(No Model.)

W. E. GAREY.

ELECTRIC INDICATOR.

No. 519,945. Patented May 15, 1894.

FIG. 1.

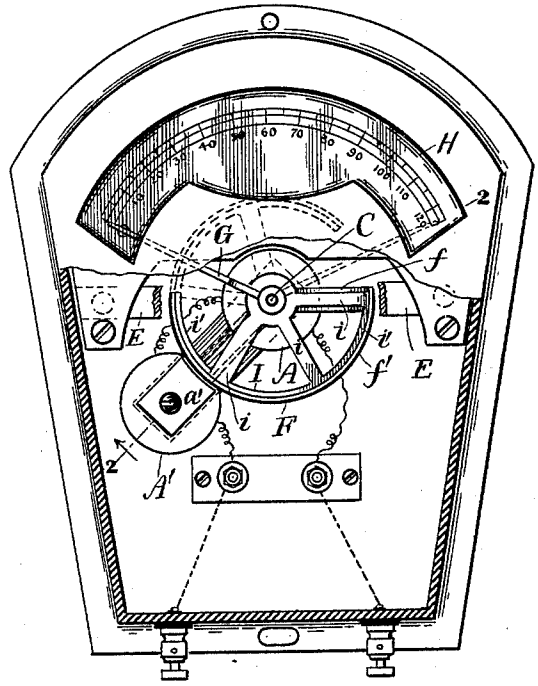


FIG. 2.

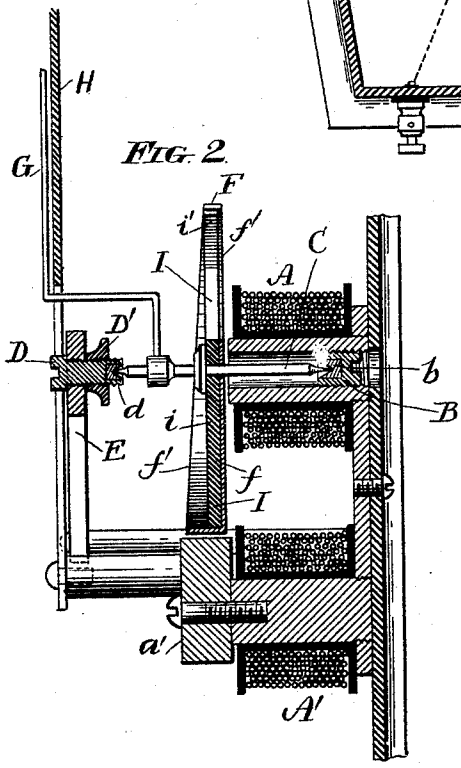


FIG. 3.

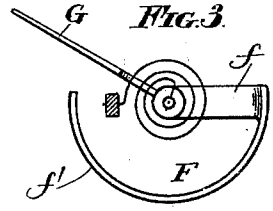
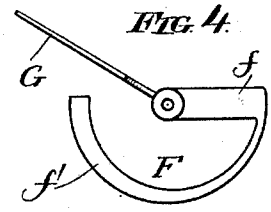


FIG. 4.



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ELECTRIC INDICATOR.

SPECIFICATION forming part of Letters Patent No. 519,945, dated May 15, 1894.

Application filed October 13, 1893. Serial No. 488,034. (No model.)

To all whom it may concern:

Be it known that I, WILBUR E. GAREY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Indicators and other Electromagnetic Apparatus, of which the following is a specification.

The present invention relates generally to that large class of electrical apparatus in which an electro magnet and an armature are so associated with each other that when the magnet is excited the armature is moved, and this movement is made use of for doing certain work, according to the purpose of the apparatus of which the parts are elements.

The invention relates more particularly to the construction of the magnet itself, and to the manner of associating the magnet and armature.

In the drawings I have shown the invention embodied in an electrical meter, but I desire to have it understood that this is to be taken as merely illustrative, some of the features of novelty in which the invention resides being equally applicable to electrical apparatus for purposes other than measuring currents.

The invention consists in the features of novelty that are pointed out in the claims hereinafter, and in order that it may be fully understood I will describe it with reference to the accompanying drawings, which are made a part hereof, and in which—

Figure 1 is a front elevation of an electrical meter embodying the invention, portions of the frame and casing being broken away. Fig. 2 is a section thereof on the line 2—2, looking in the direction of the arrow, the parts being in the positions indicated by dotted lines in Fig. 1. Fig. 3 is a detail view showing the index, the armature, and a spring instead of a weight for restraining the movement of the armature from and returning it to its initial position. Fig. 4 is a detail view showing the index, the armature and the weight incorporated with it.

A and A′ represent the two poles of a U-shaped electro magnet which is wound to proper resistance and which may be constructed as such magnets are usually constructed, excepting as hereinafter specified. One of the poles—say A—is apertured (the aperture extending, preferably, quite through it) and its interior is threaded, for the reception of a screw B having in one of its ends a jewel *b* or other suitable bearing for one end of a pivot C. The other end of this pivot is journaled in a similar bearing *d* arranged in a screw D which is tapped through a conveniently located part E of the frame or case, and a jamb nut D′ is placed on the screw for holding it against turning when the bearings are brought into relative positions to permit the free rotary movement of the arbor while preventing its endwise movement. Secured to and carried by this pivot is the armature F which comprises an arm *f* radiating from the pivot and a segment *f′* continuing from the extremity of the arm in the direction of a circle that is concentric with the pivot. This armature is, of course, of a magnetic metal—preferably soft iron—and its radius is such that its periphery comes quite close to the pole piece *a′* of the pole A′. It will be understood that the armature does not have direct contact with either pole of the magnet, albeit the space between them is very slight.

