(No Model.)

E. WESTON.

AMPERE METER.

No. 348,648. Patented Sept. 7, 1886.

Fig. 1.

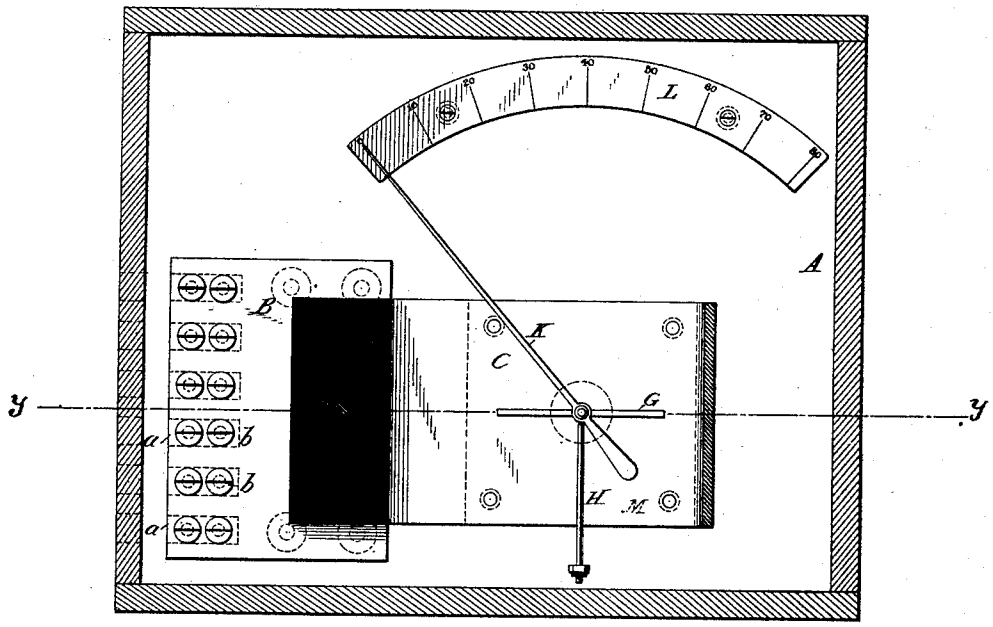
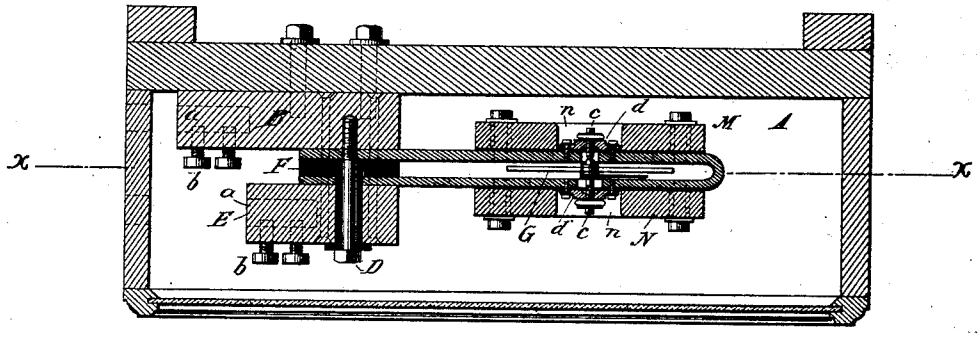


Fig. 2.



Attest:

Raymond L. Barnes.

J. Daniel Compton.

Inventor:

Edward Weston

By Parkhurst Page

Atty.

N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

EDWARD WESTON, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE UNITED STATES ELECTRIC LIGHTING COMPANY, OF NEW YORK, N. Y.

AMPÈRE-METER.

SPECIFICATION forming part of Letters Patent No. 348,648, dated September 7, 1886.

Application filed February 1, 1886. Serial No. 190,440. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WESTON, a subject of the Queen of Great Britain, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Ampère-Meters, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

My invention is an improvement in devices known as "current-indicators" or "ampère-meters," and which, by reason of the special use to which I apply it, I term a "lamp-indicator." The apparatus is one which is to be included in the circuit of a dynamo-electric machine for the purpose of showing the amount of current which such machine is furnishing. For example, when several machines are connected in multiple arc, one of these indicators is used with each machine, in order that it may be seen at a glance if each machine is furnishing its proper amount of current. So, also, when employed on any circuit containing incandescent lamps in multiple arc, it will show whether all the lamps are in circuit or some turned off. In devices used for these purposes it is manifestly desirable that any material change in the condition of the circuit should be made apparent at a glance, and that the indicating-instrument should have a wide range of movement, in order that a given change in the amount of current shall produce a sufficiently great movement or deflection of the index or needle to be at once apparent. I have devised an apparatus for doing this, the principle of its construction and mode of operation being as follows: If a magnetized needle or bar be held parallel to a conductor and a current be passed through the said conductor, the needle or bar tends to assume a position at right angles to the conductor or current. This principle is utilized in numberless instruments, the bar or needle being usually held in its normal position parallel with the conductor by some directive force, such as by magnetism, gravity, or the force of a spring. In my said device, this principle of action is present. The magnetized bar or needle is held by a pendulum in a plane parallel to a conductor or the direction of the current, and it carries a pointer, which sweeps over a scale. The conductor consists, in one form of instrument, of a broad and thick copper band, and in the simplest form of instrument the needle is placed in front of the band, about midway between its edges. The passage of a current through the copper band causes the needle to assume a position the nearer the vertical as the current increases in volume, but the increments of deflection are not proportional to increments of current, so that, while through a certain range, the movement is ample for variations in current over a given amount, any change in current will produce a proportionately slight movement of the needle. In order to counteract this I attach to the back of the copper band a soft-iron plate, with its center coinciding with the axis of the needle. This plate becomes magnetized by the current flowing in the band, and exerts an attraction upon the magnetic needle, causing it to approximate to a vertical position. Two forces thus coact upon the needle when current is flowing in the band, and they may be so proportioned that nearly equal increments of deflection are produced by corresponding increments of current through a very wide range. In practice I bend the copper band back upon itself, and support the needle between the two ends or sides. I also attach a soft-iron plate to the band on each side of the needle, increasing by this means the efficiency of the apparatus. So far as the principle is concerned, it is obvious that, in lieu of a single conductor or band, a number of insulated conductors may be used, and so in many other respects the details of construction may be greatly changed or modified without departure from the invention.

