

No. 813,297.

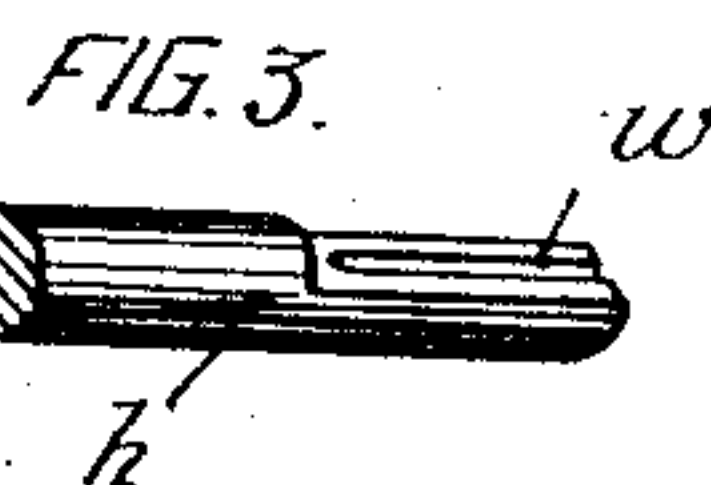
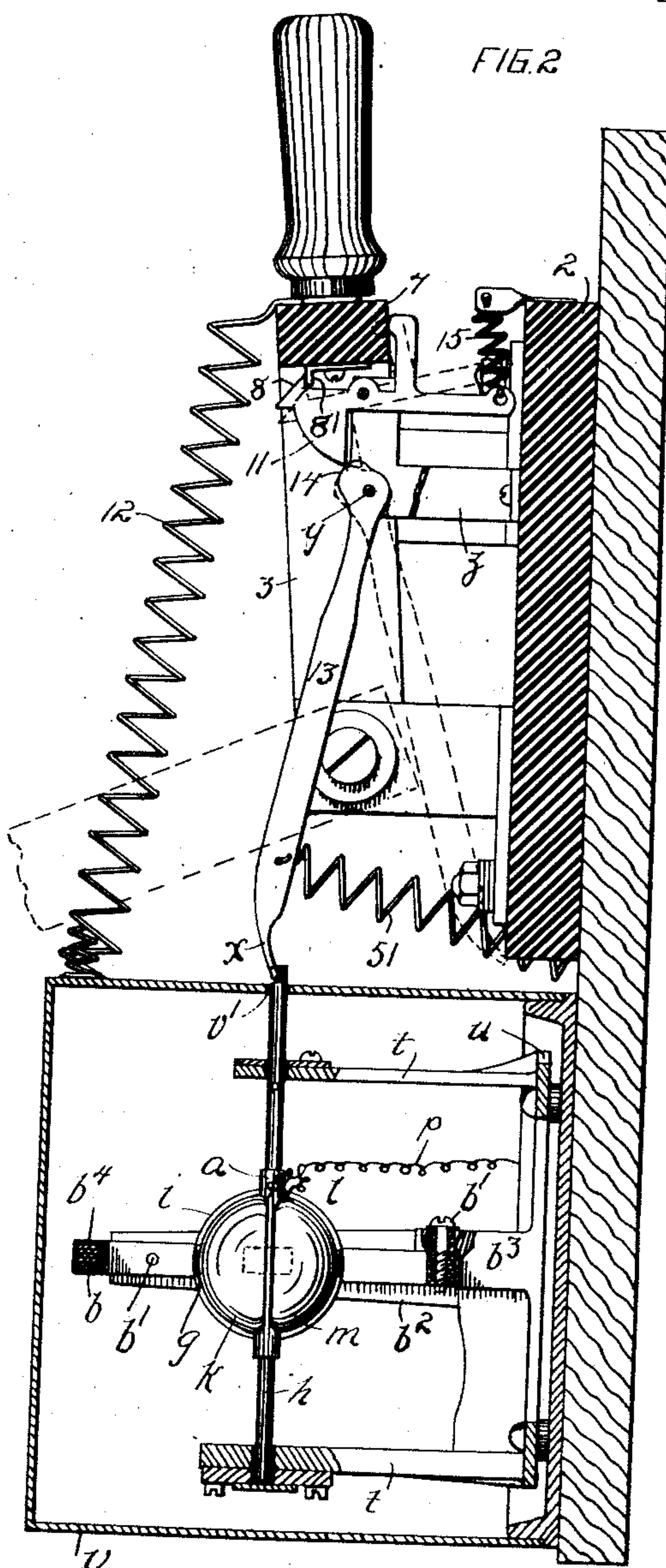
