No. 631,145. Patented Aug. 15, 1899.

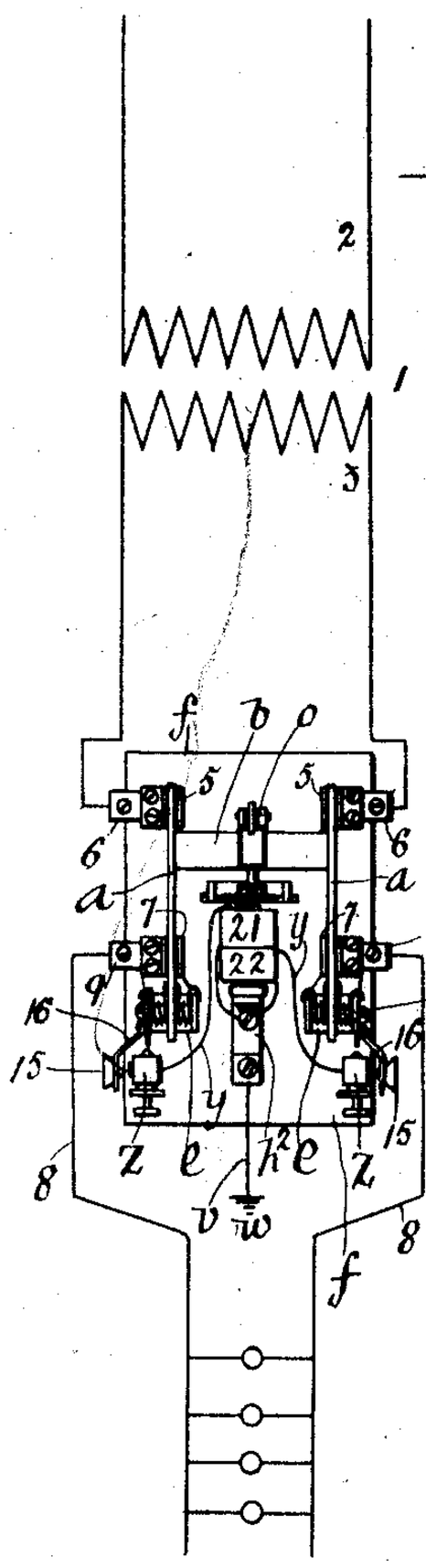
F. H. BADGER & W. J. PLEWS.

ELECTRIC SAFETY APPLIANCE.

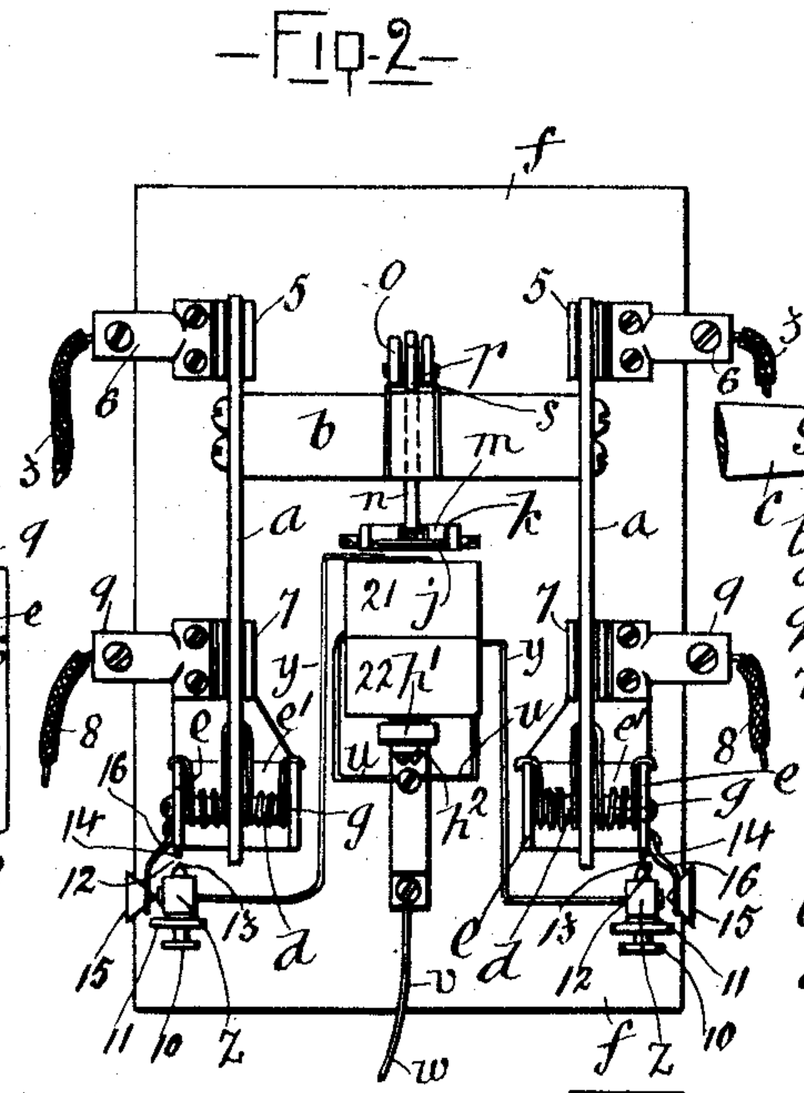
(Application filed Jan. 30, 1899.)

