(No Model.) 3 Sheets—Sheet 1.

# L. G. ROWAND.

## AUTOMATIC SAFETY DEVICE FOR ELECTRIC CIRCUITS.

No. 570,882. Patented Nov. 3, 1896.

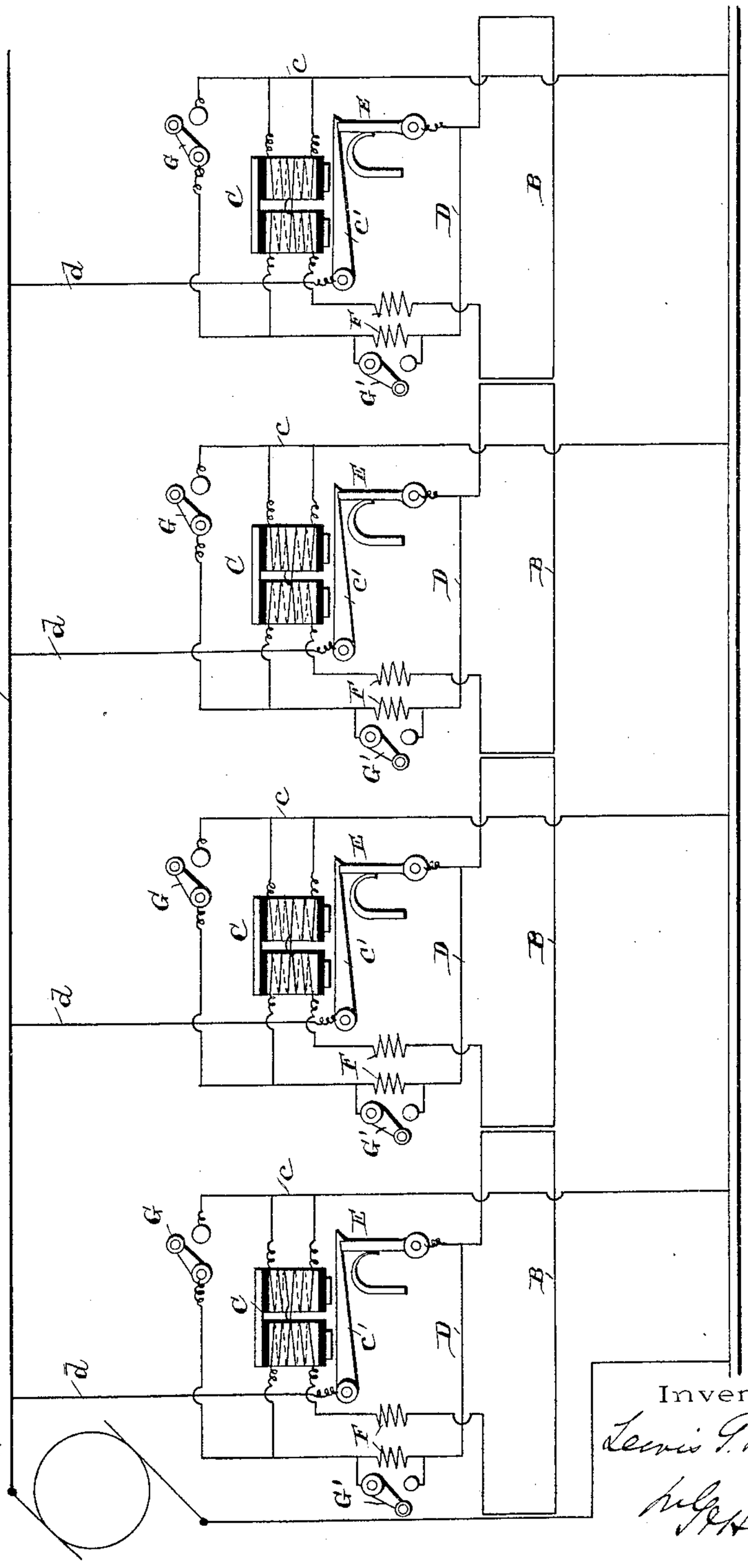


Fig. 1.

Witnesses.
Jesse B. Heller.
Minnie G. Ellis.

Inventor.
Lewis G. Rowand
by G. H. Strong
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(No Model.) 3 Sheets—Sheet 2.