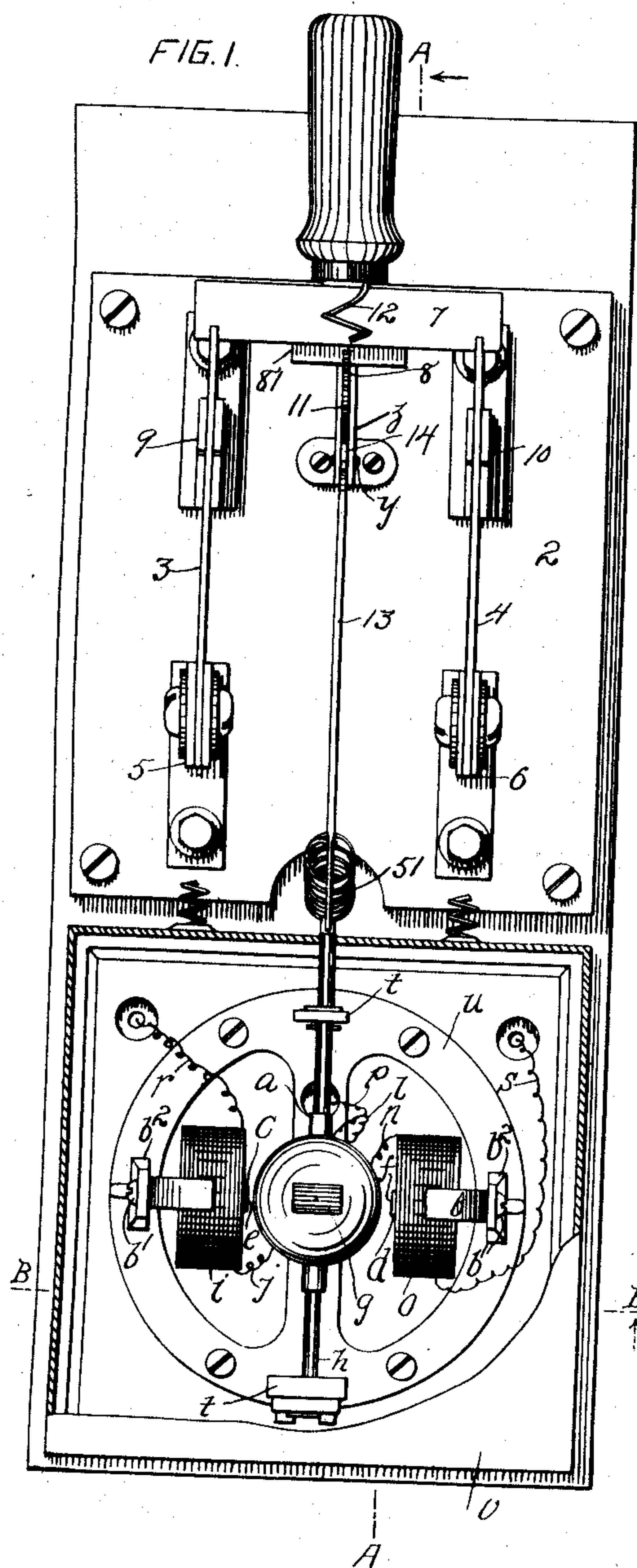
PATENTED FEB. 20, 1906.

