(No Model.)

E. WESTON.

ELECTRICAL MEASURING INSTRUMENT.

No. 499,313. Patented June 13, 1893.

Fig. 1.

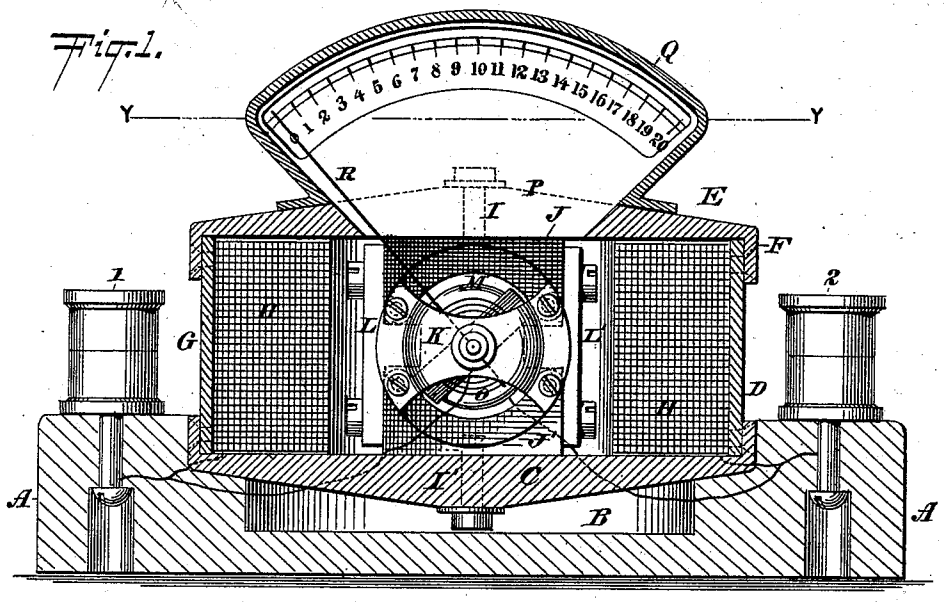
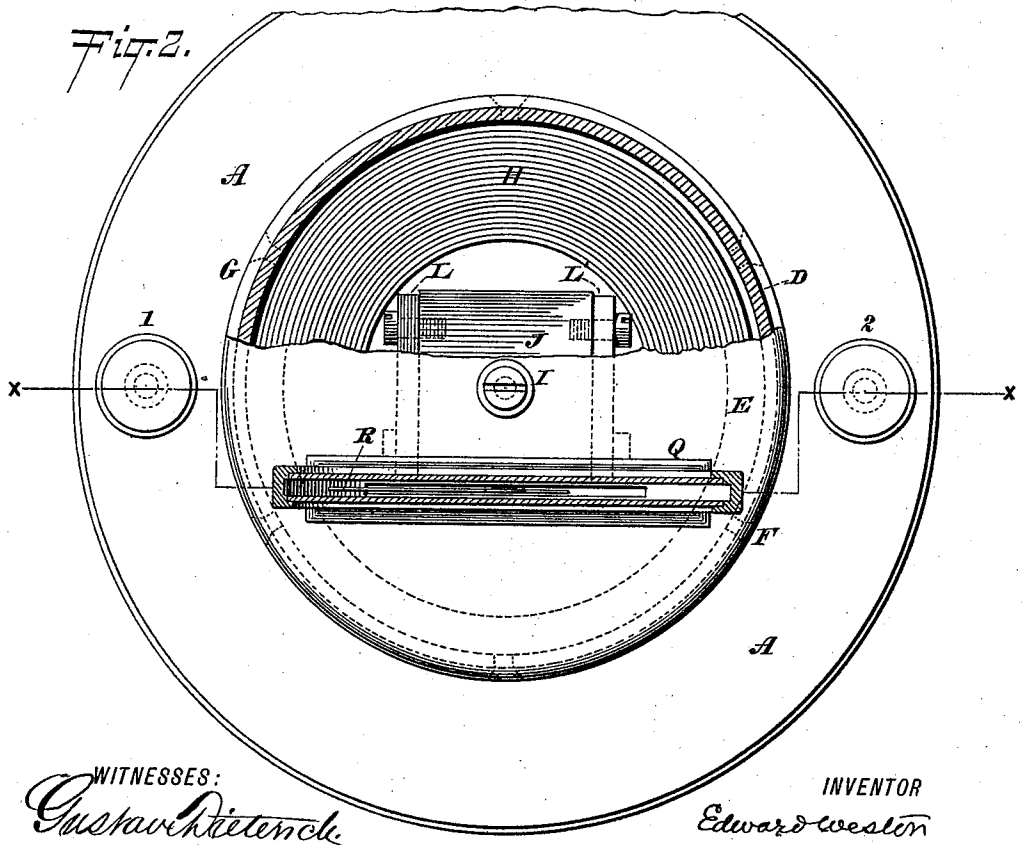


