F. ARONSON.

GALVANOMETER.

APPLICATION FILED SEPT. 16, 1910.

998,594. **Patented July 25, 1911.**

Fig. 1.

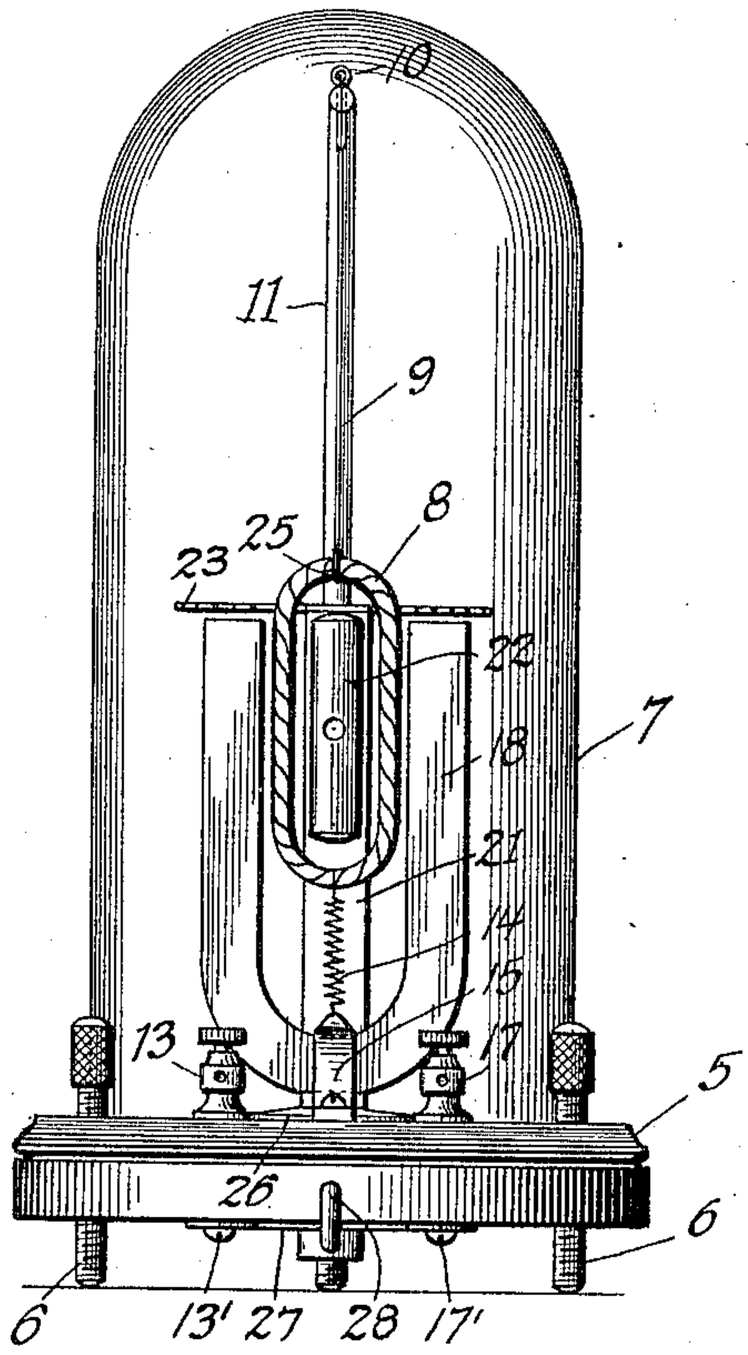


Fig. 2.