E. B. HOSMER & W. N. DIETRICH.

ELECTRICAL SAFETY DEVICE.

APPLICATION FILED JUNE 30, 1902.

2 SHEETS—SHEET 1.



Witnesses

*William R. [Signature]*  
*Frederick [Signature]*

Inventors  
*Edward B. Hosmer*  
*William N. Dietrich*

By *their* Attorney

*Oliver N. [Signature]*

No. 813,297.

PATENTED FEB. 20, 1906.

E. B. HOSMER & W. N. DIETRICH.  
ELECTRICAL SAFETY DEVICE.

APPLICATION FILED JUNE 30, 1902.

2 SHEETS—SHEET 2.

FIG. 4.

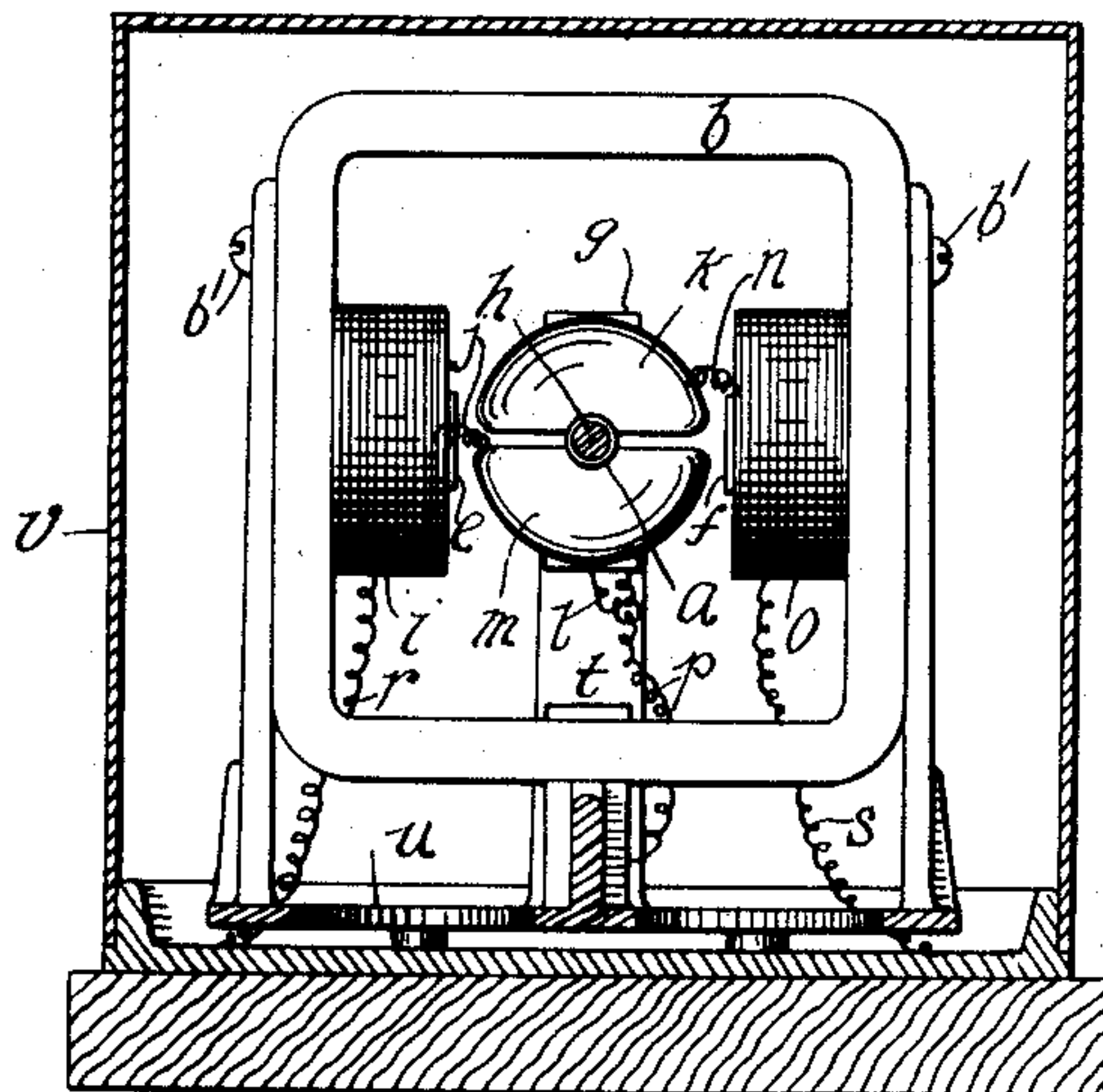
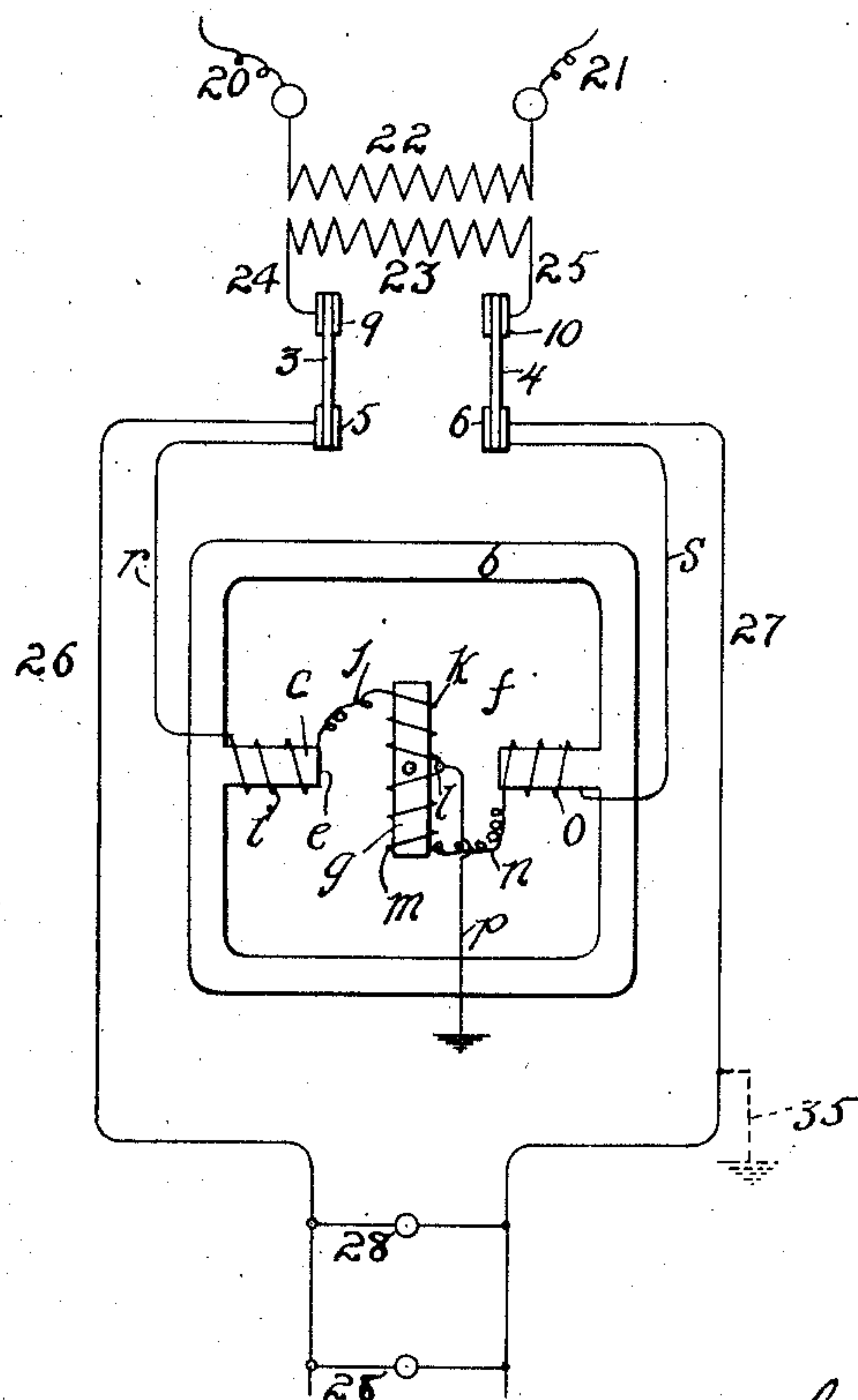