# L. G. ROWAND.

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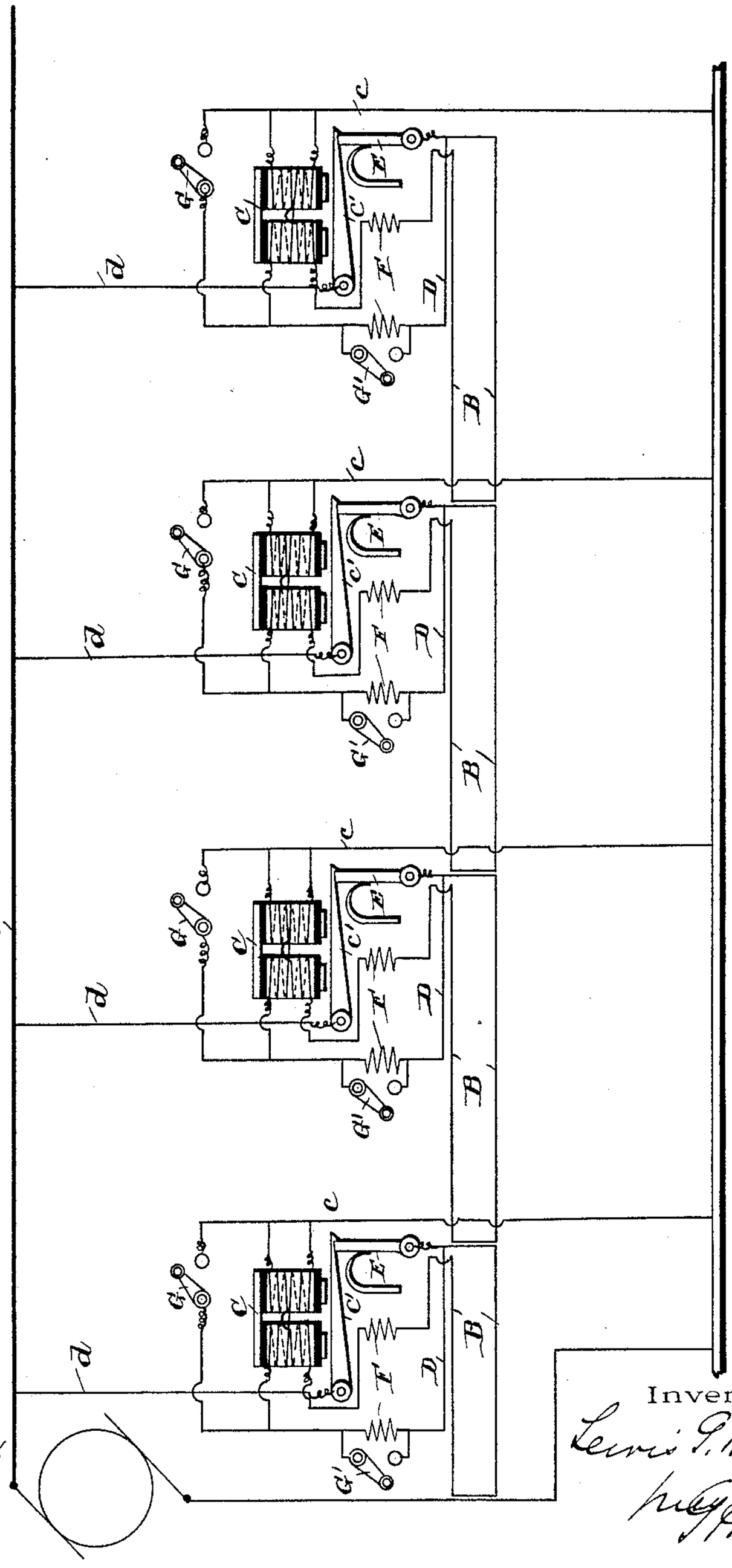


Fig. 2.

Witnesses.
Jesse B. Heller.
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(No Model.) 3 Sheets—Sheet 3.

