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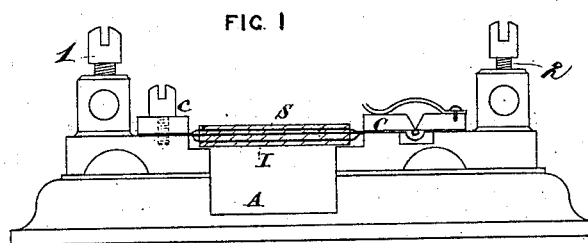
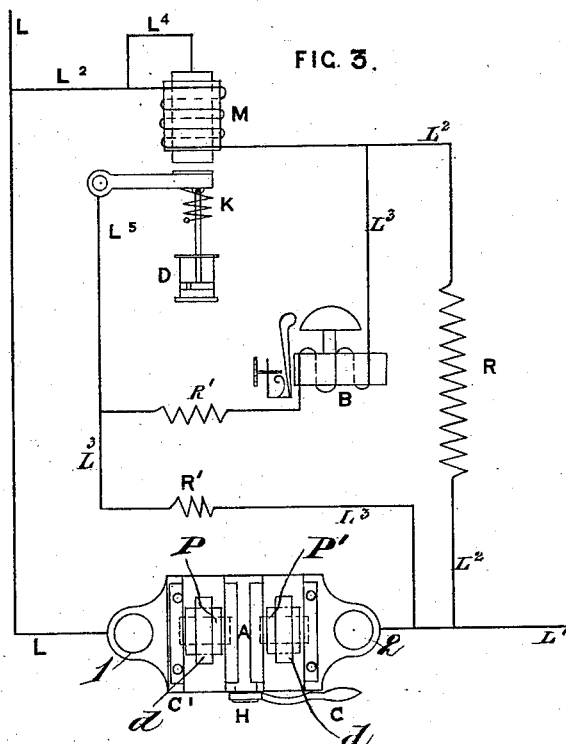
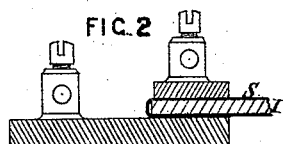
2 Sheets—Sheet 1.

K. W. HEDGES.

ELECTRICAL SAFETY APPLIANCE.

No. 302,485.

Patented July 22, 1884.



Witnesses.

Vinton Goube

Robert Everett.

Inventor

Killingworth W. Hedges.

By James L. Norris,
Att'y.

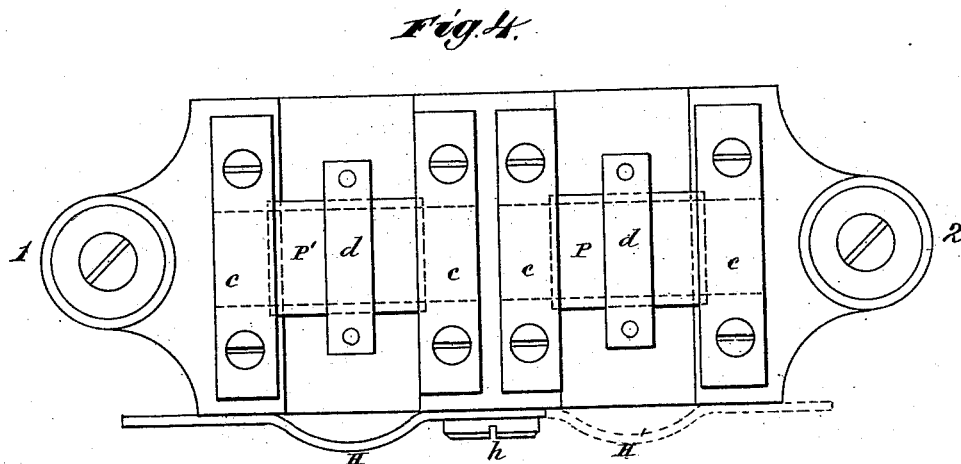
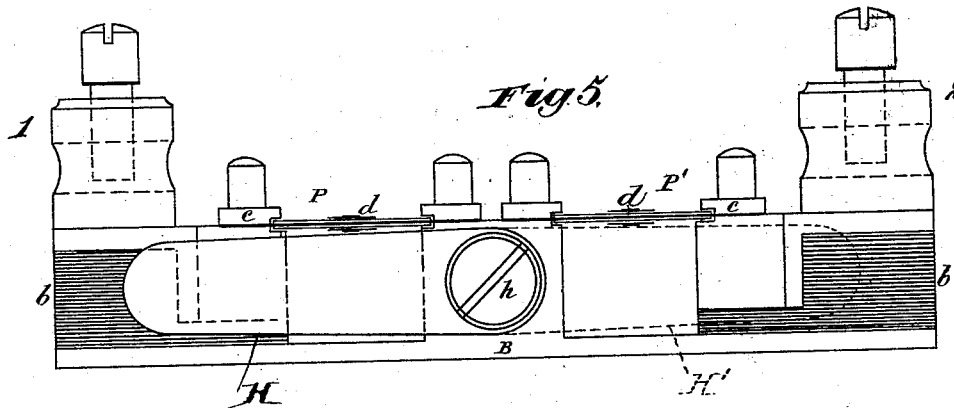
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2 Sheets—Sheet 2.

