(No Model.) 2 Sheets—Sheet 1.

P. NORDMANN.

SAFETY CUT-OUT APPARATUS FOR NETWORKS OF MULTIPLE ELECTRICAL CONDUCTORS.

No. 497,680. Patented May 16, 1893.

Fig: 1.

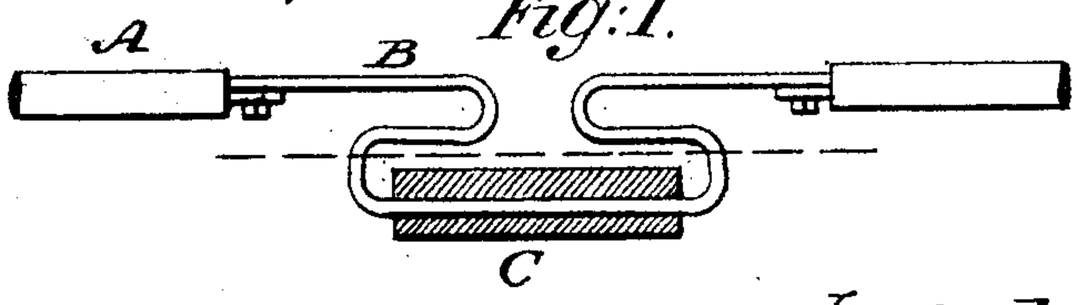


Fig: 1a.

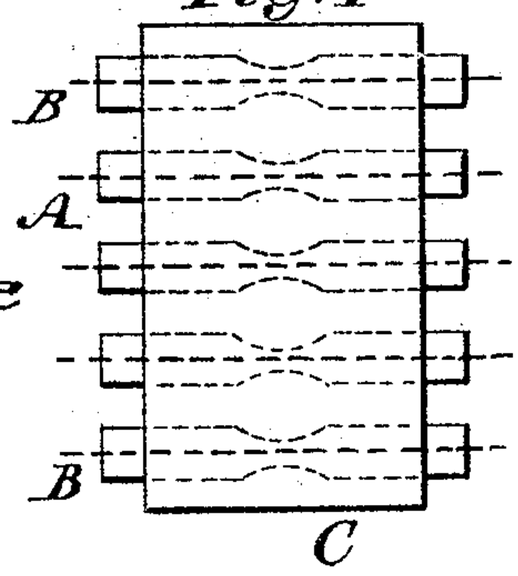


Fig: 2.

