

C. A. ROLFE.
ELECTRICAL PROTECTOR.

No. 591,426.

Patented Oct. 12, 1897.

Fig. 1.

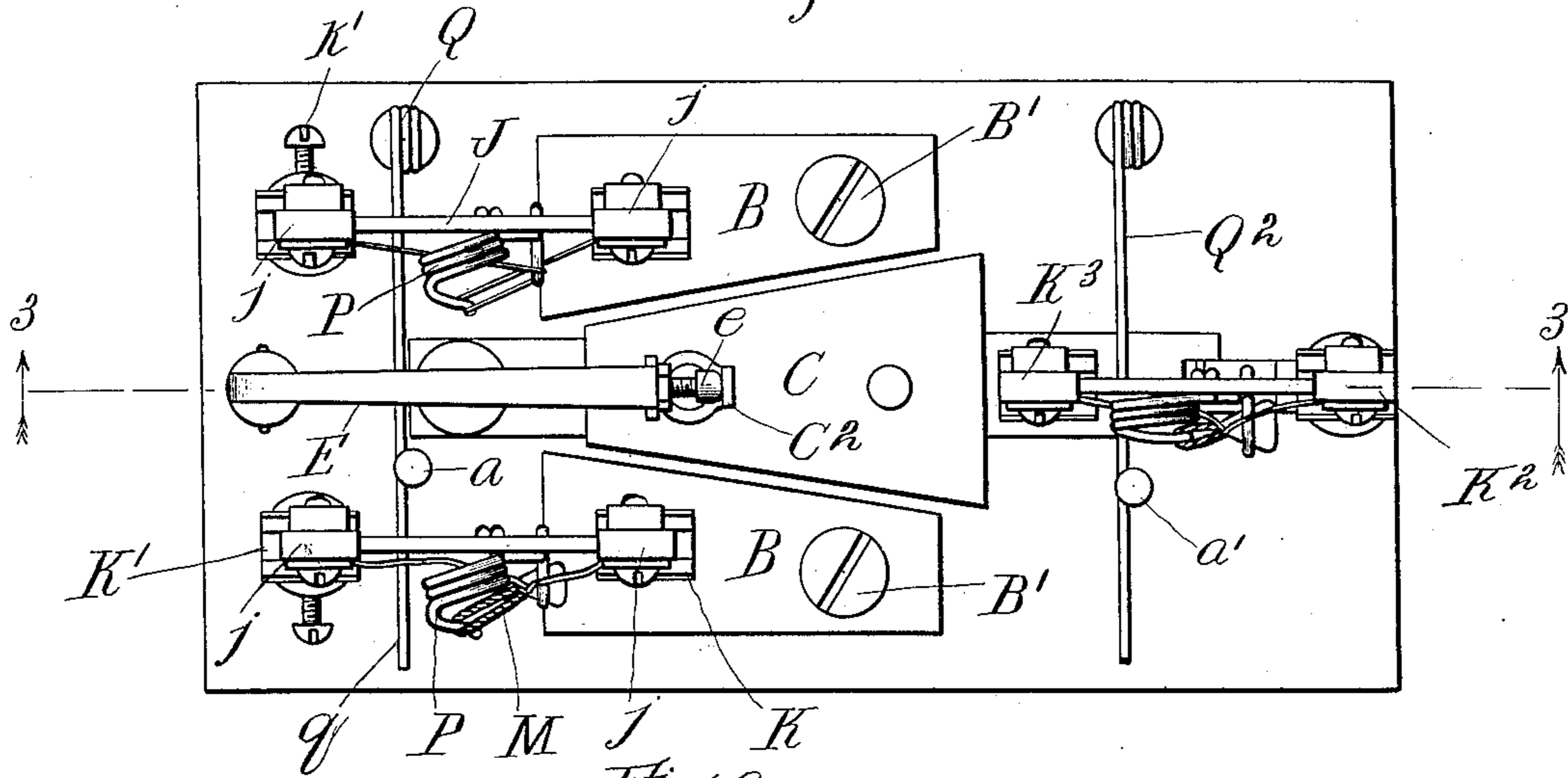


Fig. 6.

