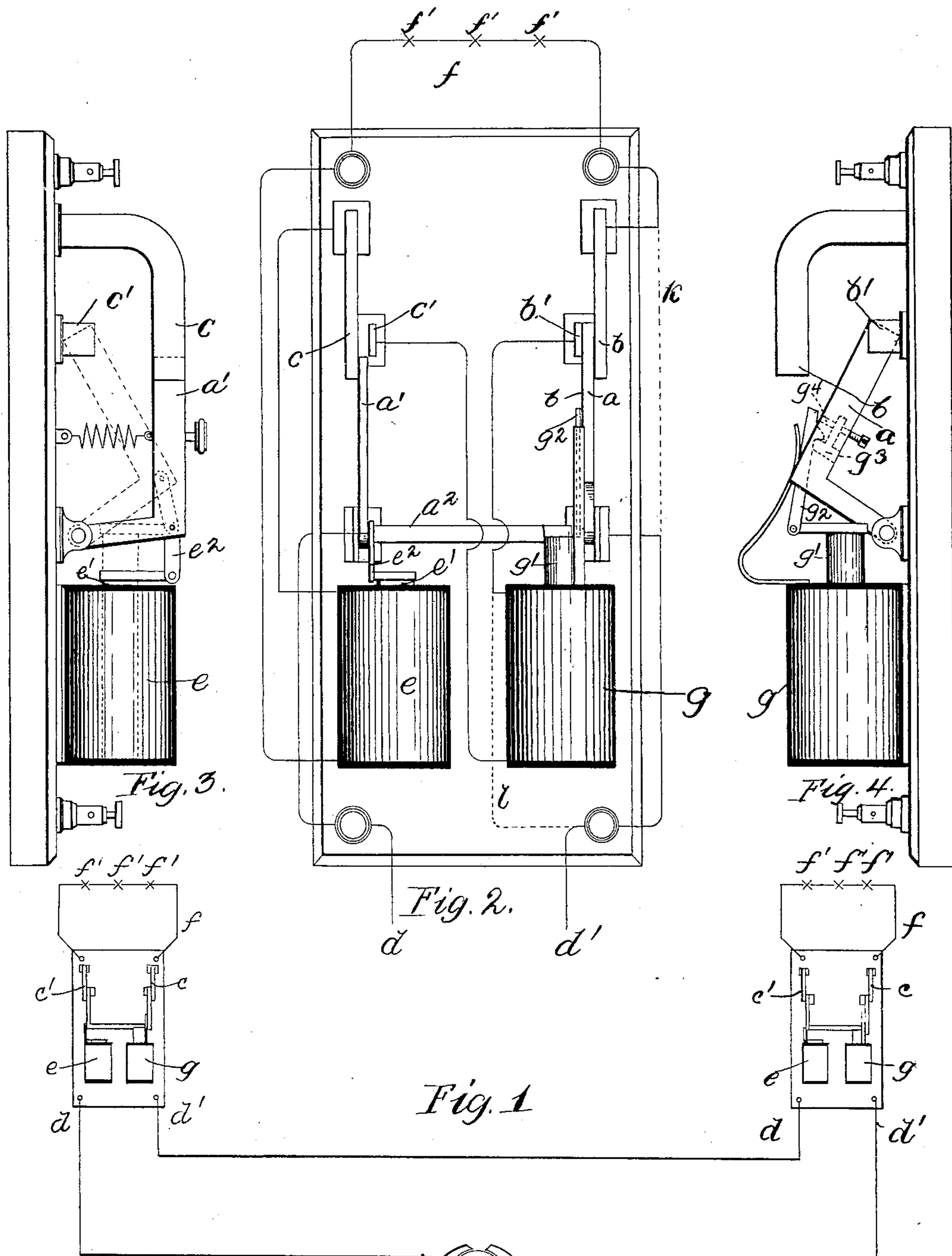


(No Model.)

