(No Model.) 2 Sheets—Sheet 1.

S. H. COBB.

ELECTRO MAGNETIC CUT-OUT.

No. 456,940. Patented Aug. 4, 1891.

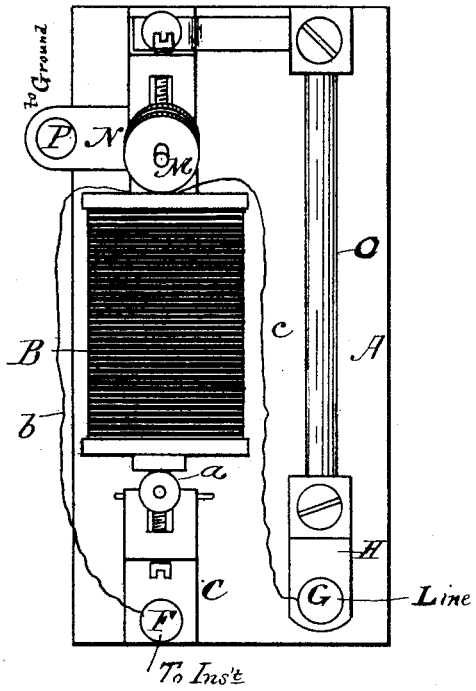

Fig. 1.

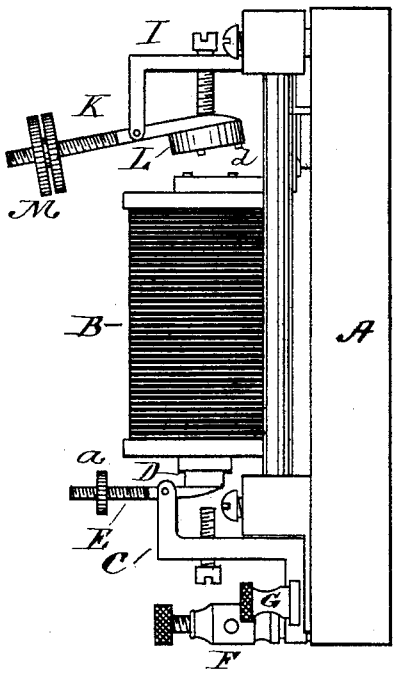

Fig. 2.

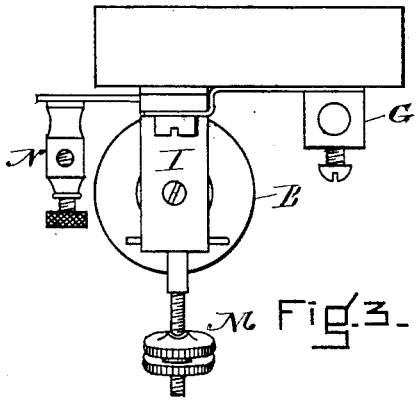

Fig. 3.

WITNESSES

Frank H. Parker.

Edward S. Day

INVENTOR

Sylvanus H. Cobb

by his attorney

Alex. L. Hays

(No Model.) 2 Sheets—Sheet 2.

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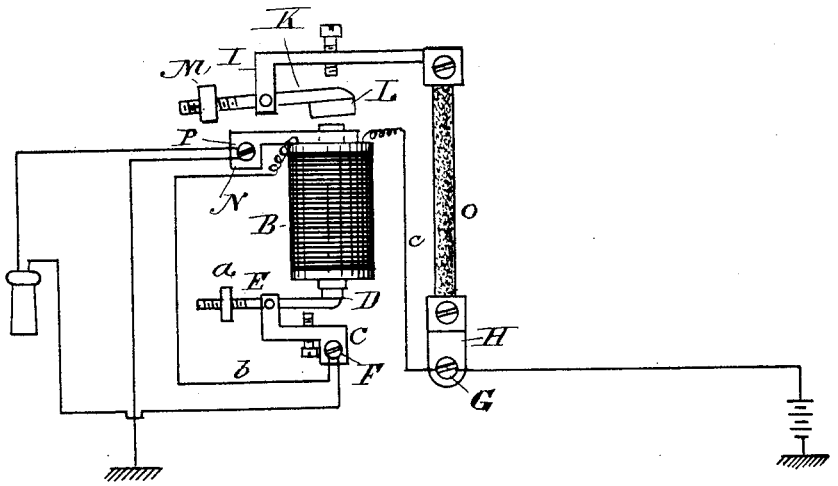

Fig. 4.

WITNESSES

Frank G. Parker

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INVENTOR

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by his attorney

Alex. L. Hayes

UNITED STATES PATENT OFFICE.

