(No Model.)

E. WESTON.

ELECTRICAL MEASURING INSTRUMENT.

No. 470,341. Patented Mar. 8, 1892.

Fig. 4.

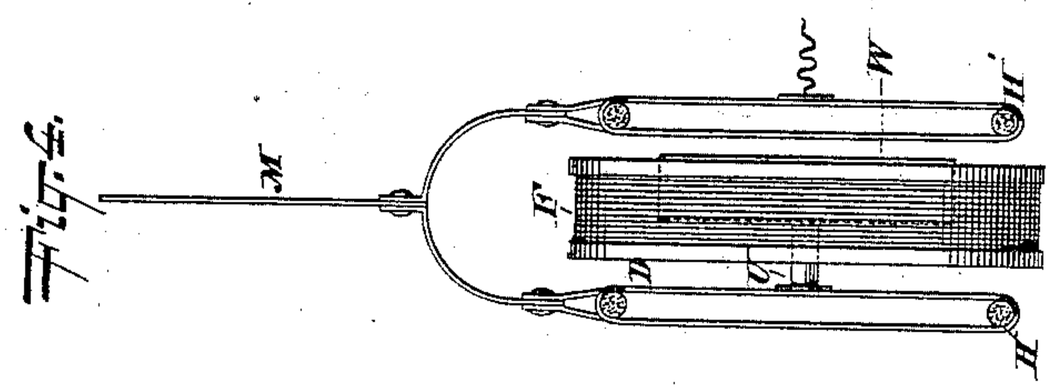

Fig. 3.

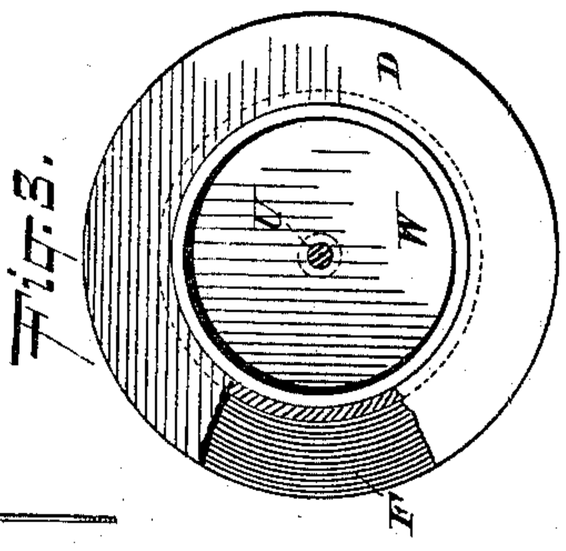

Fig. 2.

