

No. 670,986.

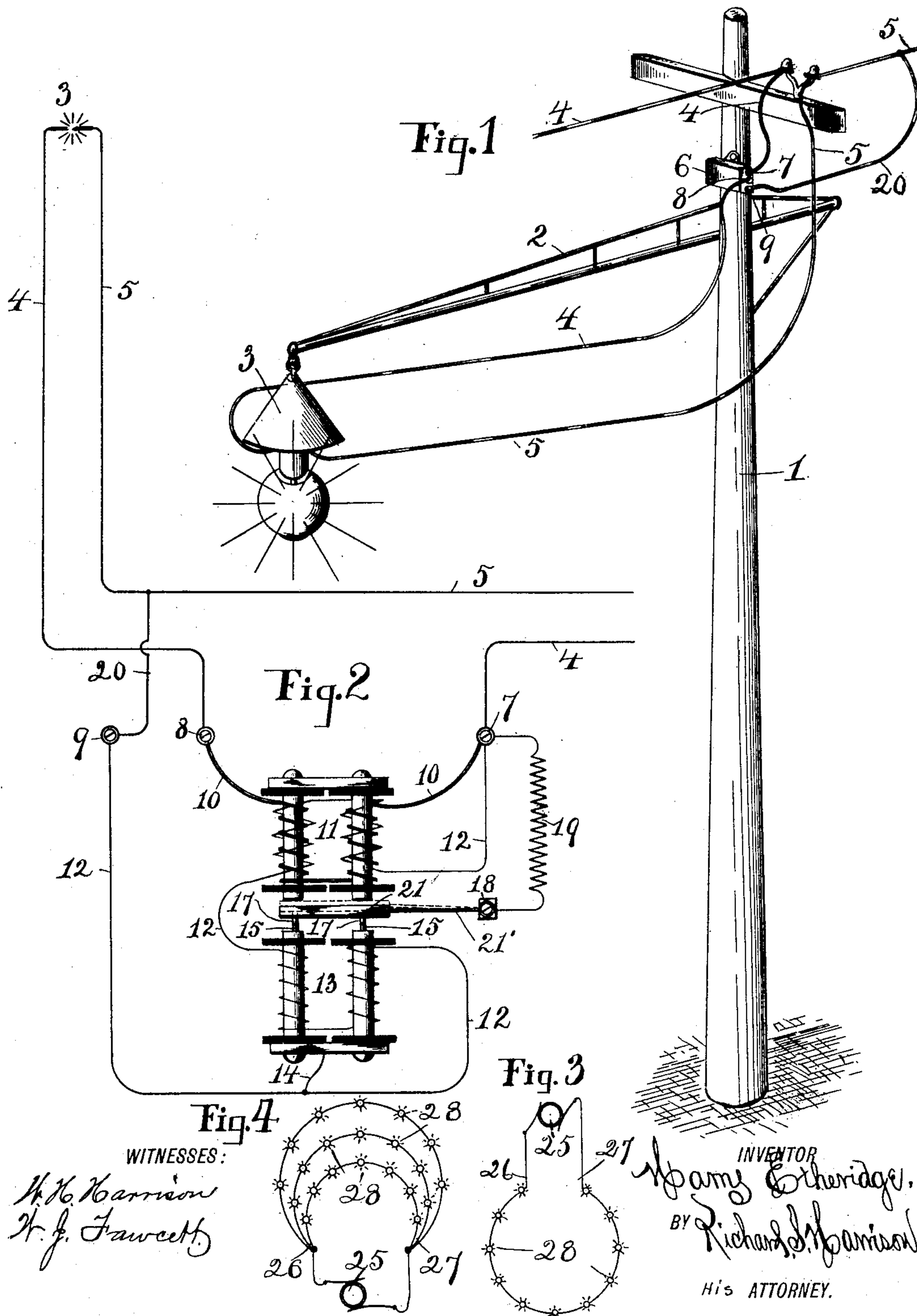
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H. ETHERIDGE.

AUTOMATIC PROTECTING AND DETECTING DEVICE FOR ELECTRIC LIGHT CIRCUITS.

(Application filed June 19, 1899.)

(No Model.)



UNITED STATES PATENT OFFICE.

HARRY ETHERIDGE, OF MCKEESPORT, PENNSYLVANIA.

AUTOMATIC PROTECTING AND DETECTING DEVICE FOR ELECTRIC-LIGHT CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 670,986, dated April 2, 1901.

Application filed June 19, 1899. Serial No. 721,130. (No model.)

To all whom it may concern:

Be it known that I, HARRY ETHERIDGE, a subject of the Queen of Great Britain, (but having filed declaration of allegiance to the United States of America at Pittsburg, Pennsylvania, February 5, 1898,) residing at McKeesport, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Protecting and Detecting Devices for Electric-Light Circuits; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to certain new and useful improvements in an automatic protecting and detecting device for electric-light circuits.

