No. 815,961. PATENTED MAR. 27, 1906.

W. H. LANE.

ELECTRICAL DEVICE AND CIRCUIT.

APPLICATION FILED JUNE 2, 1905.

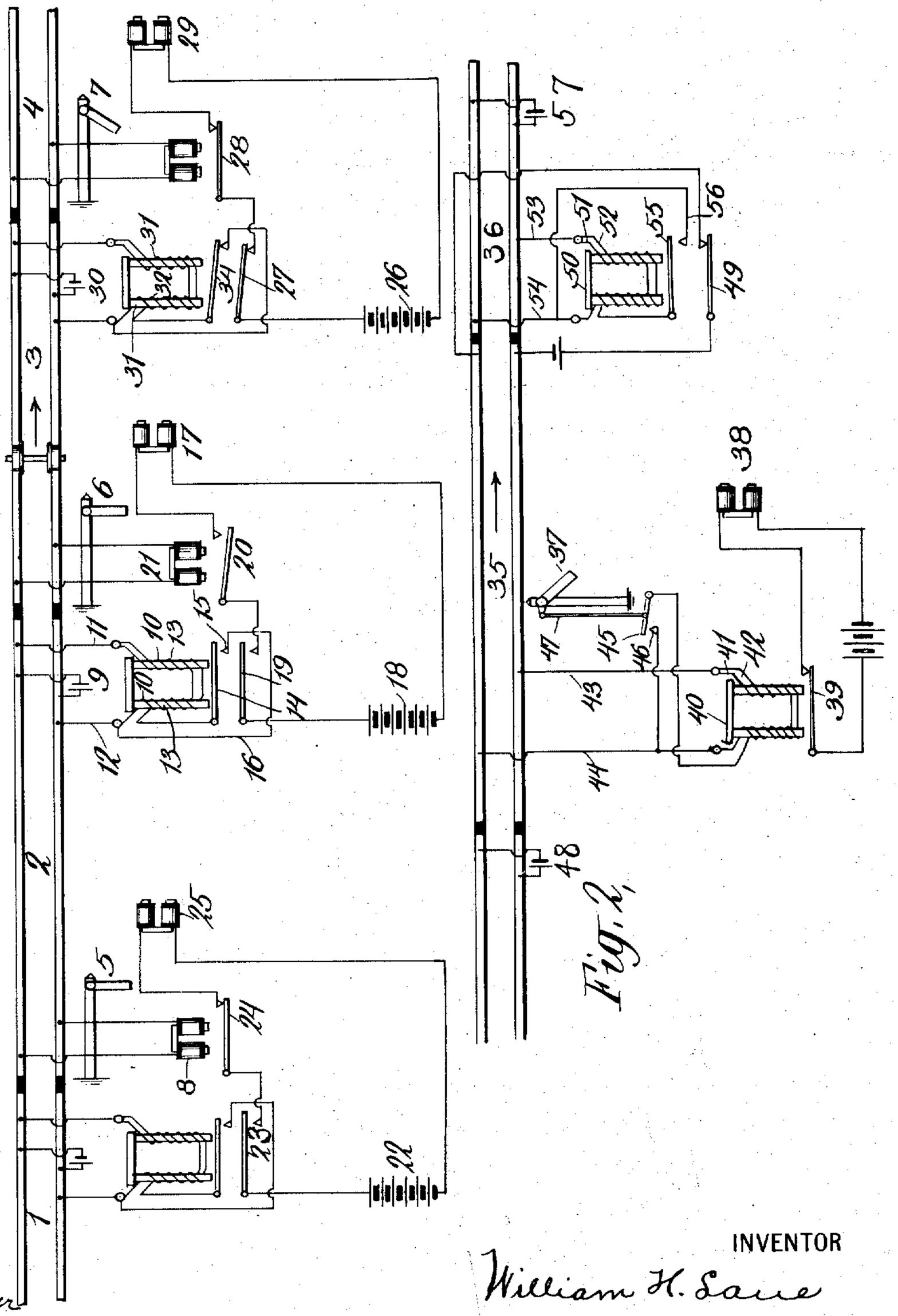

Fig. 1.

Fig. 2.

