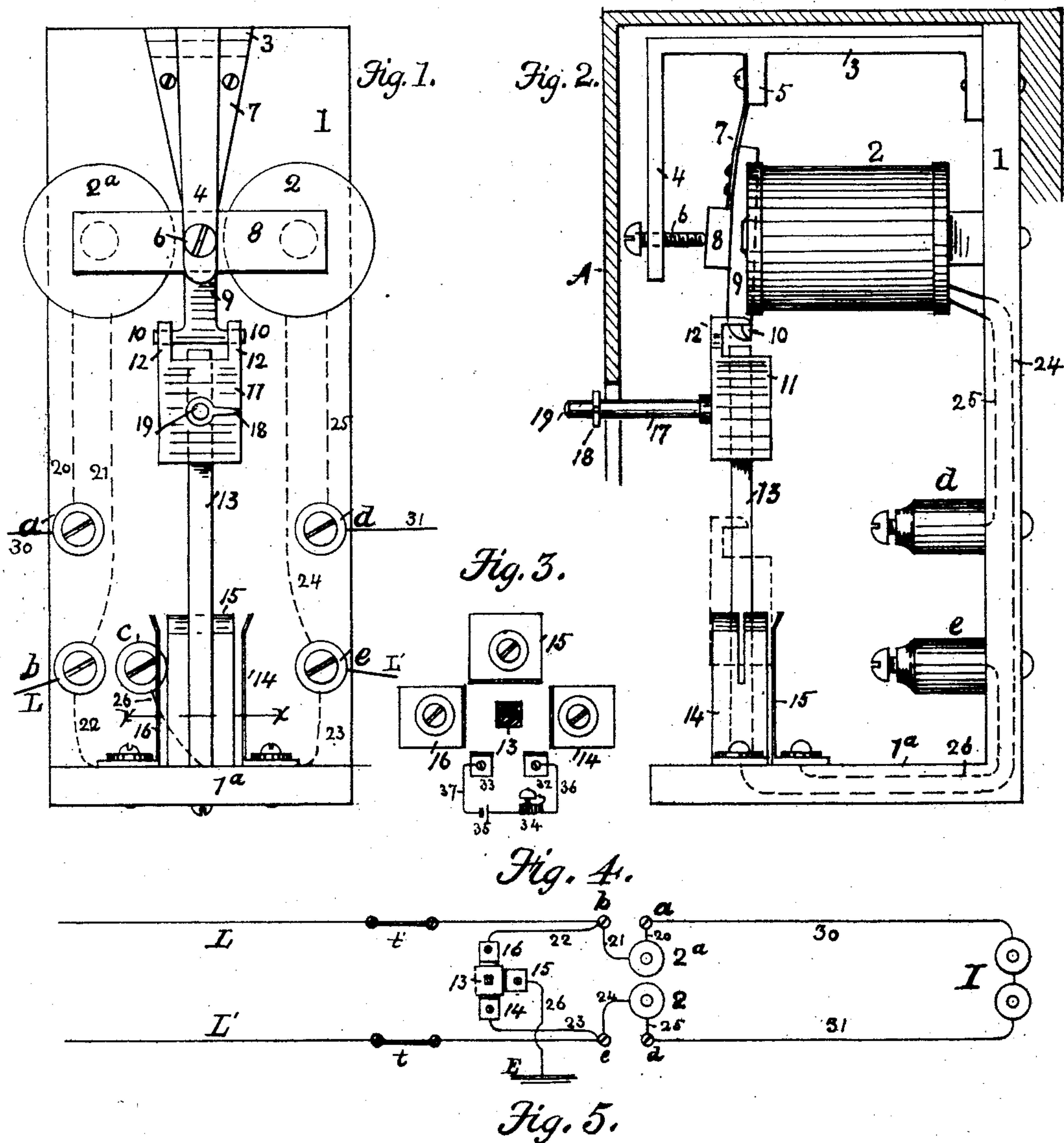


(No Model.)