In the operation of series-arc circuits considerable trouble is experienced on account of the wires breaking between the poles and lamps. This is especially true where the lamps are suspended from mast-arms extending from poles, as the constant bending of the wires in raising and lowering the lamps for trimming and repairs causes said wires to become crystallized and broken, thereby opening the main line and rendering the whole circuit and lamps inoperative. Again, the lamps become inoperative from various causes, such as the wires working loose from the terminals, wires in lamps breaking or burning off, or failure of the lamp mechanism or its cut-out to properly operate, &c., and thereby opening circuit as above. Again, where the circuit is disturbed over a large extent of territory this device has not only the very valuable function of protecting the circuit from interruption, as above stated, but also detects the point of breakage of circuit by extinguishing the lamp at the point of interruption, and thereby indicating to the attendant, inspector, or lineman that an abnormal condition exists at that particular point, and therefore not only economizes in the expense in testing for and locating these points of breakage, but prevents the extinguishing of all the remaining lamps on the

circuit and the consequent darkness which prevails until the usual method of testing, locating, and repairing same has been made before the circuit can be again operated.

My object, therefore, is to provide a means whereby the above difficulties are fully overcome should the circuit become open or broken during the time of operation or not at or between the points named.

With this object in view the invention finally consists in the novel device hereinafter described in this specification and illustrated in the accompanying drawings, and in order to make the same fully understood to those familiar with the electrical art I will proceed to describe the device in detail and then set forth its operation.

In describing the same reference is had to the accompanying drawings, wherein similar detail parts are designated by numerals of like character, in which—

Figure 1 is a vertical perspective view of a pole, circuit-wires, mast-arm, and lamp, showing my improved circuit protector and detector connected therewith. Fig. 2 is a diagrammatic view of the circuit protecting and detecting device. Fig. 3 is a diagrammatic view illustrating a single-series system to which my invention appertains. Fig. 4 is a diagrammatic view of a multiple-series system, to which my invention also appertains.

Referring now to the drawings, the numeral 1 designates a pole, 2 the mast-arm, 3 the lamp, and 4 and 5 the conductors, all such parts being of any approved form or construction.

The automatic protector and detector I prefer to inclose within a suitably-constructed case 6 and attach the same to the pole or a convenient point thereto, and at a convenient place upon the said case are attached the terminals 7, 8, and 9, all properly insulated from one another and the case. The main-line wire 4 is coupled up to the terminals 7 and 8, and between these terminals is connected the low-resistance wire 10, which is wound about the cores of the magnets 11. A high-resistance wire 12 is connected between the terminals 7 and 9, said wire being wound about the magnets 11 (in opposite direction to the low-resistance wire) and also about the magnets 13. This high-resistance

wire is connected up to the main-line wire 5 by a wire 20, leading from the terminal 9. A wire 14 is connected between the wire 12 and any suitable point upon the magnets 13.

5 These magnets are provided at their poles with platinum contacts 15, which engage with similar contacts 17, arranged upon the armature 21. The armature is arranged upon a leaf-spring 21', which is made fast to an insulated part 18 and connected up to the terminal 7 by an auxiliary resistance-coil 19. All parts combined and coupled up, as shown, form the device complete.

15 In practice the operation of the device would be as follows: When the current comes in over the main line, it energizes the magnets 11, attracting the armature 21, and breaks the circuit between the contacts 15 and 17, thereby allowing the current to pass through the lamp 3, and will remain in this condition undisturbed or as long as the current passes through the lamp or its cut-out or no breaks or disconnections occur between the lamp and circuit protector and detector. Should the current cease from any interruption of the circuit between the above-named points, the magnetism (from the windings 10) in the said magnets 11 will no longer exist, and the armature 21 being released will by virtue of the spring 21' return to its former position against the contacts 15, thus maintaining the continuity of the main line through the auxiliary resistance 19.

35 It is of course understood that when the current enters on the main line and passes through the lamp and its mechanism in the usual manner a part of this current will pass through the magnets 11 and part through the auxiliary resistance 19, the amount varying in proportion to the ratio between the resistance of the lamp and heavy wire 10 and auxiliary resistance-coil 19; but the lamp and heavy wire 10 being of much less resistance than that of the resistance-coil 19 the greater quantity of current will pass through the low-resistance wire 10 and energize the magnet 11, which will attract the armature 21 and separate the contacts 15 and 17, thereby cutting out the auxiliary resistance 19 and allowing the whole current to pass through the lamp in the usual manner.

