(No Model.)

A. M. RITCHIE.

GALVANOMETER.

No. 413,812. Patented Oct. 29, 1889.

Fig. 7.

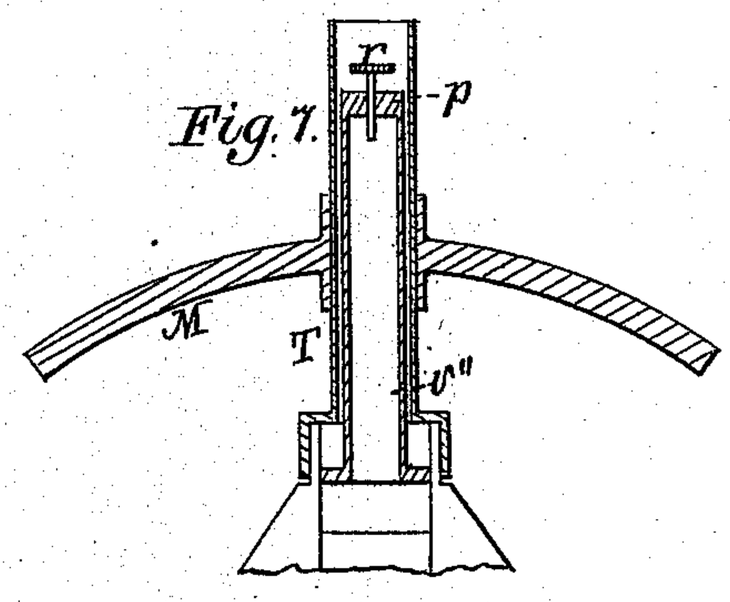


Fig. 6.

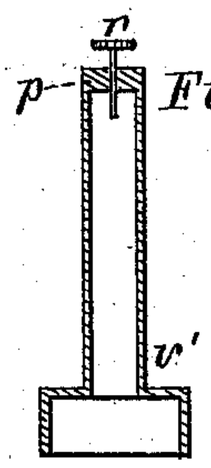


Fig. 5.

