No. 695,497. Patented Mar. 18, 1902.

A. A. SEELEY & C. SILET.

AUTOMATIC CUT-OUT.

(Application filed Oct. 10, 1901.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

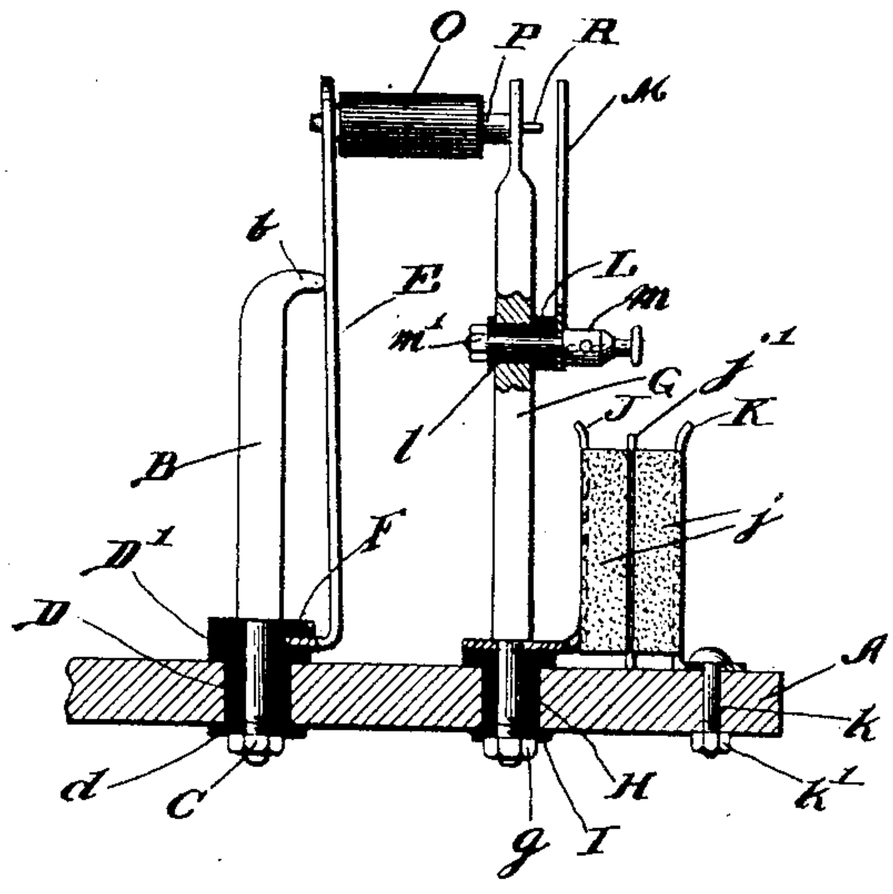


Fig. 1½.

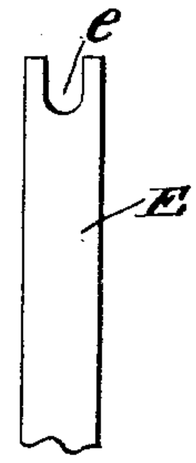


Fig. 2.

