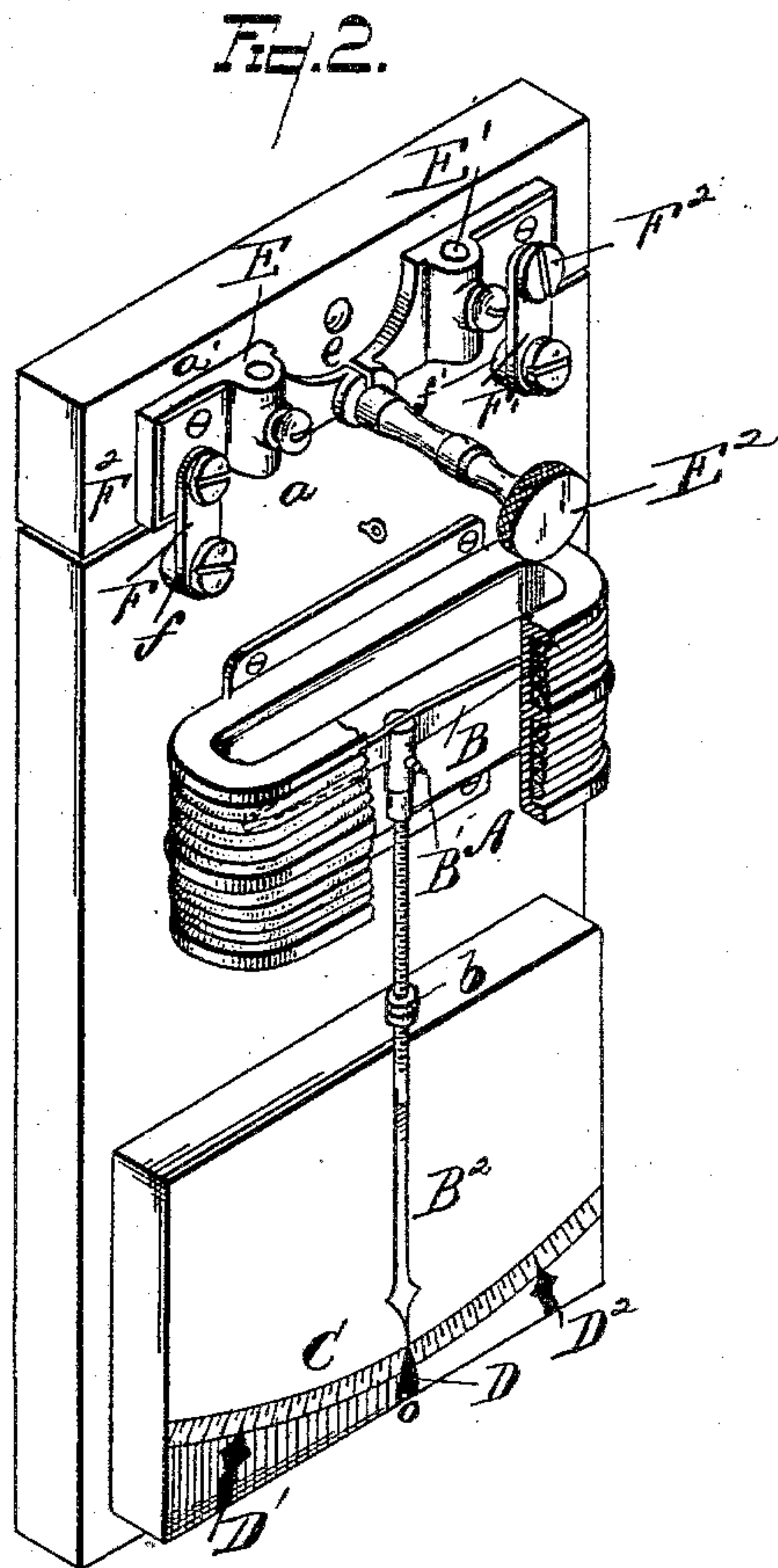