Fig. 2.



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ELECTRICAL MEASURING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 499,313, dated June 13, 1893.

Application filed October 3, 1892. Serial No. 447,680. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WESTON, of Newark, Essex county, New Jersey, have invented a new and useful Improvement in Electrical Measuring-Instruments, of which the following is a specification.

My invention relates to that class of electrical measuring instruments in which a coil, supported and vibrating in a field of force, is caused, by the passage of a current through it, to move over an angular distance depending upon difference of potential between the instrument terminals.

My invention consists, first, in the novel construction of the means for producing the field of force in which the coil vibrates, the same being an electro-magnet coil having its pole pieces opposite and facing one another and located within the coil, whereby an intense field is generated between said pole pieces due both to the magnetizing effect of the coil and also to the disposition of said pole pieces within the inductive field of the coil; and second, in the inclosing of all the working parts of the instrument in a shell of magnetic material which acts both as a means of preventing access of dust, moisture, &c., to said working parts and as a magnetic screen for said parts against the effects of outside inductive influences.

In the accompanying drawings, Figure 1 is a vertical section on the line X X of Fig. 2. Fig. 2 is a horizontal section on the line Y Y of Fig. 1.

Similar letters of reference indicate like parts.

A is the base of the instrument, and is provided with a recess B to receive the circular iron plate C. The plate C is provided with an upwardly turned circumferential flange D.

E is a circular plate similar to C, having a circumferential flange F. Between the plates E and F is disposed the metal ring G, so that when the said plates E, C and ring G are put together, a closed, circular box or case is produced. Within said case is arranged the coil H of insulated wire; the said coil being concentric with said case.

Secured to the inner sides respectively of the plates C and E by the screws I and I′ are the iron pole pieces J and J′. The opposing faces of the pole pieces J and J′ are made concave, and on their sides they are provided with recesses to receive caps, one of which is shown at K. The construction of these pole pieces and of the caps K is the same as has already been repeatedly described by me in various patents for electrical measuring instruments already granted to me; such, for example, as United States Letters Patent No. 392,386, dated November 6, 1888.

Bolted to the sides of the pole pieces J J′, are bars L L′ of brass, which are provided with projections, which projections carry the solid cylinder M of magnetic material. Surrounding the cylinder M is a coil N, the pivots of which are received in the caps K. A spiral spring O is connected at one end to the coil pivot, and at the other end to an abutment, a similar coiled spring (not shown) is connected with the pivot near its opposite extremity and these springs by their elasticity, oppose the movement of the coil N. Also carried by the coil pivot is an index needle R. The arrangement of the cylinder M, the coil N, the springs O and the needle R actuated by the coil, is precisely the same as has already been described by me repeatedly in numerous patents, such, for example, as the patent before cited, and therefore no further description is necessary. So, also, in said Letters Patent I have pointed out the mode of operation of a pivoted coil thus disposed, when traversed by a current. In the present instance, the stationary coil H has its terminals connected to the binding posts 1 and 2. The coil N is arranged in multiple arc connection with the fixed coil H. When a current traverses the instrument, the movable coil N will set itself in a new angular position, and its extent of movement will depend upon the difference of potential between the binding posts 1 and 2. As the instrument is here shown constructed, the coil N being in multiple arc with the fixed coil H, it is adapted for use as an ammeter, and the extent of movement of the movable coil N will bear a relation to the strength of the current passing through the instrument, and the nee-

dle actuated by said coil will show said current strength on a suitable scale marked in ampères.