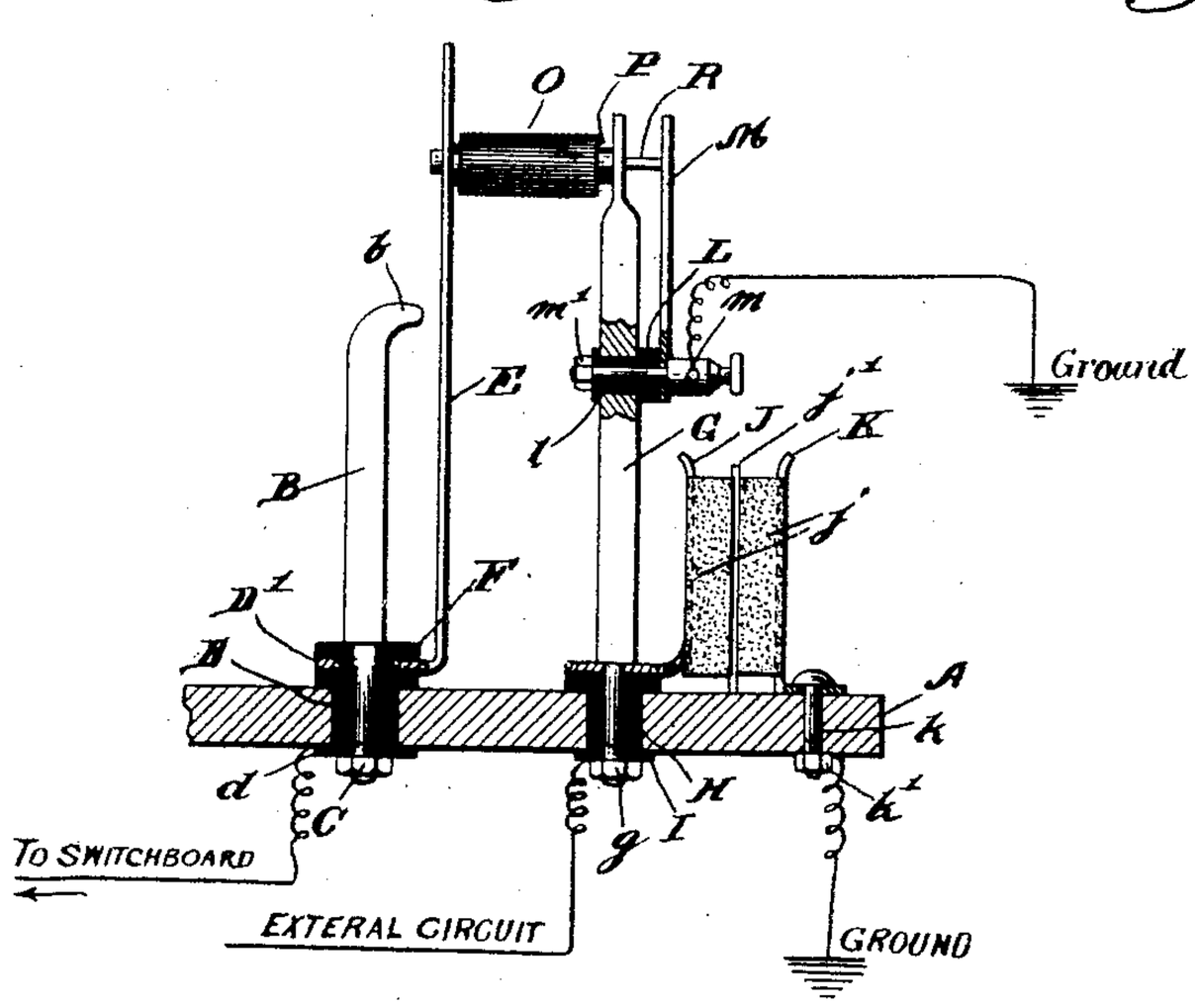
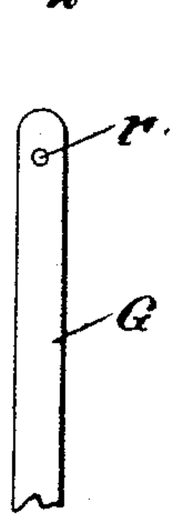


Fig. 2½.



Witnesses:

Ira D. Perry

F. B. Allen

Inventors

Aaron A. Seeley & Charles Silet

By Raymond & Barnett

Attys

No. 695,497. Patented Mar. 18, 1902.

A. A. SEELEY & C. SILET.

AUTOMATIC CUT-OUT.

(Application filed Oct. 10, 1901.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