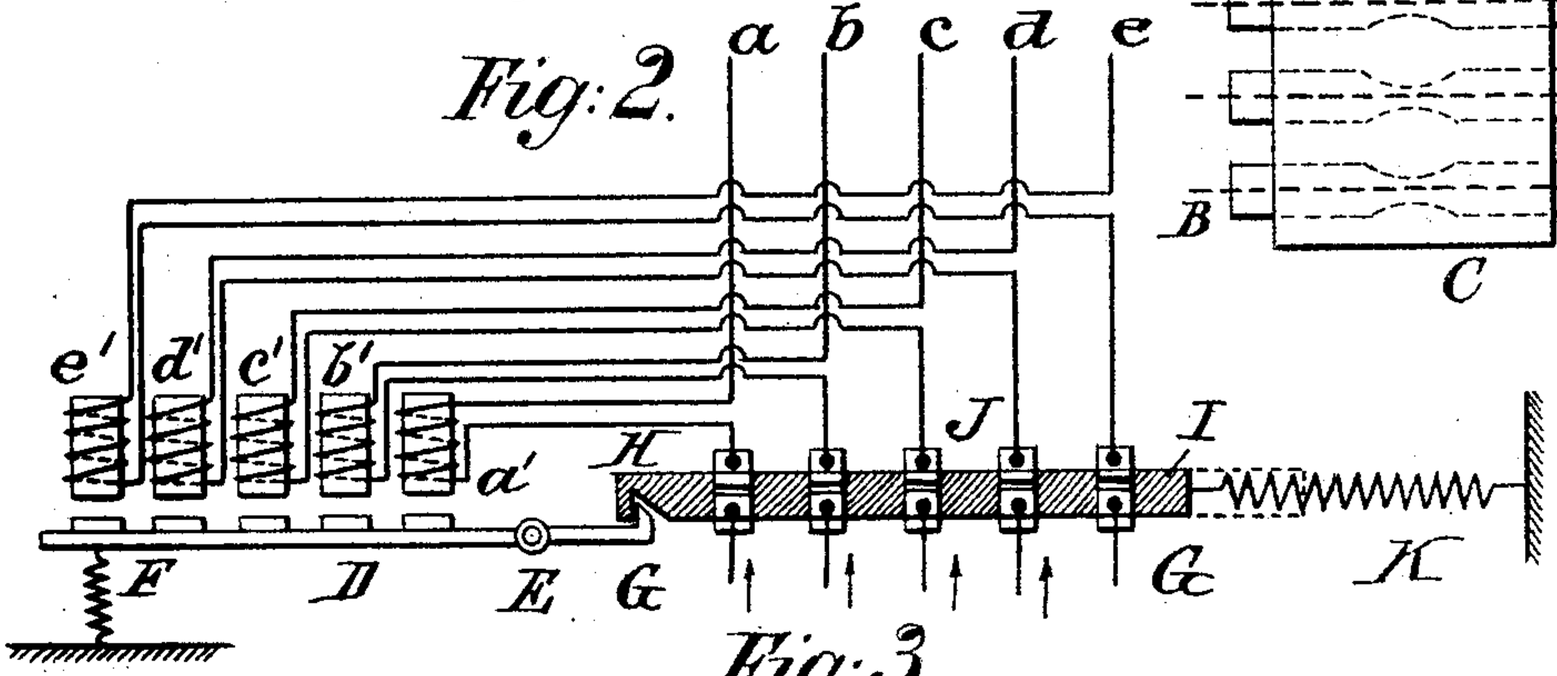


Fig: 3.

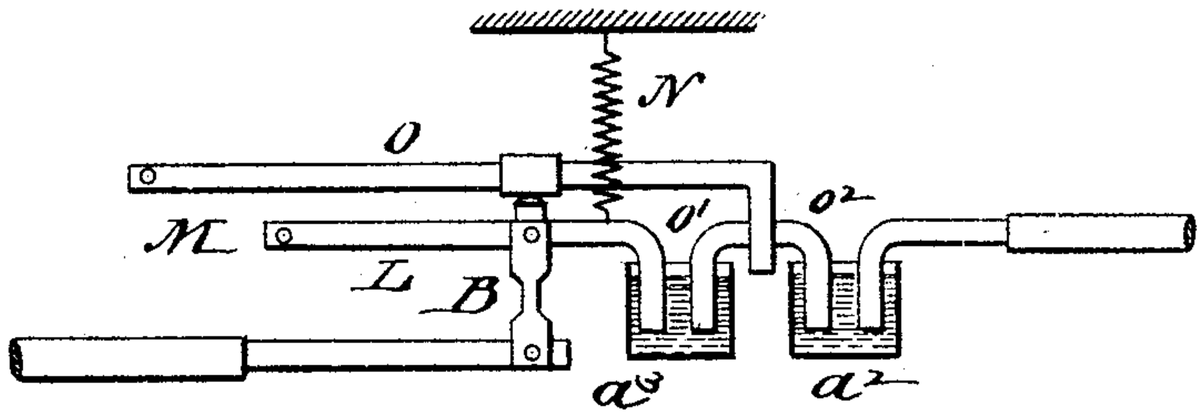
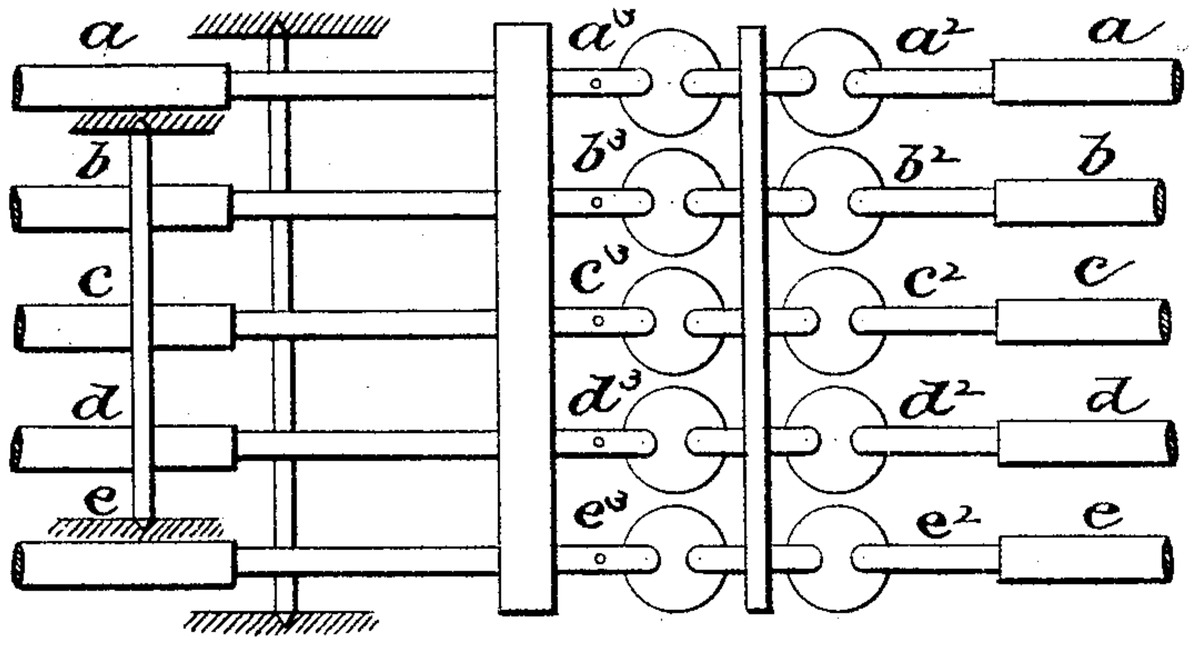