Secured to the pivot C is an index G arranged to sweep a dial plate H, which is suitably graduated to show the measurement of the current to which the meter is applied.

Normally (when there is no current passing through the coils of the magnet) the pointer is at zero and the armature is in the position in which it is shown by full lines in Fig. 1; *i. e.*, the circular portion *f′* crosses the axis of the magnet while the radial arm *f* forms more or less of an angle with said axis. In order to offer a constant resistance to the movement of the armature from this position, and to return it to this position upon the removal of the condition that moves it therefrom, either a weight or a spring is applied to it or to some part movable with it. In Figs. 1 and 2 a weight I is shown for this purpose. This weight takes the form of a segment of a wheel having spokes *i* and rim *i′*, and it is associated with the pivot and armature in such manner that it serves also as a brace for preventing the deflection of the curved portion *i′* of the armature toward the pole piece, and away from its normal position, when under the influence of the magnetic current.

The armature is, preferably, constructed of sheet-metal, but if desired may be constructed of metal of sufficient strength to resist such deflection even without the radial braces corresponding to the spokes *i*, and the weight may be incorporated in, or otherwise associated with, its circular portion. In other words, the braces *i* may be omitted, as shown in Fig. 4. The weight should, in any event, be so disposed that no part of it ever reaches a line extending vertically upward from the axis of motion of the armature, because as soon as any part of the weight passes this line its effect will be to accelerate (instead of resist) the movement of the armature. Instead of a weight, a spring may be used, a spring suitably arranged for the purpose being shown in Fig. 3. Where radial braces such as *i* are used they should be of non-magnetic material, so that the magnetic current will be compelled to traverse the radial portion *f* of the armature.

In operation, the magnetic current traverses the radial arm *f* of the armature, and so much of the circular portion *f'* as lies between the extremity of said arm and the pole piece *a'* of the magnet, and the movement of this armature—as is the case with other armatures—results from the effort of the magnet to shorten the magnetic circuit. If the movement of the armature were unresisted, as soon as the magnet was excited the armature would at once assume a position with its radial arm *f* in the magnetic meridian, but by resisting its movement toward this position by a constant force, the extent of its movement is made proportional to the force which moves it. Or, in other words, the extent of its movement is made proportional to the strength of the current, and thus the use of an index and dial for showing the strength of the current is made possible.

The foregoing description is confined to the invention as embodied in a volt meter and shown in the drawings. It will be understood, however, that the same elements may be used in an ammeter, the only difference between a volt meter and an ammeter embodying the invention being in the winding of the magnet. This difference is fully understood by those skilled in the art, and it is therefore not necessary to add to the drawings another figure differing from Fig. 2 only in the size and number of coils of wire used in the magnets.

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

1. An electric apparatus having, in combination, an electro magnet, and an armature having a portion pivoted in the field of one pole of the magnet and a portion located in the field of the other pole of the magnet and extending laterally from the portion first aforesaid, substantially as set forth.

2. An electric apparatus having, in combination, an electro magnet, and an armature having a portion pivoted in the field of one pole of the magnet and a portion located in the field of the other pole of the magnet and extending laterally from the portion first aforesaid in a plane that is transverse to the axis of motion, substantially as set forth.

3. An electric apparatus having, in combination, an electro magnet having two wound poles, and an armature having a portion pivoted in the field of one pole of the magnet and a portion located in the field of the other pole of the magnet and extending laterally from the portion first aforesaid, substantially as set forth.

4. An electrical apparatus having, in combination, a U-shaped electro-magnet, a pivoted armature so located that its axis of motion passes through one pole of the magnet, and means for resisting the movement of said armature said armature having a curved portion located in the field of the other pole of the magnet, substantially as set forth.

5. An electrical apparatus having, in combination, a U-shaped electro magnet, a pivoted armature having a portion *f* and a curved portion *f'* continuing laterally from said portion *f*, the portion *f* being pivoted in the field of one pole of the magnet and the portion *f'* being located in the field of the other pole of the magnet and means for resisting the movement of said armature, substantially as set forth.

6. An electrical apparatus having, in combination, a U-shaped electro magnet, a pivoted armature so located that its axis of motion passes through one pole of the magnet, said armature having a portion *f* radiating from its center of motion and a curved portion *f'* continuing laterally from said portion *f* and located in the field of the other pole of the magnet, and means for resisting the movement of said armature, substantially as set forth.

7. An electrical apparatus having, in combination, a U-shaped electro magnet, and an armature pivoted in line with one pole thereof, said armature comprising an arm *f* radiating from its pivot and a curved portion *f'* continuing laterally from said arm, and located in the field of the other pole of the magnet and a weight for resisting the movement of the armature and holding it normally with its arm *f* at an angle to the axis of the magnet, substantially as set forth.

8. A meter having, in combination, a U-shaped electro magnet having an aperture in one of its poles, an adjustable bearing located in said aperture, the pivot C journaled at one end in said bearing, a bearing for the other end of said pivot, an armature carried by said pivot, means for resisting the movement of said armature, an index actuated by the movement of the armature, and a dial upon which the extent of movement of the index is read, substantially as set forth.

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