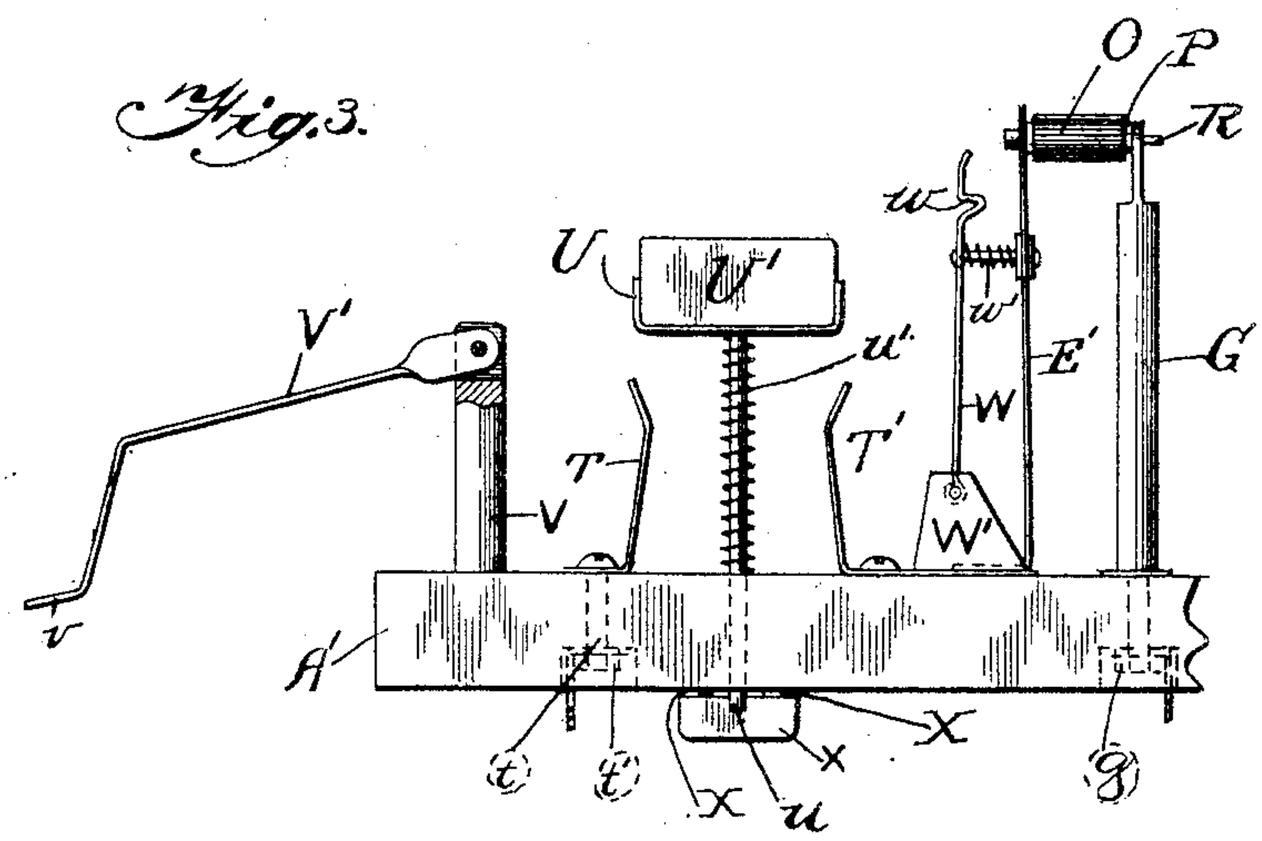


Fig. 4.

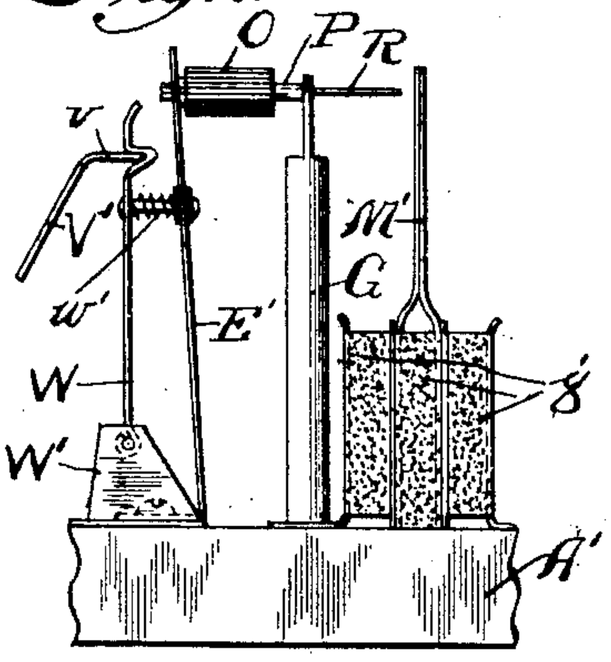


Fig. 5.

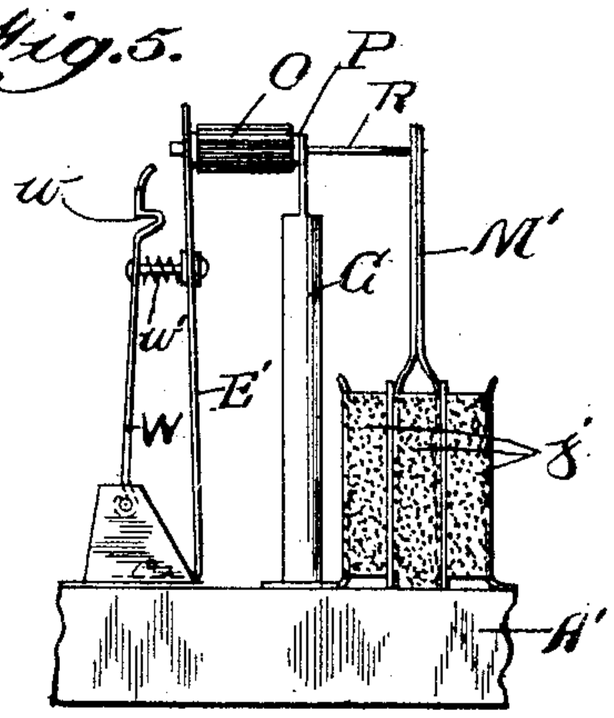
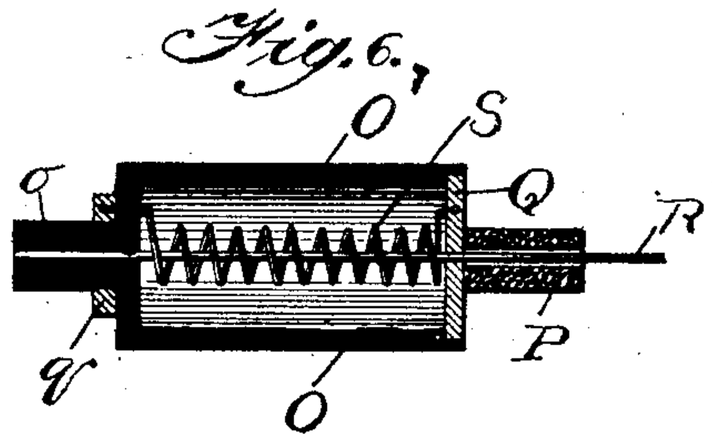


Fig. 6.



Witnesses:
Ira D. Perry
J. B. Weir

Inventors
Aaron A. Seeley and Charles Silet
By Raymond and Barnett
Atts

No. 695,497. Patented Mar. 18, 1902.