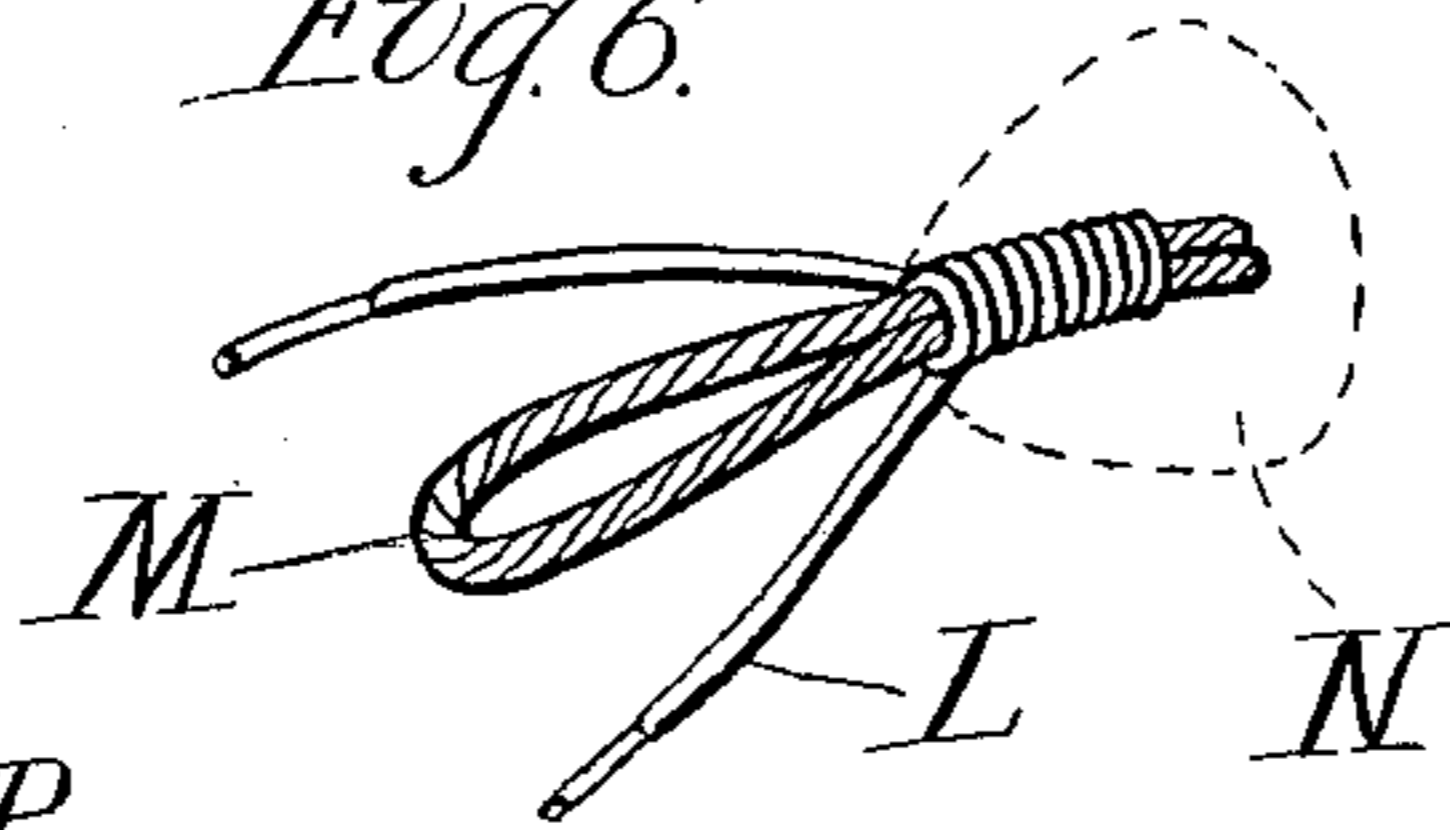
