

(No Model.)

2 Sheets—Sheet 1.

E. R. KNOWLES.
AMMETER.

No. 520,963.

Patented June 5, 1894.

Fig. 1.

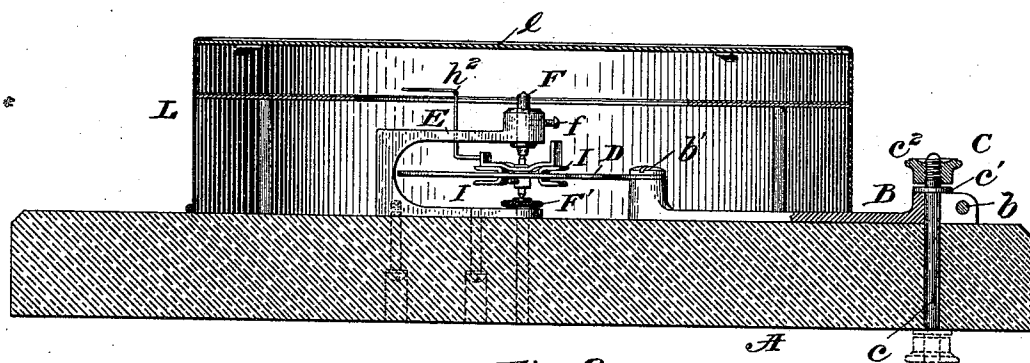
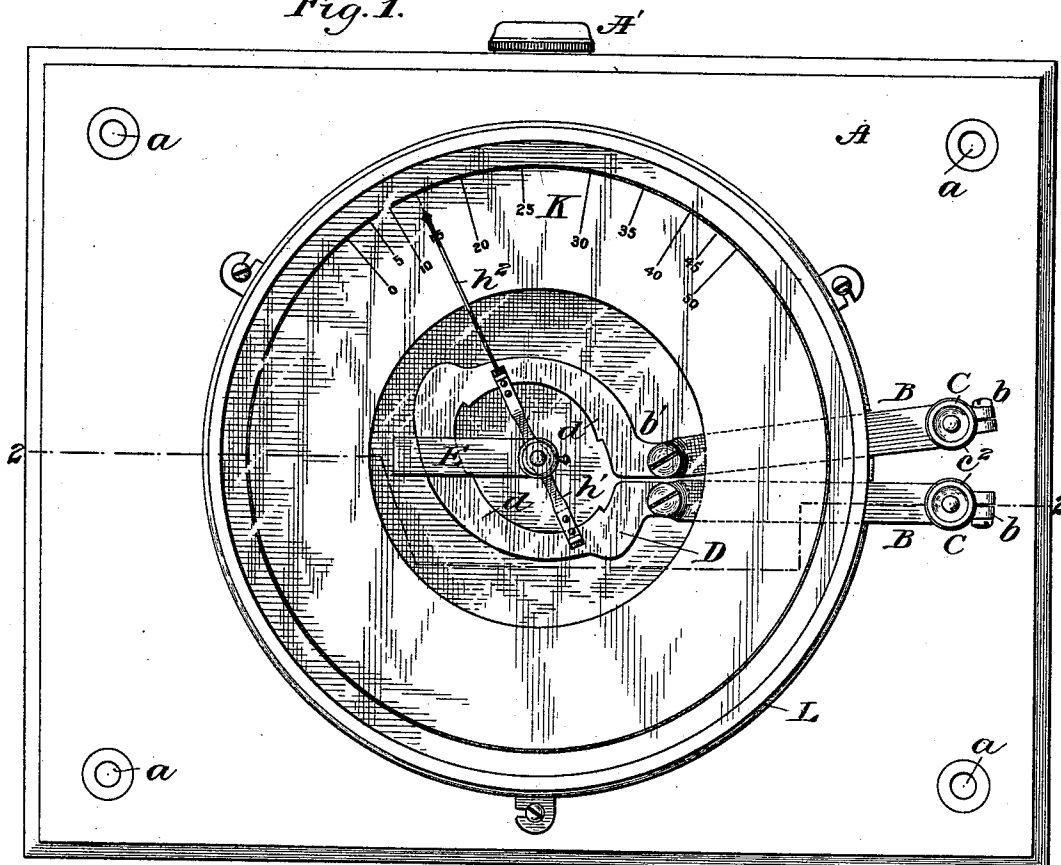


Fig. 2.