A. A. SEELEY & C. SILET.

AUTOMATIC CUT-OUT.

(Application filed Oct. 10, 1901.)

(No Model.) 3 Sheets—Sheet 3.

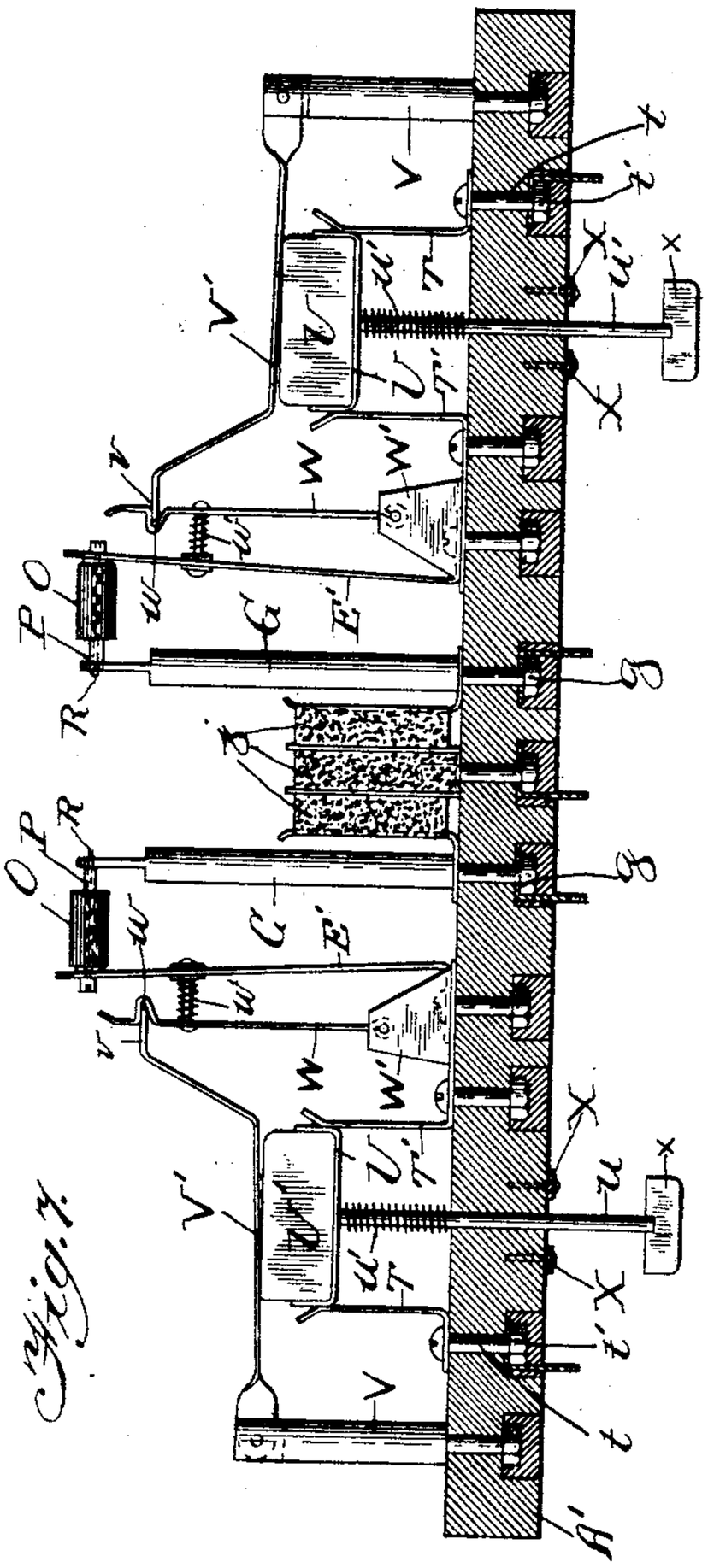


Fig. 7.

