(No Model.)

E. P. WARNER.

ELECTRIC CURRENT INDICATOR.

No. 378,029. Patented Feb. 14, 1888.

Fig. 1.

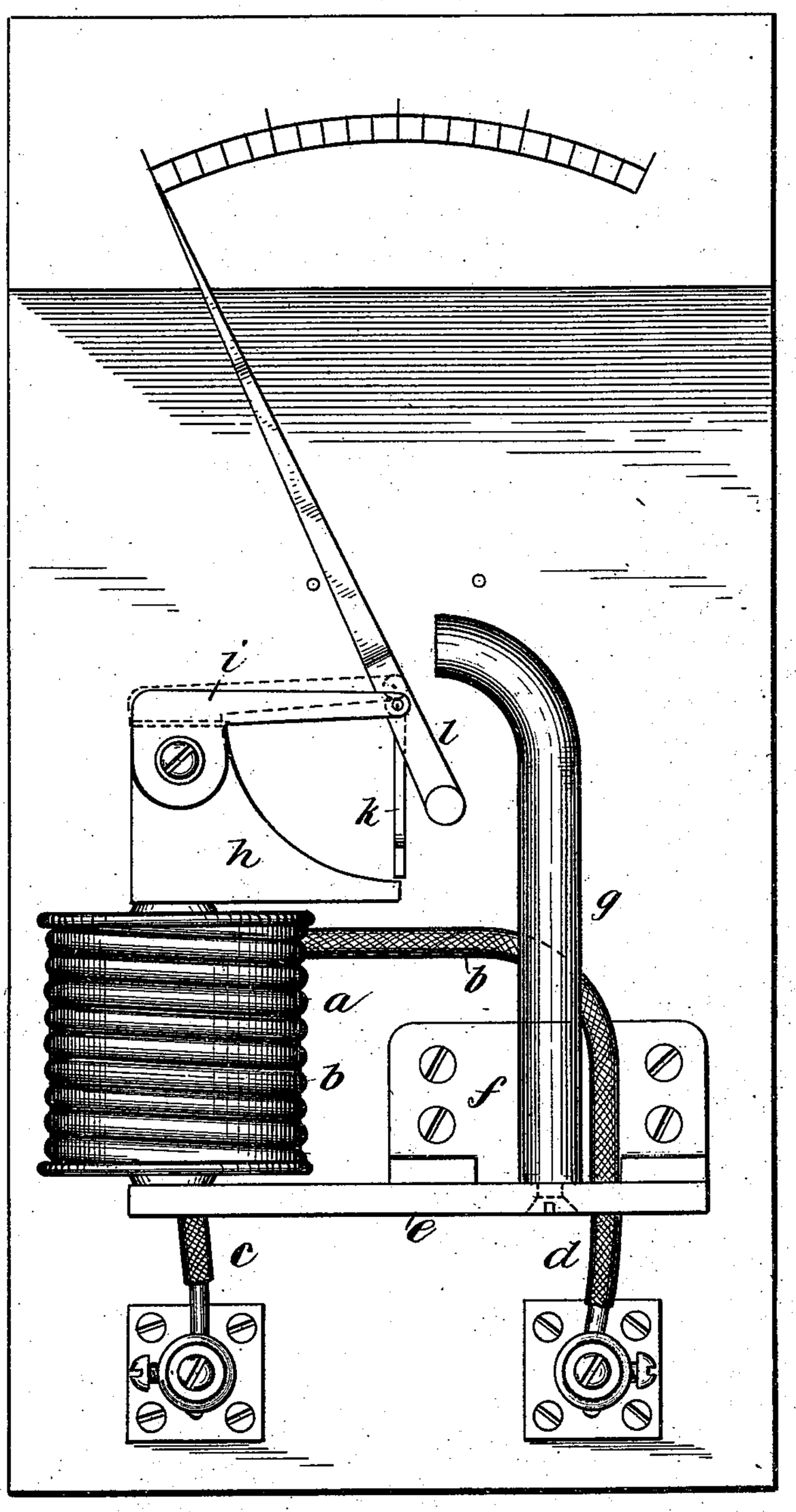

Fig. 2.

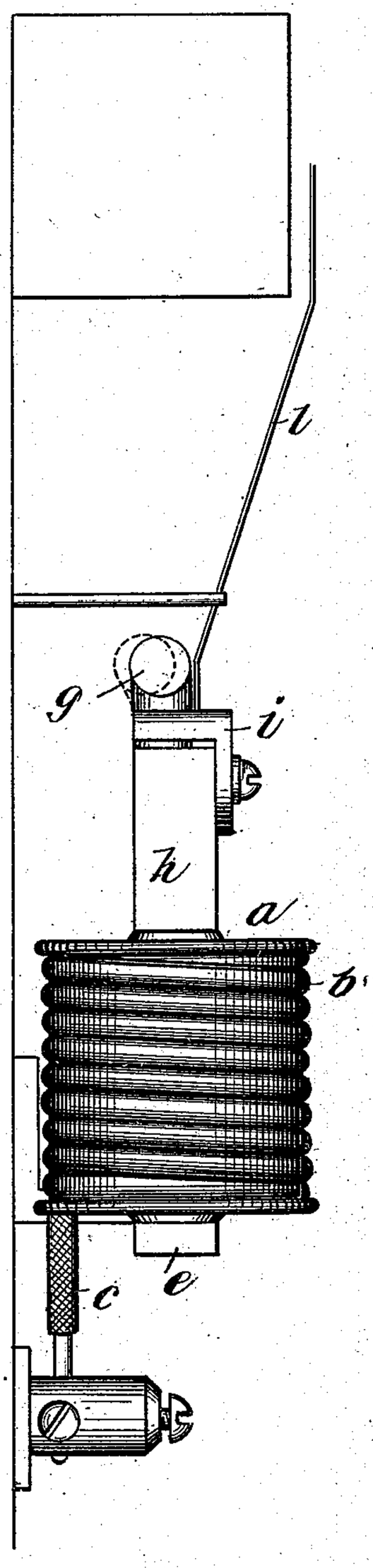

Fig. 4.