Witnesses

L. A. Connor

Paul L. Clark.

Inventor

Edward R. Knowles

By *J. A. Anthony*
Attorney

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2 Sheets—Sheet 2.

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Fig. 3.

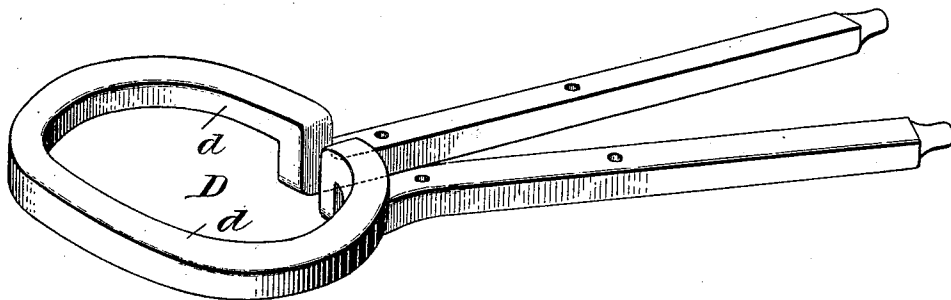


Fig. 4.

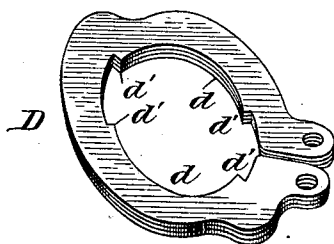
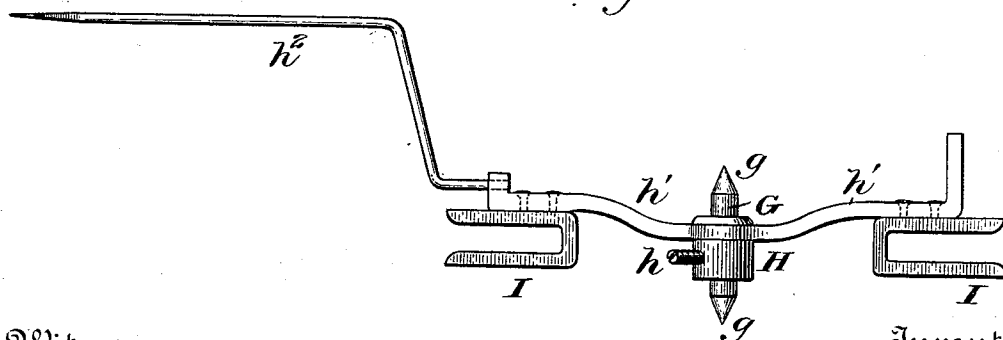


Fig. 5.



Witnesses
T. A. Connor Jr.

Paul L. Clark.

Inventor
Edward R. Knowles

By *Geo. W. H. H. H. H.*
Attorney

UNITED STATES PATENT OFFICE.

EDWARD R. KNOWLES, OF MIDDLETOWN, CONNECTICUT, ASSIGNOR TO THE SCHUYLER ELECTRIC COMPANY, OF CONNECTICUT.

AMMETER.

SPECIFICATION forming part of Letters Patent No. 520,963, dated June 5, 1894.

Application filed December 9, 1892. Serial No. 454,661. (No model.)

To all whom it may concern:

Be it known that I, EDWARD R. KNOWLES, a citizen of the United States, residing at Middletown, in the county of Middlesex and State of Connecticut, have invented certain new and useful Improvements in Ammeters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to apparatus for measuring and indicating the strength of electric currents, and its object is to improve upon existing devices and provide a more delicate instrument.

It consists in an ammeter having a bar helix of a peculiar shape, by which I obtain the advantages of two coils placed eccentrically.

The invention also includes an improved removable needle, and other details of construction, as hereinafter set forth and particularly pointed out in the claims.