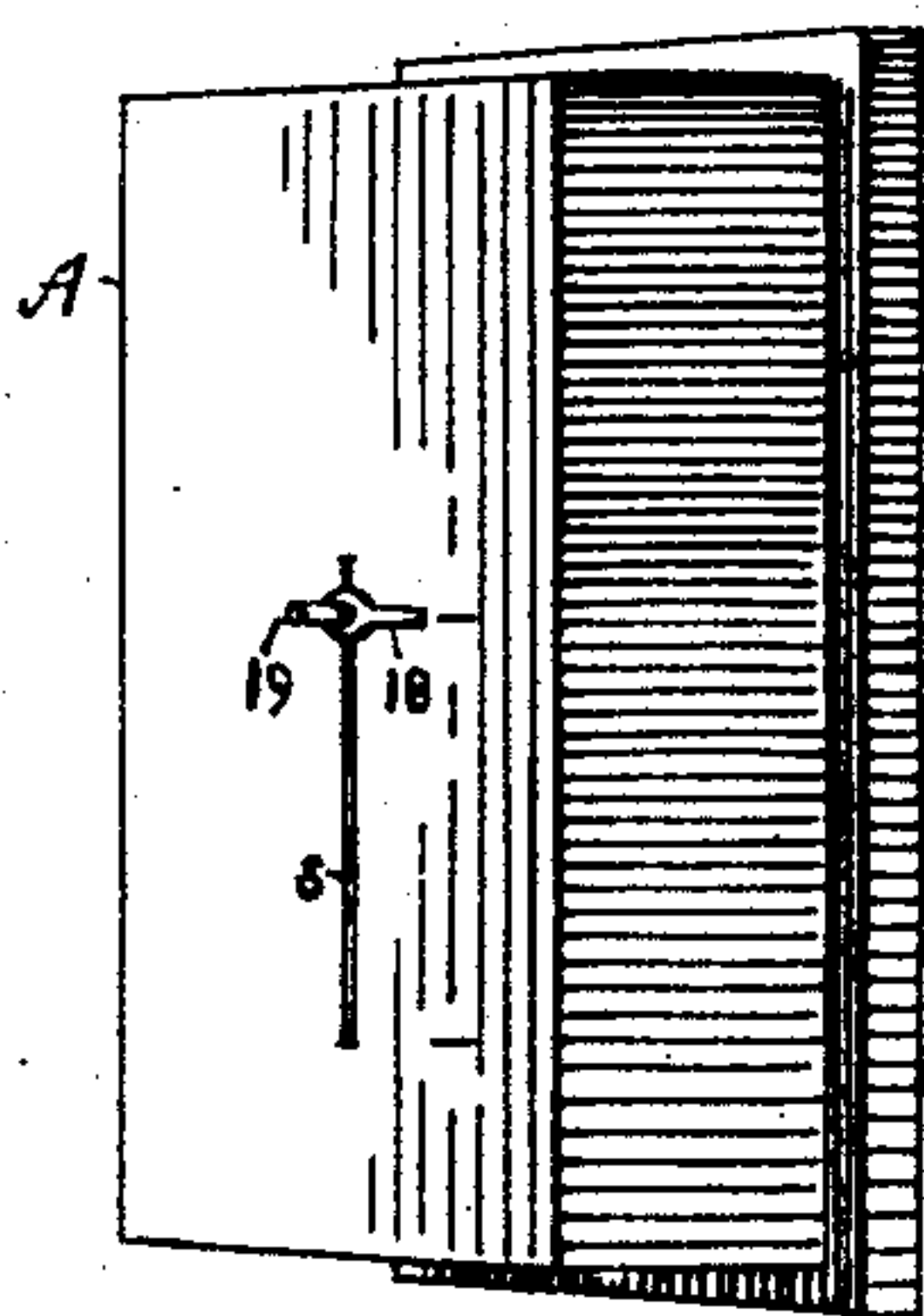
C. H. MORSE.
PROTECTOR FOR ELECTRICAL APPARATUS.

No. 470,697.

Patented Mar. 15, 1892.



WITNESSES
M. I. Pierce.
V. M. Berthold.



INVENTOR
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UNITED STATES PATENT OFFICE.

CHARLES H. MORSE, OF CAMBRIDGE, MASSACHUSETTS.

PROTECTOR FOR ELECTRICAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 470,697, dated March 15, 1892.

Application filed January 12, 1892. Serial No. 417,860. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. MORSE, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Protectors for Electrical Apparatus, of which the following is a specification.

This invention relates to the protection of electrical apparatus connected in electric circuits from currents of electricity abnormal to the circuits, or of such a character as to burn out the helices of such apparatus and to occasion danger from fire thereto and to the surroundings.