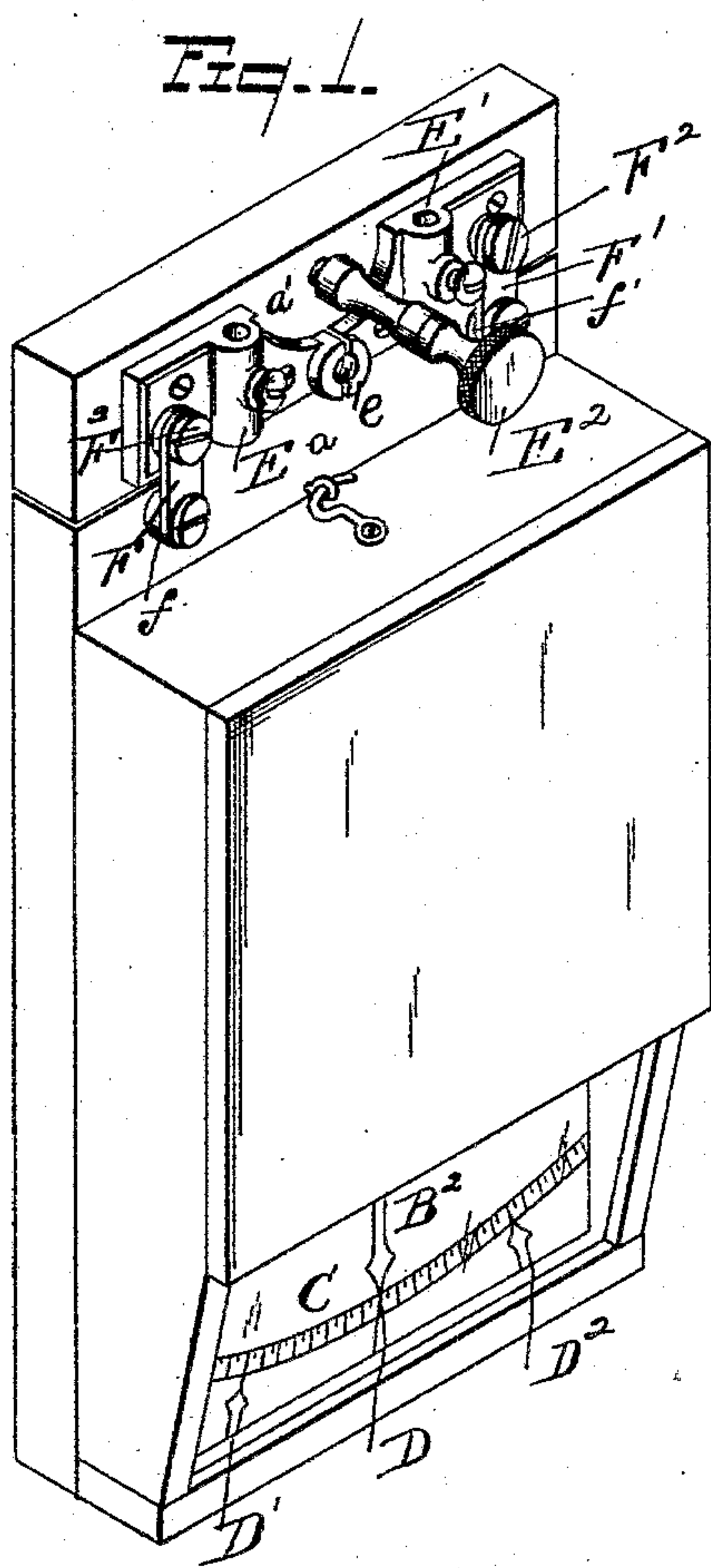