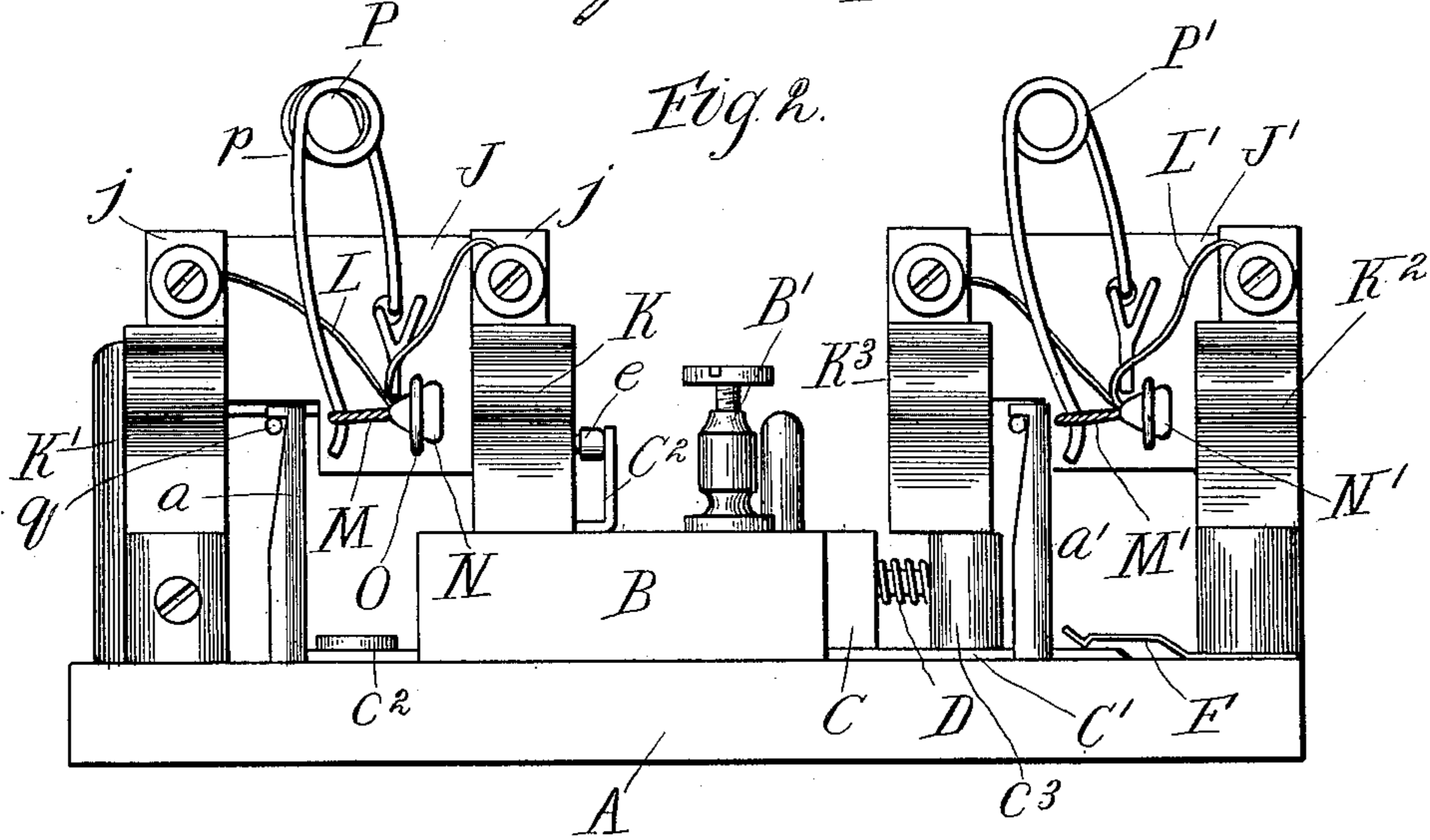