The invention relates to a method of protecting electrical apparatus by shunting the abnormal current through a path of least resistance to the earth, and especially relates to an electro-magnetic protector having two independent helices, one of which is located in each side of the line-circuit as it enters and leaves the apparatus to be protected. The normal current does not affect the said helices, but an abnormal current attracts an armature, to which is locked a weight arranged upon a vertical guide, and operates to unlock the weight, which, instantly falling by its gravity down its guide, wedges itself between or upon one or more contacts, the effect being to short-circuit or shunt the apparatus to be protected or to ground the line at a point away from the said apparatus, or to do both. In addition to the electro-magnetic protector I also combine therewith fusible protectors, as more fully set forth hereinafter. I confine the electro-magnetic protector in an inclosing case and connect therewith a visual and an audible indicator, whereby the person in charge may see at a glance whenever the device has operated and whenever the apparatus is shunted by means of the former, and may hear from a distance by means of the latter form of indicator, all of which I will now proceed to describe and claim.

Figure 1 of the drawings is a face view of the electro-magnetic protector out from its inclosing box. Fig. 2 is a side view of the same, a portion of its inclosing box being shown in section at the top. Fig. 3 is a cross-section on line *xx* of Fig. 1. Fig. 4 is a diagram showing the electro-magnetic protector

in position, the fusible protectors, and the instruments to be protected. Fig. 5 is a perspective view of the electro-magnetic protector in its inclosing box and its visual indicator.

1 and 1^a is a base of insulating material, to which the several parts of the protector are secured.

2 and 2^a are the helices of the electro-magnet secured to the base 1.

3 is a standard extending forward, having the two projections 4 and 5.

8 is the armature secured to the projection 5 by the flat spring 7, so as to stand away from the cores of the helices 2 and 2^a against the regulating-screw 6 in the projection 4.

9 is a central block extending downward from the armature 8 between the helices, having at each side of its lower end extensions or horns 10 10.

13 is a vertical bar, square in cross-section, secured to the base 1^a and serves as a guide to the weight 11, which has a hole through its length and slides upon the guide. The weight 11 has upon the outer edges of its upper end hooks 12 12, which engage with the extensions 10 10 of the armature-block 9. Upon the base 1^a, around the guide 13, are three spring-contacts 14, 15, and 16, the former connected to screw-post *e*, the second to earth, and the latter to screw-post *p*. Projecting from the front side of the weight 11 is a rod 17, having near its outer end a pointer 18, its end terminating in a knob 19. When the electro-magnetic protector is inclosed in its box A, the rod 17 extends through a slot in the front thereof, as shown in Fig. 5. The line L enters at screw-post *b*, where it branches, one branch going by wire 21 through helix 2^a, wire 20, screw-post *a*, wire 30, through the apparatus I to be protected, wire 31, screw-post *d*, wire 25, helix 2, wire 24, screw-post *e*, to return wire L', which may be the return wire of a metallic circuit or a ground wire, as shown in dotted lines in Fig. 4. This is the normal working circuit of the apparatus. Whenever an abnormal current enters, the armature 8 is attracted, the extensions 10 10 leave the hooks 12 12, and the weight 11 falls by gravity down its guide 13 and wedges itself between the spring-contacts 14, 15, and 16, and forms a

short circuit between the screw-posts *b* and *e*, and also puts a ground onto the line, the circuit being from line *L*, wire 22, contact 16, wedge-weight 11, contact 14, wire 23, screw-
 5 post *e*, line *L'*, and by contact 15, wire 26, to earth at *E*, thus shunting the apparatus *I*. If the abnormal current is of very high electro-motive force, the fusible wires *t'* and *t* will blow out and open the line. When the short-
 10 circuiting or shunting wedge-weight 11 is locked to the armature 8, the indicator 18 shows through the slot *s*, as shown in Fig. 5, at its upper end, and when it is unlocked and down, as shown in dotted lines in Fig. 2, the
 15 indicator is at the bottom of the slot *s*, serving to visually indicate to the attendant the conditions of the circuit, whether in working condition or shunted. The audible indicator is represented in Fig. 3.

20 32 and 33 are spring-contacts secured to the base 1^a, and are slightly separated from one another. Wires 36 and 37 are secured to the springs and include in circuit a battery 35 and bell 34. When the weight 11 descends, as
 25 previously described, it makes contact with both contact-springs 32 and 33 and bridges the space between them, closing the circuit and causing the bell to ring.