# L. G. ROWAND.

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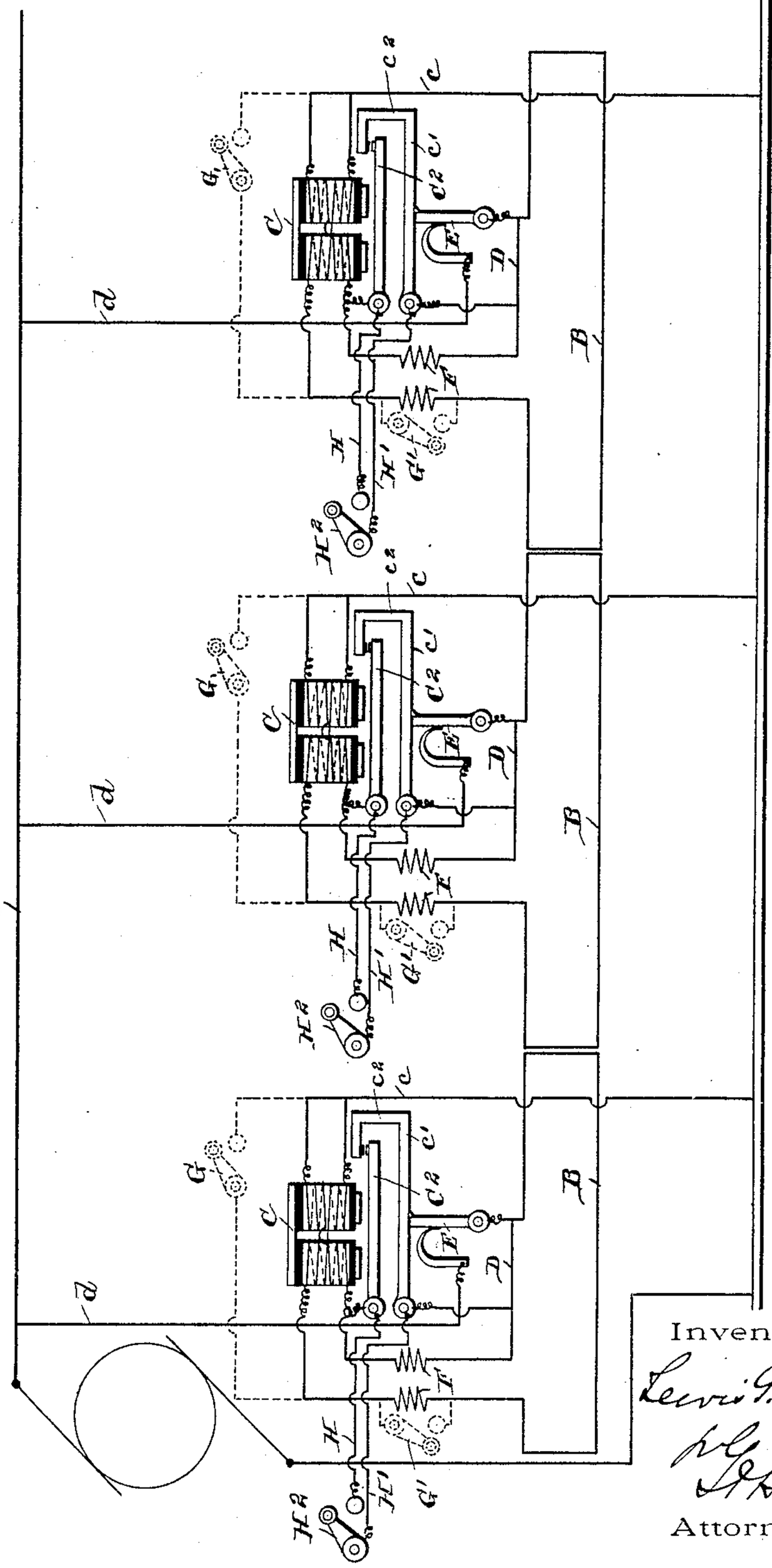

Fig. 2.

Witnesses.
Jesse B. Keller,
Minnie F. Ellis

Inventor.
Lewis G. Rowand
by G. H. Harding
Attorney.

# UNITED STATES PATENT OFFICE.

LEWIS G. ROWAND, OF CAMDEN, NEW JERSEY, ASSIGNOR TO THE UNIVERSAL FIRE ALARM COMPANY, OF SAME PLACE.