Fig: 3a.



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(No Model.) 2 Sheets—Sheet 2.

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SAFETY CUT-OUT APPARATUS FOR NETWORKS OF MULTIPLE ELECTRICAL CONDUCTORS.

No. 497,680. Patented May 16, 1893.

Fig. 4.

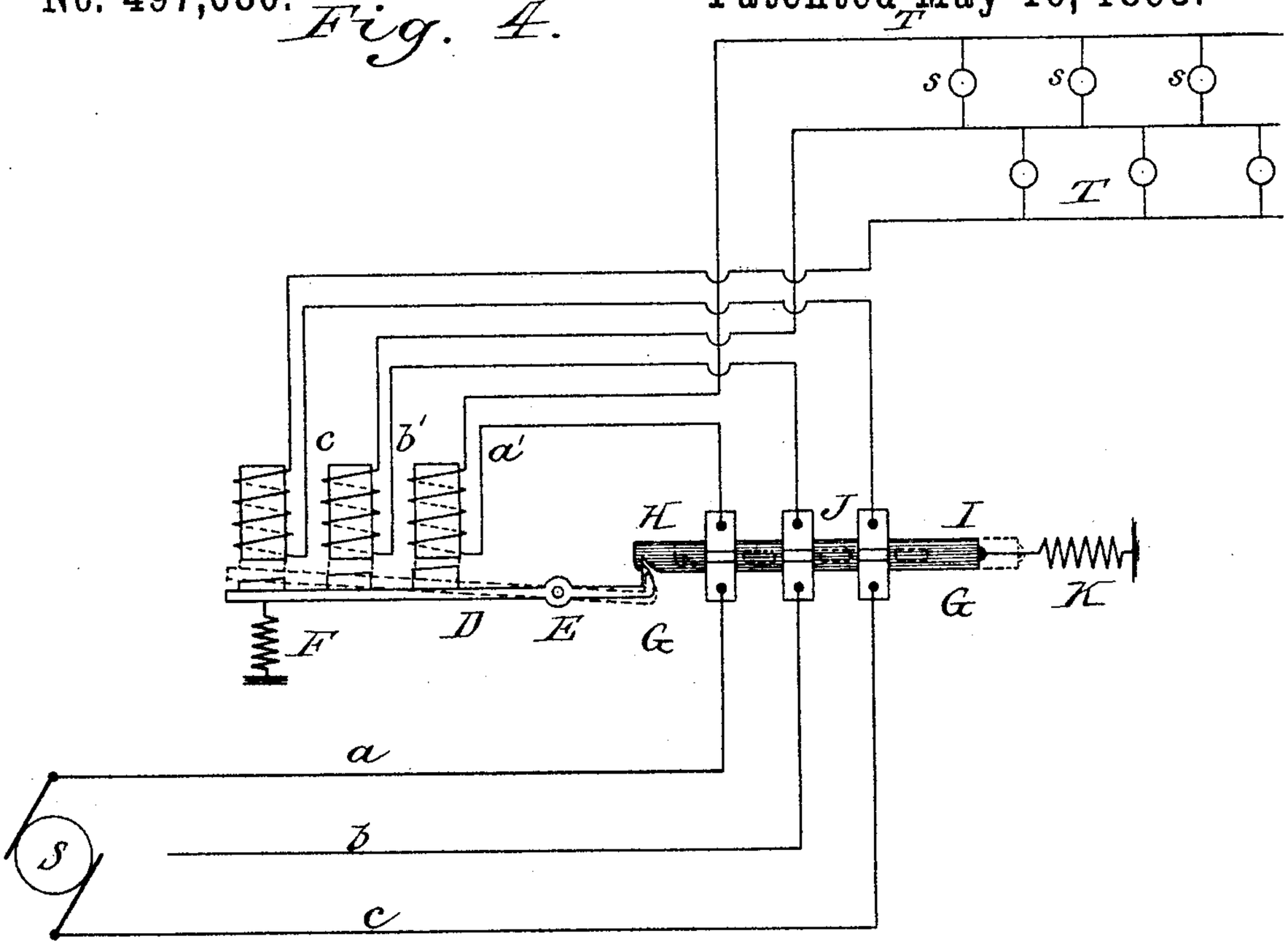
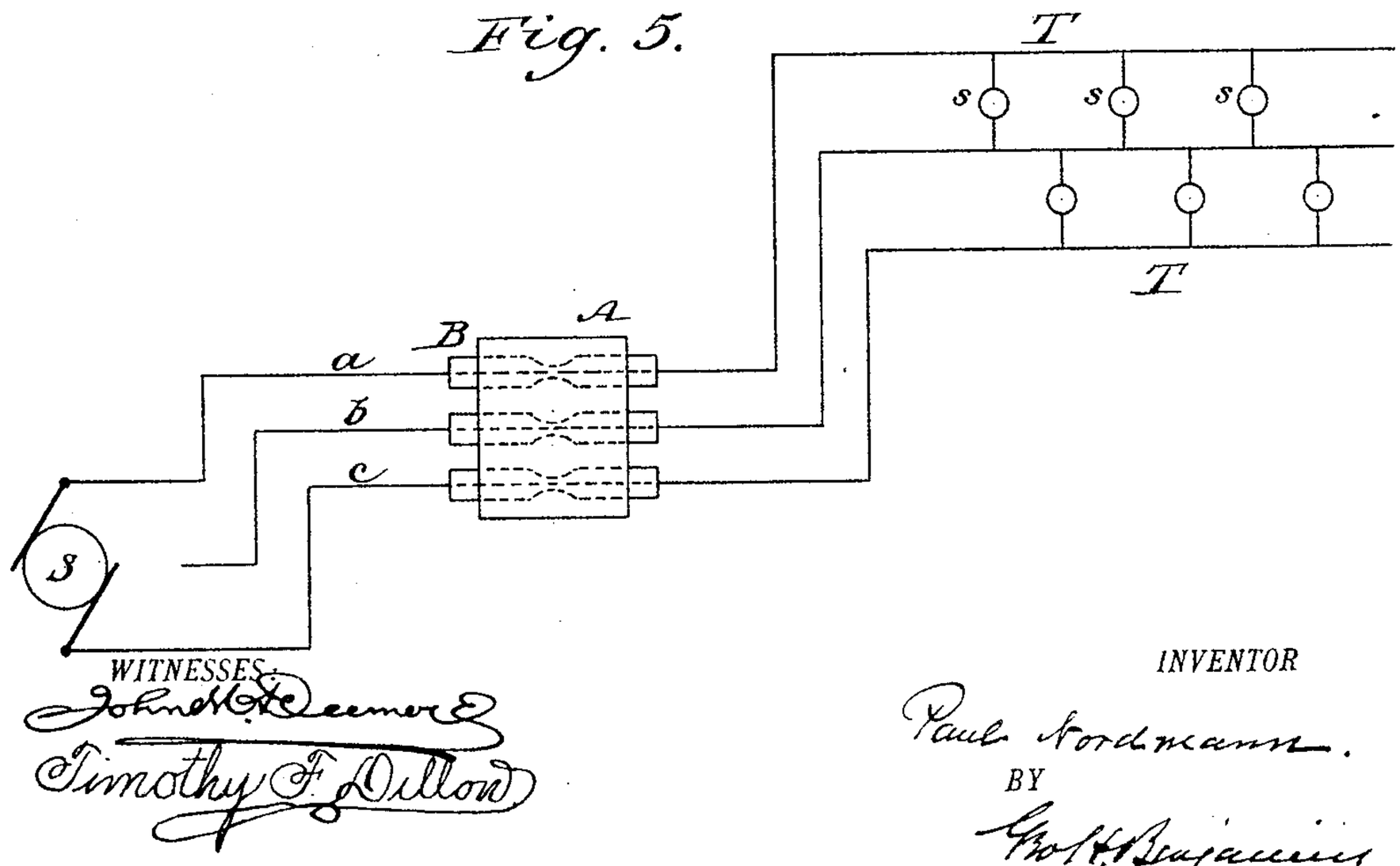