Fig. 2.



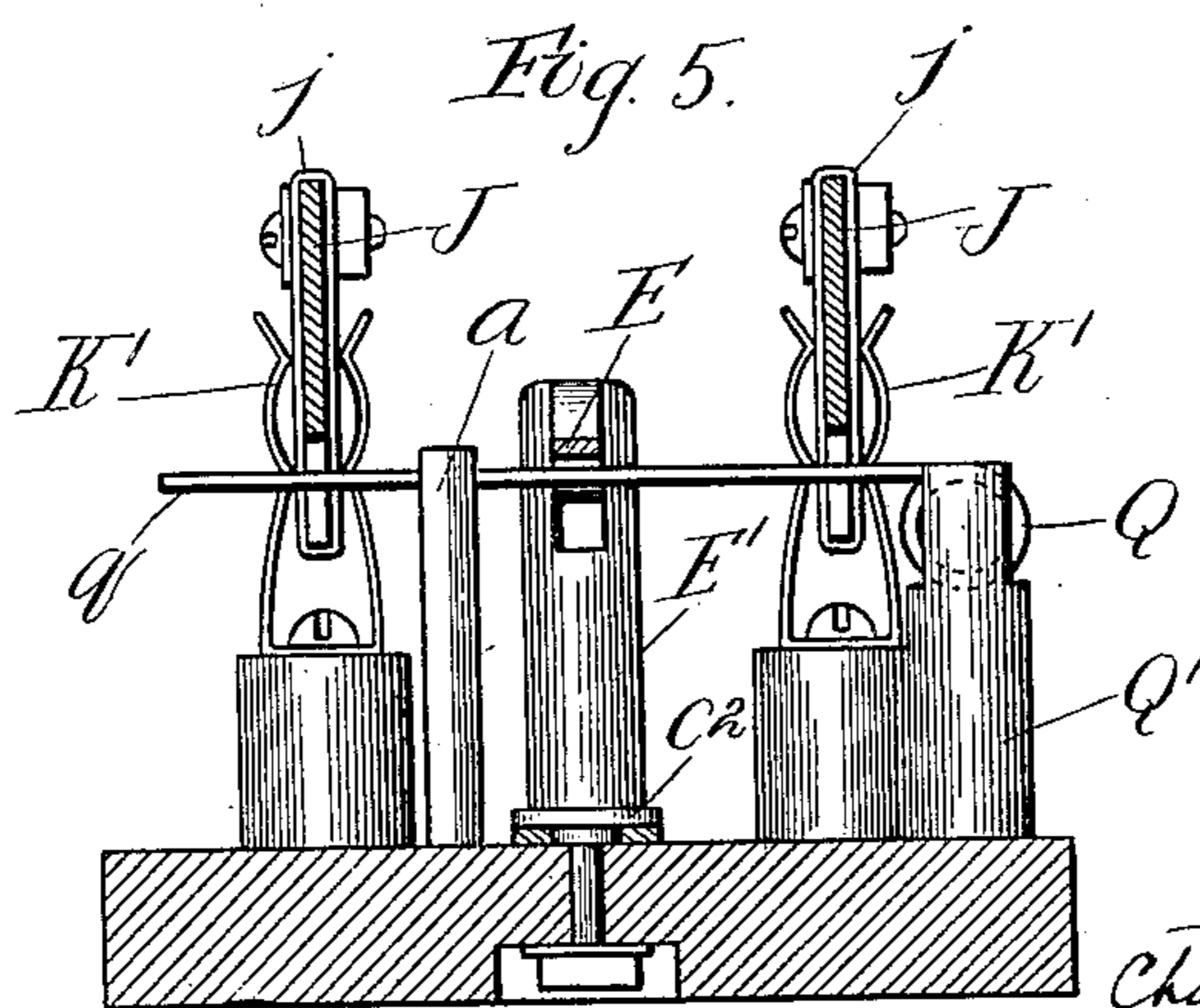
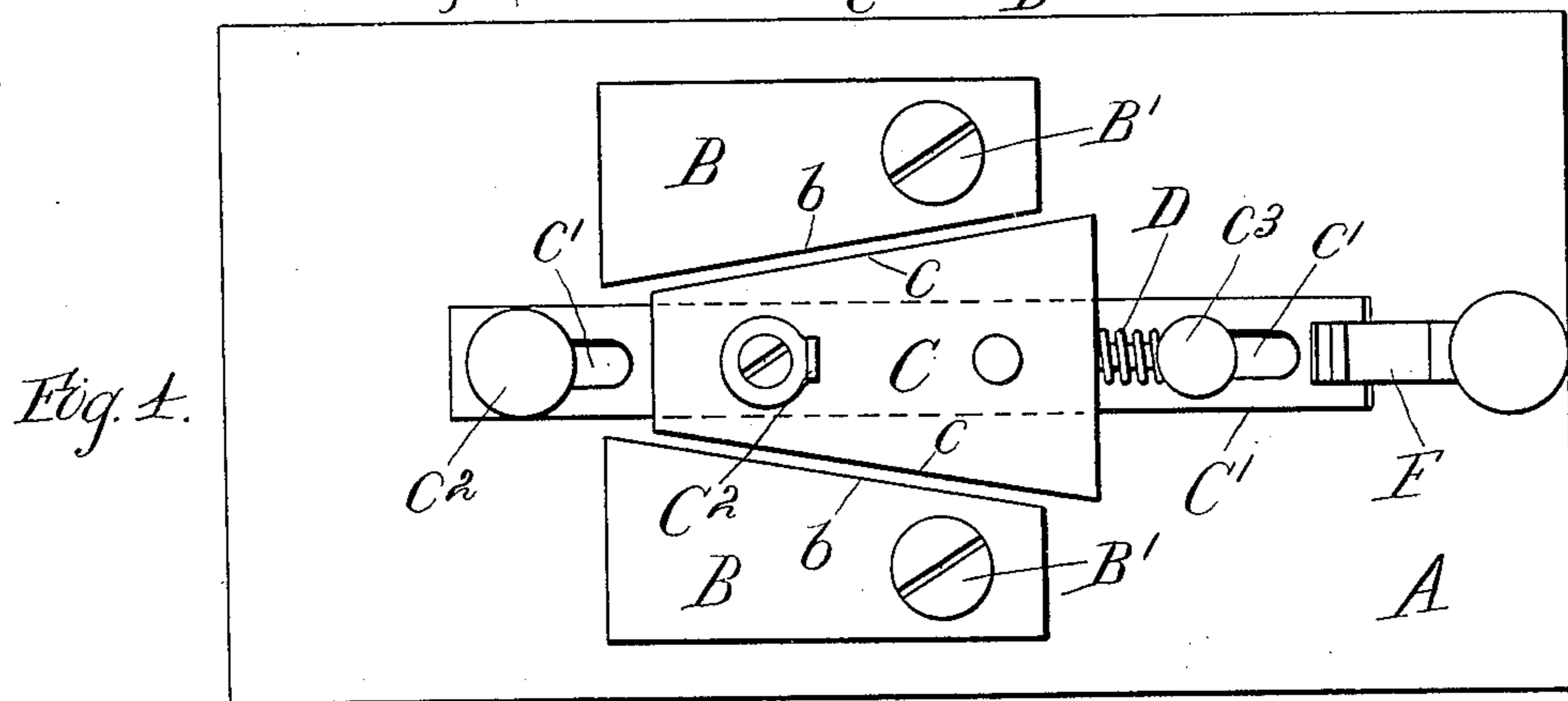