55 The current in the high-resistance winding 12, which is connected in parallel with the lamp and auxiliary resistance 19, is not intended to be broken or disturbed, as the same is always in operation, and its functions are as follows: The winding of the high-resistance wire 12 is in opposition to the low-resistance winding 10 and is designed to reduce the magnetism produced in the magnets 11 by the low-resistance winding 10, so that when the usual arc or difference of potential has exceeded the usual adjustment of forty-five or fifty volts at the lamp the magnetism produced by the low-resistance winding will have become so reduced in strength that the armature 21 will be released and return to

its position of rest against the contacts 15, thereby closing the circuit through the auxiliary resistance 19 and preventing the drawing of a long arc, (or difference of potential, as previously mentioned,) causing the lamp mechanism to feed carbons, and will be repeated as often as the lamp-coils fail in their feeding operation. Again, the winding 12 on the magnets 13 has other functions, one of which is that when the magnetism in the magnets 11 has been reduced, as before stated; and anything should occur that the armature 21 would not be released the magnetism produced in the magnets 13 will exert an influence upon the armature 21 and cause it to be released, thereby closing the contacts 15 and 17 and establishing a circuit through the auxiliary resistance 19. Secondly, the magnetic influence exerted by the magnets 13 upon the armature 21 serves to keep the contacts rigidly together, thereby preventing any vibration or disturbance between the contacts which might otherwise occur. Again, a function of the high-resistance winding on the magnets 13 is to cause a quick action of the armature as in case of the circuit operating under full operation, so as to prevent any possible disturbances of the circuit should they occur, as above referred to. Experience shows that this function is so complete that if the main-line terminals are opened under a full working condition the armature 21 will instantly respond and close the circuit through the auxiliary resistance 19 before a difference of potential of sixty volts has occurred at the place of breakage, thus preventing any sparking and consequent destruction or oxidation of the platinum contacts 15 and 17.

When the circuit becomes disturbed, as described, between the above-named points during the day-time or at periods when the circuit is not in operation, my device operates to establish the continuity of the circuit by closing the main circuit through the auxiliary resistance 19 and will remain protected until the fracture has been detected and repaired, at which moment the current will again be automatically divided between the lamp 3 and coil-winding 10 and the auxiliary resistance-circuit 19, the armature 21 attracted to the magnet-poles 11, and the whole current diverted through the lamp 3, as above described.

125 In Figs. 3 and 4, where I have shown a single-series system and a multiple-series system, in which the numerals 25 designate the dynamos, 26 and 27 the main wires, and 28 the lamps, the circuit protector and detector will operate upon both of these systems, either by placing my device in circuit for each lamp or arranging the same for several lamps.

130 It can be readily understood from the above that the device can be so wound and adjusted that it will automatically close a loop of main circuit containing one or more arc-lamps.

I desire it to be distinctly understood that this device is not to be classed with what are known to the art as automatic "cut-outs," as its function is to protect the circuit independent of the usual cut-out in the lamp should the same become broken or opened between the main line and lamp from any of the causes hereinbefore mentioned during the time of operation or not.

The particular construction of the device is not essential, as the detail parts may be modified, enlarged upon, &c., and still preserve its functions.

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

1. An automatic protecting and detecting device for electric-light circuits, comprising an electromagnet arranged within the main circuit upon a low-resistance winding, a spring-supported armature normally attracted thereto, said armature having contacts, an auxiliary resistance, arranged in a shunt-circuit and connected with said armature, a separate electromagnet having contacts to be engaged with those of said armature, and a separate circuit of high-resistance winding, upon both of said magnets, arranged in parallel with the main circuit, part of which separate circuit is arranged to aid in releasing said armature and the remaining portion thereof arranged to aid in returning and retaining the contacts of said armature rigidly against said magnet-contacts and reestablishing the continuity of the main circuit, through said resistance.

2. The combination with one or more electric lamps, or other devices, of an automatic protecting and detecting device, independent of their cut-outs, said protecting and detecting device comprising a pair of confronting electromagnets, one of which is arranged within the main circuit upon a low-resistance

winding and both of which are upon a separate circuit of high-resistance winding, in parallel with said main circuit, a spring-supported armature arranged between the confronting ends of said magnets and normally attracted to the one of the latter which is upon the low-resistance winding, said armature having contacts to engage similar contacts upon the other of said magnets, and an auxiliary resistance arranged in a shunt-circuit and connected with said armature, substantially as described and for the purposes set forth.

3. An automatic protecting and detecting device for electric-light circuits, comprising a casing having two terminals with which the main-circuit wires are designed to be connected, a magnet, a low-resistance wire wound around said magnet and extending from one to the other of said terminals, a second magnet, having contacts, a wire of high resistance wound around both of said magnets parallel with the low-resistance wire and connected at one end with a third terminal on the case and designed to have its other end connected with one of the main-circuit wires, an armature arranged between confronting ends of said magnets and having one of its sides provided with contacts to engage those of said second magnet, a supporting-spring attached to one end of said armature, and an auxiliary resistance connected at one end with one of the first-mentioned terminals and at its other end with said armature, substantially as described and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HARRY ETHERIDGE.

Witnesses:

S. S. LITTLE,
JAS. J. MCAFEE.