FIG. 5.



Witnesses

*William M. East*  
*Ed. J. Jones*

Inventors  
*Elwood A. Hosmer*  
*William N. Dietrich*

By *their* Attorney

*Oliver W. Swan*



# UNITED STATES PATENT OFFICE.

ELWOOD BIGELOW HOSMER AND WILLIAM NORMAN DIETRICH, OF  
MONTREAL, CANADA.

## ELECTRICAL SAFETY DEVICE.

No. 813,297.

Specification of Letters Patent.

Patented Feb. 20, 1906.

Application filed June 30, 1902. Serial No. 113,862.

*To all whom it may concern:*

Be it known that we, ELWOOD BIGELOW HOSMER and WILLIAM NORMAN DIETRICH, of the city of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Electrical Safety Devices; and we do hereby declare that the following is a full, clear, and exact description of the same.

Our invention relates particularly to the protection of electric circuits; and it has for its object to protect said circuits against ill effects from abnormal conditions therein, such as may be caused, for instance, by accidental grounding, lightning striking the circuit, or other reasons.

The invention may be said briefly to consist of the combination, with a metallic electric circuit to be protected, including a switch and means for releasing said switch and an additional circuit permanently in shunt with said metallic circuit and having a permanent ground connection, said additional circuit including an electromagnet and an armature within the magnetic field of said magnet, of mechanical means acted upon by said armature and acting directly upon said means for releasing said switch and opening the circuit to be protected. This shunt preferably comprises the windings of a pair of electromagnets one movable relatively to the other and adapted to be influenced by an accidental or other undesired grounding to cause the release of an automatically-opening switch, and consequently the cutting off or breaking of the circuit to be protected, while during the interval between the time of the occurrence of the abnormal condition of the circuit and the cutting off or breaking of the circuit the current will flow to ground through our permanently-grounded shunt.

For full comprehension, however, of our invention reference must be had to the accompanying drawings, forming a part of this specification, in which like symbols indicate the same parts, and wherein—

Figure 1 is a front elevation of our improved safety device with its inclosing casing partly broken away. Fig. 2 is a longitudinal vertical sectional view thereof, taken on line A A, Fig. 1. Fig. 3 is a detail perspective view of the end of a rotary spindle upon which a portion of the switch-releasing

means is supported. Fig. 4 is a transverse horizontal sectional view taken on line B B, Fig. 1; and Fig. 5 is a detail diagrammatical view of a local lighting-circuit including a transformer and furnished with our improved safety device.

We prefer in the present embodiment of our invention to arrange in the same device the means for providing the permanent ground connection and for automatically cutting off or opening the circuit to be protected. To this end we secure a preferably square laminated open frame *b* by insulated screws *b'* to a pair of arms *b<sup>2</sup>* and a short arm *b<sup>3</sup>*, all of which arms are integral with a base *u*, to be hereinafter referred to. This frame is covered with insulated material, as at *b<sup>4</sup>*, and is constructed with a pair of inwardly-projecting core-pieces *c* and *d*, respectively, the inner ends *e* and *f* whereof are utilized as active magnetic poles, (as will be hereinafter shown,) while an oscillatory armature in the form of a bar *g* is pivoted midway of its length between said magnetic ends *e* and *f* upon and insulated, as at *a*, from a spindle *h*, to be presently further alluded to.

A series of coils are wound upon these core-pieces and armature to constitute a series of electromagnets as follows, (see Figs. 3 and 4:) A coil *i*, wound upon the core-piece *c*, is connected at its inner terminal by a slack wire *j* to an oppositely-wound coil *k* upon one end of the oscillatory armature, this latter coil being connected by a wire *l* to a third coil *m*, wound oppositely thereto upon the other end of the armature and connected in turn by a slack wire *n* to the inner terminal of a fourth coil *o*, wound oppositely to the coil last mentioned upon the core-piece *d*. A ground-wire *p* is led from the wire *l* midway between the coils *k* and *m* upon the armature, and the outer terminals of the coils *i* and *o* are connected by wires *r* and *s* in shunt with the circuit to be protected, as will be presently described in connection with a local lighting-circuit, as an instance for purposes of illustration.

