight *c* which may be adjustable along the arm *d* connected with the axis or rock shaft which constitutes the pivotal support for the armature, *b*. The said counterweight *c* being nearly opposite the center of gravity of the armature *b* produces a substantially constant resistance to the downward oscillation of said armature, and in order to provide a variable resistance which increases as the armature departs from its normal or horizontal position, its axis is provided with a second arm *e* which is vertically below the said axis when the armature *b* is in its normal or horizontal position, and

thus has at that time no tendency to turn the said armature in either direction, but when the said armature is turned the said arm *e* moves away from vertical position and its weight e^2 thus acts with increasing leverage to resist the oscillation of the armature as the latter moves from the horizontal toward the vertical position, and the said weighted arm moves from the vertical toward the horizontal position. The weight e^2 may be adjustable along the arm *e* so as to vary its leverage and thus vary the amount of resistance to the movement of the armature. By this construction the amount of movement of the armature will vary with the strength of the current traversing the solenoid, and such movement may be indicated by a suitable pointer *f* connected with the axis or arbor of the armature and co-operating with a suitably graduated scale f^2 so that the position of the pointer relative to the said scale at any time indicates the strength of the current then traversing the coil.

By the herein described construction an instrument capable of use with very powerful currents is produced which at the same time has great delicacy of movement so that it responds readily to slight variations in said currents, the instruments being far simpler, more compact, and less expensive than those heretofore commonly used for currents of such character in which the direct attraction of the solenoid for a core is employed, requiring a comparatively long solenoid coil and core to give a sufficient range of movement to afford satisfactory indications.

I claim—

1. The combination of a solenoid coil with an armature pivoted near one end of its own length and near one end of said coil, and provided with a counterbalancing weight as *c* and a weighted arm as *e*, e^2, opposing a variable resistance to the oscillatory movement of said armature under the attraction from the said solenoid, substantially as described.

2. The combination of the solenoid flat or oval in cross section, with the armature pivoted at one end near one end of one side of the opening through the solenoid, the said armature being wider at its free end than at its pivoted end, and provided with a retractor to oppose its oscillatory movement produced by the attraction of the solenoid, substantially as described.

3. The combination of the solenoid, flat or oval in cross section with the armature pivoted at one end near one end of one side of the opening through the solenoid, and provided with a weighted arm opposing a variable resistance to its oscillatory movement, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ADRIAN H. HOYT.

Witnesses:

JOS. P. LIVERMORE,

JAS. J. MALONEY.