A. L. TUCKER & F. H. LOVERIDGE.  
CIRCUIT REESTABLISHING CUT-OUT.

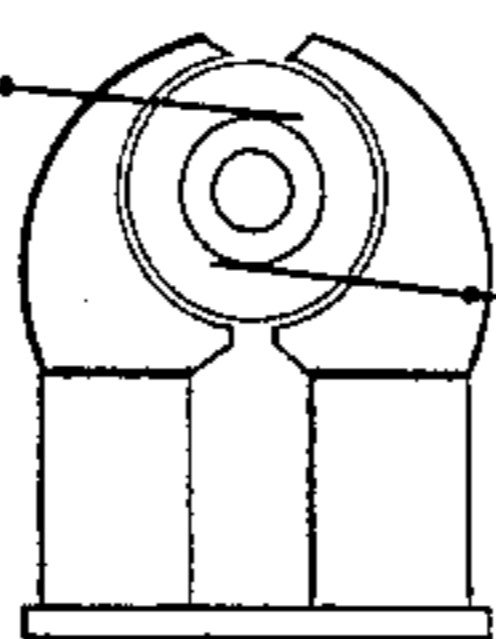
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Witnesses:

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# UNITED STATES PATENT OFFICE.

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## CIRCUIT-REESTABLISHING CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 563,335, dated July 7, 1896.

Application filed August 8, 1895. Serial No. 558,664. (No model.)

*To all whom it may concern:*

Be it known that we, ALBERT L. TUCKER and FREDERICK H. LOVERIDGE, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Circuit-Reestablishing Cut-Outs, (Case No. 3,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Our invention relates to a circuit-reestablishing cut-out for electric circuits, our object being to provide an automatic cut-out that will momentarily open the circuit when the continuity of the circuit is interrupted and then reestablish the circuit, so that, should the continuity of the circuit be restored, the circuit will be again completed through the automatic cut-out, while if the continuity be not restored the working circuit will be insulated from the supply-circuit.

In accordance with our invention, we provide a pair of contacts adapted to normally rest in engagement to complete circuit through the working circuit, a solenoid being included in circuit adapted to maintain the contacts in engagement. When, from any cause, the continuity of the working circuit is interrupted, the solenoid is deenergized and the contacts are separated, thus disconnecting the working circuit from the supply-circuit. The deenergizing of the solenoid permits the closing together of a second pair of contacts, which completes the circuit through a second solenoid, which acts to immediately separate the members of the second pair of contacts, an arc being formed between the same, the first pair of contacts being again closed together, so that, should the continuity of the working circuit have been restored, the first solenoid will be again energized to maintain the first pair of contacts in engagement, and, as the resistance through the working circuit is considerably less than the resistance through the arcs formed between the second pair of contacts, the arcs will be interrupted and circuit maintained through the working circuit as long as the continuity thereof remains intact. If, during the operation of the cut-out, the continuity of the working circuit should not

have been restored, the first pair of contacts would be permanently separated to cut out the working circuit and the second pair of contacts would be closed together to complete the supply-circuit through the cut-out.

We will describe our invention in connection with the accompanying drawings, in which—

Figure 1 is a diagram of our improved cut-out as employed in connection with an electric-light circuit, the lamps of which are included in series and a portion controlled by each of two cut-outs. Fig. 2 is a plan view of a cut-out embodying our invention, circuit connections being indicated diagrammatically. Fig. 3 is a side view thereof as seen from one side. Fig. 4 is a view as seen from the opposite side.

Like letters refer to like parts in the several figures.

A pair of relatively-insulated arms  $a$   $a'$  are mounted to swing, being mounted upon a bar  $a^2$ , journaled in bearings  $a^3$   $a^4$ . The end of the arm  $a$  is adapted, when elevated, to engage a contact  $b$  and when in its lowered position to make engagement with the contact  $b'$ . Likewise, the end of arm  $a'$  alternately engages the upper contact  $c$  and the lower contact  $c'$ . One side,  $d$ , of the supply-circuit is connected with the arm  $a'$ , while the other side,  $d'$ , of the circuit is connected with the arm  $a$ .