SYLVANUS H. COBB, OF HYDE PARK, MASSACHUSETTS, ASSIGNOR TO THE ELECTRICAL SAFETY COMPANY, OF PORTLAND, MAINE.

ELECTRO-MAGNETIC CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 456,940, dated August 4, 1891.

Application filed November 29, 1890. Serial No. 373,023. (No model.)

To all whom it may concern:

Be it known that I, SYLVANUS H. COBB, of Hyde Park, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in Current-Protectors for Electrical Instruments, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to that class of protectors for electrical instruments in which class a current above the strength which can be received without injury by the instrument to be protected is automatically diverted from the instrument as long as the current remains at this strength, but in which the circuit through the instrument to be protected is automatically re-established when the current falls to that strength which will not injure the protected instrument, thus leaving the instrument in circuit.

The object of this invention is to obtain a protector which will be capable of being operated by currents of feeble strength—as, for example, what is known as "sneak currents"—and which will also receive without injury much stronger currents, thus increasing the efficiency of the instrument by enlarging the limits of current strength within which it will be operative.

In protecting instruments of the class referred to a contact-point through which the circuit is directed is attached to the armature of an electro-magnet included in the circuit, and when this electro-magnet is energized the armature is attracted, and the contact-point attached thereto is caused to establish a connection with the ground, and the circuit through the protected instrument is broken. The sensitiveness of the electro-magnet to currents passing through its helix is proportional, other factors being equal, to the number of turns in this helix; but as each turn adds to the resistance of the helix it is obvious that increase in sensitiveness is accompanied by increased resistance, and consequently that a magnet which is capable of responding to currents of feeble strength would in proportion to its sensitiveness be liable to become heated by increase in the strength of the current, and thereby be injured or destroyed. An electro-magnet which would be useful for protecting against weak currents would therefore be useless as a protector for strong currents, and would, in fact, be a source of danger, owing to the heat produced by the resistance of its helix to the strong current.

In the application of protecting devices to electrical instruments it is customary to include in the circuit a piece of wire of high resistance known as a "safety-fuse," which wire is burned out by a strong current entering the line. The destruction of this wire necessarily breaks the circuit, a result which it is desirable to avoid, especially when the protector is applied to fire-alarm instruments—a class of instruments which are of little value unless at all times available for use.

In the invention which forms the subject of this application for Letters Patent of the United States there is a wide range of current strength between which the instrument will operate, and consequently the safety-fuse will only be required as a protection against currents of very great strength, and there will be but little possibility, under the conditions which ordinarily prevail upon lines, of the circuit becoming broken.

I have shown my invention in connection with the protector described in and claimed in Letters Patent of the United States No. 320,912, issued to David J. Cartwright June 30, 1885; but it is obvious that the principle of my invention can be carried into effect with any protecting device in which an electro-magnet acts to divert the dangerous current from the instrument to be protected.

For the purpose of accomplishing the desired object the invention consists in the combination, substantially as and for the purpose hereinafter more fully set forth, with the electro-magnet, of a resistance connected with the line and of two armatures, one of which is attracted by currents of feeble strength and causes the diversion of the current from the instrument to be protected, and the other which is attracted by strong currents, and which when attracted causes a division of the current between the electro-magnet and the resistance to such an extent that injury to the magnet by heating is prevented.

In the accompanying drawings, Figure 1 is

a front view of my device. Fig. 2 is a side view in elevation of the same. Fig. 3 is an end view of the same, and Fig. 4 is a diagram showing the electrical connections.

In the several figures the same letters refer to the same parts.

The peculiarity of the Cartwright protector is that the current is carried to the ground through the core of the electro-magnet.

Referring to the drawings, A is a suitable base-board which supports the parts of the instrument.

B is the electro-magnet.

C is a standard of metal attached to the base-board, and D is an armature attached to one end of a lever E, pivoted to this standard. The other arm of the lever carries an adjustable weight *a* and balances the armature, the position of this weight determining the sensitiveness of the armature to the current passing through the electro-magnet B.

The instrument to be protected is electrically connected to the standard C by the binding-screw F, and from this screw a wire *b* passes to one end of the helix on the electro-magnet. The other end of this helix is connected by a wire *c* with a binding-screw G on the metallic plate H, attached to the base-board, and this binding-screw is connected to the line.

Opposite the other end of the magnet B is another metallic standard I, to which is pivoted the lever K, one arm of which carries the armature L and the other arm the adjustable weight M. This armature is heavier than the armature D, and is not attracted under the action of the feeble currents which cause the attraction of the armature D.