(No Model.)

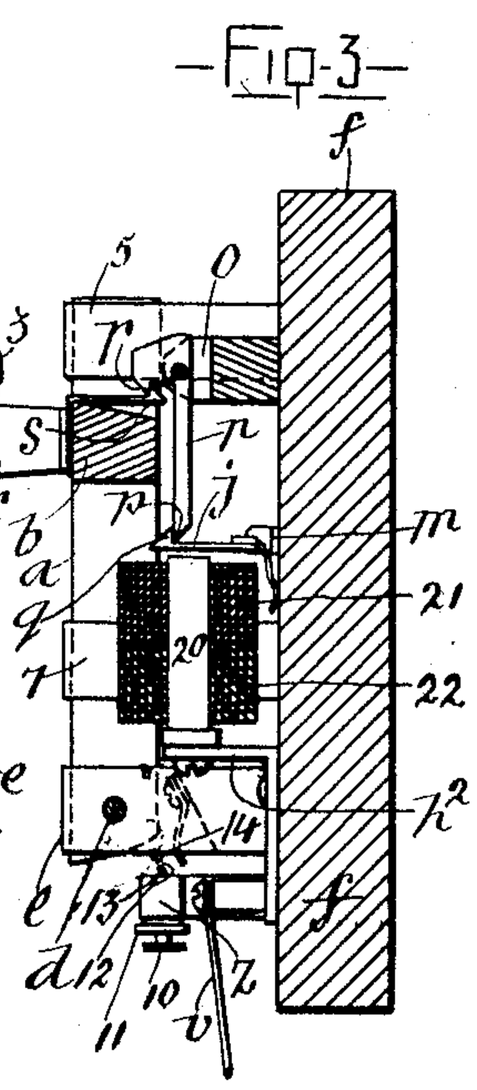
—Fig. 1—



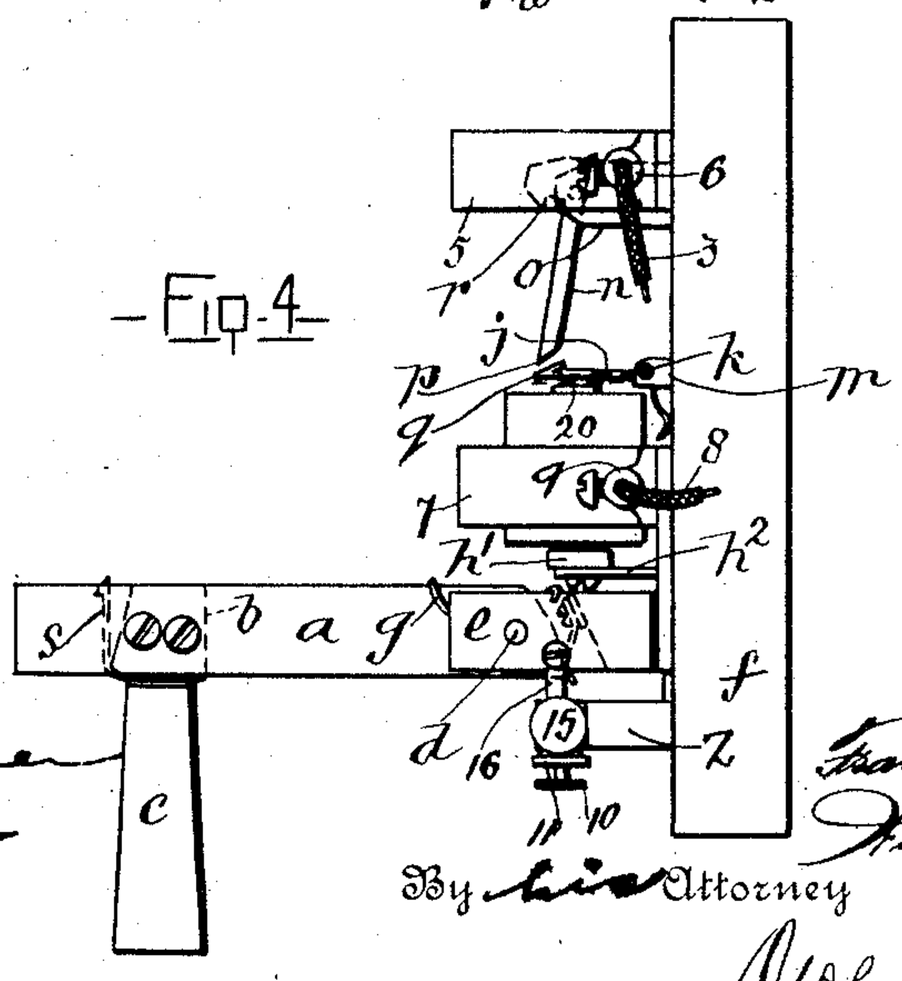
—Fig. 2—



—Fig. 3—



—Fig. 4—



Witnesses

Inventors.

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UNITED STATES PATENT OFFICE.

FRANKLIN HODGKINS BADGER AND WILLIAM JOHN PLEWS, OF MONTREAL, CANADA, ASSIGNORS OF ONE-THIRD TO ROBERT EDMUND THOMAS PRINGLE, OF SAME PLACE.

ELECTRIC SAFETY APPLIANCE.

SPECIFICATION forming part of Letters Patent No. 631,145, dated August 15, 1899.

Application filed January 30, 1899. Serial No. 703,899. (No model.)

To all whom it may concern:

Be it known that we, FRANKLIN HODGKINS BADGER, electrician, and WILLIAM JOHN PLEWS, of the city of Montreal, in the Province of Quebec, Canada, have invented certain new and useful Improvements in Electric Safety Appliances; and we do hereby declare that the following is a full, clear, and exact description of the same.

This invention relates to electric safety switch devices whereby high-tension currents are prevented from injuring any apparatus or wiring arranged for low-tension currents in the event of the high-tension current accidentally reaching such apparatus or wiring.

The invention consists in adapting the customary hand-switch to automatically open upon being released through the action of an electromagnetic device operated only upon the passage of a high-tension current across one or more spark-gaps arranged in a protective circuit which includes the points of the spark-gaps, the electromagnetic device, and an earth connection, the high-tension current, when an accident happens, reaching the protective circuit through the switch proper, but acting instantly to open the switch, and thus completely disconnecting the entire local circuit, including the operating device itself, and the protective circuit from the main circuit or supply wires.

A secondary feature of the invention consists in providing one or more testing-keys adapted to bridge the spark-gaps, so that the ordinary low-tension-service current may be sent through the protective circuit to show whether such circuit is in operative condition or not, while a third feature consists in the particular construction of the electromagnet.