I prefer to use the visual and audible indicators in the same instrument and secure the
 30 double and simultaneous indication.

My electro-magnetic protector is adapted for straight or alternating currents and in practice has proved very efficient, and by varying the winding of the helices it is exactly
 35 adapted to any voltage and ampèreage, and when alternating currents traverse its helices "arcing" is entirely prevented, as when a pulsation in either direction of sufficient
 40 strength passes through the helices the armature is attracted and the weight drops instantly before the next pulsation comes in. All electro-magnetic protectors that I am aware of operate only by currents of one direction. The means for shunting the circuit,
 45 including the instruments to be protected, operated by the armature, are not of a character to be operated quick enough between a positive and negative pulsation, and so when an
 50 abnormal alternating current passes through the helices instead of operating to shunt the current the device is inert, the consequence being that the instruments in circuit are burned out and fire introduced into their surroundings.
 55

To reset the protector the attendant pushes the knob 19 up until the hooks 12 12 reach the extensions 10 10, over which they are forced, the spring 12 allowing the armature-
 60 bar 9, with its extensions, to move inward and forcing it outward when the hooks pass the extensions, and thus hold the weight up, as shown.

I do not confine myself to the precise form
 65 and shape of the parts or arrangement of circuits shown and described, but may change

and otherwise form them without departing from the spirit of my invention.

I claim—

1. An electro-magnetic protector having 70 two independent helices in opposite sides of the circuit including the apparatus to be protected, an armature extending across the cores of said helices, two contacts respectively connected to the opposite sides of said circuit 75 and one contact connected to the earth, and a shunting or short-circuiting and grounding weight normally locked to the said armature, but adapted to be released therefrom when the said armature is attracted to said helices 80 and to fall vertically and make connection with the said contacts, as set forth.

2. An electro-magnetic protector having two independent helices in opposite sides of the circuit including the apparatus to be pro- 85 tected, an armature extending across the cores of said helices, two contacts respectively connected to the opposite sides of said circuit and one contact connected to the earth, and a shunting or short-circuiting and grounding 90 weight normally locked to the said armature, but adapted to be released therefrom when the said armature is attracted to said helices and to fall vertically and make connection with the said contacts, combined with fusible 95 protectors, one in each side of the said circuit, as set forth.

3. The combination, in an electro-magnetic protector, of an electro-magnet having two helices and cores therefor included in cir- 100 cuit with the apparatus to be protected, as described, an armature extending over the cores of each helix, and a weight normally locked to the said armature, but adapted to be released therefrom upon the attraction of said arma- 105 ture by its helices, with a vertical guide for the said weight having at its base grounding contacts, substantially as described.

4. The combination, in an electro-magnetic protector, of an electro-magnet having two 110 independent helices, one in each side of the circuit including the apparatus to be protected, an armature extending across the cores of each helix, a shunting-weight normally locked to the said armature, but adapted to 115 be released therefrom upon the attraction of said armature by its helices, and three contact-springs, two of which are connected, respectively, to opposite sides of the circuit, the other being connected with the earth. 120

5. The combination, in an electro-magnetic protector, of an electro-magnet having two independent helices, one in each side of the circuit including the apparatus to be pro- 125 tected, an armature extending across the cores of each helix, a shunting-weight normally locked to the said armature, but adapted to be released therefrom upon the attraction of said armature by its helices, and a vertical guide for the said weight having at its base 130 three contact-springs, two of which are connected, respectively, to opposite sides of the

circuit, the other being connected with the earth.

6. The combination, in an electro-magnetic protector, of an electro-magnet having two independent helices, one on each side of the circuit including the apparatus to be protected, an armature extending across the cores of each helix, a shunting-weight normally locked to the said armature, but adapted to be released therefrom upon the attraction of said armature by its helices, and three contact-springs, two of which are connected, respectively, to opposite sides of the circuit, the other being connected with the earth, combined with means for effecting simultaneously visual and audible indications, consist-

ing of a pointer attached to the said shunting-weight forming a visual indicator, and an open circuit including a battery and bell, the said circuit terminating in two contacts adapted to be closed by the said shunting-weight, forming an audible indicator, substantially as and for the purposes set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 9th day of January, 1892.

CHARLES H. MORSE.

Witnesses:

ALICE S. MORSE,
V. M. BERTHOLD.