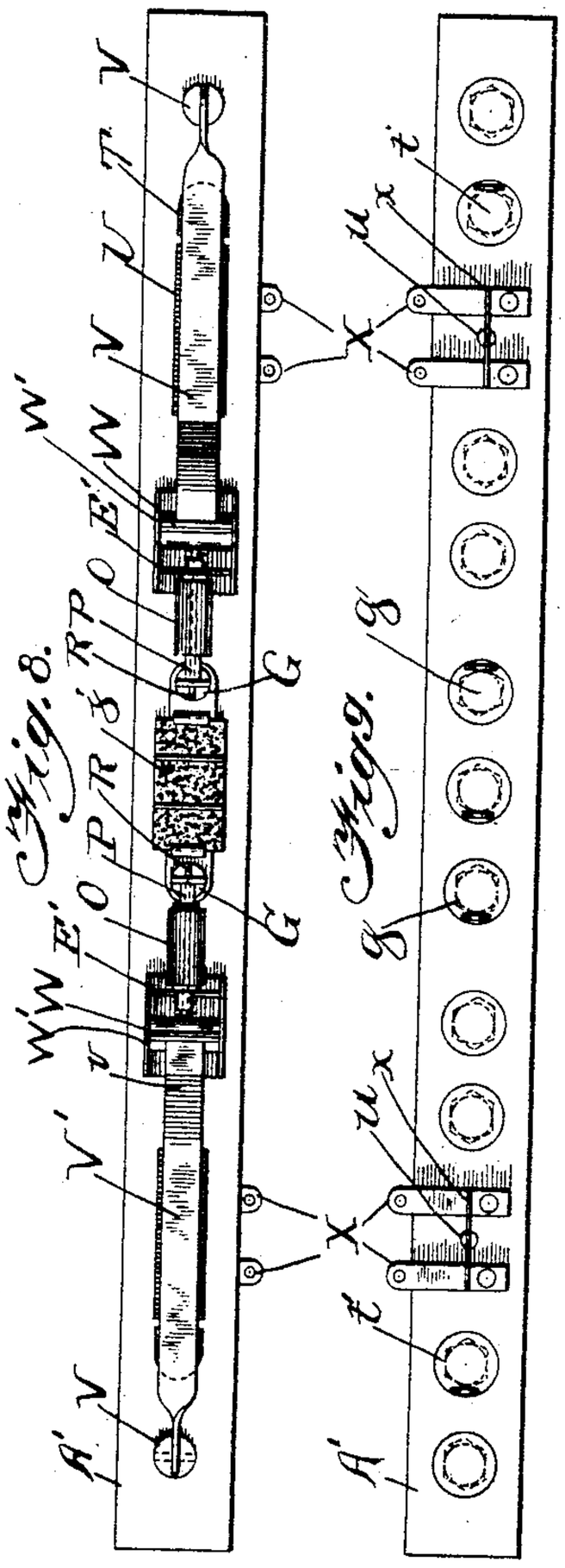


Fig. 8.

Fig. 9.

Witnesses:
J. B. Weir
Ira L. Perry

Inventors
Aaron A. Seeley and Charles Silet
By Raymund & Barnett
Attys

UNITED STATES PATENT OFFICE.

AARON A. SEELEY AND CHARLES SILET, OF CHICAGO, ILLINOIS.

AUTOMATIC CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 695,497, dated March 18, 1902.

Application filed October 10, 1901. Serial No. 78,180. (No model.)

To all whom it may concern:

Be it known that we, AARON A. SEELEY and CHARLES SILET, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Cut-Outs, of which the following is a specification.

Our invention relates to improvements in that class of devices for automatically breaking an electric circuit whenever an excessive current enters the same and also for automatically shunting such excessive current either to a ground-wire or to another circuit, as may be desired, in which a fusible plug interposed in the circuit will be melted by such excessive current.

In devices of the class to which our invention relates, so far as we are advised, it is customary to interpose in the circuit a heat-coil in electrical connection with a fusible plug, such plug being secured or attached to a portion of the structure in such a manner as to hold the same against spring-pressure. With such a device an excessive current passing through the heat-coil and fusible plug will melt the plug, thereby releasing the portion of the structure soldered or attached thereto, whereupon such portion will be moved by spring-pressure in such a manner as to break the circuit. It is clear that with a device so constructed the fusible plug must be of sufficient tensile strength to securely hold the portion of the device attached thereto against the spring-pressure, which tends to draw the same away from such plug. It has been found that for all practical purposes the softest composition which may be safely and reliably used for such a plug is pure solder, which will fuse or melt at a temperature of 160°. This limitation has made it necessary to use a heat-coil which shall offer such a resistance to the passage of a current exceeding in voltage the desired maximum as to generate a temperature of at least 160° within the fusible plug. In practice it is found that with such a device the heat-coil must offer at least five ohms resistance, which for many purposes is sufficiently great to interfere seriously with the operation of the instruments interposed in the circuit, especially as every circuit must contain a number of such heat-coils.

The primary object of our invention is to provide such a device which shall be reliable in operation, shall offer a very low resistance, and shall be exceedingly compact, simple, and inexpensive.

Another object of our invention is to utilize such fusible plug to operate a trip for breaking the circuit.

A further object of our invention is to provide means whereby the circuit-breaking device will automatically close a local circuit.

These and such other objects as may hereinafter appear are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of our device, partly in section, showing the same in set position. Fig. 2 is a like view showing the apparatus after the plug has been fused and the circuit broken. Fig. 1½ is a detail showing the face of the contact-spring E in elevation. Fig. 2½ is a similar detail of the electrode G. Fig. 3 shows a modified form of our device with the plug fused and the circuit broken. Fig. 4 shows the trip mechanism of a further modification of our device with the instrument in set position. Fig. 5 is a view of the modification shown in Fig. 4 with the parts in the position occupied after the plug has been fused, the main circuit broken, and the current shunted to the ground-circuit. Fig. 6 is a detail view of our improved heat-coil and plug. Fig. 7 is a side elevation, partly in section, of two instruments of the form shown in Fig. 3, mounted upon a common base and arranged so as to shunt the current from either or both of said instruments to a common ground-wire. Fig. 8 is a plan view of Fig. 7, and Fig. 9 is a view of the under side of the base of Fig. 7.