WITNESSES:

Emily Gravier
A. Lowerson

INVENTOR

William H. Lane

BY

Nicholas W. Goodell Jr.

ATTORNEY

UNITED STATES PATENT OFFICE

WILLIAM H. LANE, OF WESTFIELD, NEW JERSEY, ASSIGNOR TO THE HALL SIGNAL COMPANY, A CORPORATION OF MAINE.

ELECTRICAL DEVICE AND CIRCUIT.

No. 815,961. Specification of Letters Patent. Patented March 27, 1906.

Application filed June 2, 1905. Serial No. 263,429.

To all whom it may concern.

Be it known that I, WILLIAM H. LANE, a citizen of the United States, and a resident of Westfield, Union county, and State of New Jersey, have invented certain new and useful Improvements in Electrical Devices and Circuits, of which the following is a specification.

This invention relates to electrical devices and circuits, and more particularly to such as are adapted for use in connection with railway signaling systems.

The invention seeks, among other things, to provide a relay of increased reliability, efficiency, and economy of battery output. This relay may be used as a "clearing-relay" or as a "track-relay."

In a signaling system the clearing-relay is one which is usually connected to the track-circuit at the exit end of the track-section, at which end is also generally located the battery. A clearing-relay is used to change a signal normally at "danger" from its danger to its clear position when an approaching train has reached a track-section in the rear of the signal. It it deënergized or unresponsive when there is no train in the track-section and is energized or made responsive when there is a train in the track-section.

In a signaling circuit the relays are usually provided with front and back contacts, and the armature which carries the contacts must have a relatively great movement, and consequently a wide air-gap. On account of this air-gap the energy required to attract the armature from its remote or pick-up position is necessarily considerably greater than the energy required to hold the armature in its attracted or pick-up position. In clearing-relays as heretofore in general use the same energy was employed to keep the armature in its hold-up position that was used to move it from its pick-up position. As a result of this the relay was not likely in many cases to respond promptly to the shunting action of a train entering the track-section at the end remote from its clearing-relay. If, however, a train should back into the track-section at the end where the battery and clearing-relay are located, it would shunt the clearing-relay and it would readily respond. This condition, however, does not obtain except in special systems of normal danger-signaling. In the usual systems of normal danger-signaling the clearing-relay is located at the exit end of a track-section, and therefore operates under the disadvantages above mentioned.

The cause for the lack of prompt responsiveness of a relay to the shunting action of a train is the resistance of the rail-circuit which intervenes between the approaching train and the clearing-relay. This rail-resistance sometimes amounts to as much as one ohm. When the train first enters the track-section, the entire rail resistance intervenes between it and the clearing-relay, and the shunting action of the train on the clearing-relay is therefore likely to be incomplete and so as not to readily deënergize the clearing-relay. As the train advances the rail resistance is gradually reduced, and finally at some indefinite point along the track the rail resistance is sufficiently reduced to enable the train to completely shunt the clearing-relay, when it will be deënergized and drop its armature so as to clear the signal. The signal is therefore cleared when a train is at some indefinite point in the section, whereas it should be cleared as soon as the train enters the section.

According to the present invention a clearing-relay is provided which responds promptly to the shunting action of a train entering the track-section at the farther end. This relay is also useful as a track-relay. A track-relay is normally energized in the ordinary signaling systems. When my improved relay is used as a track-relay, it effects a considerable saving of battery output, being normally energized in a condition of comparatively high resistance to hold up its armature and being energized momentarily to pick up its armature in a condition of comparatively low resistance.

In the accompanying drawings, forming part of this specification, Figure 1 shows a normal danger-signaling system employing my invention as a clearing-relay. Fig. 2 shows a normal clear-signaling system employing my invention as a track-relay.