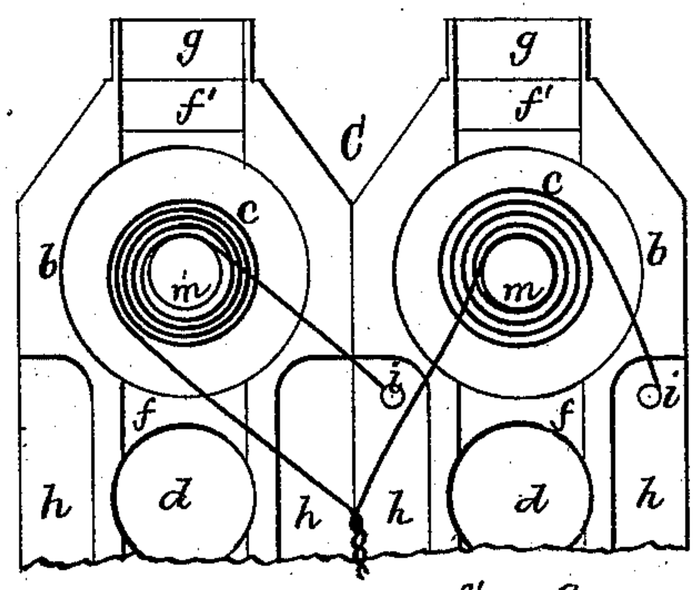


Fig. 1

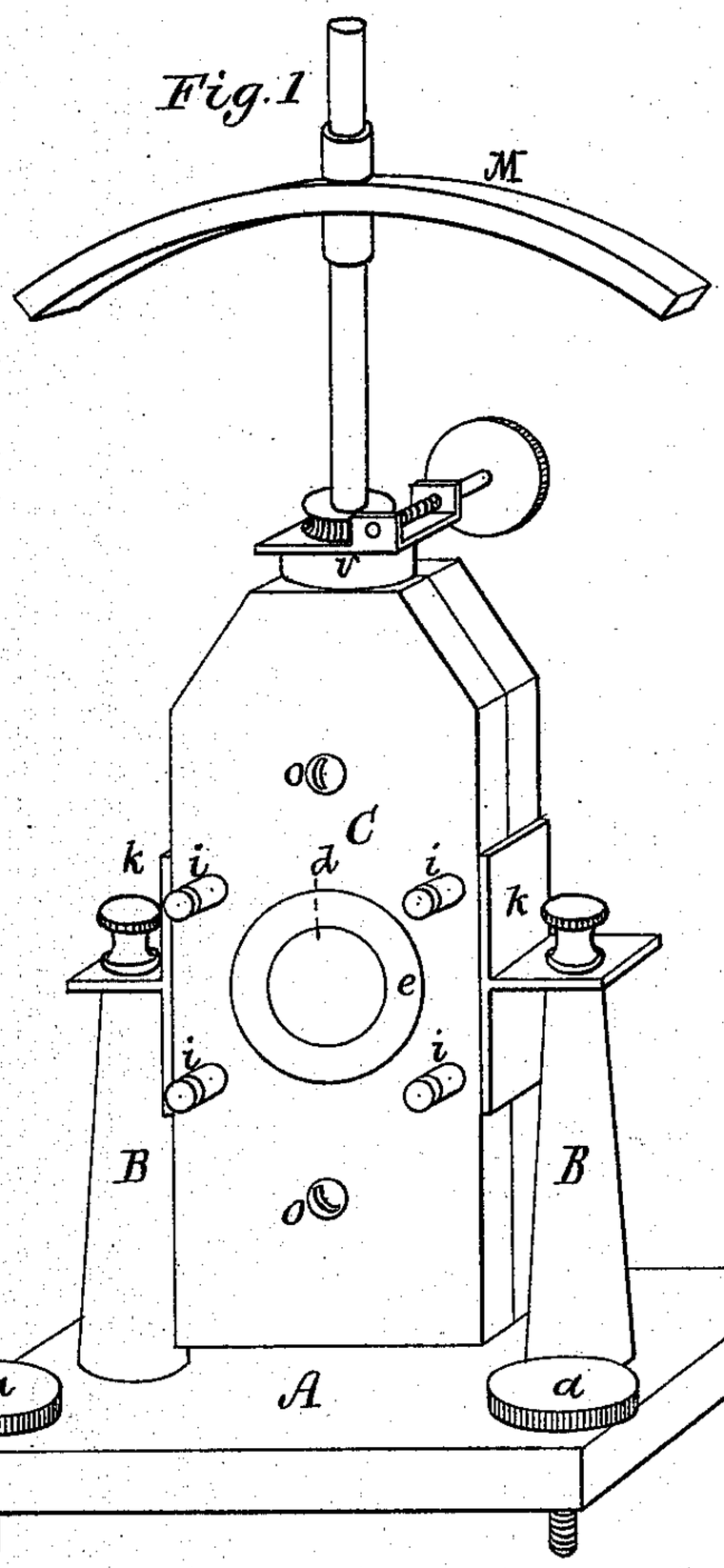


Fig. 4.

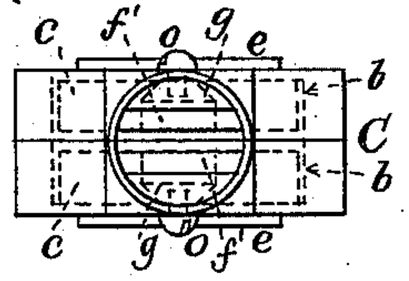


Fig. 3

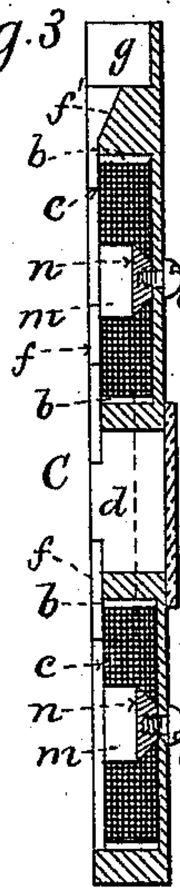
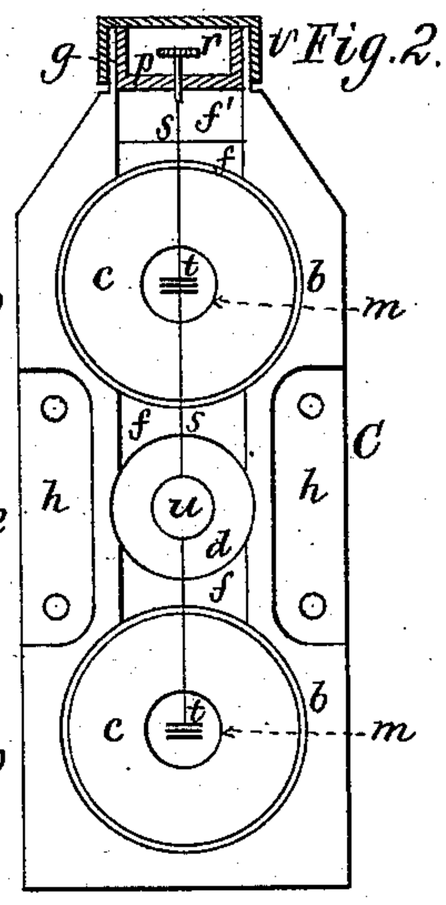