The upper contact  $c$  is connected with a solenoid  $e$ , the circuit then extending through the working circuit  $f$ , which may contain arc-lamps  $f'$   $f''$ , or other translating devices, and thence to the upper contact  $b$ . A solenoid  $g$  is included between the lower contacts  $b'$  and  $c'$ . The core  $e'$  of solenoid  $e$  is connected with the arm  $a'$  by means of a link  $e^2$ , the connection being permanent, so that any movement of the core  $e'$  imparts a corresponding movement to the arm  $a'$ . The core  $g'$  of the solenoid  $g$  is detachably connected with the arm  $a$ , a latch or hooked lever  $g^2$  being pivoted to the solenoid  $g'$ , the hooked end of which is adapted to engage a lug  $g^3$ , carried upon the arm  $a$ , a screw  $g^4$  being provided upon the arm and adapted to engage by its end the latch  $g^2$ . When the solenoid  $g'$  is attracted, the latch  $g^2$  engages the lug  $g^3$  and raises the

arm  $a$  until the end of the screw  $g^4$  raises the hook or catch of the latch out of engagement with the lug  $g^3$  and the arm  $a$  is moved downward by means of the spring  $h$ , connected with arm  $a'$ , the two arms  $a$   $a'$  being rigidly connected together. By adjusting the screw  $g^4$  the latch  $g^2$  may be caused to release the arms  $a$   $a'$  at any desired point.

Normally the current passes from the side  $d$  of the supply-circuit to the arm  $a'$ , thence to the contact  $c$ , with which the arm is in engagement, and then through the solenoid  $e$  to the working circuit  $f$ , returning to contact  $b$ , thence to arm  $a$ , and to the opposite side  $d'$  of the circuit. The solenoid  $e$  is thus energized, attracting its core  $e'$  and holding the arms  $a$  and  $a'$  in engagement with the upper contacts  $b$  and  $c$ , respectively. Should the continuity of the working circuit be interrupted, the solenoid  $e$  will be deenergized and the spring  $h$  will draw the arms  $a$   $a'$  downward out of engagement with the upper contacts  $b$   $c$ , thus opening the circuit. The arms  $a$  and  $a'$  will make contact, respectively, with the lower contacts  $b'$   $c'$  and circuit will thus be closed from the side  $d$  of the supply-circuit through the arm  $a'$ , contact  $c'$ , solenoid  $g$ , contact  $b'$ , arm  $a$ , and back to the opposite side  $d'$  of the supply-circuit. The solenoid  $g$  is thus energized, core  $g'$  is drawn in and by means of catch  $g^2$  engaging with the lug  $g^3$ , the arms  $a$   $a'$  are raised and brought into engagement with the contacts  $b$  and  $c$ , the current arcing across from contacts  $b'$  and  $c'$  to the arms  $a$  and  $a'$ , the relation of the parts being such that the arcs do not break until the upper contact is made. Shortly after the contacts above are established, the catch  $g^2$ , by the action of the screw  $g^4$ , adjusted for this purpose, becomes disengaged from the lug  $g^3$ , and if the working circuit is not reestablished, thereby permitting the solenoid  $e$  to become energized, the arms  $a$   $a'$  are forced downward by the spring until again in engagement with the contacts  $b'$  and  $c'$ . The core  $g'$  having once been drawn within the solenoid  $g$ , remains in that position and the catch  $g^2$  is permanently disengaged from the lug  $g^3$ . The current is thus short-circuited from the side of the supply-current through arm  $a'$ , contact  $c'$ , solenoid  $g$ , contact  $b'$ , arm  $a$ , to the opposite side  $d'$  of the circuit, the working circuit being thereby cut out and the supply-circuit established through the cut-out.

Should the continuity of the working circuit have been restored while the cut-out is operating, upon the engagement of the arms  $a$   $a'$  with the upper contacts  $b$   $c$  circuit will be again closed through the solenoid  $e$ , thus energizing the same and causing the attraction of the core  $e'$ , which will maintain the arms  $a$   $a'$  in engagement with the upper contacts  $b$   $c$  and, the resistance through the working circuit being much less than the resistance through the arcs, the arcs will be interrupted and the parts will remain in their

normal positions as long as the continuity of the circuit is maintained.