Referring now more particularly to Fig. 1, 1, 2, 3, and 4 are insulated track-sections. Signals 5, 6, and 7 guard blocks 2, 3, and 4, respectively, and work on the normal danger principle, traffic being from left to right, as indicated by the arrow. Connected with the rails at the entering end of section 2 is mag-

net 8 of the track-relay for this section. At the other end of the section is connected a track-battery 9 and the coils of the clearing-relay. The clearing-relay has two coils. One coil 10 is connected on one side to wire 11, leading to one rail, and on its other side to wire 12, leading to the other rail. The other coil 13 is connected on one side through moving contact 14, back contact 15, and wire 16 to wire 12. When moving, contact 14 is in its hold-up position, as shown, coil 13 is excluded from the circuit and current through the relay passes through coil 10 alone. This is the relay's condition of high resistance. When moving, contact 14 is in its pick-up position and closes the brake at 14, then coils 13 and 10 are included in multiple in the circuit. This is the relay's condition of low resistance. In the normal condition of the track-circuit, and as shown, current from battery passes through the rails of section 2 and through track-magnet 8. It also passes through coil 10 of the clearing-relay, thereby energizing it, holding open the break at contact 14, and thus excludes coil 13.

17 is a magnet which represents the motor or other means for operating signal 6. It is included in the circuit with generator 18 and circuit-controllers 19 and 20. Circuit-controller 19 is operated by clearing-relay of section 2 and is normally open, as shown. Circuit-controller 20 is operated by track-magnet 21 of track-relay for section 3 and is normally closed. Generator 22, circuit-controllers 23 and 24, and magnet 25 operate in the same way with reference to signal 5 as do generator 18, circuit-controllers 19 and 20, and magnet 17 with reference to signal 6. Generator 26, circuit-controllers 27 and 28, and magnet 29 operate in the same way with reference to signal 7.

30 is the track-battery for section 3. This section has a clearing-relay and associated parts in all respects similar to that of section 2. Coils 31 and 32 correspond to coils 10 and 13, and moving contact 34 corresponds to moving contact 14.

The operation is as follows: A train entering section 2 shunts magnet 8, thereby opening circuit-controller 24 and putting signal 5 to "danger" behind the train in the usual way. At the same time coil 10 of the clearing-relay is shunted, thereby causing moving contact 14 to drop from its hold-up to its pick-up position, so as to include coil 13. When coil 10 was shunted, circuit-controller 19 was closed, thereby energizing magnet 17 and putting signal 6 to "safety" in front of the train. When the train passes out of section 2, battery 9 energizes magnet 8, thereby restoring circuit-controller 24 to its normal closed position. Battery 9 also energizes coils 10 and 13 in multiple, thereby causing moving contacts 14 and 19 to move from their pick-up to their hold-up positions. When contact 14 so operates, it breaks the circuit through coil 13 and excludes it from the circuit, thus restoring the clearing-relay and all the other parts associated with section 1 to their normal condition. When the train enters section 3, it operates upon the track-relay and clearing-relay for this track-section in the manner already described with reference to section 2, putting signal 6 to "danger" behind the train and signal 7 to "safety" in front of the train.

With reference to the clearing-relay it will be observed that when current is traversing one coil alone, as coil 10, the relay has just sufficient power, magnet 8 being in multiple with it, to hold up contacts 14 and 19 and that as soon as a train enters the track-section, as section 2, the hold-up energy of the magnet is so reduced by the shunting action of the train that contacts 14 and 19 at once drop to their pick-up positions, whereupon signal 6 is at once cleared. It will also be observed that when the train passes out of section 2 battery 9 supplies current to magnet 8, as usual, and with the resistance of this magnet added to the circuit in multiple with the clearing-relay the proportion of current flowing through the multiple coils of the clearing-relay will be increased sufficiently to enable the clearing-relay to pick up its contacts at once.

In Fig. 2, 35 and 36 are track-sections which consitute the block guarded by the signal 37, this signal being normally at "safety." The signal is operated or controlled by magnet 38 in circuit with circuit-controller 39, operated by track-relay 40. Track-relay 40 has two coils 41 and 42, coil 41 having its ends connected to wires 43 and 44, leading to the rails of section 35, and coil 42 having one end connected to wire 43, and its other end connected to wire 44 through normally open contacts 45 and 46. Contact 45 is connected with and operated by the operating-rod 47 of signal 37. At the exit end of section 35 the rails are connected by circuit-wires leading through battery 48 and normally closed circuit-controller 49. 50 is the track-relay connected with section 36, having coils 51 and 52, corresponding to coils 41 and 42. Coils 51 and 52 are connected on one side to track-wire 53. These coils are connected on their other side to track-wire 54, coil 52 passing through normally open contacts 55 and 56, which are controlled by the track-relay, this latter being energized by battery 57. In the operation of the device shown in Fig. 2 a train entering section 35 shunts the track-relay 40, putting signal 37 to "danger" behind the train. The movement of the signal to "danger" closes contacts 45 and 46, which thereby include coil 42 in closed multiple with coil 41. When the train enters section 36, it shunts track-relay 50, thereby opening circuit-controller 49 and continuing signal 37