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

Figure 1 is a diagram illustrating the invention; Fig. 2, a plan view or front elevation of the switch with safety devices in connection therewith; Fig. 3, a central vertical longitudinal section of Fig. 2, some of the parts being shown in full lines; and Fig. 4 is a side elevation of the device with the switch open.

1 represents a transformer in which a high-tension-current wire 2 and low-tension-current wire 3 are generally in such proximity that there is always a possibility of the high-tension current from such high-tension wire or other sources accidentally escaping to or reaching the low-tension system and local-circuit apparatus supplied thereby, and it is the object of this invention, as before mentioned, to prevent such high-tension current, if it should so come into connection with the low-service system, reaching and damaging all local wires or apparatus included in the service system.

5 5 are the switch-terminals of the main supply-wire 3, connected therewith through binding-posts 6 6, and 7 7 are the terminals of the local or installation circuit wires 8 8, connected therewith through binding-posts 9 9, the switch for connecting such terminals being formed, as usual, of pivoted metal arms *a a*, insulating cross-bar *b*, connecting such arms, and handle *c*. The arms *a a* are pivoted upon pivot-pins *d* in posts mounted upon the bases of the terminals 7 7, but insulated therefrom, and the various other parts all carried by a base *f*, of slate or other insulating material.

Thus far the parts described are those of the ordinary and well-known hand-switch, and we will now explain what we at the present time believe to be the best arrangement of elements and devices for carrying out our invention, although we do not wish to be confined to the particular details and parts shown, as there are various equivalents and modifications of same which might also be used without departing from the spirit of our invention.