Fig. 5.



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SAFETY CUT-OUT APPARATUS FOR NETWORKS OF MULTIPLE ELECTRICAL CONDUCTORS.

SPECIFICATION forming part of Letters Patent No. 497,680, dated May 16, 1893.

Application filed November 25, 1892. Serial No. 453,015. (No model.) Patented in Germany September 7, 1889, No. 53,534; in France December 28, 1889, No. 195,045; in Austria-Hungary April 18, 1890, No. 17,798 and No. 41,346; in Italy April 22, 1890, No. 27,351; in Belgium April 26, 1890, No. 90,329; in England November 16, 1890, No. 18,343, and in Switzerland December 19, 1890, No. 528/73.

To all whom it may concern:

Be it known that I, PAUL NORDMANN, a subject of the King of Prussia, German Emperor, residing at the city of Berlin, in the German Empire, have invented new and useful Improvements in a Safety Cut-Out Apparatus for a Network of Multiple Electrical Conductors, (for which I have obtained Letters Patent as follows: in Germany, No, 53,534, dated September 7, 1889; in France, No. 195,045, dated December 28, 1889; in Belgium, No. 90,329, dated April 26, 1890; in Italy, No. 27,351, dated April 22, 1890; in Switzerland, No. 528/73, dated December 19, 1890; in England, No. 18,343, dated November 16, 1890; in Austria, No. 17,798, dated April 18, 1890, and in Hungary, No. 41,346, dated April 18, 1890,) of which the following is a specification.

My invention relates to means for automatically breaking the circuits of all of the conductors of a multiple conductor system, when the current in any one conductor exceeds a predetermined amount. When two electrical conductors between which a dynamo-electric machine is inserted come in contact, thereby establishing a short circuit, the current produced by means of the machine becomes of undue strength, and may produce combustion of surrounding objects through the overheating of the conductors. In order to prevent this, fusible safety strips have been introduced in the circuit of the individual conductors, which melt or burn as soon as the current transmitted by the conductor exceeds a certain strength, and thus interrupt the circuit before overheating has taken place. This arrangement, however, does not hold good in a system of distribution with multiple conductors wherein the lamps or other translating devices are in parallel between pairs of the conductors, and in parallel series between the two outermost conductors. If, in such a system of distribution, two of the conductors come in contact, the resistance produced by the lamps or other translating devices between these conductors is reduced to zero, while that of the lamps in the other groups remains the same. Or, in other words, the whole resistance interposed between the external conductors connected to the dynamo machine will be reduced by the amount of the resistance of the lamps or translating devices in circuit between the two conductors in contact. In such a case, the strength of the current transmitted to the remaining group of lamps or other translating devices (three-wire system), or groups of lamps or other translating devices in series (four or five wire system) will be increased: but such increase will not be sufficient to be dangerous, so far as regards setting fire to surrounding objects, but will act destructively upon the lamps or translating devices through which it is transmitted.

To obviate the objections, as stated, I provide means whereby when the current transmitted through any one of the conductors of the system exceeds the normal amount, the circuit of all the conductors of the system will be automatically broken.

In the accompanying drawings which illustrate my invention, I have shown three different ways of automatically breaking the circuit of all the conductors of the system.