Fig. 2.



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UNITED STATES PATENT OFFICE.

ANDREW MONTGOMERY RITCHIE, OF BROOKLINE, MASSACHUSETTS.

GALVANOMETER.

SPECIFICATION forming part of Letters Patent No. 413,812, dated October 29, 1889.

Application filed January 18, 1889. Serial No. 296,788. (No model.)

To all whom it may concern:

Be it known that I, ANDREW MONTGOMERY RITCHIE, a citizen of the United States, residing at Brookline, in the county of Norfolk and State of Massachusetts, have invented a new and useful Galvanometer, of which the following is a specification.

My invention relates to improvements in what is generally known as the "Thomson reflecting galvanometer," with two or four coils, in which the system of magnetic needles carrying the reflecting-mirror is suspended by a fiber between the coils of wire, so that the needles are practically inclosed between the centers of the coils.

The objects of my improvements are to provide a supporting and protecting case for the coils, that they may readily be brought and held in proper relation to each other and to the system of needles, and that the coils may be separated without disturbing their connections and without their disarrangement or injury; also, to provide means to support the system of needles by its fiber in a manner that the support is not a fixed part of the instrument, and that the fiber may be replaced easily and the needles inserted without removing the coils from their supporting-case, and permitting the use of a longer fiber, thus increasing the sensitiveness of the instrument and rendering it practicable to place the compensating magnet above or below the supporting-case, and to greatly improve the insulation by enabling the use almost entirely of vulcanite or other insulating material.

As the instrument has heretofore been constructed a central fixed support of metal is used, to each side of which the coils are screwed or attached. The fiber suspending the needle is attached to a pin, which passes through the support and is held by friction. To replace a broken fiber, it is necessary to remove one of the coils. To attach the fiber to the pin, draw it through the hole in the support and secure it to the needle system, this requiring great care, to avoid breaking the fiber or damaging the connections, and to replace the coils in exactly the former position. The connections between the coils are generally made by spirally-coiled wires outside of the support.

In my improved construction I do not have a central support, and obtain the objects by the construction illustrated by the accompanying drawings, in which—

Figure 1 is an elevation in perspective of the instrument. Fig. 2 is a front view of one of the pieces of the supporting-case. Fig. 3 is a cross-section of the piece. Fig. 4 is a top view of the supporting-case. Fig. 5 shows the direction in which the wire coils are wound and their connections. Fig. 6 shows the support for a long fiber. Fig. 7 shows the support for the fiber and for the adjusting-magnet.

Similar letters refer to similar parts throughout the several views.

The base A, Fig 1, is furnished with leveling-screws *a a*. Two pillars B B support the case C, composed of two pieces. Each piece has two cylindrical cavities *b b*, of diameter to receive the wire-coils *c c*. The depth is greater than the thickness of the coils, thus leaving space between the coils, when the parts are fastened together, to receive the needle system *d d*, and holes through the middle of the parts for passage of light. They are covered on the outside with glass plates *e e*. A semi-cylindrical groove *g* is cut in the upper end of each part to receive the support for the needle system. A rabbet *f f* is cut lengthwise from the semi-cylindrical cavity *g*, to receive the needle system. At the upper end it is beveled at *f'*, and serves to guide the needle system to its place in the rabbet. I prefer to fill the space *b* with paraffine, thus making the rabbet continuous and avoiding obstruction in lowering the system of needles. A plate *p*, Fig. 2, rests in the cylindrical opening *g*. Through the plate passes a sliding pin *r*, to which the fiber *s*, holding the needle system, is attached. The needle system is composed of magnetic needles *t t* and reflecting-mirror *u*. This is the same as now in use.