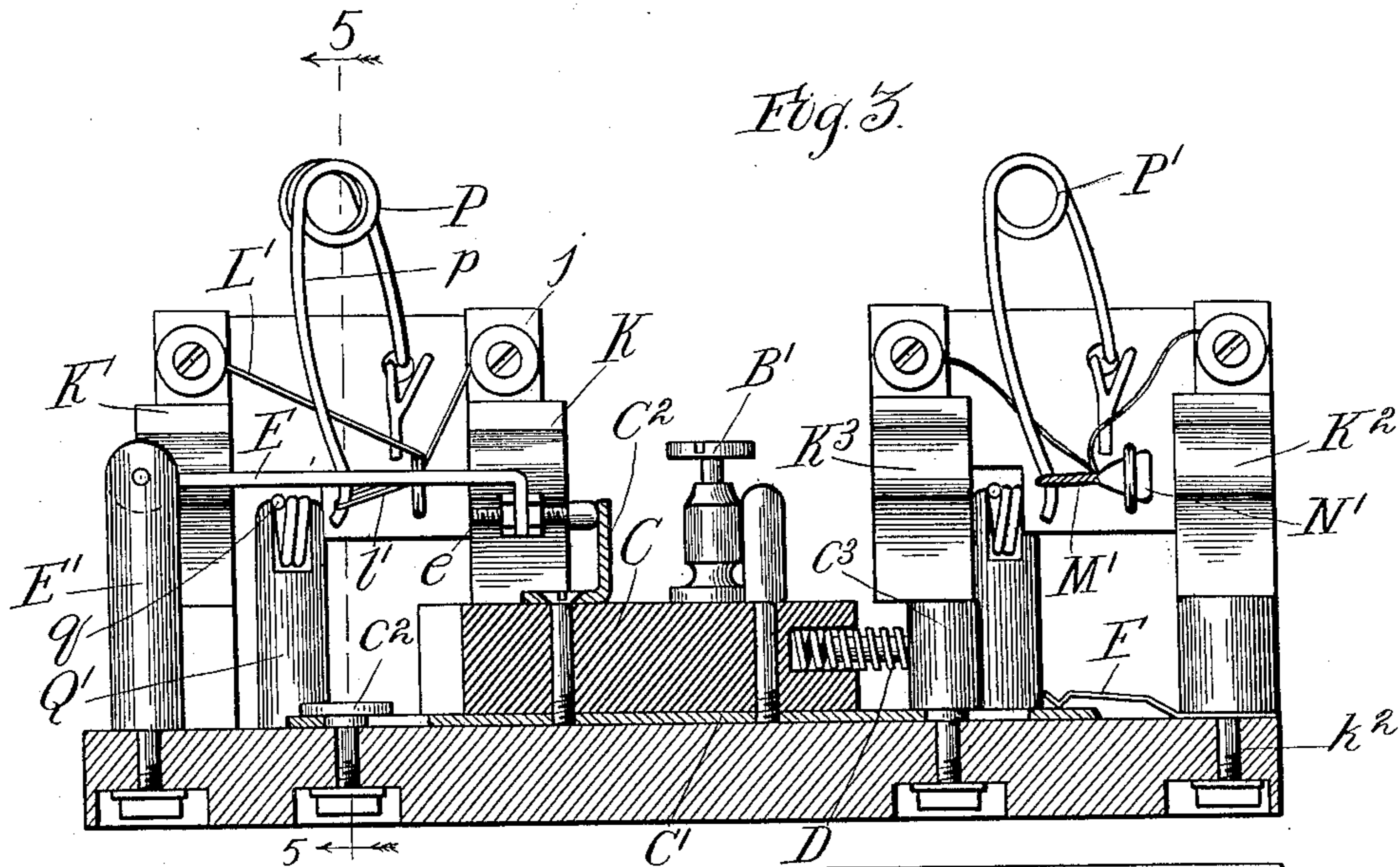
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UNITED STATES PATENT OFFICE.