Through the plate E is made a slot P, and above this slot and supported on the plate E, is a case Q. The said case is provided with a plate of glass let into each of its vertical walls; and on one of said plates of glass is inscribed a suitable scale marking. The needle R extends up through the slot P, and therefore moves in front of the scale.

The new features to which I desire to call particular attention in this instrument, are the following:—It will be apparent that the coil H and the plates C and E constitute an electro-magnet, of which J and J′ are the poles; and that, by reason of the close approximation of these poles, there will be a powerful field of force between them. The further important fact will also be apparent; namely, that the pole pieces J and J′ are, in fact, the core of the electro-magnet; and that, therefore, they are subjected to a double magnetic effect, so to speak, first, because they are poles of the magnet, and second, because they are magnetized by reason of their location within the coil. The cylinder M is also magnetized because of its position within the core. As a consequence, the field between the pole pieces J and J′ is of the strongest possible character. All lines of force are gathered onto the iron and sent to the poles. Further than this, the magnet H and its pole pieces J and J′ are completely inclosed in a shell of magnetic material; this shell being the plates C and E and the inclosing ring G, which, in accordance with the well-known laws, will completely shield the parts inclosed from the influence of exterior fields of force. It will also be observed that the necessary slot or opening P through which the needle R extends, is hermetically closed by means of the case Q; so that every working part of the instrument is not only screened from outside magnetic effects, but is also mechanically protected from dust, moisture, or other possible causes of impairment. Attention is also called to the fact that the cylinder M of soft iron or other magnetic material is also a part of the core of the electro-magnet and serves to gather the lines of force; so that the inner cylinder and the outer pole pieces coact both by reason of their construction and their location to intensify the field in which the coil moves.

I claim—

1. In an electrical measuring instrument, a body of magnetic material having separated terminals, a loop conductor supported and vibrating between said terminals, a spring opposing and counterbalancing the vibratory movement of said loop, and an energizing coil inclosing said terminals and said loop conductor, substantially as described.

2. In an electrical measuring instrument, an electro-magnet coil, a shell of magnetic material inclosing said coil and having its polar extremities within said coil, a loop conductor supported and vibrating between said polar extremities, and a spring opposing and counterbalancing the movement of said conductor, substantially as described.

3. In an electrical measuring instrument, an index actuated by the working parts thereof, a shell of magnetic material inclosing said working parts and having a slot or opening through which said index protrudes, and a box or case inclosing the protruding part of said index.

4. In an electrical measuring instrument, an index actuated by the working parts thereof, a shell of magnetic material inclosing said working parts and having a slot or opening through which said index protrudes, and a box or case supported on said shell above said opening and receiving the protruding end of said index.

5. In an electrical measuring instrument, an index actuated by the working parts thereof, an inclosing box or case for said working parts having a slot or opening through which said index protrudes, and a second box or case covering said slot and inclosing said index and provided with a scale plate over which said index moves.

6. In an electrical measuring instrument, an index actuated by the working parts thereof, an inclosing box or case for said working parts having a slot or opening through which said index protrudes, a second box or case covering said slot and inclosing said index and provided with plates of glass or other translucent material in its opposite walls; one of said plates being inscribed with a scale over which said index moves.

7. In an electrical measuring instrument, the combination of the circular flanged plates E and C, the peripherical envelope D, the pole pieces J J′ and the coil H between said plates E and C and surrounding said pole pieces, the movable coil supported and vibrating between said pole pieces, the index R actuated by said coil and extending through the slot P in the plate E, and the box Q arranged above said slot and inclosing the protruding part of the index R.

8. A fixed electro-magnet coil, a core supported within said coil a movable loop conductor inclosing said core and itself surrounded by said fixed coil, and a spring opposing and counterbalancing the movement of said conductor, substantially as described.

9. A body of magnetic material having separated terminals, a loop conductor supported and vibrating between said terminals, a spring opposing and counterbalancing the movement of said conductor, a second body of magnetic material inclosed by said con-

ductor, and a fixed coil inclosing said terminals, said conductor and said body of magnetic material.

10. In an electrical measuring instrument the combination of the circular flanged plates E and C, the peripherical envelope D, the pole pieces J J′, the coil H between said plates E and C and surrounding said pole pieces, the movable coil supported and vibrating between said pole pieces, the cylinder M of magnetic material inclosed by said coil, and the index R actuated by said coil.

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Witnesses:
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