

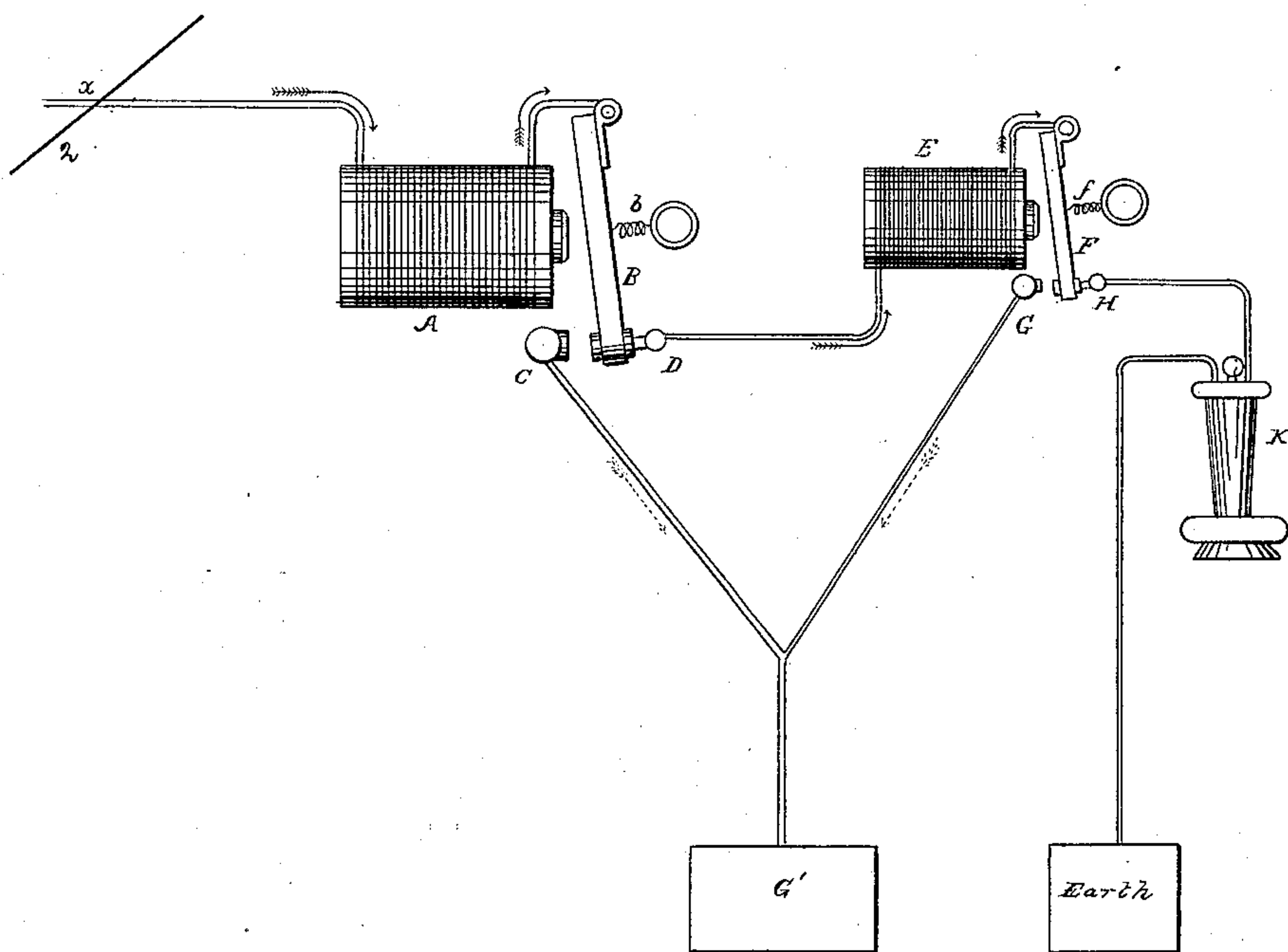
(No Model.)

M. D. CONNOLLY.

PROTECTOR FOR TELEGRAPHIC AND TELEPHONIC INSTRUMENTS.

No. 279,712.

Patented June 19, 1883.



WITNESSES

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# UNITED STATES PATENT OFFICE.

M. DANIEL CONNOLLY, OF PHILADELPHIA, PENNSYLVANIA.

PROTECTOR FOR TELEGRAPHIC AND TELEPHONIC INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 279,712, dated June 19, 1883.

Application filed February 16, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, M. DANIEL CONNOLLY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Protectors for Telegraphic, Telephonic, and other Electrical Instruments; and I do hereby 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 it, reference being had to the accompanying drawing, which forms part of this specification, in which the figure is an elevation exhibiting my improvements.