K. W. HEDGES.
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No. 302,485.

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Witnesses.

Victor Douma

Robert Everett

Inventor.

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By James L. Norris,
Atty.

UNITED STATES PATENT OFFICE.

KILLINGWORTH WILLIAM HEDGES, OF WESTMINSTER, COUNTY OF MIDDLESEX, ENGLAND.

ELECTRICAL SAFETY APPLIANCE.

SPECIFICATION forming part of Letters Patent No. 302,485, dated July 22, 1884.

Application filed November 7, 1883. (No model.) Patented in England August 22, 1882, No. 4,025, and February 9, 1883, No. 719.

To all whom it may concern:

Be it known that I, KILLINGWORTH WILLIAM HEDGES, a citizen of England, residing at Westminster, in the county of Middlesex, England, have invented an Improvement in Electrical Safety Appliances, (for which I have obtained patents in Great Britain, No. 4,025, dated August 22, 1882, and No. 719, dated February 9, 1883,) of which the following is a specification.

In an electrical circuit it is often desirable to introduce a safety plug or appliance, which gives way and breaks the circuit when an excess of electricity passes through it, and such safety appliances have been arranged in conjunction with electric bells or other signals, so as to give an alarm when the breach of circuit takes place.

My invention relates to an arrangement of electric safety-plug in combination with an electric bell and an automatic switch, whereby an audible signal is given when the electricity in a circuit becomes excessive, but before the safety-plug gives way, and whereby a by-pass circuit of moderate resistance is completed when the main circuit is broken by the rupture of the plug.

Figure 1 of the accompanying drawings is a longitudinal section of the safety-plug. Fig. 2 is a part section showing a modification; and Fig. 3 shows, diagrammatically, the arrangement which I adopt in combining it with the alarm and automatic switch. Fig. 4 is a plan view, and Fig. 5 a sectional view, of a double safety-plug.

The safety-plug shown in Fig. 1 consists of several strips, S, of metallic foil separated from each other and inclosed by plates I of mica, or other suitable insulating material that will not be fused by such heat as will fuse the foil. The several strips S are at each end gathered together into clamps C, forming terminals for the conducting-wires. These terminal clamps are so shaped as to raise the safety-plug a little from the base A, so that there is free air-space between the plug and the base, so as to increase the surface exposed to the air for the purpose of preventing them from becoming overheated.

Although I have shown in Fig. 1 three strips of foil S, it is to be understood that there might be a less or a greater number, according to the amount of current that is intended to pass through them. In some cases a single strip of foil inclosed between a pair of mica plates suffices; but generally I prefer to distribute the current over several very thin strips, arranged as shown in Fig. 1, so as to reduce and subdivide as much as possible the mass of metal that has to give way at any point in case of an excess of current. When a double strip suffices, it may be bent around the mica plate at one end, as shown in Fig. 2.