The spindle *h*, before mentioned, upon which the oscillatory armature is mounted, is rotatably supported in a pair of bracket-arms *t*, formed integrally with a frame *u*, secured inside of any suitable inclosing casing *v*, through a perforation *v'* in the top whereof



one end of said spindle projects. (See Figs. 1 and 2.) This projecting end of the spindle is preferably flattened and longitudinally grooved, as at *w*, to at times support the diminished end *x* of a detent fulcrumed, as at *y*, between a pair of supporting-plates *z*. These plates are secured to and project from a base-plate 2 of a spring-actuated bipolar switch, the knives or switch-arms 3 and 4 whereof are pivoted to switch-terminals 5 and 6 and yoked together by an insulating bridge-piece 7, a latch 8 holding said knives or switch-arms in electrical contact with switch-terminals 9 and 10 against a retractile helical spring 12. The detent before mentioned is preferably in the form of a lever, consisting of a flat bar 13, and its fulcrum *y* is a short distance from one end thereof, thus constituting a long and a short arm. The end of the short arm is concentric to the fulcrum-point, as at 14, to (when its long arm is supported upon the grooved flattened end *w* of the spindle) bear beneath a lateral projection 11 upon the latch and retain the latter in engagement with a ledge 81 upon the switch-arm. A retractile helical spring 15 detaches the latch from the switch-arm and allows the latter to fly open immediately the detent is released by the turning of the spindle, and a similar spring 51 draws back the long arm of the detent when it is released, as will be presently shown in connection with the operation of our invention.

Before describing the operation of the invention we will first describe the application thereof to the lighting-circuit of a dwelling or other building, reference being had particularly to Fig. 5.

20 and 21 are respective leads of the main circuit, 22 and 23 the primary and secondary coils, respectively, of the transformer, and 24 and 25 the house-leads, which are connected to the switch-terminals 9 and 10, between which and the terminals 5 and 6 electrical connection is made by means of the knives or switch-arms 3 and 4. The main leads 26 and 27 of the local lighting-circuit are connected to the switch-terminals 5 and 6, while lamp-feeding branches 28 are included in the circuit, and the leads *r* and *s* also include our safety device in the circuit in shunt. The current being in this instance an alternating one for lighting purposes of course oscillates over the circuit; but for purposes of illustration it is only necessary for us to indicate its course in one direction. Entering at 5 the light-current will flow, as usual, through lead-wire 26, branches 28, lead-wire 27 to switch-terminal 6, and out. A portion of the current will traverse the shunt-circuit, entering, say, for instance, at switch-terminal 5, flowing through lead-wire *r*, coil *i*, wire *j*, coil *k*, wire *l*, coil *m*, wire *n*, coil *o*, and lead-wire *s* to switch-terminal 6. A current flowing in this manner owing to the particular

winding of the coils (each coil of the series being, as hereinbefore pointed out, wound oppositely to that preceding it) will create, as before mentioned, magnetic poles of negative sign at the inner ends *e* and *f* of the pole-pieces *c* and *d* and like magnetic poles at the ends of the oscillatory armature *g* or magnetic poles of positive sign at these terminals when the current reverses. In any case under normal conditions similar magnetic poles will be created at all these terminals, and consequently as both poles *e* and *f* will repel the poles at the terminals of the oscillatory armature the latter will be held in a position at right angles to the pole-pieces *c* and *d*, with the spindle *h*, upon which it is rigidly mounted, in a position to retain the switch-releasing detent. The ground-wire *p* constituting, as is obvious, only one side of an incomplete ground-circuit will not under normal conditions be traversed by the current.

Having now specifically described one embodiment of our invention and the normal condition of the parts while the current traversing the circuit is of normal polarity, we will now set forth the functions thereof in obviating ill effects should an abnormal condition occur in the circuit.

Should a high potential reach the local circuit through, for example, the breaking down of the transformer, (it being supposed that the primary circuit has a ground connection somewhere therein,) the course of the current will at once be in through both switch-knives 3 and 4, shunt-leads *r* and *s* (part of the current traversing each of said leads,) the coils, and their connecting-wires to the ground connection, which being the course of least resistance will conduct the abnormal current to ground. The course of the current under these conditions will be in the opposite direction, and the result of this change of direction of the flow will be to change the sign of the poles at the inner end *f* of core-piece *d* and at the lower end of the oscillating armature, the natural sequence being that the negative poles will attract the positive poles, or vice versa, and the oscillatory armature will turn to a position in line with the core-pieces *c* and *d*, thereby releasing the detent and allowing the switch to be opened by its spring.

Should either side of the local circuit be accidentally grounded—for instance, the side including the house-lead 25—by, say, the chafing away of the insulation thereon by frictional contact with a water-pipe, (which accidental ground connection is indicated at 35 in Fig. 4,) the ground-circuit will immediately be completed through ground and our permanent ground-wire *p*, thus cutting out coils *o* and *m*. Upon this last-mentioned condition prevailing a change in polarity will immediately take place, the armature will oscillate, and the switch open.