In the drawings,—Figure 1 is a front elevation. Fig. 2 is a section on line 2—2, Fig. 1. Fig. 3 is a perspective view of a modified helix. Fig. 4 shows another form of helix; and Fig. 5 is a side elevation of the needle, on an enlarged scale.

The ammeter is mounted on an insulating base A, preferably of slate, having holes *a* for fastening screws, and a spirit level A' on its upper edge. Secured upon the base are two metallic bars B, the outer end of each being drilled and split, to receive the smooth shank *c* of a binding screw C, which projects down into a hole in the base A, and is securely clamped by a screw *b* which draws together the split end of the bar B. The shank *c* has a collar *c'* to rest on the bar B, and its upper end is threaded to receive a nut *c²*, by means of which the line wire is clamped upon the collar and thus put in connection with the bar B. In case it is more convenient or desirable to make the connection at the back, the screws *b* are loosened, the shanks *c* withdrawn, and re-inserted from the rear, as shown in dotted lines in Fig. 2.

The inner ends of the bars B lie near each other, and are preferably turned upward, as shown, to afford support for the helix D, which is a curved strip of metal, preferably copper or brass, having its ends perforated to receive screws *b'*, by means of which the helix is rigidly fastened to the bars B, in a plane parallel with the base A. The helix is preferably of the same thickness, being punched or otherwise formed from a sheet of metal. In width it varies, consisting essentially of two tapering portions, one following the other, so as to lie symmetrically on opposite sides of a common center. The inner edge *d* of each portion is eccentric with reference to said center, approaching it as the width of the portion increases. At each end of each portion is an abrupt shoulder *d'*, so that the eccentric edges stand inwardly from the two portions of the helix.

Fastened to the base A is a bridge or yoke E, embracing the helix and having its ends drilled to receive the pins F, F' in the ends of which are conical bearings for the pivots *g* of the needle arbor or spindle G. These pins F, F' are removable, the outer one being adjustable by means of a set-screw *f*. The needle comprises the hub H adjustably fastened to the arbor by the set-screw *h*, and carrying the diametrically opposite arms *h'*, to one of which is attached the index *h²*. A U-shaped piece of soft iron I is fastened to the end of each arm, and the parts are so proportioned that the armatures I straddle the two portions of the helix, as shown, the needle swinging freely in the same plane as the helix, and the axis of its movement coinciding with the center to which the edges *d* of the helix are eccentric. As the needle turns to the right, the lights of the armatures approach more and more closely to the edges *d*, owing to the latter's eccentricity. The index end of the needle is the heavier, so that it normally stands at zero of the graduated scale K. When a current of electricity flows through the helix, the lines of force constituting the magnetic whirl around the helix are diverted out through the bent armatures. But since these lines tend to arrange themselves symmetrically around the helix, the armature is attracted toward the helix. Inasmuch as it is

not free to move radially, the only way it can approach the helix is by turning the needle on its axis. By using two armatures, the torque is doubled, and the action of the needle is prompt.

5 The mechanism is protected by a metallic cover L having a glass face 7.

To make an ammeter for heavier currents, the helix may be increased in size by using
10 two or more thicknesses of metal, as shown in Fig. 4. Or, it may consist of a heavy bar, bent to the proper shape, as shown in Fig. 3, in which case it may be integral with the bars B.

15 Having thus described my invention, what I claim is—

20 1. An ammeter having its helix composed of two or more superposed blanks of sheet metal, the plane of each sheet being transverse to the axis of the needle, substantially as described.

2. An ammeter having its helix composed of a strip of metal containing two narrow and wider portions, one following the other, substantially as described. 25

3. An ammeter having its helix composed of a continuous strip of metal containing two portions symmetrically arranged on opposite sides of a center and each eccentric to said center, substantially as described. 30

4. An ammeter having its helix composed of a continuous strip of metal curved around a center, the inner edge of said strip having two opposite portions eccentric to said center, substantially as described. 35

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD R. KNOWLES.

Witnesses:

MAX LOEWENTHAL,
LEWIS T. ROBINSON.