N is a metallic plate which is metallically connected to the core of the magnet, and on the plate is a binding-post P, which is connected to the ground.

Between the standard I and the metallic plate H is interposed a resistance O, preferably a rod of hard carbon, and which should be of less resistance than the helix on the electro-magnet. Carbon blocks *d* may be placed upon the poles of the armature L and on the extremity of the core of the magnet for the purpose of preventing the adhesion of the armature of the core by fusing in case that the current through the core should be very strong. Carbon blocks may also be placed upon the face of the other armature D and upon the end of the core opposite to this armature for the same purpose.

The requirements of the telephone service demand that the instruments should not be exposed to currents greater than three-tenths of an ampère, and the armature D is therefore so adjusted and the magnet B is of such dimensions and so wound that a current of this strength, or, if desired, of feebler strength, will be sufficient to attract the armature. When the current on the line is not of sufficient strength to attract the armature D, the circuit is from the binding-screw G through wire C, helix of the magnet, wire *b*, binding-screw F, to the instrument to be protected; but when for any reason—as, for example, accidental contact of the line-wire with a wire carrying a sneak current for an electric light or power wire—the current on the line becomes sufficiently strong to attract the armature D, the armature is drawn in contact with the core and the current is diverted from the instrument to be protected and passes through the standard C and armature D and the core of the magnet, and thence to the ground through the binding-post N. When a strong current comes on the line, and one which may be of sufficient strength to unduly heat the helix of the electro-magnet B, the armature L is attracted and the standard I is electrically connected to the core and the metallic plate N attached thereto and thus to the ground, so that a path is afforded for the current through the carbon rod O. Currents divide between two or more branch circuits in proportion to the resistance of these branches, and therefore sufficient current will pass through the helix to maintain the armatures in contact with the core, but not enough current to heat the helix sufficiently to injure it, for the reason that a large part of the current will pass through rod O. As this carbon rod becomes heated by the passage of the current its resistance diminishes, and consequently the stronger the current the greater the proportionate part which will pass through the carbon rod, and for this reason undue heating of the helix by a strong current cannot take place.

In the instrument represented in the accompanying drawings as embodying the principle of my invention the electro-magnet is represented as in a vertical position and the retraction of the armature is obtained by means of the adjustable weights on the levers, to which armatures are attached; but the magnet may be placed horizontally and the retracting force may be obtained by means of springs.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a current-protector for electrical instruments, the combination, substantially as and for the purpose set forth, of an electro-magnet included in the circuit and acting by the movement of its armature when the magnet is energized by a current of strength sufficient to injure the instrument to be protected to establish a connection with ground, a resistance less than the resistance of the magnet and connected to the circuit, a supplementary armature electrically connected to this resistance, operated by the same or another electro-magnet in the circuit and not attracted except by currents stronger than those which cause the attraction of the other armature, and connections, as described, whereby the attraction of the supplementary armature establishes the connection of the

resistance with the electro magnet or magnets and ground, thus causing a division of the current between this resistance and the electro magnet or magnets.

2. In a current-protector for electrical instruments, the combination, substantially as and for the purpose set forth, of an electro-magnet included in the circuit and having its core electrically connected to ground, an adjustable armature adjusted to be attracted as soon as the current becomes strong enough to injure the instrument to be protected, and when attracted establishing a path for the current to the ground through the core of the magnet, a resistance less than the resistance of the magnet and connected to the circuit, and a supplementary adjustable armature for the electro-magnet so adjusted and of such size that it is not attracted by the currents which cause the attraction of the other magnets, but only by stronger currents, and electrically connected to the resistance, whereby when the supplementary magnet is attracted to the core the strong current is divided between the resistance and the electro-magnet, and injurious heating of the magnet is prevented.

3. In a current-protector for electrical instruments, the combination, substantially as and for the purpose set forth, of the base-board A, the vertical electro-magnet B, supported upon this base-board, the metallic standard N, connected to the core of the magnet and to the ground, the metallic standard C, connected to the instrument to be protected, the metallic lever E, pivoted on this standard and carrying on one arm an armature E and on the other an adjustable weight, the metallic plate H, connected to the line, the carbon rod O, attached to this plate, the metallic standard I, metallically connected to the other end of this rod, and the metallic lever pivoted to this standard and carrying on one arm an adjustable weight M and on the other the armature L, of such weight and adjustment that it is not attracted by the currents which attract the armature D, but only by stronger currents, and the wires *b c*, connected with the terminals of the helix to the binding-posts F and G, respectively.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 26th day of November, A. D. 1890.

SYLVANUS H. COBB.

Witnesses:

JOHN H. COOMBS,

HENRY S. BUNTON.