From the foregoing it will be seen that by applying our invention to any electric circuit it (the circuit) will be effectively protected against ill effects from abnormal conditions and accidental groundings, in that the circuit will be immediately relieved of abnormally high potentials should same reach the circuit and said circuit will be simultaneously opened, thus obviating any chance of damage and giving warning that a disturbance has taken place in the circuit.

What we claim is as follows:

1. The combination with a metallic electric circuit to be protected including a switch and means for releasing said switch, and an additional circuit permanently in shunt with said metallic circuit and having a permanent ground connection, said additional circuit including an electromagnet and an armature within the magnetic field of said magnet, of mechanical means acted upon by said armature and acting directly upon said means for releasing said switch and opening the circuit to be protected, for the purpose set forth.

2. The combination with an electric circuit to be protected, of an electric safety device comprising an additional circuit in shunt with said circuit, said additional circuit including two electromagnets the relative positions whereof are changeable, means coacting with said electromagnets and actuated upon the said change of position, for opening the said circuit to be protected and a permanent ground connection connected to said shunt-circuit, for the purpose set forth.

3. The combination with an electric circuit to be protected and means for opening said circuit, of an electric safety device comprising a pair of oppositely-wound electromagnets a short distance apart and in line with one another, an oscillatory armature pivotally mounted between the adjacent poles of said electromagnets and having coils wound oppositely to one another upon the ends thereof, a wire connecting the outer terminal of one of the coils of said pair of electromagnets to one terminal of the circuit to be protected, a slack wire connecting the opposite terminal of said last-mentioned coil to the outer terminal of the coil wound oppositely thereto upon one end of the armature, a wire connecting the opposite terminal of the last-mentioned coil to the adjacent terminal of the coil upon the other end of said armature, a slack wire connecting the opposite terminal of the last-mentioned coil to one terminal of the other coil of said pair of electromagnets, a wire connecting the opposite terminal of said last-mentioned coil to the other terminal of the circuit, and means whereby the oscillation of said armature will cause the circuit-opening means to open the

circuit, substantially as described and for the purpose set forth.

4. The combination with an electric circuit to be protected and means for opening said circuit, of an electric safety device comprising a pair of oppositely-wound electromagnets a short distance apart and in line with one another, an oscillatory armature pivotally mounted between the adjacent poles of said electromagnets and having coils wound oppositely to one another upon the ends thereof, a wire connecting the outer terminal of one of the coils of said pair of electromagnets to one terminal of the circuit to be protected, a slack wire connecting the opposite terminal of said last-mentioned coil to the outer terminal of the coil wound oppositely thereto upon one end of the armature, a wire connecting the opposite terminal of the last-mentioned coil to the adjacent terminal of the coil upon the other end of said armature, a grounded wire connected to this last-mentioned wire midway of its length, a slack wire connecting the opposite terminal of the last-mentioned coil to one terminal of the other coil of said pair of electromagnets, a wire connecting the opposite terminal of said last-mentioned coil to the terminal of the circuit, and means whereby the oscillation of said armature will cause the circuit-opening means to open the circuit, substantially as described and for the purpose set forth.

5. The combination with an electric circuit and the switch-arm of a spring-actuated multipolar switch included in said circuit, of a latch having a lateral projection, said latch being pivotally connected to the frame of the switch and adapted to engage the switch-arm and retain same in its closed position, a spring tending to disengage said latch from the switch-arm, a detent in the form of a lever fulcrumed near one end to the frame of the switch, the end of the short arm of said lever being concentric to its fulcrum-point and engaging said lateral projection when the long arm of said lever is raised and retaining same, against said last-mentioned spring, in engagement with the switch-arm, a support for retaining said long arm in its raised position, and electrical means for displacing said support and operated, upon emergency, by the current traversing said circuit, substantially as described and for the purpose set forth.

In testimony whereof we have affixed our signatures in presence of two witnesses.

ELWOOD BIGELOW HOSMER.  
WILLIAM NORMAN DIETRICH.

Witnesses:

WILLIAM L. McFEAT,  
FRED. J. SEARS.