My invention has relation to that class of lightning arresters, or protectors for telegraphic, telephonic, and other electrical instruments, in which, by means of an armature movable only under the impulse of a powerful current, the circuit is changed from line to ground or return metallic circuit.

My present improvements have for their object to provide an arresting or protecting instrument capable of producing the diversion of currents of different potentials without injury to itself or without requiring adjustment to render it effectually operative for currents of unlike power.

Given an electro-magnet and a pivoted armature with retractile spring, the armature may be adjusted so that it will be attracted by a relatively strong current and fail to be attracted by a weaker one, the latter being sufficient to overcome the pull of the spring through the distance at which the armature is adjusted relatively to the face or polar extremity of the magnet. Let it be assumed that the armature is in circuit with the helix of the magnet and has a front and a back stop, line being made by either of the latter, and ground or a return metallic circuit by way of the former. By adjusting the stops and spring of the armature the latter may be brought into such position and relation to the magnet that it will be attracted by a relatively weak current flowing through the latter. So adjusted, it will also, of course, be similarly attracted by a more powerful current. Under the conditions of adjustment just suggested, the extent of movement of the armature from back to front stop

is but slight, and so when the armature is attracted against the front stop it is but a short distance away from the back stop. If the attracting current be a very powerful one—such, for example, as is produced by a large dynamo-electric machine—a voltaic arc will or may be formed between the armature and the back stop, although such armature may be in good contact with the front stop and have a ground-circuit by way of the latter. Now, to render the protecting-instrument effectually operative under the influence of currents of unlike potential, yet to avoid the formation or maintenance of the arc by even the most powerful, is the intent of the improvements herein set forth. I accomplish this result by the employment of two circuit-changing magnets and armatures, one of said armatures having means of adjustment whereby it will be attracted by a relatively weak current, while the other will be attracted only by a more powerful current, and have a range of movement between its back stop and its front stop so extensive that when attracted to the latter the arc cannot be maintained or will not be sustained between the armature and said back stop.

Referring to the accompanying drawing, A represents an electro-magnet having an armature, B, in circuit with its helix, and front and back stops C D, respectively. Normal line is by way of helix to armature, to back stop, and onward toward the telephone or other instrument sought to be protected. The stops C D are located or adjusted so far apart and the retracting-spring *b* is so strong and adjusted to such an extent that it will require a very powerful current passing over line to attract the armature B, and when attracted it will be so far removed from the back stop D that the arc cannot be sustained between said stop and the armature, the current having a free path to ground or a metallic circuit by way of the front stop. From back stop D line leads on to a second magnet, E, having an armature, F, in circuit, and front and back stops G H, respectively. Line leads from back stop H to the telephone K or other instrument to be protected, the armature F being held normally against said back stop by a retracting-spring, *f*. The distance between the stops G H and the tension and adjustment of the spring *f* are



such that a current considerably weaker than that which would be required to attract the armature B will suffice to attract said armature F, the latter having but a relatively slight movement between its stops.

The operation is substantially as follows: The armatures, being first duly adjusted, remain undisturbed by the regular working-currents on line, which make circuit through magnet A to armature B, to back stop D, to magnet E, to armature F, to back stop H, to instrument K. Let it be supposed that an irregular abnormal current, such as would injure the instrument K if allowed to act thereon for any considerable period, gets on the line, as it might if, for illustration, a cross occurred at  $x$  with an electric-light line, 2. If this abnormal current were only a moderately powerful one, it would fail to draw up armature B, but would attract armature F, drawing the latter against front stop G, thus diverting circuit from instrument K to ground at G' or to return metallic circuit, thus protecting the said instrument. It is assumed that the current which would fail to attract armature B would be insufficient or incompetent to sustain an arc between armature F and stop H. But let a current of sufficient potency to attract armature B fall upon the line. Attracting said armature B, it breaks line-circuit at D and diverts it to ground by way of stop C. The distance now between armature B and stop D is so great that it can-

not be bridged by the arc, or, if momentarily bridged, will not be sustained.

If desired to make the instrument very delicate in gradation of arrest or diversion of currents according to their strength, quantity, potential, or other quality of power or volume, more than two magnets like B E—say three or a series of a larger number—may be employed, such a series being progressive, the most strongly retracted armature being first and the others following in the order of decreasing strength of retraction.

What I claim as my invention is as follows:

In a device for protecting telegraphic, telephonic, or other electrical instruments from abnormal currents of electricity, the combination of two helices and armatures with front and back stops in circuit, respectively, to ground and to line, both of said helices and armatures being in normal line-circuit, and said armatures being arranged substantially as described, whereby one will be caused to be attracted by the force of a current incapable of producing the attraction of the other, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 15th day of February, 1883.

M. DANL. CONNOLLY.

Witnesses:

JOS. B. CONNOLLY,  
WM. H. POWELL.