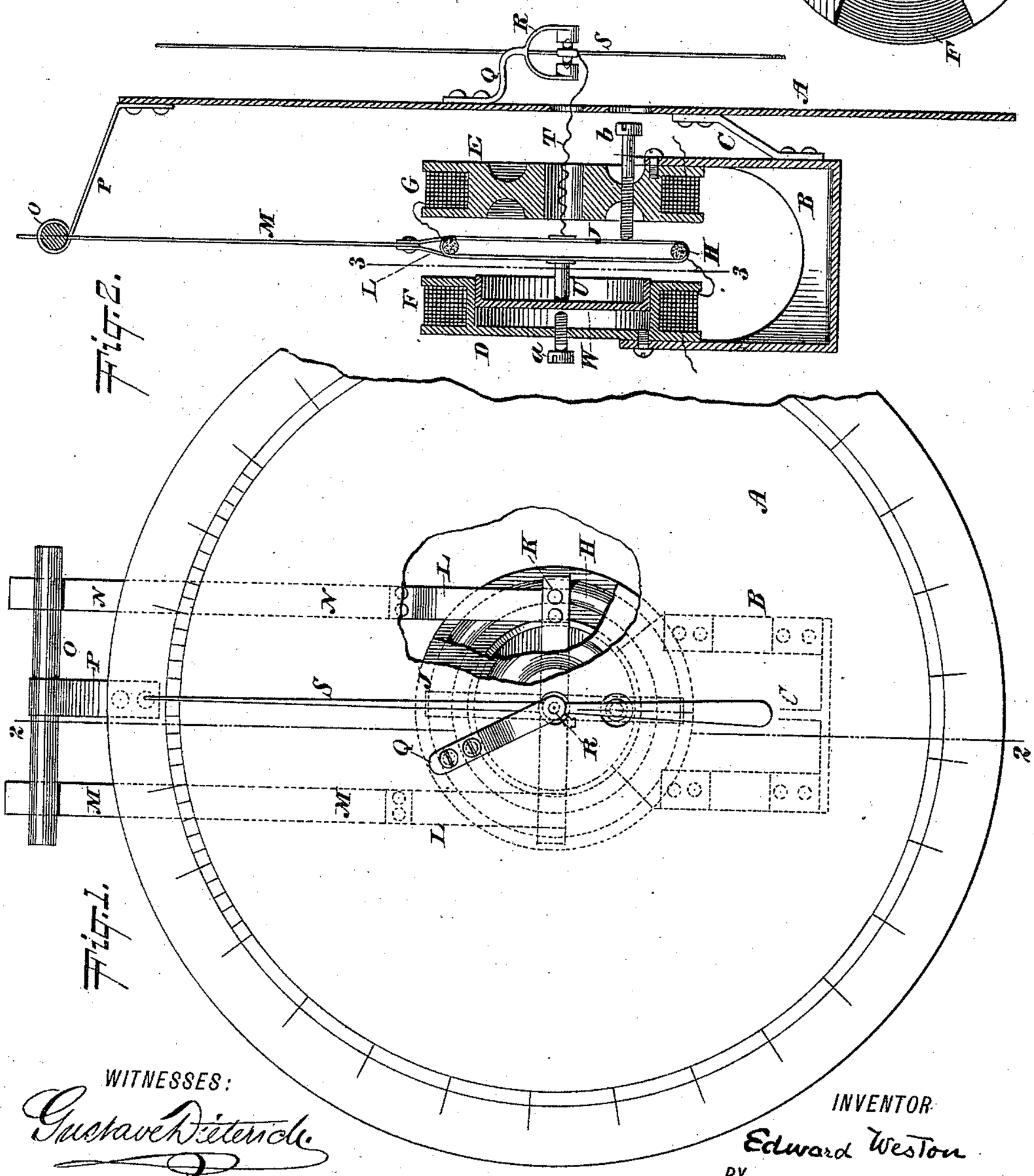

Fig. 1.

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ELECTRICAL MEASURING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 470,341, dated March 8, 1892.

Application filed June 4, 1891. Serial No. 395,129. (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.

The principle of my invention is as follows: To support a movable electrical conductor in loop form parallel to and in front of a fixed electrical conductor, also in loop form, so that by reason of the reaction of the fields of force at the facing poles of said conductors due to the passage of a current the said movable conductor shall be caused to change position in an axial direction to an extent dependent upon the difference of potential between the terminals of the instrument; to check or retard this motion by means of a mechanical dash-pot combined with said movable conductor, and by suitable transmitting mechanism to convert the axial movement of said movable conductor into rotary movement of an index over a suitably-marked scale.

In the accompanying drawings, Figure 1 is a front view of the instrument with a portion of the scale-plate broken away, so as to show the interior mechanism. Fig. 2 is a sectional view on the line 2 2 of Fig. 1. Fig. 3 is a section on the line 3 3 of Fig. 2. Fig. 4 is a side and partial sectional view showing a modification of the instrument in which two coils and a single stationary electro-magnet are employed instead of one coil and two electro-magnets.

Similar letters of reference indicate like parts.

A is the scale-plate of the instrument.

B is a frame supported on the rear side thereof by a bracket C. To the said frame and on opposite sides thereof are bolted the bobbins or spools D and E, which support the coils F G. There is a space or interval between the said spools, and suspended therein is a circular coil H. This coil is held between two double bars or straps J and K, placed at right angles.

To the straps K are secured yokes L, and to the upper extremities of these yokes are fastened two leaf-springs M N. The upper ends of these leaf-springs are received in a slit bar O, which is supported on the back of the scale-plate A by a bracket P. On the front of the scale-plate is secured by a bracket Q a yoke R, in which is pivoted the index-needle S. There is an opening through the center of the spool E, through which opening extends a spiral spring T, fastened to the center of the coil-bar K and also to the needle S near its pivot. This spring may be of any desired form or arrangement suitable to perform the function for which it is intended—namely, the conversion of the bodily movement of the suspended coil H in the direction of its axis into rotary movement of the needle S. As spiral springs for this purpose are well known, and, in fact, are already described in several electrical measuring-instruments already patented to me, further description will not be necessary.