In Fig. 1 we have illustrated two cut-outs embodying our invention as applied to a working circuit containing arc-lamps  $f'$   $f'$ , half of the number of lamps being controlled by each of the cut-outs. Should the circuit in one of the working circuits be interrupted, both cut-outs will operate to move the arms  $a$   $a'$  out of contact with the upper contacts  $b$   $c$ , thus disconnecting the two working circuits from the supply-circuit, but both of the cut-outs will immediately act to move the arms  $a$   $a'$  into engagement with the contacts  $b$   $c$  again and, presuming that the continuity of the circuit through the first working circuit has not been restored, the contacts will be separated again and the cut-out will act to open the working circuit and insulate the same from the supply-circuit while completing the supply-circuit through the cut-out. The cut-out belonging to the second working circuit, the continuity of which has not been interrupted, will act to reestablish the circuit and the lamps therein will continue to burn, although the lamps of the first working circuit have been cut out.

While we have illustrated the working circuit as divided into two portions, each provided with a cut-out, any greater number than two may be provided.

While but a single cut-out is employed in the supply-circuit, a single arm  $a'$  and a single pair of contacts  $c$   $c'$  may be employed, the circuit extending directly from the working circuit to the return  $d'$  of the supply-circuit, as illustrated by the dotted line  $k$  in Fig. 2, and when desired the solenoid  $g$  may be connected at one end directly to the return side  $d'$  of the supply-circuit, as indicated by the dotted line  $l$ .

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

1. In a cut-out, the combination with a pair of contacts normally in engagement to complete the electric circuit, of means for separating said contacts when the circuit is interrupted at any point, means for effecting a single return of said contacts to their position of engagement to momentarily complete the circuit therethrough, and means for maintaining said contacts in engagement when the continuity of said circuit has been restored; whereby the cut-out acts to reestablish the circuit if the circuit external to the cut-out be reestablished, while if the external circuit remain open the contacts are permanently separated; substantially as described.

2. The combination with a pair of contacts normally in engagement to complete the circuit, of a solenoid or electromagnet normally energized to maintain said contacts in engagement, means for separating said contacts when said solenoid is deenergized, a second pair of contacts adapted to be closed together when said solenoid is deenergized, and a so-

lenoid or electromagnet in circuit with said second pair of contacts adapted when energized to move said first pair of contacts into engagement; substantially as described.

5 3. The combination with a pair of contacts normally in engagement to complete the circuit, of a solenoid or electromagnet in series in the working circuit and normally energized to maintain said contacts in engagement, 10 said contacts being moved out of engagement when the solenoid is deenergized, a second pair of contacts adapted to be closed together when said solenoid is deenergized to complete the circuit through the cut-out, a solenoid or 15 electromagnet adapted to be included in series in the circuit when said second pair of contacts are closed together, and means for re-establishing the engagement between the first pair of contacts through the agency of said 20 second solenoid or electromagnet; substantially as described.

4. The combination with a movable contact, of a stationary contact normally engaged thereby to complete the circuit, a solenoid or 25 electromagnet included in said circuit, the movable element of said solenoid or electromagnet being fixedly connected with said

movable contact, a second contact with which said movable contact is adapted to engage when the solenoid is deenergized, and a second solenoid or electromagnet in circuit with said second contact, the movable element of said solenoid or electromagnet being detachably connected with said movable contact; 30 substantially as and for the purpose set forth. 35

5. The combination with the pivoted arms  $a a'$ , of the contacts  $c b$  and  $c' b'$  adapted to be alternately engaged thereby, the solenoid  $e$  the core  $e'$  of which is fixedly connected with said pivoted arms, and the solenoid  $g$  40 the core  $g'$  of which is detachably connected with said arms; substantially as described.

In witness whereof we hereunto subscribe our names in the presence of two witnesses.

ALBERT L. TUCKER.

FREDERICK H. LOVERIDGE.

Witnesses to signature of Albert L. Tucker:

W. CLYDE JONES,

ERNEST P. WARNER.

Witnesses to signature of Frederick H. Loveridge:

WILLIAM H. TURNER,

IRVIN W. DUFFEE.