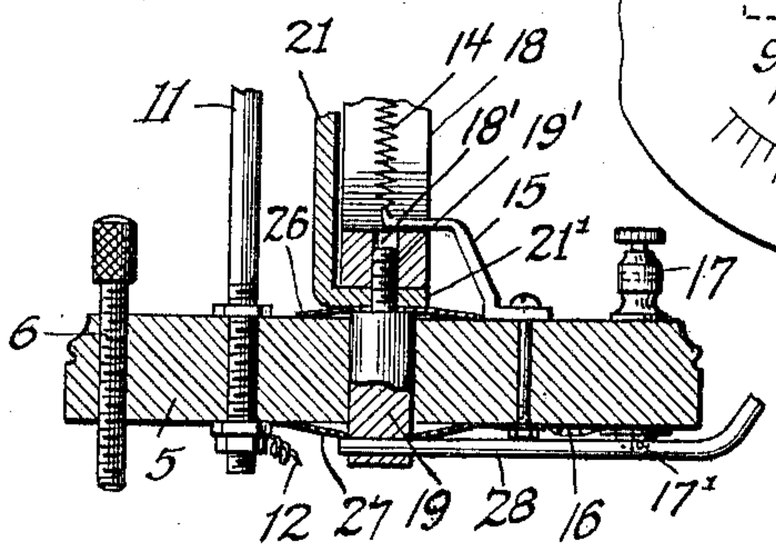
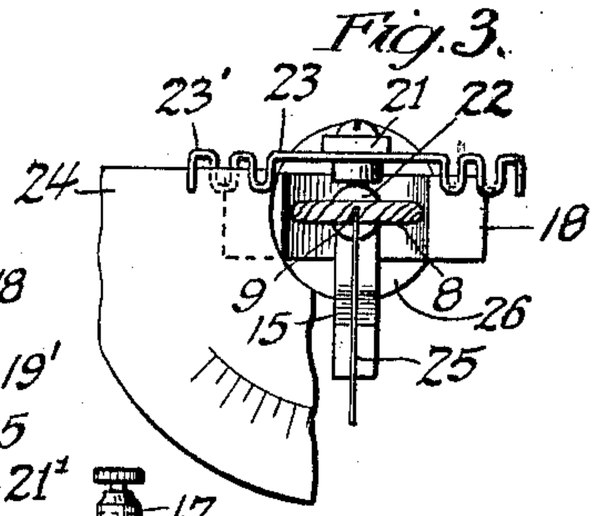


Fig. 3.



Witnesses
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UNITED STATES PATENT OFFICE.

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GALVANOMETER.

998,594. Specification of Letters Patent. Patented July 25, 1911.

Application filed September 16, 1910. Serial No. 582,347.

To all whom it may concern:

Be it known that I, FRANK ARONSON, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Galvanometers, of which the following is a specification.

My invention relates to improvements in galvanometers, and especially to galvanometers of the D'Arsonval or moving-coil type.

My invention relates especially to the adjustment or calibration of the instrument to insure uniformity in the zero relation of the coil and the permanent magnet system for each reading.

Another object of my invention is generally to improve the construction of galvanometers and to secure cheapness of construction with maximum effectiveness and reliability in operation.

In the drawings, Figure 1 is an elevation of a complete galvanometer constructed in accordance with my invention; Fig. 2 is a transverse sectional detail; and Fig. 3 is a plan detail.

In the specific construction shown, 5 indicates the base, mounted on leveling screws, 6, and affording support to the customary glass housing, 7, and to the operating mechanism contained therein. The movable, oscillating coil, 8, is suspended electrically connected to the torsional spring, 9, attached to a cotter-pin adjusting part, 10, supported in a standard, 11, projecting from the base and electrically connected, as by wire 12, with a binding post, 13, which is disposed at the front of the base and projects, as at 13′, therebelow. The customary lower spring 14, electrically connected to the opposite extremity of the coil is connected to a bracket, 15, upon the base, said bracket having independent connection, as by wire 16, with a second binding post, 17, laterally spaced apart from the first mentioned binding post 13 and likewise having a bottom projection, 17′. Thus, it will be observed, the coil mounting is complete without regard to the permanent magnet system or its mountings.

The permanent magnet system,—either as a whole, or as to such parts thereof as stand in different positions in relation to the coil, as a result of twisting movements of the coil,—is mounted for rotary adjustment about a vertical axis coincident with the vertical axis of the coil, which axis I will hereinafter for brevity term the central axis of the instrument. Also a vernier or scale, related to a pointer carried by the coil, is rotatable coincidently with the permanent magnet system and is preferably carried thereby.

Specifically, the permanent horse-shoe magnet, 18, is secured upon a non-magnetic stud, 19, rotatable in the base, preferably by engagement of a threaded aperture, 18′, in the yoke of the magnet with a reduced projection, 19′, of said stud. To said projection is also secured a non-magnetic vertical arm, 21, having an inturned apertured extremity, 21′, for engagement with projection 19′, and extending up in rear of the central axis of the instrument to support in axial position within the coil 8 a soft iron core, 32, suitably secured to the arm.