CHARLES A. ROLFE, OF CHICAGO, ILLINOIS.

ELECTRICAL PROTECTOR.

SPECIFICATION forming part of Letters Patent No. 591,426, dated October 12, 1897.

Application filed January 11, 1897. Serial No. 618,794. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. ROLFE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electrical Protectors, of which the following is a specification.

My invention relates to electrical devices adapted for cutting out or removing electrical instruments or appliances from the line upon the passage therein of an excessive or unduly strong current and having a ground-circuit arranged to connect the line with the earth after the instrument has been cut out or removed therefrom.

The principal object of my invention is to prevent injury either to the line or to other instruments connected thereto, or to the dynamo or generator supplying electrical energy to the line, by the passage of unduly strong currents through the ground-circuit after the instrument has been cut out and the line connected to earth.

To the attainment of the foregoing and other useful ends my invention contemplates the provision, in connection with a cut-out for cutting out or removing the instrument from the line, of a cut-out for breaking or opening the ground-circuit upon the passage therein of an unduly strong current and of means for including the ground cut-out in the ground-circuit after the operation of the line cut-out. By such arrangement, after the instrument has been removed from the line and the latter grounded an excess of current in the ground-circuit operates to break or open the same. The line and ground cut-out devices and the means for including the ground cut-out in the ground-circuit could be of any suitable construction. As a preferred arrangement and also as a matter of further improvement, however, I employ for the line cut-out a cut-out arrangement similar to the one illustrated and claimed by me in my application for Letters Patent of the United States filed July 16, 1896, and serially numbered 599,404, and employ as the ground cut-out a cut-out device for which I have secured Letters Patent of the United States No. 538,284, dated April 30, 1895.

In the accompanying drawings, Figure 1 is a top plan of a protector embodying my in-

vention. Fig. 2 is a side elevation of the same. Fig. 3 is a section taken on line 3 3 in Fig. 1. Fig. 4 is a top plan of a portion of the device. Fig. 5 is a section taken on line 5 5 in Fig. 3. Fig. 6 is a detail view of a fusible button employed as a preferred means of causing the operation of the device by an unduly strong current.

As illustrated in the drawings, the various parts of the protector are mounted on the base A, which may be composed of hard rubber, slate, or similar insulating material. Situated upon this base A, in accordance with the invention described in my said application, are the conductors B B, Fig. 4, having suitable binding-posts B' B' for connection with the terminals of the line, and between the conductors B B is the third conductor C, all of said conductors being desirably composed of carbon. The conductors B B, which are secured to the base A, have inclined edges *b b*, and the conductor C, which is movable with respect to the base A, is tapering or wedge-shaped, so as to fit between the conductors B B and make good contact therewith at the sides *c c*. To such end the conductor C has a sliding connection with the base A, the connection shown consisting of the metal plate C', secured thereto and having slots *c'*, which serve as guideways for the screws *c*² and *c*³, which are screwed into the base A.

As a preferred means of causing the conductor C to move into contact with the conductors B B and also for simultaneously cutting the instrument out of circuit, I have shown substantially the arrangement described in my said application, although it is obvious that I could employ other devices for this purpose. Such arrangement consists in subjecting the conductor to a spring or the like tending to move it into contact with the conductors B B, including in each leg of the circuit extending between the conductors B B and the terminals of the instrument to be protected a cut-out device adapted to be operated by an excessive current in the circuit. One of said devices, as explained in my said application, is designed to be affected by so-called "sneak" currents and the other by a sudden excess of current, and each is arranged so that when it alone is actuated the

whole device operates to cut out the instrument and to close the line across the terminals of the same by moving the conductor C into contact with the conductors B B.