On the edge of each part, Fig. 2, a recess *h* is made to allow space to attach the ends of the wires to the pole-cups *i i*, which extend through, and to connect the coils to each other. When the parts are put together, brackets *k k* are screwed to each part covering the recess and rest upon the pillars B B.

The coils *c c* are wound, in the usual manner, of insulated wire, with a central aperture

m, cylindrical to about half its thickness and conical below. The cylindrical part gives space for the needle to swing. A plug of vulcanite *n* fits the cone with a screw *o*, which holds the coil in place in the case. The circuit and connections of coils are shown in Fig. 5. Enough of slack wire is left to allow the two pieces to be opened, as if they were hinged, without endangering the connections. The rabbet *f*, Fig. 2, is covered by a plate *p*, bearing a sliding pin *r*, to the bottom of which the fiber *s* is attached, and the top of the opening *g* is covered by a cap *v*, or by a cap and tube *v'*, Fig. 6, with a plate *p* at the top, the fiber passing through the tube, or by a plate and tube *v''*, as shown in Fig. 7, with a fiber suspension at the top. A tube T, carrying the adjusting-magnet M, rests upon the top of the case and surrounds the tube *v''*. The adjusting-magnet may be placed below the system of needles, as it is now sometimes placed.

In the event of the breaking of the fiber the needle will slide out by removing the cap and inverting the case. The fiber is then fastened to the needle outside of the instrument, and the needle system is slid into the rabbet from above, being guided into place by the beveled part.

The same general construction can be used for a two-coil galvanometer.

The parts that I claim as new are the two pieces composing the case, as described, the two brackets supporting the two pieces, the plug of vulcanite and its screw, the recess formed in the pieces, the connecting and inclosing the wires in the recess, the rabbet and connecting openings, the plate *p* and its attachments, the cap and tube *v'* and its attachments, the plate and tube *v''* and its attachments, and the tube T and its attachments.

What I claim, and desire to secure by Letters Patent, is—

1. In a galvanometer, the case C, formed in two parts, each part provided with the cavities *b* and *g*, recesses *h*, and hole *d*, the rabbet *f*, inclined at top and connecting said hole and cavities, all arranged and constructed essentially as shown and set forth.

2. In a galvanometer, the case C, formed in two parts, each provided with the cavities, the recesses, and hole, and rabbeted, as shown, combined with the brackets supporting said case, essentially as described and represented.

3. In a galvanometer, the combination of the case C, formed in two parts, each provided with the cavities, the recesses, and hole, and rabbeted, as shown, with the coils *c*, the plugs *n*, sustaining said coils within the cavities *b* and secured to the case, all as shown and set forth.

4. In a galvanometer, the combination of the case C, constructed in two parts, each part recessed, provided with cavities and holes, and rabbeted, as shown, with the coils *c*, the plugs *n*, secured to the case and supporting the said coils within the cavities *b*, and the pole-cups *i*, all as shown and set forth.

5. In a galvanometer, the combination of the case C, constructed in two parts, each part recessed, provided with cavities and hole, and rabbeted, as shown, with the coils *c*, having apertures *m*, the plugs *n*, secured to the case and supporting the said coils within the cavities *b*, the pole-cups *i*, the plate *p*, sliding pin *r*, sustaining fiber *s*, needles *t*, and reflecting-mirror *u*, all essentially as shown and set forth.

6. In a galvanometer, the combination of the case C, formed in two parts, each part recessed, provided with cavities and hole, and rabbeted, as shown, said case sustaining the coils *c*, and pole-cups *i*, with the cap and tube *v'*, plate *p*, and sliding pin *r*, for supporting the fiber *s*, which sustains the needle system, all as shown and set forth.

7. In a galvanometer, the combination of the case C formed in two parts, each part recessed, provided with cavities and hole, and rabbeted, as shown, and sustaining the coils *c*, and pole-cups *i*, with the tube *v''*, supported by the case and provided with the plate *p*, and sliding pin *r*, for supporting the fiber *s*, sustaining the needle system, the tube T, surrounding the tube *v''*, resting on the case and carrying the adjusting-magnet M, with said magnet, all as shown, and essentially as set forth.

ANDREW MONTGOMERY RITCHIE.

Witnesses:
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