Like letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, A is a base of metal or any other suitable material upon which is mounted an electrode B, which at its lower end constitutes a binding-post upon which is mounted a nut C. The electrode B is insulated from the base A by means of an insulating-bushing D

and insulating-washer D. Also mounted on the base A, and preferably upon the bushing D, is a spring-contact E, which is insulated from the base A and is also insulated from the electrode B, preferably by means of a shoulder D′ on the bushing D and an insulating-washer F.

G is a second electrode, which is likewise mounted upon the base A and is insulated therefrom by means of an insulating-bushing H and an insulating-washer I, and the lower end of the electrode G constitutes a binding-post and is provided with a nut *g*. Clamped between the bushing H and a shoulder on the electrode G and in electrical contact with the electrode G is a carbon-holder J, between which and a second holder K are held the usual carbons *j* of a lightning-arrester having a perforated sheet of mica *j′* interposed therebetween in the usual manner. The carbon-holder K is secured to the base A by a bolt *k* and nut *k′*, said bolt constituting a binding-post to which a ground-wire may be attached. Mounted upon the electrode G and insulated therefrom by means of an insulating-bushing L, an insulating-washer *l*, is an electrode M, which is clamped to said bushing by a binding-post *m*, the washer *l*, and a nut *m′*.

For convenience in making contact between the electrode B and the contact-spring E we provide the electrode B with an angular portion *b*, extending in the direction of the contact-spring E. Normally the spring E extends in the direction of the electrode G and out of contact with the electrode B. By interposing the heat-coil O and plug P between the electrode G and the contact-spring E said contact-spring is thrown in electrical contact with the angular portion *b* of the electrode B, and at the same time the spring E and electrode G are brought into electrical connection with each other. The parts are so adjusted that when the plug P is removed or fused the spring E, which is wedged against the electrode B by means of the heat-coil O and plug P, will be released sufficiently to allow it to move out of contact with the electrode B, as shown in Fig. 2.

The construction of the heat-coil O and plug P is shown in detail in Fig. 6 and is as follows: O′ is a casing of insulating material and is preferably cylindrical in form. This casing is open at one end and is provided at the other end with a projecting cylindrical portion *o*. The opposite end of the casing O′ is closed by a metallic disk or contact-piece Q. In the preferred form of our invention there is a metallic wire or rod R, which extends axially through the casing O′ and is mounted at one end within the closed end of the casing O′. The other end of the wire R projects through the contact-piece Q. Loosely mounted upon the projecting end of the wire R is the fusible plug or sleeve P, which when in use is in electrical contact with the plate Q. Mounted upon the projection *o* at one end of the casing O′ is a metallic washer *q*, which is electrically connected with the plate Q by means of the heat-coil S, contained within the casing O′.

Referring to Figs. 1½ and 2½, the upper end of the spring E is provided with an opening *e*, and the upper end of the electrode G is provided with an opening *r*. When the heat-coil and plug are interposed between the ends of the spring E and the electrode G, the opening *e* in the spring E receives the projecting cylindrical portion *o* of the casing O′, the inner face of the spring E lying against and in electrical contact with the washer *q*, while the projecting end of the wire R is passed through the opening *r* in the electrode G. It will thus be seen that while the heat-coil and plug serve to wedge the spring E into electrical contact with the electrode B, and also to electrically connect the spring E with the electrode G, at the same time the stress of the spring E holds the spring E in electrical contact with the washer *q* and also holds the plate Q, the plug P, and the electrode G in contact, so as to complete the electrical connection between the spring E and the electrode G. As so assembled it will be seen that the projecting end of the wire R is not in contact with the electrode M, although it projects through and beyond the electrode G. It is obvious that with a device so constructed there is no tension at any time upon the plug P, the only requirements as to its composition being that it shall have sufficient crushing strength to withstand the light tension of the spring E and that it shall not fuse at the atmospheric temperature of the location where it may be placed. It is therefore possible to use a plug which will quickly fuse at a very low temperature, and consequently we are enabled to use a heat-coil which shall offer an exceedingly low resistance.

The operation of our device when constructed as above described is as follows: The parts being set as shown in Fig. 1, whenever the potential of the current passing over the main circuit shall exceed that for which the heat-coil and plug are arranged or set the heat generated by the passage of such excessive current through the heat-coil will result in instantaneously melting or fusing the plug P, which, thereupon collapsing, ceases to aid in wedging the spring E against the electrode B. Consequently the spring E, being released, will automatically spring out of contact with the electrode B, thereby breaking the main circuit and at the same time carrying the casing O′ and its connected parts in the direction of the electrode G until the projecting end of the wire R is brought in contact with the electrode M, against which it is held in contact by the stress of the spring E, thereby shunting the current to the electrode M and to the ground-wire connected therewith.