I have illustrated in the accompanying drawings the preferred form in which my invention is or may be carried into effect.

Figure 1 is a view of the instrument in section on a line, *x x*, Fig. 2, which latter figure is a cross-section on line *y y* of Fig. 1.

A is the inclosing box or case, of any desired construction and material.

B is a block, of copper or other metal, secured to the rear wall of the box or case.

C is the copper band through which the current passes. Its width is generally one-third of its total length or slightly less. This

band is bent back upon itself, as shown, and its ends are held by a bolt, D, that passes through a metal block, E, which is held by it in contact with the band, and a plate of insulating material, F, placed between the two ends of the band. The two blocks B and E form the terminals of the apparatus, and sockets *a a*, with binding-screws *b*, are provided in the blocks for attaching the line wire or wires to them.

Between the two sides of the band C is mounted a magnetic needle or bar, G, by pivoting-screws *c*, that are held in small plates *d*, secured to the band C, and extend through the perforation in the band. The bar G is made of the hardest glass steel and is magnetized. From its fulcrum or spindle depends an arm, H, at right angles to it and rigidly connected, so as to serve as a counter-balance to maintain the bar in a horizontal position. The spindle also carries a light pointer, K, that is arranged to sweep over a scale, L. When a current is passed through the band C the needle is tilted more or less toward a vertical position, according to the strength of the current; but as it leaves its horizontal or normal position the increments of deflection for given increments of current become less and less. To remedy this and to give greater amplitude to the deflections, I apply to the band C, on one or both sides of the needle, soft-iron plates M N. These are secured to the band in any convenient way and have perforations *n*, to make room for the pivotal screws of the magnetized bar.

The iron plates serve a double purpose. They are magnetized to a certain extent by the current in the band C, their polarity being such as to co-operate with the current in deflecting the magnetized bar toward a vertical position. On the other hand, they serve as a magnetic guard or shield to insulate and protect the needle from all extraneous magnetic influences. With this arrangement of parts it will be observed that the greater the deflection of the needle by the current the greater the influence upon it of the magnetic poles, and that in consequence the amplitude of the deflections produced by variations in a very strong current may be as great as that of those which take place while the needle is near the horizontal position. The device may be easily proportioned to give very exact results.

The particular construction of the device may be very greatly varied. I have shown the most efficient form of which I am aware; but it is obvious that similar results may be obtained by dispensing with one of the iron plates, or by placing the band C on one side only of the needle, or by using a coil or group of wires in place of the single conducting-band, or by various other arrangements which are obvious modifications of that particularly shown and described.

What I claim is—

1. In a current-indicator, the combination, with a conductor, of an indicating magnetized needle or bar mounted in a position parallel to said conductor, and one or more pieces of soft iron placed in proximity to the conductor and needle, these parts being so arranged that the bar or needle is deflected by the combined action of a current passing in the conductor and the magnetism induced in the iron by such current, substantially as set forth.

2. The combination, with a conductor turned or bent back upon itself, an indicating magnetic bar or needle mounted between the turns or convolutions of the conductor and parallel therewith, and one or more soft-iron pieces or plates in proximity to the conductor and the needle, these parts being so arranged that the bar or needle is deflected by the combined action of a current passing in the conductor and the magnetism induced in the iron by such current, substantially as set forth.

3. The combination, with a metal band or strip bent back upon itself, of a magnetic bar or needle mounted between the ends or sides of the band, and parallel therewith, an index-arm attached to or moved by the needle, and iron plates secured to the band on opposite sides of the needle, as and for the purpose set forth.

4. The combination, with a metal band or strip bent back upon itself, of a magnetic bar or needle mounted between the ends or sides of the band, a weighted arm or pendulum for maintaining the needle in a normally-horizontal position and parallel with the band, an index-arm attached to or moved by the needle, and iron plates secured to the band on opposite sides of the needle, as and for the purpose set forth.

5. The combination, with a U-shaped conducting band or strip, of a balanced magnetic bar or needle between the ends or sides of the same, and carrying a pointer adapted to sweep over a scale, the said needle being held in a position normally parallel to the conducting-band, and iron plates secured to the band on opposite sides of the needle, as and for the purpose set forth.

6. The combination, with a band or strip of copper with its ends bent back upon themselves and secured to terminal blocks or plates, of a magnetic bar or needle mounted between the ends of the band, a counter-balance for maintaining the needle in a horizontal position parallel with the band, a pointer carried by the needle, and soft-iron plates secured to the bands on opposite sides of the needle, as herein set forth.

7. In a current-indicator, the combination of a conductor and a magnetized bar or needle arranged to be deflected by currents passing in said conductor, and one or more magnets placed in such position relatively to the bar or needle as to co-operate with the current in deflecting the said bar, as set forth.

Witnesses: EDWARD WESTON.
HENRY A. BECKMEYER,
JOHN C. YOUNG.