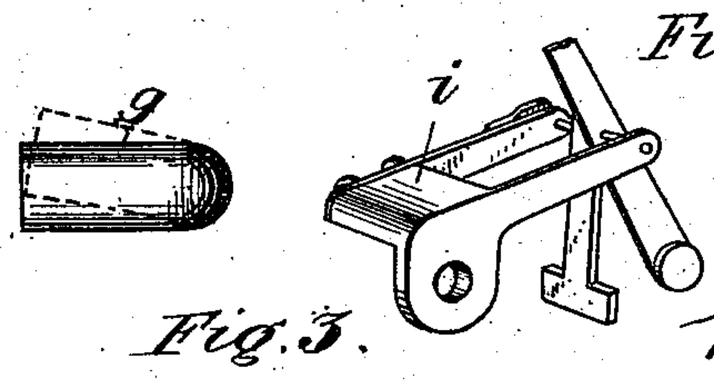

Fig. 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

ERNEST P. WARNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC-CURRENT INDICATOR.

SPECIFICATION forming part of Letters Patent No. 378,029, dated February 14, 1888.

Application filed March 21, 1887. Serial No. 231,645. (No model.)

To all whom it may concern:

Be it known that I, ERNEST P. WARNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electric-Current Indicators, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates more especially to that class of electric instruments called "ammeters;" and its object is to provide an instrument which may be used by those of little skill for measuring the strength of electric-light currents.

My invention consists in an electro-magnet with its poles extended so as to nearly meet and an armature carrying a pointer suspended between the extended poles, the position of the suspended armature and that of one of the extended poles being adjustable, in order that the instrument may be set so that the pointer will be moved when current is sent through the coil of the electro-magnet to indicate on the graduated scale the current strength.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of my ammeter. Fig. 2 is a side elevation thereof. Fig. 3 is a plan of the adjustable extended pole. Fig. 4 is a view of the adjustable support which carries the armature and pointer.

Like parts are indicated by similar letters of reference in the different figures.

The electro-magnet *a* is wound with coarse wire *b*, connected with binding-posts *c d*. The soft-iron heel-piece *e* is extended, as shown, and supported by the brass bracket *f*. The lower pole of the electro-magnet is still farther extended by the soft-iron rod *g*, mounted, as shown, upon the heel-piece, the upper end of the rod being preferably bent, as shown, so as to approach the upper pole of the electro-magnet. This rod *g* may be turned in either direction and set in any desired position with respect to the electro-magnet. I have shown a screw inserted through the heel-bar into the rod *g* for holding said rod in any position to which it may be adjusted. The upper pole of the electro-magnet is preferably extended by the soft-iron piece *h*. The adjustable brass carrier *i*, upon which the armature *k* and pointer *l* are pivoted, is mounted upon the upper portion of the soft-iron extension *h*. The armature *k* is suspended at its upper end upon pivots, so as to hang vertically when there is no current passing through the coil of the electro-magnet. The magnet, when energized, acts upon the armature in opposition to the force of gravity. Thus the armature is moved and the needle deflected according to the strength of the magnetic field.

The side of the pole *h* next to the armature is concave, the radius of the curved surface being measured by the radial length of the swinging armature. The initial adjustment of the magnetic field is effected by the rod *g*, after which the final adjustment is effected by raising the pivotal center of the armature above the radial center of the curved surface of the pole sufficiently to cause the free end of the armature as it is swung by the attractive force of the magnet to approach nearer and nearer to the concave surface of the pole. Thus the attractive force of the pole exerted upon the armature increases over and above the increased magnetic power on account of the gradual approaching of the swinging end of the armature to the surface of the pole. Thus I adjust the armature so that it will be moved a given distance for each additional ampère in the current.

I am thus enabled to place my uniformly-graduated scale approximately in position with respect to the needle and then adjust the instrument to the scale. The swinging armature and the pointer are rigidly mounted upon the same shaft or pivotal bearings. The pointer is preferably weighted at its lower end, so that its pivotal point may be as nearly as possible at its center of gravity. Any change in the position of the pointer will not affect the action of the armature.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with the electro-magnet and its extended poles, one of said poles being fixed and the other adjustable, of an armature suspended between the poles, said armature

being adjustable with respect to the fixed pole, a needle carried by the armature, and a uniformly-graduated scale to which the needle is adjusted to indicate units of current strength, as described.

2. The combination, with the extended poles of the electro-magnet, of an adjustably-suspended armature between said poles, one of said poles being adjustable and the other fixed, the said fixed pole presenting a concave surface to the free end of the suspended armature, the pivoted center of the armature being above the radial center of the curved surface to cause the swinging end of the armature to approach gradually nearer thereto as it is swung upwardly to balance the weight of the armature, as described.

In witness whereof I hereunto subscribe my name this 23d day of February, A. D. 1887.

ERNEST P. WARNER.

Witnesses:
GEORGE P. BARTON,
WM. M. GILLER.