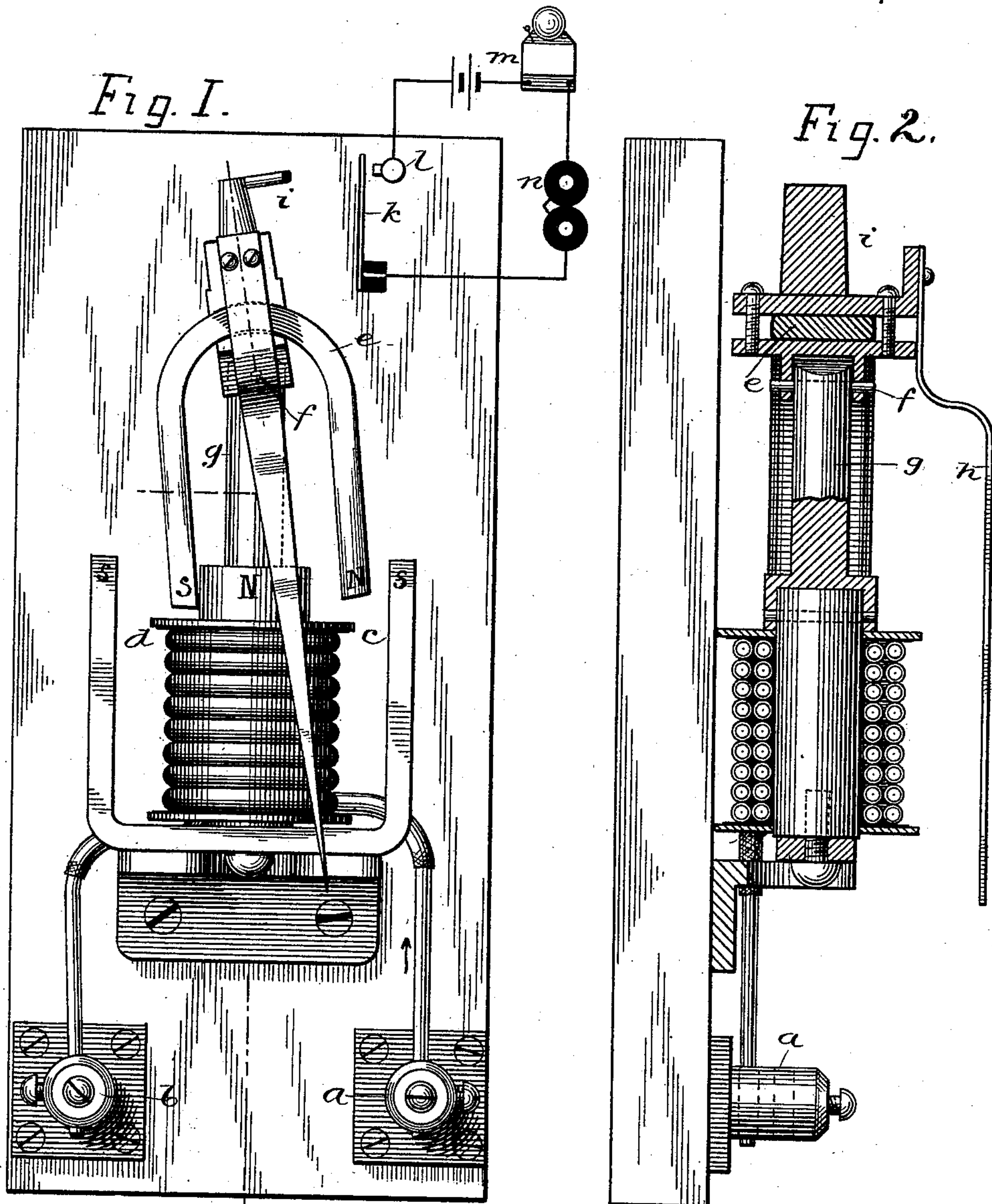


(No Model.)

E. P. WARNER.
CURRENT DIRECTION INDICATOR.

No. 420,422.

Patented Jan. 28, 1890.



Witnesses.

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

CURRENT-DIRECTION INDICATOR.

SPECIFICATION forming part of Letters Patent No. 420,422, dated January 28, 1890.

Application filed August 27, 1889. Serial No. 322,067. (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 Current-Direction Indicators, (Case 27,) 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.

It has been found desirable to provide ready means of indicating the direction of the current, especially upon arc-light circuits. Since a reversal in the direction of the current would cause the lower carbons, which are the shortest, to be consumed more rapidly than the upper carbons, the result would be that in a short time the lower carbons would be consumed, so that their clamps would be burned out and destroyed. Moreover, it is always desirable to have the current enter the upper carbon in order that the light may be directed downward instead of upward, as is well known.