In the modified form of our device shown in Figs. 3, 4, and 5, A′ is a base of insulating material, upon which are mounted a pair of

spring-electrodes T T', between which is a bridge U, mounted on a stem *u* and normally held out of contact with the electrodes T T' by the spring *u'*. Pivotally mounted upon a post V is a controlling-arm V', the free end of which *v* is adapted to engage a trip W. When set in engagement with the trip W, the controlling-arm V' confines the bridge U against spring-pressure between and in contact with the electrodes T T', the arm V' being insulated from said bridge by an insulating-block U'. The trip W is pivoted to a base W' and is provided with a rounded catch *w*, which engages the end *v* of the arm V', the trip W being held in locked position by a spring *w'*, which is interposed between the trip W and the contact-spring E'. Preferably the spring *w'* is coiled about a headed pin or rod which is arranged to pass loosely through the spring W, as shown in Fig. 3. As in the prior construction, the contact-spring E' normally inclines toward the electrode G and is wedged away therefrom and electrically connected therewith by the heat-coil O and the plug P, the set position of the contact-spring E' serving also to put the spring *w'* under sufficient stress to throw the trip W into locking contact with the end *v* of the arm V'. The terminal T is attached to the base A' by means of a screw *t*, which is provided with a nut *t'* and serves as a binding-post. The stem *u* of the bridge U is provided at its lower end with a contact-maker *x*, which when the bridge U is released by the disengagement of the arm V' from the trip W serves to connect the terminals X, thereby closing a local alarm-circuit which may be used to give notice of the break in the main circuit and the location of such break. M' is a terminal for a ground-wire, one end of said terminal being fitted over one of the carbons *j* of the lightning-arrester. With the device as so constructed when the apparatus is set and the circuit is closed the main circuit passes from the binding-post *t* through the terminal T, the bridge U, the terminal T', the contact-spring E', the heat-coil O, the plug P, and the electrode G. Whenever the current exceeds the predetermined maximum, the plug P is fused, as shown in Fig. 5, thereby allowing the contact-spring E' to yield in the direction of the terminal G. This results in lessening the stress of the spring *w'*, thereby releasing the arm V' from the trip W, the upward pressure of the insulating-block U' against the under side of the arm V' assisting in disengaging the arm V' from the trip W. As soon as the arm V' is released the bridge U is thrown upwardly and disengaged by the spring *u'* from the electrodes T T', thereby breaking the main circuit. At the same time the contact-maker *x'* is drawn into contact with the terminals X, thereby bridging the same and closing a local circuit. If it be desired to at the same time shunt the main current into another wire otherwise than by means of the usual lightning-arrester, the device will be fitted with the electrode M', with which the wire R makes direct contact when the plug P is fused and the spring E' moves in the direction of the electrode G.

Where a number of automatic cut-out devices are desired at a given point, they may be compactly mounted in pairs, as shown in Fig. 7, in which two of our devices of the form shown in Fig. 3 are mounted upon a common base, each of said devices being interposed in a separate circuit from the other device; but whenever circuit is broken the current will be shunted to the same ground-wire. This arrangement in pairs can of course also be made with the preferred form of our device, as shown in Figs. 1 and 2.

Aside from the advantages previously noted it will also be seen that with our improved device it is impossible for an excessive current to injure the instruments which are protected by our automatic cut-out. Further, whenever the circuit is broken by an excessive current no part of the device except the fusible plug P needs to be renewed, and as this plug can be made in the form of a sleeve, which is merely slipped over the wire R, the fused plugs can be readily replaced at practically no expense and with a minimum of delay and labor. So, also, as the casing O' and attached parts need be held in engagement with the spring E and electrode G only by spring-pressure it is a simple matter to keep on hand a number of the heat-coils complete, including the casing O' and attached parts, in which the heat-coils proper shall afford any desired resistance. With such a supply on hand it is only the work of an instant to remove any given heat-coil and plug from our apparatus and replace it with one affording any desired resistance.

While we have described our preferred constructions, there are many modifications which may be made as a matter of convenience or of shop expediency, but which do not involve a departure from the spirit of our invention. Obviously the contour and proportions of many of the parts may be varied considerably and parts not needed for a given service may be omitted, as convenience or expediency may suggest, without departing from the spirit of our invention.

While we have shown and described our invention as an automatic cut-out, our combination of the heat-coil and fusible plug with a pair of electrodes, one at least of said electrodes being spring-actuated in such a manner that said electrodes are wedged apart by the fusible plug through which the circuit is completed and movement of the spring-actuated electrode is permitted whenever the plug is fused by an excessive current, thereby narrowing the wedge, is suitable for use in any situation and for any purpose where it is desired that the introduction of an excessively strong current into the circuit shall result in the movement of a portion of the apparatus, whether such movement be used to operate

a switch for wholly or in part shunting the current or to operate a trip for breaking the circuit or for opening a valve or for any other usual purpose.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The combination with an electric circuit, of a pair of electrodes, a fusible plug interposed therebetween, means interposed in said circuit for automatically fusing said plug, and means for automatically moving one of said electrodes in the direction of the other electrode whenever said plug is fused.

2. The combination with an electric circuit, of a spring-contact, an electrode, a fusible plug interposed in said circuit between said spring-contact and said electrode so as to deflect said spring-contact against spring-pressure, and means interposed in said circuit for automatically fusing said plug.