## AUTOMATIC SAFETY DEVICE FOR ELECTRIC CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 570,882, dated November 3, 1896.

Application filed September 13, 1895. Serial No. 562,380. (No model.)

*To all whom it may concern:*

Be it known that I, LEWIS G. ROWAND, a citizen of the United States, residing at Camden, county of Camden, and State of New Jersey, have invented a new and useful Improvement in Automatic Safety Devices for Electric Circuits, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention is particularly adapted for trolley-lines in streets, and in its adoption to that purpose I will describe my invention, although it is to be understood that I do not intend to limit the invention to any particular use.

In the drawings, Figure 1 is a diagram of a single line. Fig. 2 is a diagram of a double line. Fig. 3 is a detail diagrammatical view showing devices whereby the current to magnet may be decreased.

Speaking first of Fig. 1, A is the main or trunk wire of an electric road; B, the trolley-section. The return of this trolley-section B before passing to ground passes through the electromagnet C, which has double winding, the windings being in opposite directions. The trolley-sections B pass to one of these windings. From the magnet C a wire *c* connects to ground.

D is a wire connected also with the trunk-line, the trolley-section B and wire D having a common connection with the trunk-line A through wire *d*. The wire D is connected with the opposite winding of the magnet C to that to which wire B is connected. It may thus be seen that, speaking of the circuits formed by wire B and wire D, there are two circuits in multiple, having a connection *d* with the source of current supply (trunk A) common to both, each circuit having a winding of the magnet C in circuit, but the windings being opposite, so that normally the currents passing through the magnet C from the two circuits neutralize each other, and the magnet is not energized.

Upon the connection *d*, common to both circuits B and D, is placed a switch E, which switch is normally closed, the switch being controlled by the armature *c'* of the magnet C, the arrangement being such, as is clearly shown in the drawings, that when the magnet is energized the armature acts to operate the switch to open the circuits upon the portion *d*.

Upon both the circuits of the wires B and D are placed resistances F to prevent unnecessary current passing through the magnet.

The practical operation of this device may be thus described: Under ordinary conditions the current passes from the trunk-line A both through the circuit B and circuit D. The circuit B is the trolley-circuit and feeds the trolley-cars. The current from both circuits B and D passes through the magnet C, but passing in opposite directions does not energize it. Now if, in case the trolley-wire B should break, the current will no longer, so far as that circuit is concerned, pass through the magnet C. The consequence is that the current from the circuit D passing through the magnet C will energize it, and the armature will open the switch and cut off any current passing to either the circuit B or the circuit D. As a consequence, if for any cause a trolley-wire should break, no matter how many cars were upon the circuit, at once the current passing to that wire would be cut off, and there would be no danger of any live wires.

In Fig. 2 the only difference existing between it and Fig. 1 is that in the former case, Fig. 2, I have shown a trolley equipment for a double-track road. In this case, instead of the section or circuit B passing directly back to the magnet, it passes back over the opposite track, and then the return-wire passes through the magnet C to ground.

In order to cut off any trolley-section which may be desirable in case of a fire or for any other cause, I place upon either circuit B or D, (as shown it is circuit D,) preferably at a point contiguous to the magnet C, a switch G, having a ground connection, which switch may be operated by hand, so as to short-circuit the wire D to ground, which of course will have the effect of preventing it passing through the armature C, and therefore, as in the case of the broken wire, the magnet C will become energized and open the circuit on the common wire *d*. The same thing may

be accomplished by a switch which, as shown, is short-circuited around the resistance, as shown at G′. In many cases it is desirable that the least possible amount of current should pass to the magnet C through circuits B and D. This is accomplished by making the resistances F very high. In this case when the magnet is energized it would be but slightly, and hence might not act upon the armature $c'$. I provide the following, (see Fig. 3:) The lever $c'$, instead of being acted on directly by a magnet C, is acted on through the medium of pivoted lever $C^2$, which forms the armature of the magnet C. The lever C′ has a projection $c^2$ in line of movement of one end of lever $C^2$. Both levers at this point carry contact-points normally out of contact with each other. A wire from one side of resistances F in circuit D passes to lever C′, and from the other side of resistances F a wire passes to lever $C^2$. Now suppose the circuit B to be broken. At first the magnet C is energized by the slight amount of current in circuit D passing resistances F, which is enough to move the lever $C^2$, so that the contacts on it and lever $c'$ are in contact, and at once the current in circuit D passes to the magnet C independent of the resistances and the magnet becomes highly energized, drawing up lever $C^2$, so that it, acting on the projection $c^2$ of lever $c'$, moves said lever so as to trip up switch E. In this connection I can, by means of the wires H and H′ and switch $H^2$, by hand shunt the circuit B around the resistances, and thus energize the magnet and open circuit B, and this may be used in connection with or in place of switch G, Figs. 1 and 2.