5 In Fig. 3 the conductor C is shown subject to the spring D, tending to force it into contact with the conductors B B and provided with a removable stop in the form of the lever E, which is pivotally connected to the
10 post or standard E' on the base A and adapted to oppose the force exerted on the conductor C by the spring D. To such end the conductor C is provided with a projection C², which forms a shoulder against which the end of the
15 lever E can abut, the lever E being for the purposes of adjustment provided with an adjusting-screw *e*. When the lever E is swung upward, the conductor C is free to move and is forced by the spring D between and into
20 contact with the conductors B B, whereby the circuit is closed across the terminals of the instrument being protected.

The cut-out devices mentioned as being included in the sides of the operating-circuit
25 between the conductors B B and instrument terminals for cutting out the instrument simultaneously with the closing of the circuit across the same are best shown by reference to Figs. 2 and 3. Both comprise a
30 plate J, composed of non-conducting material and provided with metal end pieces *j*, which are held within and in contact with a pair of spring-metal jaws K K', one of which latter, K, is secured to and in contact with a
35 conductor B, and the other, K', is secured to the base A and provided with a binding-screw *k'*, a spring P, secured upon the non-conducting plate J and having a spring-arm
40 *p*, and means for holding the spring-arm *p* in tension, said means being adapted to release the spring-arm *p* when the current becomes excessive. In the device particularly de-
45 signed for actuation by sneak currents (see Fig. 2) the means for holding the spring-arm *p* in tension *c* consists of a hoop or loop M, (see Fig. 6,) which engages the spring and has its shank wrapped with a portion of the
50 fine or high-resistance wire L, bridging the space between the metal end pieces *j* and embedded in a mass of fusible material or a fusible button N, which latter extends
55 through and is held in place by an eye O, secured to the plate J. The metal jaws K K', the metal plates *j*, held by said jaws, and the wire L are all included in the circuit. Hence when an unduly strong current trav-
60 erses the circuit the heat developed in the fine wire will fuse the button and thereby liberate the hoop or loop to which said wire is attached, and thereupon the spring-arm
65 engaging the hoop or loop will move in a direction to cause a sudden strain upon and a consequent rupture of the fine wire, which will usually break the circuit. For this arrange-
ment I have obtained Letters Patent of the United States No. 538,284.

In the other device, designed particularly

for sudden increases of current, the means for retaining the spring-arm *p* in tension
70 consists of a loop of fusible wire *l'*, Fig. 3, which engages the spring-arm, said loop being formed of a portion of the fusible wire L', which bridges the metal end pieces *j*, and being retained in engagement with the spring-
75 arm *p* by an eye O, secured to the plate J. Obviously the fusion of the fusible wire L' at any point in its length releases the spring-arm *p*.

As an arrangement by which the release of
80 either spring-arm *p* operates to swing the lever E upward to liberate the conductor C a second spring Q, having an arm *q*, is secured to the post or standard Q' on the base A and is situated so that its arm *q*, which is nor-
85 mally under tension by the catch or hook *a*, lies in the path of both of the spring-arms *p* and extends under the lever E, whereby the release of either spring-arm *p* liberates the
spring-arm *q* from the catch *a*, whereupon
90 said spring-arm *q* flies upward and swings the lever E upward out of engagement with the shoulder on the conductor C. The spring-arm *q* is also arranged to extend under the
plates J, which are removably held in circuit
95 by the metal jaws K K', and hence the spring-arm *q* when liberated also throws or kicks the plates J out of their jaws K K' and therefore out of circuit. It is obvious that both
the springs P on the plates J could be held
100 in tension by fusible buttons or both by loops of fusible wire, but I prefer the arrangement shown; also, that the end of the spring-arm *q*
could be arranged to serve as a stop for the
conductor C; but the interposition of the
105 lever E is preferable, for the reason that the spring Q can be situated across the end of the device, so as to lessen its length.

The conductor C has a ground connection which is normally direct and of low resist-
110 ance, but which includes in series when the instrument is cut out and the line short-circuited across the same a cut-out device that will operate to break the circuit and thereby
disconnect the line from the earth. As a
115 simple and efficient arrangement for this purpose I have shown a fusible-button cut-out device similar to that hereinbefore described, comprising the plate J', removably held in the
jaws K² and K³ and having secured thereto
120 the spring P', which is held in tension by the loop M', terminating in the fusible button N', and the spring Q², held in tension by the catch
a' and arranged to be liberated by the re-
125 lease of spring P', so as to throw plate J' out of the jaws K² and K³. Instead, however, of including this fusible cut-out normally in the
ground-circuit it is by preference arranged to be included therein only after the device
has operated to cut out the instrument and
130 short-circuit the line, as previously described. To such end the metal post supporting the
jaw K² is provided with a spring-contact
piece F, and the metal strip C', attached to
conductor C, is constructed of suitable length,