The upper extremity of the arm 21 preferably carries also a transverse wire, 23, having each of its ends contorted, as at 23′, to form a paper clip for holding a suitably graduated paper scale, 24, in horizontal position to be swept over by a pointer, 25, mounted upon and movable with the coil. Between the shoulders formed by the body of the stud 19 and its projection 19′, and the inturned end, 21′, of the bar 21, I arrange a cupped spring washer, 26, and below the base upon the stud 19 I also mount a reversed similar washer, 27, retained in position by a handle, 28, passing through a horizontal aperture in the stud 19 and projecting forward beyond the base between the bottom projections 13′ and 17′ of the corresponding binding posts, which form limitation stops for determining the angular throw of the handle 28. Thus the two spring washers grip the base and act frictionally to hold the magnet system in any rotative position.

It will be observed that, within reasonable limits, the magnet system may be rotarily adjusted with respect to the central axis and will be held in adjustment by the spring washers, thereby enabling the operator to set the magnet and coil to a definite zero relation for each reading, even though the coil may not always return to the same position after deflection. It will also be obvious that the provision of the scale carried by and movable with the permanent magnet system enables said adjustment accurately and eas-

ily to be effected, as the adjustable magnet system need only be rotated to bring the zero point of the scale into register with the pointer 25 carried by the coil, thereby insuring proper zero relation of the coil and the magnet system for the reading to be made.

It will further be observed that in virtue of the mounting of the coil, in connection with parts, both above and below, which are not affected by movement of the magnet system, such adjustment of the magnet system will not in any way affect the resistance of the coil to movement, and therefore, will not disturb its sensitiveness in any particular.

It will be obvious that the axial core, 22, does not change its effective relation to the coil by reason of the movement of the magnet system, and such part of the system might have its stationary mounting without departing from the spirit of my invention, although it is my preference that it shall at all times maintain precisely the same relation to the horse-shoe magnet 18, and therefore shall move with the eccentric limbs of the permanent magnet.

It will also be apparent to those skilled in the art that many changes may be made in the specific construction employed in the embodiment of my invention within its spirit and scope, and it will be understood that the details of construction herein set forth are developed for purposes of full disclosure without intent to limit the invention thereto.

What I claim is:

1. In a galvanometer, an oscillating coil, suspension means therefor, a permanent magnet system, and means for rotarily adjusting said magnet with respect to the coil about the axis of oscillation of the coil.

2. In a galvanometer, the combination of a base, a permanent magnet, means supporting said magnet on said base for rotative adjustment, a coil coöperating with said magnet, and means supporting said coil, independent of said rotatively adjustable parts.

3. In a galvanometer, the combination of a suspended coil, a pointer thereon, a magnet rotatively adjustable with reference to said coil about the axis of oscillation of said coil, and a scale coöperating with the pointer coincidently adjustable with the magnet.

4. A galvanometer comprising in its construction a base, a magnet system mounted thereon with its effective axis vertically arranged, said magnet system being rotatively adjustable about said vertical axis, a coil supported independently of the rotatively adjustable magnet system, and means accessible upon the base, for effecting rotative adjustment of the magnet system with respect to the coil.

5. In a D'Arsonval galvanometer, the combination of a base a pivotal member mounted on said base, a magnet carried by said pivotal member for rotary adjustment about its vertical axis, an oscillating coil within the field of said magnet, means for suspending the coil, electrical connections for said coil including two binding posts, and a lever connected with said pivotal member extending over said base between the binding posts which act as limitational stops therefor.

6. A galvanometer comprising in its construction a base, a part pivotally mounted in said base, a magnet pivotally movable with said pivot part having its polar limbs extending in the general direction of the pivotal axis on opposite sides thereof, a standard projecting from the base, and a coil suspending from said standard and positioned between the polar limbs of the magnet, whereby pivotal movement of the magnet adjusts the latter rotatively about the axis of oscillation of the coil.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

FRANK ARONSON.

In the presence of—
MARY F. ALLEN,
W. LINN ALLEN.