As stated previously in the specification, while I have described my invention in connection with the trolley-wire, I do not intend to limit myself to that purpose, as my improvement is adapted for use in any electrical circuit used for any purpose.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. Two circuits in multiple having a common connection with the source of current supply, and a normally-closed switch controlling said common connection, an electromagnet having reverse windings creating a normally ineffective field, one winding being in one circuit and the other winding in the other circuit, said magnet controlling the operation of the switch, and adapted when its field becomes effective to open said switch.

2. Two circuits in multiple having a common connection with the source of current supply, and a normally-closed switch controlling said common connection, an electromagnet having reverse windings creating a normally ineffective field, one winding being in one circuit and the other winding in the other circuit, said magnet controlling the operation of the switch and adapted when its field becomes effective to open said switch and a switch adapted when operated to cut off the current from one of the magnet-windings.

3. The combination with a main electric circuit, a secondary circuit, an electromagnet included in both circuits, said magnet having reverse windings creating a normally ineffective field, one winding being included in the main circuit and the other in the other circuit, and a normally-closed switch controlling the current in the main circuit controlled by said magnet, said magnet being adapted when its field becomes effective to open said switch.

4. Two circuits in multiple having a common connection with the source of current supply, and a switch controlling said common connection, an electromagnet having reverse windings, creating a normally ineffective field, one winding being in one circuit, and the other winding in the other circuit, said magnet controlling the operation of the switch and adapted, when its field becomes effective, to open said switch, resistances in both circuits, and means when said magnet-field becomes effective to shunt the current about one of said resistances.

5. The combination with a main electric circuit, a secondary circuit, an electromagnet included in both circuits, said magnet having reverse windings creating a normally ineffective field, one winding being included in the main circuit, and the other in the other circuit, and a switch controlling the current in the main circuit controlled by said magnet, said magnet being adapted, when its field becomes effective, to open said switch, resistances in both circuits, and means, when the magnet becomes effective, to shunt the current about one of said resistances.

6. Two circuits in multiple having a common connection with the source of current supply, and a switch controlling said common connection, an electromagnet having reverse windings, creating a normally ineffective field, one winding being in one circuit, and the other winding in the other circuit, said magnet controlling the operation of the switch and adapted, when its field becomes effective, to open said switch, resistances in both circuits, and means independent of the magnet to shunt the current about one of said resistances.

7. The combination with a main electric circuit, a secondary circuit, an electromagnet included in both circuits, said magnet having reverse windings, creating a normally ineffective field, one winding being included in the main circuit, and the other in the other circuit, and a switch controlling the current in the main circuit controlled by said magnet, said magnet being adapted, when its field becomes effective, to open said switch, resistances in both circuits, and means independent of the magnet to shunt the current about one of said resistances.

8. Two circuits in multiple having a com-

mon connection with the source of current supply, and a normally-closed switch controlling said common connection, an electric device having double windings, making said device normally ineffective, one winding being in one circuit, and the other winding in the other circuit, said electric device controlling the operation of the switch and adapted when rendered effective to open said switch.

9. Two circuits in multiple having a common connection with the source of current supply, and a normally-closed switch controlling said common connection, an electric device having double windings, making said device normally ineffective, one winding being in one circuit, and the other winding in the other circuit, said electric device controlling the operation of the switch, and adapted when rendered effective to open said switch, and a switch adapted to cut the current from one of said windings.

10. The combination with a main electric circuit, a secondary circuit, an electric device included in both circuits, said device having double windings making said device normally ineffective, one winding being included in the main circuit, and the other in the other circuit, and a normally-closed switch controlling the current in the main circuit controlled by said electric device, said device, when rendered effective, being adapted to open said switch.