The pivot-pins *d* of the switch-arms are extended sufficiently either side to accommodate the windings of double torsional springs *g*, bearing beneath the pivoted arms *a a* of the switch and tending to throw them out of contact with the main and local circuit ter-

minals when the switch is released by the operation of the electromagnetic device. We have shown this electromagnetic device as comprising an electromagnet of novel construction.

Our improved electromagnet consists of a soft-metal core 20, having two independent coils 21 and 22 wound thereon. The first coil 21 is wound upon the core from the middle thereof to one end, and the coil 22 is also wound on the core and from the middle to the opposite end thereof.

The electromagnet just described is carried by an insulating-yoke h', supported by a post h^2, mounted upon the base f, an armature j, pivoted at k to a plate m, carried by the base f, a trip-lever n, also pivoted to a plate o, carried by the base f and presenting a beveled toe end p to engage a projecting lip q on the armature, and a hook r near its fulcrum to engage a hook s on the cross-bar b, connecting the switch-arms a a.

The wires of the coils of the electromagnet are connected together at one end to the base of the post h^2 by wires u u, while a wire v leads from the post h^2 to any suitable ground-terminal w, and other wires y y lead from the opposite ends of the electromagnet-coils to insulated posts z z. These posts z z are located a short distance from and face the outermost of the posts e e of the bearing-brackets e', in which the switch-arms a a are pivoted, and each post z carries an adjusting-screw 10, provided with set-nut 11 for regulating the length of a spark-gap 12, extending between the end of each screw, furnished with a platinum point 13, and a similar point 14, projecting from each post e.

In operation, should a high-tension current from the wire 2 or any other source reach the low-tension wire 3 by defective insulation or other accident such high-tension current will pass via either one or both of the switch-arms a to the spark-gaps, jump same, and proceed by wires y y through the electromagnets to the earth-terminal w, thus energizing the magnets operating the armature, so as to release the trip-lever n and through it disengage the hook s on the cross-bar of the switch, so that the arms a a are thrown out of contact with the terminals (as shown in Fig. 4) and all current disconnected from the local circuit and installation.

As a means of testing as to whether the service system is in proper condition as regards insulation and also incidentally to determine the working condition of the device, press-buttons 15 15 may be arranged, as shown, with one end of their flexible metal portions 16 connected with the posts e and the other ends adapted to be pressed into contact with the posts z z, thus bridging the spark-gaps. If the insulation of the service system is imperfect, the low-tension current will pass through the magnet or magnets, opening the switch, and thereby indicating any such defect.

What we claim is as follows:

1. In an automatic safety-switch, the combination with a main circuit and a local circuit, separated one from the other, of a spring-operated switch, adapted to connect the flow and return wires of said separated circuits, and a protective circuit, separated from the local circuit by a high-resistance medium and containing electromagnetically-operated means for automatically releasing the switch, said means comprising independent magnetic coils operating upon a common trip, whereby the local circuit, including the operating device itself and the protective circuit, is disconnected from the main circuit.

2. In an automatic safety-switch, the combination with a main circuit and a local circuit, separated one from the other, of a switch adapted to connect the flow and return wires of said separated circuits, of means for retaining said switch in connection with said circuits, means for disconnecting the switch from said circuits, and a protective circuit, separated from the local circuit by a spark-gap and containing an electromagnetic device adapted to operate the switch-retaining means, whereby said switch may be released from contact with said circuits, and means for shunting current from the local circuit through the electromagnetic device.

3. In an electric safety appliance, comprising a main circuit, a local circuit to be protected, said circuits being separated one from the other, switch arms or levers normally connecting the flow and return wires of said circuits, a trip-lever and detent mechanism for retaining said switch arm or lever in contact with said flow and return wires, springs tending to throw the switch arms or levers out of contact with the flow and return wires, and an insulated protective circuit, including therein in a ground circuit, an insulated electromagnetic releasing mechanism for said trip-lever said mechanism consisting of magnetic coils in separate circuits operating upon the common trip, separated from the local circuit by a spark gap or gaps, which may be jumped by the current flowing from the main circuit to and over said local circuit through the switch arm or lever, when increased in tension above a predetermined low degree, thereby operating said electromagnetic mechanism to cause the switch arms or levers to completely separate the local and protective circuits from the main circuit.

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

FRANKLIN HODGKINS BADGER.
WILLIAM JOHN PLEWS.

Witnesses:
WILLIAM P. MCFEAT,
FRED. J. SEARS.