In the drawings, Figures 1 and 1ª show in longitudinal section and plan the arrangement employed for rupturing the circuit by means of fusible strips. Fig. 2 is an elevation of an arrangement wherein magnets are included in the separate circuits, and which serve, when any one of them is actuated, to break the circuits of all the conductors. Figs. 3 and 3ª show in elevation and plan, an arrangement of a mechanical device, fusible strips, and mercury cups for accomplishing the desired result. Figs. 4 and 5 diagrammatically represent two forms of devices for automatically breaking the circuit of all of the conductors, when the current in any one of the conductors exceeds a predetermined amount, applied to a three-wire system.

Referring first to Figs. 1 and 1ª: A indicates a conductor between the ends of which is included a strip of fusible metal B, embedded in a body of non-conducting combustible material C, such for instance, as powdered cork and linseed oil dried, or a material otherwise

known as linoleum. Any suitable non-conducting combustible material may be employed.

In Fig. 1ª, the strips of a five-wire system are shown embedded in a similar body of non-conducting combustible material.

The operation of my invention is as follows: If a fusible strip B in any one of the conductors A is heated by the transmission of an excessive current, it will cause the ignition of the combustible body C. This, in burning, will melt all of the strips B of the five conductors, thereby rupturing the circuit of all of these conductors.

In Fig. 2, *a b c d e* represent the main conductors of a five-wire system. In each of these conductors is included an electro-magnet *a' b' c' d' e'*. D represents an armature pivoted at E, and normally held in the position shown by means of a spring F, and provided at one end with a hook G, which takes under a recess H, in a plate of insulating material I, on which are contact plates J which, when the plate I is in the position shown, complete the circuits between the divided ends of the conductors *a b c d e*. K is a coiled spring connected to the end of the plate I. The operation of the device is simple. Any increase of current in any one of the conductors *a b c d e* will cause the electro-magnet included in the circuit to attract the armature D, to release the plate I, which is retracted by the spring K, and therefore break the circuit through all of the conductors *a b c d e*.

Another arrangement is shown in Fig. 3. One end of each conductor *a b c d e* dips into a mercury cup a^2 b^2 c^2 d^2 or e^2. The opposite end of each of the conductors is connected through fusible strips B with the rods L, pivoted at M and dipping into a mercury cup a^3 b^3 c^3 d^3 or e^3. These pivoted portions are connected to coiled springs N. Laying over the rods L is another series of rods O, which carry on their ends the dependent portions O' O^2 which dip into the respective mercury cups a^3 a^2.

The operation of this device is as follows: If an excessive current is sent through any one of the conductors *a b c d e*, the fusible strip B therein will melt, in which case the rods L are drawn upward by the spring N, and acting on the rod O, break the circuits of all the conductors by lifting the dependent portions O' O^2 out of the mercury cups a^3 a^2.

In Figs. 4 and 5, S indicates a dynamo-electric machine, and *s*, lamps connected in parallel of the conductors and in parallel series with each other.

I wish it understood that I do not limit myself in any wise to the various means shown and described for rupturing the circuit of all of the conductors of a multiple system, when the current in any one of the conductors exceeds a predetermined amount, as very many devices can be made for the purpose which will embody the intent of my invention.

Having thus described my invention, I claim—

1. The combination of the conductors of a multiple conductor system, and means normally inactive, but energized when the current in any one of said conductors exceeds a predetermined amount, to rupture the circuit of all of said conductors.

2. A system of electrical distribution, comprising three or more conductors, lamps or other translating devices in parallel of two of said conductors and in parallel series with each other, and means normally inactive, but energized when the current in any one of said conductors exceeds a predetermined amount, to rupture the circuit of all of said conductors.

3. A system of electrical distribution, comprising a source of electric energy, three or more conductors, two of which are connected to the terminals of said source of electricity, lamps or other translating devices in parallel of two of said conductors and in parallel series with each other and the conductors connected with the source of energy, and means normally inactive, but energized when the current in any one of said conductors exceeds a predetermined amount, to rupture the circuit of all of said conductors.

4. In combination with a dynamo-electric machine and with the conductors of a multiple conductor system, of fusible safety strips in circuit with each of said conductors, and a body of non-conducting combustible material enveloping said safety strips.

5. The combination with two or more conductors, of fusible safety strips in circuit with each of said conductors, and a body of non-conducting combustible material enveloping said safety strips.

In testimony whereof I have affixed my signature in the presence of two witnesses.

PAUL NORDMANN.

Witnesses:
MAX WAGNER,
GEO. H. BENJAMIN.