11. Two circuits in multiple having a common connection with the source of current supply, and a switch controlling said common connection, an electric device having double windings, making said device normally ineffective, one winding being in one circuit, and the other winding in the other circuit, said electric device controlling the operation of the switch, and adapted, when rendered effective, to open said switch, resistances in both circuits, and means controlled by said electric device to shunt the current about one of said resistances.

12. The combination with a main electric circuit, a secondary circuit, an electric device included in both circuits, said electric device having double windings, making said device normally ineffective, one winding being included in the main circuit, and the other in the other circuit, and a switch controlling the current in the main circuit, controlled by said electric device, said electric device being adapted, when rendered effective, to open said switch, resistances in both circuits, and means controlled by the electric device to shunt the current about one of said resistances.

13. Two circuits in multiple having a common connection with the source of current supply, and a switch controlling said common connection, an electric device having double windings, making said device normally ineffective, one winding being in one circuit, and the other winding in the other circuit, said electric device controlling the operation of the switch, and adapted, when rendered effective, to open said switch, resistances in both circuits, and means independent of the electric device to shunt the current about one of said resistances.

14. The combination with a main electric circuit, a secondary circuit, an electromagnet included in both circuits, said magnet having reverse windings, creating a normally ineffective field, one winding being included in the main circuit, and the other in the other circuit, and a normally-closed switch controlling the current in the main circuit controlled by said magnet, and adapted when its field becomes effective to open said switch, and means to open one of said circuits independent of the magnet-switch.

15. The combination with a main electric circuit, a secondary circuit, an electric device included in both circuits, said device having double windings, making said device normally ineffective, one winding being included in the main circuit, and the other in the other circuit, and a normally-closed switch controlling the current in the main circuit controlled by said electric device, said device when rendered effective being adapted to open said switch, and means to open one of said circuits independent of the electric-device switch.

16. Two circuits having a common source of current supply, a switch controlling the admission of current from the source of current supply to said circuits, an electric device having double windings, making said device normally ineffective, one winding being in one circuit, the other winding in the other circuit, said electric device controlling said switch and adapted when rendered effective, to open said switch.

17. In an electric railroad, the combination of a source of current supply, a main feeder-wire, trolley-section wires each having connection with the main feeder-wire, a normally-closed switch controlling the admission of current from the feeder-wire to each trolley-section, an electric device having double windings, one winding in the trolley-section-wire circuit, the other in a circuit independent of the trolley-section, said electric device controlling the operation of the switch, and adapted when the trolley-wire breaks to operate to open said switch.

18. In an electric railroad, the combination of a source of current supply, a main feeder-wire, a trolley-section wire having connection with the said main feeder-wire, a normally-closed switch controlling the admission of current from the feeder-wire to said trolley-section, an electric device having double windings, one winding in the trolley-section-wire circuit, the other in a circuit independent of the trolley-section wire, said electric device controlling the operation of the switch and adapted when the trolley-section wire breaks to open said switch.

19. In an electric railroad, the combination of a source of current supply, a trolley-section having connection with the trolley-section wire, a normally-closed switch controlling said connection, an electric device having double windings, one winding in the circuit including the trolley-section, the other in the circuit independent of the trolley-section, said electric device controlling the operation of the switch and adapted when the trolley-section is broken to operate to open said switch.

20. In combination, an electric circuit, a source of current supply, a normally-closed switch controlling the admission of current from the source of supply to said circuit, an electric device on a circuit independent of the first-mentioned circuit, adapted when its field is effective to open said switch, and an electric device on the first-mentioned circuit acting against said first-mentioned electric device and adapted with the normal resistance of the main circuit to neutralize the action of the first-mentioned electric device.

21. In combination, an electric circuit, a source of current supply, a normally-closed switch controlling the admission of current from the source of supply to said circuit, an electric device on a circuit independent of the first-mentioned circuit but having the same source of current supply adapted when its field is effective to open said switch, and an electric device on the first-mentioned circuit acting against said first-mentioned electric device and adapted with the normal resistance of the main circuit to neutralize the action of the first-mentioned electric device.

In testimony of which invention I have hereunto set my hand.

LEWIS G. ROWAND.

Witnesses:
GEO. W. REED,
MINNIE F. ELLIS.