My current-direction indicator is intended as a cheap, strong, and reliable device for simply indicating current-direction.

My invention consists in an electro-magnetic device having return-poles on opposite sides of the central or main pole of the core, in combination with a permanent magnet having its polar extensions inclosing the end of the pole of the core, so that each polar extension will come between said core and one of its polar extensions, this permanent magnet being pivoted and adapted to vibrate in different directions, according to the direction of the current through the coil of the electro-magnet.

My invention also consists in a local circuit containing a signaling device, said circuit being adapted to be closed by the movement of the permanent magnet in a particular direction.

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

Figure 1 is a front elevation of my current-direction indicator with a diagram of the local signal circuit. Fig. 2 is a side elevation thereof, partly in section.

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

My current-direction indicator is adapted to be connected into the circuit by binding-posts *a b*. Suppose the current in the direction indicated by the arrow and passing in the direction shown from binding-post *a* through the coil of the electro-magnet to binding-post *b*. The upper end of the core will then be of N polarity, as indicated, and the polar extensions *c d* will be each of S polarity.

The permanent magnet *e* is pivoted as shown at *f*, being supported by a column *g* of non-magnetic material—for example, brass. This magnet *e* is permanently polarized, we will say, as indicated by the letters N and S, placed upon the different arms thereof. The current then being in the direction before described, this permanent magnet will take the position shown, being acted upon by the poles of the electro-magnet—that is to say, the extension *d*, being of an S polarity, will repel the S pole of the permanent magnet. The other polar extension *c*, being likewise of S polarity, will attract the N pole of the permanent magnet. The upper end of the core being of an N polarity, will attract the S pole of the permanent magnet and repel the N pole thereof. Then the entire force of the polarity of the electro-magnet is exerted to move the permanent magnet upon its pivot in the direction indicated. Now, if the current be reversed, the condition as to polarity of the electro-magnet will be reversed, the extensions *c d* will become N, and the upper end of the core will become S. Thereupon the permanent magnet will be impelled in the other direction by all the polarity of the electro-magnet.

A pointer *h* may be conveniently provided, as shown, and adapted to move with the permanent magnet, one position indicating one direction of current and the other position another direction of current. Suppose the normal direction of the current to be as before described. On a reversal of the current the permanent magnet *e* will be moved about its pivot and the foot or presser *i* will be brought against the spring *k*, and, pressing said spring

against the contact *l*, will close the local circuit, including the bell *m* and the annunciator *n*. Thus the signal device included in this local circuit will be operated when the
5 current is of an improper direction.

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

1. The combination, with the electro-magnet included in a circuit, of a pivoted permanent magnet, one pole of said electro-magnet being placed between the opposite poles of said permanent magnet, said permanent magnet being adapted to take one position or another, according to the direction of the current through the coils of the electro-magnet, substantially as and for the purpose specified.

2. An electro-magnet having polar extensions on opposite sides of the main core, in combination with a pivoted permanent magnet with its N and S polarized arms placed between said polar extensions and on opposite sides of said core, whereby the entire magnetic force of said electro-magnet is exerted
20 to move said permanent magnet in one direction or the other, according to the direction of the current through the electro-magnet, substantially as and for the purpose specified.

3. An electro-magnet having polar extensions on opposite sides of the main core, in combination with a pivoted permanent magnet carrying a pointer or index with its N and S polarized arms placed between said polar extensions and on opposite sides of said core, whereby the entire magnetic force of said electro-magnet is exerted to move said permanent magnet in one direction or the other, according to the direction of the current through the electro-magnet, substantially as and for the purpose specified.

30 combination with a pivoted permanent magnet carrying a pointer or index with its N and S polarized arms placed between said polar extensions and on opposite sides of said core, whereby the entire magnetic force of said electro-magnet is exerted to move said permanent magnet in one direction or the other, according to the direction of the current through the electro-magnet, substantially as and for the purpose specified.

4. An electro-magnet having polar extensions on opposite sides of the main core, in combination with a pivoted permanent magnet with its N and S polarized arms placed between said polar extensions and on opposite sides of said core, a presser moved by said permanent magnet, and a local circuit including a signaling device, said local circuit being adapted to be closed by said presser when the permanent magnet is moved in a given direction, substantially as and for the purpose specified.

In witness whereof I hereunto subscribe my name this 13th day of June, A. D. 1889.

ERNEST P. WARNER.

Witnesses:

ELLA EDLER,

GEORGE P. BARTON.