Referring now to Fig. 3, L L' indicate the line of the main circuit, in which is introduced the safety-plug P, which is made double, as hereinafter described, so that if one portion be destroyed by an abnormal current the other portion may be immediately brought into circuit. From the line L there is a by-pass lead, L², through the coil of an electro-magnet, M, and a resistance, R, back to L'. From L² there is also a branch lead, L³, through an electric bell, B, and resistances R' to L', and L² has also a branch lead, L⁴, through the core of the electro-magnet M to the bell B. A movable armature, K, connected by a lead, L⁵, to L² is kept by a weight or spring out of contact with the core of the magnet M. The resistances of the by-pass circuits, including the coils of the magnet and bell and the resistances R and R', are so adjusted that in ordinary working the portion of current which follows these circuits is not sufficient to sound the bell B nor to give the magnet M attractive power enough to move the armature K, its spring being so adjusted that a much greater amount of current than normally passes through circuits L² R and R' B L³ L² is necessary to give M the necessary strength to overcome the retractive force of the spring; but when the current increases to such an extent as to endanger the safety-plug P the bell is sounded, giving an alarm, so that the attendant may take measures to reduce the current. If the current should so much increase as to cause rupture of the safety-plug P, then, the direct connection from L to L' being broken, the whole

current must follow the by-pass. The magnet M becomes thus sufficiently excited to attract the armature K, which then, with the core of M and L¹, forms a short circuit to circuits L² R and R' B L³, there still being a portion of the current through the bell B, causing it to sound until the main circuit is re-established, while at the same time such current is sufficient to cause M to hold K by residual magnetism.

It is to be noted that the spring of K is adjusted to exert but little force, merely enough to overcome the effect of the very small current normally passing through the coil of M. When this coil is fully charged and K attracted, the residual magnetism causes M to hold K a sufficient time for the full operation of all the devices, notwithstanding the stress of the spring, the force of the spring having once been overcome and K attracted.

It is convenient to provide the safety-plug P in duplicate, so that if one gives way the other can be immediately included in the circuit. The arrangement for this purpose is shown in detail in Figs. 4 and 5, wherein B is a base, upon which are secured the binding-posts 1 2 for the circuit-wires, ebonite or other insulating material, *b*, being interposed between the base and posts.

Clamped down by plates *c* are fixed the two safety-plugs P P', each of which consists of a strip of metal foil with a plate of mica on each side of it, the edges of the mica entering, but being free without tightly fitting, the chases or grooves along the front of the plates *c*. Instead of one strip of metal foil, there may be several with mica interposed. It is convenient also to clamp the safety-plug between cross-bars *d* of mica pinned together, these clamps serving to prevent the plug from becoming deformed by the expansion of the metal strip and the scattering of the metal if it should fuse. A spring-handle, H, can be turned on a central pivot, *h*, into either the position

shown or into the dotted position H'. When it is in the position H, the circuit is through 1 H P 2, no current or only a small fraction of the current passing through P'. Should the safety-plug P give way, then by turning H to the position H' the circuit is established through 1 P' H' 2 and a fresh safety-plug can be put in the place of P.

Having thus described the nature of my invention and the best means I know of carrying it into effect, I claim—

1. An electric safety device consisting of a strip of metallic foil inclosed between plates of mica, adapted to be connected in an electrical circuit and break the same upon an abnormal or greater than desired flow of current, substantially as set forth.

2. In an electric circuit, the combination of an electrical safety-plug, P, an electro-magnet, M, with electro-magnetic circuit-closer or armature K, an electric bell B, and by-pass circuits L², L³, L⁴, and L⁵, with adjusted resistances R R', arranged and operating substantially as and for the purposes herein set forth.

3. The combination, with a supporting-base, of two electrical safety plugs or devices and a switch for short-circuiting either, substantially as described.

4. In an electrical safety-plug, the combination of one or more strips of metallic foil, plates or sheets of mica inclosing the foil, and transverse strips of mica secured together at their ends and retaining the inclosing-strips of mica and the foil in position, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 22d day of October, A. D. 1883.

KILLINGWORTH WILLIAM HEDGES.

Witnesses:

JOHN DEAN,

J. WATT,

Both of 17 Gracechurch Street, London.