(No Model.)

J. E. LOCKWOOD.
GALVANOMETER.

No. 414,422.

Patented Nov. 5, 1889.



WITNESSES

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UNITED STATES PATENT OFFICE.

JOSEPH E. LOCKWOOD, OF DETROIT, MICHIGAN, ASSIGNOR OF ONE-HALF
TO CHARLES P. LARNED, OF SAME PLACE.

GALVANOMETER.

SPECIFICATION forming part of Letters Patent No. 414,422, dated November 5, 1889:

Application filed February 5, 1889. Serial No. 298,757. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH E. LOCKWOOD, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Ammeters and Polarity-Indicators; and I 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

In the drawings, Figure 1 is a perspective view of an apparatus embodying my invention. Fig. 2 is a perspective view of the same with the case removed and a section broken away to illustrate the construction.

It is the purpose of my invention to produce a simple and efficient mechanism for use more particularly with electric-lighting apparatus adapted to indicate at a glance from any point near at hand or at a distance therefrom the direction of the current, the number of amperes, and showing at a glance how near the current is to the normal, and whether it is short or in excess of the normal.

In carrying out my invention, A represents a hollow vertical core, preferably of brass or other diamagnetic material, upon which is wound horizontally a helix of insulated wire.

B is a horizontal steel magnetic needle adjusted within the core and supported by a pivot-shaft B'.

B² is a long index-arm projecting vertically downward at right angles to the needle B. Upon this arm is a weight *b*, made adjustable up and down upon the shaft.

C is an ampère-scale with the 0 or neutral point at the middle. Upon one side the background is of a different shade or color from that on the other side of the said neutral point. Thus, for instance, the background of the right half may be white, indicating "all right," while the left half may be red, the universal "danger-signal," indicating that something is wrong. The index-pointer is preferably darkened—as, for instance, it may be black. Its position is therefore clearly apparent, even at a great distance away. Upon the ampère-scale, at the neutral point, I provide

a heavy dark line or dart D, and at the proper points at the right and left I place prominent darts or indices D' D², marking these points on the scale, which indicate the normal current for the line upon which the apparatus is employed.

E E' represent binding-posts for the line-wire terminals. They are preferably brought nearly together at *e*, so as to be readily united or electrically connected by any suitable means—as, for instance, by a plug E²—and for convenience I locate the plug adjacent thereto in a suitable rest or orifice in the frame, as shown in Fig. 1.

F F' represent metallic connecting straps or links, which, by the screws F², are caused to unite the binding-posts E E' with the immediate terminals *f f'* of the instrument proper. So, also, I prefer to make the base-board *a* of the instrument proper entirely separate from the base-board *a'* of the terminals E E', so that by uniting said latter terminals by the plug E² the screws F² may be removed and the instrument disconnected without disturbing the line or its terminals.

The operation of the device will now be understood. It is connected into the circuit for which it is designed—as, for instance, into an arc-light circuit. The darts D' and D² are at the proper points on the scale—as, for instance, at the ten-ampère graduations, that being the normal current for the line. Now, when the current is started, the tendency of the needle B to assume a vertical position at right angles with the direction of the wire in the helix causes the index-pointer B² to move to the right or left, according to the direction of the current on the main line. If it moves to the right over the white field, it indicates that the current has its proper direction. So, also, its relative position with respect to the dark middle and side darts will show at a glance from a long distance off just about the indicated amperage. So, again, as the current approaches its normal, the position of the index-pointer with respect to the normal-current dart D' will show with great distinctness for a great distance the slightest variation to the right or left of the dart, and so indicate whether it is slightly too great or too little. Should the index-pointer start off to the left over the

field, the attendant knows at once that something is wrong: either his generator has been connected in reverse order into the line, or through some accident the polarity of the generator has been changed, or the instrument itself may be connected into the line in reverse order. In any event, he is at once put on his inquiry to discover the difficulty and correct the same. The instrument standing vertically, its scale and pointer can readily be seen at a distance. If the attendant desires to calibrate a series of instruments so they all have a uniform reading, he needs simply to plug between the terminals E E', remove the screws F², and then connect the several instruments together in series.

If for any reason the needle B loses a part

of its magnetism and so acts sluggishly, the weight *b* may be adjusted upward along the pointer, so as to afford less resistance to the deflection of the pointer, and vice versa.

What I claim is—

The combination, with an ammeter, of the terminals E E', connecting-plug E², and connecting-links F², whereby the line may be closed and the instrument removed or adjusted without disturbing the terminals, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

JOSEPH E. LOCKWOOD.

Witnesses:

CHAS. P. LARNED,
L. A. DOELTZ.