so as to extend under and make contact with the contact-piece F when the conductor C is held out of contact with the conductors B B by the lever E and to be separated therefrom after the conductor C has been released and has made such contact. The screw c^3 , which serves as a guide for the strip C', is desirably formed integral with the jaw K³, and thus serves also as a connection between the strip C' and jaw K³. By such arrangement lightning normally passes from the line to conductor C, and thence to the ground by means of the strip C', contact-piece F, and suitable connection, which, it is understood, is attached to the screw k^2 of the jaw K². However, after the liberation of the conductor C and its movement into contact with conductors B B the end of strip C' is withdrawn from under the contact-piece F, thereby compelling any current escaping to the earth to leave conductor C by means of the strip C', metal jaw K³, fine wire L', and jaw K². Hence any excess of current in the ground-circuit will fuse the fusible button N', which will result in the plate J' being thrown out of its cooperating contacts by the spring Q', as previously described, whereby a portion of the ground-circuit will be thrown out of circuit and the line disconnected from earth.

What I claim is—

1. A protector comprising a cut-out for removing the instrument from the line; a ground-circuit provided with a cut-out operating upon an excess of current therein; and means for including the ground cut-out in the ground-circuit after the operation of the line cut-out.

2. A protector comprising a cut-out for removing the instrument from the line; means for bridging the break caused by such removal; a ground-circuit provided with a cut-out operating upon an excess of current therein; and means for including the ground cut-out in the ground-circuit after the operation of the line cut-out.

3. A protector comprising a cut-out consisting of a couple of removable sections of conductor arranged for bodily removal from the circuit for removing the instrument from the line; a ground-circuit provided with a cut-out operating upon an excess of current therein; and means for including the ground cut-out in the ground-circuit after the operation of the line cut-out.

4. A protector comprising a cut-out for removing the instrument from the line; a ground-circuit provided with a cut-out consisting of a section of removable conductor arranged for bodily removal upon the passage of an excess of current in the ground-circuit; and means for including the ground cut-out in the ground-circuit after the operation of the line cut-out.

5. In a protector having means for automatically cutting the instrument to be protected out of the operating-circuit, and for

bridging the break caused by such removal of the instrument; a ground-circuit provided with a cut-out device which is arranged for inclusion in such circuit after the operation of the protector to cut out and bridge the instrument, said device comprising a removable holder for a fine or high-resistance wire, a mass of fusible material having embedded therein a coil formed of a portion of such high-resistance wire and a spring normally held in tension and arranged to throw the movable holder out of its cooperating contacts upon the fusion of the mass of fusible material, substantially as described.

6. In a protector constructed with a couple of conductors adapted for inclusion in the operating-circuit on either side of the instrument to be protected, a third conductor arranged to connect the other two conductors and subject to a spring tending to bring about such connection, a movable stop normally opposing the action of said spring, and means for simultaneously removing said stop and cutting out the instrument from circuit when the current therein becomes excessive; a ground-circuit terminating in the third conductor and provided with a cut-out device which is arranged for inclusion in such circuit after the connection of the pair of conductors by the third, said device comprising a removable holder for a fine or high-resistance wire, a mass of fusible material having embedded therein, a coil formed of a portion of such high-resistance wire, and a spring normally held in tension and arranged to throw the movable holder out of its cooperating contacts upon the fusion of the mass of fusible material substantially as set forth.

7. In a protector constructed with a couple of conductors adapted for inclusion in the operating-circuit on either side of the instrument to be protected, a third conductor arranged to connect the other two conductors and subject to a spring tending to bring about such connection, a movable stop normally opposing the action of said spring, and a couple of cut-out devices situated to be included in the sides of the circuit between said pair of conductors and the terminals of the instrument, each of said devices comprising a movable holder having secured thereto a spring which is held in tension in one device by a fusible button containing a coil of fine or high-resistance wire, and in the other by a loop of fusible wire, both of said springs being arranged to liberate when released themselves, a kicker-spring which is normally held in tension and which is situated to throw the movable holders out of their cooperating contacts and to withdraw the stop from the third conductor when freed by either of said springs; a ground-circuit terminating in the third conductor and provided with a cut-out device which is arranged for inclusion in such circuit after the connection of the pair of conductors by the third,

said device comprising a removable holder for a fine or high-resistance wire, a mass of fusible material embedded therein, a coil formed of a portion of such high-resistance
5 wire, and a spring normally held in tension and arranged to throw the movable holder out of its cooperating contacts upon the fusion of the mass of fusible material, substantially as described.

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