3. The combination with an electric circuit, of a pair of electrodes, a wedge interposed between said electrodes, said wedge comprising a fusible plug, and means for completing said circuit between said electrodes, means for automatically fusing said plug, and means for automatically deflecting one of said electrodes in the direction of the other electrode whenever said plug is fused.

4. The combination with an electric circuit, of a pair of electrodes, a wedge interposed between said electrodes and completing said circuit, said wedge comprising a heat-coil, contacts and a fusible plug, and means for automatically moving one of said electrodes in the direction of the other electrode whenever said plug is fused.

5. The combination with an electric circuit, of a pair of electrodes, a contact-maker, a wedge interposed between said contact-maker and one of said electrodes so as to hold said contact-maker in contact with the other of said electrodes, said wedge comprising a fusible plug, means for automatically fusing said plug and means for automatically throwing said contact-maker out of contact whenever said plug is fused, substantially as described.

6. In an automatic cut-out device, the combination with a pair of electrodes, of a spring-contact arranged to make contact with one of said electrodes, but normally out of contact therewith, a circuit-closing device comprising a fusible plug interposed between said spring-contact and one of said electrodes so as to force said spring-contact into contact with the other of said electrodes, and means for automatically fusing said fusible plug, substantially as described.

7. The combination with an electric circuit, of a pair of electrodes, a contact-maker arranged to make contact with one of said electrodes but normally out of contact therewith, a fusible plug interposed between the other of said electrodes and said contact-maker so as to force said contact-maker into contact with the first-mentioned electrode, means for automatically fusing said plug and releasing said contact-maker, and means actuated by the movement of said contact-maker, when so released, for automatically closing a second circuit.

8. In an automatic cut-out device, the combination with a spring-electrode, of a fusible plug interposed between said spring-electrode and a stationary part of the device so as to force said spring-electrode out of its normal position and complete said circuit, means for automatically fusing said plug, and means, set in motion upon the release of said spring-electrode, for breaking said circuit, substantially as described.

9. In an automatic cut-out device, the combination with a spring-electrode, of a fusible plug interposed between said spring-electrode and a stationary part of the device so as to complete said circuit and force said spring-electrode out of its normal position, means for automatically fusing said plug, and means, set in motion upon the release of said spring-electrode, for breaking said circuit and for closing a second and independent circuit, substantially as described.

10. In an automatic cut-out device, the combination with a spring-electrode, of a fusible plug interposed between said spring-electrode and a stationary part of the device so as to complete said circuit and force said spring-electrode out of its normal position, means for automatically fusing said plug, and means, set in motion upon the release of said spring-electrode, for breaking said circuit and for closing a shunt-circuit, substantially as described.

11. In a circuit breaking and closing device, the combination with a pair of electrodes, of a contact-maker arranged to make contact with one of said electrodes but normally out of contact therewith, a circuit-closing device comprising a fusible plug interposed between said contact-maker and the other of said electrodes so as to force said contact-maker into contact with the first-mentioned electrode, means for automatically fusing said plug, a third electrode, and means actuated by the movement of said contact-maker upon the fusing of said plug for electrically connecting said third electrode with one of the aforesaid electrodes, substantially as described.

12. In an automatic cut-out device, the combination with a spring-electrode, of a fusible plug interposed between said spring-electrode and a stationary part of the device so as to complete said circuit and force said spring-electrode out of its normal position, means for automatically fusing said plug, and means, set in motion upon the release of said spring-electrode, for breaking said circuit, closing a shunt-circuit and also closing an independent circuit, substantially as described.

13. In an automatic cut-out device, the combination with a spring-electrode, of a fusible plug interposed between said spring-electrode

and a stationary portion of the device so as to force said spring-electrode out of its normal position, means for automatically fusing said plug, a trip automatically operated by the movement of said spring-electrode when released, an arm engaged by said trip, a pair of electrodes, a circuit-closing bridge arranged therebetween and held by said arm in contact with said pair of electrodes, and means for automatically throwing said bridge out of contact with said pair of electrodes upon the release of said arm, substantially as described.

14. A circuit-closing plug comprising a cell formed of insulating material, a heat-coil arranged within said cell, an exposed metallic contact arranged at each end of said heat-coil, and a loose fusible plug arranged adjacent to one of said metallic contacts.

15. A circuit-closing plug comprising a cell made of insulating material and provided at one end with a projection of like material, a heat-coil arranged within said cell, a metallic contact mounted upon said projection and electrically connected with one end of said heat-coil, an exposed metallic contact electrically connected with the other end of said heat-coil, and a fusible plug arranged externally of said cell and adjacent to said metallic contact.

16. The combination with an electric circuit, of a freely-removable fusible plug interposed therein to complete said circuit, and means for automatically fusing said plug, said means being adapted to be operated by the entrance of an excessive current to said circuit, substantially as described.

17. The combination with an electric circuit, of a pair of contacts and a fusible plug forming a part of said circuit and interposed between one of said contacts and another portion of the apparatus, so as to complete said circuit by deflecting one of said contacts into electrical contact with the other of said contacts, substantially as described.

AARON A. SEELEY.
CHARLES SILET.

Witnesses:
M. E. SHIELDS,
E. Y. GRIDLEY.