The spool D, carrying the coil F, has a large central opening, in which is received a flanged disk W. This disk is secured by a pin U rigidly to the rear portion of the transverse coil-bar K. The flanges of the disk W fit neatly within the opening in the spool D. This part of the apparatus forms a dash-pot to check or retard the movement of the suspended coil H. In the center of the rear wall of the spool D is an adjusting-screw *a*, which may be turned in or out, and passing through the body of the spool E is a similar adjusting-screw *b*. By regulating these adjusting-screws *a b* the extent of movement of the coil H may be limited. The circuit in the instrument proceeds through the two coils F and G and also through the suspended coil H. The construction is such that the coils F and G are practically electro-magnets having opposite polar faces opposed, and by the reaction of the fields of these magnets and the field produced around the coil H the coil H becomes attracted to one of the fixed coils and repelled by the other, and the extent of its consequent movement will bear a relation to the difference of potential between the terminals of the instrument. This movement of the coil being translated into rotary movement of the needle, it follows that the extent of said movement is indicated by the needle on the scale, which is to be laid off in any suitable units.

In place of employing two fixed coils, as F and G, and a movable coil H, suspended between them, I may employ a single fixed coil,

as F, Fig. 4, and two movable coils H and H′, suspended in the same manner as before. The coil H then carries the pin U, to which is secured the flanged disk W, which, as before, enters the central portion of the spool D and operates as a dash-pot. Of course the opposite faces of the coil F are of different polarities, and the reaction of the fields there existing with the fields produced around the coils H and H′ results in the bodily movement of the two coils axially in one direction or the other, and this movement, in the manner already described, is translated into rotary movement of the index-needle.

I claim—

1. The combination, in an electrical measuring-instrument, of a fixed coil, a movable coil supported in front of one face of said fixed coil, a rotary index-needle, and transmitting mechanism between said movable coil and said index, whereby the movement of said movable coil due to the passage of a current through said coils is transmitted to and causes a rotary movement of said index.

2. In an electrical measuring-instrument, two fixed coils having their faces opposed and relatively parallel and a movable coil supported in the interval between said parallel and opposing faces, in combination with means for indicating the extent of movement of said movable coil toward one or the other fixed coil, due to the passage of a current through said coils.

3. In an electrical measuring-instrument, two fixed coils having their faces opposed and relatively parallel, a movable coil supported in the interval between said parallel and opposing faces, means for indicating the extent of movement of said movable coil toward one or the other fixed coil, due to the passage of a current through said coils, and adjustable stops for limiting the movement of said movable coil.

4. In an electrical measuring-instrument, a fixed coil, a movable coil carried on an elastic or resilient support parallel to and in front of the face of said coil, and means for indicating the extent of movement of said movable coil, due to the passage of a current through said coils.

5. In an electrical measuring-instrument, a fixed coil, a movable coil carried on a resilient or elastic support parallel to and in front of the face of said fixed coil, and means for retarding the vibrations of said coil and support.

6. In an electrical measuring-instrument, two fixed coils having their faces opposed and relatively parallel, a movable coil supported in the interval between said parallel and opposing faces, means for indicating the extent of movement of said movable coil due to the passage of a current through said coils, a recess in one of said fixed coils, and a piston connected to said movable coil and entering said recess.

7. In an electrical measuring-instrument, a supporting-plate A, parallel coils D E F G, a movable coil H, disposed between said parallel coils, and an index-needle S, actuated by said movable coil, the said coils being supported upon and on one side and the said index-needle being supported on the other side of said plate A.

8. In an electrical measuring-instrument, a supporting-plate, a yoke R, secured to one side of said plate, an index-needle S, pivoted in said yoke and supported on the other side of said plate, two fixed coils D E F G and a movable coil H, and transmitting mechanism extending through an opening in said plate, whereby said index is actuated by the movement of said movable coil.

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