at "danger." It also drops circuit-controller 55 to its pick-up position, thereby including coil 52 in closed multiple with coil 51. When the train passes out of the block, track-relay 50 has its coils energized in multiple, so that contact 55 moves to its hold-up position and cuts out coil 52, contact 55 being then kept in its hold-up position by coil 51 alone. Circuit-controller 49 of track-relay 40 is also moved to its hold-up position and closed, thereby energizing both coils of track-relay 40 in multiple. This moves circuit-controller 39 to hold-up position and closes the circuit through magnet 38, thereby moving signal 37 to "safety." This opens contacts 45 and 46 and cuts out or excludes coils 42 from the track-circuit, so that circuit-controller 39 is kept at hold-up position by coil 41 alone.

It will be observed that when the track-relays are carrying out their hold-up function, which is by far the greater part of the time, the battery output is considerably reduced as compared with the battery output when these track-relays are carrying out their pick-up function. This of course is due to the fact that the hold-up function employs only one coil of the track-relay, whereas the pick-up function employs both coils in multiple.

One of the chief advantages of the relay in its use as a track-relay is the reliability and promptness with which a train in the section operates to shunt the relay, thereby causing its armature to move from its hold-up to its pick-up position and put the signal to "danger" behind the train. This results from the increased sensitiveness of the relay.

The contacts which operate to exclude one of the multiple coils of the relays in Fig. 1 and the track-relays in Fig. 2 operate in reality as circuit-changers, and for convenience they are thus designated in the claims.

It will be observed that the movement of a circuit-changer to the position which excludes one coil is initiated when both of said coils are energized in multiple.

In the preferred form of my relay the multiple coils are wound on the same core. This is the preferred construction.

I claim—

1. The combination of two magnet-coils in multiple; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil, and when in its other position it connects said coil in multiple with the other coil.

2. The combination of two magnet-coils in multiple; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil, and when in its other position it connects said coil in multiple with the other coil, said circuit-changer being controlled by said magnet-coils.

3. The combination of two magnet-coils in multiple; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil, and when in its other position it connects said coil in multiple with the other coil, the movement of said circuit-changer to the position which excludes one coil being initiated when both of said coils are energized in multiple.

4. The combination of two magnet-coils in multiple; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil, and when in its other position it connects said coil in multiple with the other coil; and a circuit-controller operated by said magnet-coils.

5. The combination of two magnet-coils in multiple; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil, and when in its other position it connects said coil in multiple with the other coil; and a circuit-controller operated by said magnet-coils and arranged to be moved from its pick-up position to its hold-up position when both of said coils are energized in multiple and arranged to be held up when one of said coils is excluded.

6. The combination of two magnet-coils in multiple; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil, and when in its other position it connects said coil in multiple with the other coil, said circuit-changer being controlled by said magnet-coils; and a circuit-controller operated by said magnet-coils.

7. The combination of two magnet-coils in multiple; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil, and when in its other position it connects said coil in multiple with the other coil, said circuit-changer being controlled by said magnet-coils; and a circuit-controller operated by said magnet-coils and arranged to be moved from its pick-up position to its hold-up position when both of said coils are energized in multiple and arranged to be held up when one of said coils is excluded.

8. The combination of two magnet-coils in multiple; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil, and when in its other position it connects said coil in multiple with the other coil, the movement of said circuit-changer to the position which excludes one coil being initiated when both of said coils are energized in multiple; and a circuit-controller operated by said magnet-coils.

9. The combination of two magnet-coils in multiple; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil,

and when in its other position it connects said coil in multiple with the other coil, the movement of said circuit-changer to the position which excludes one coil being initiated when both of said coils are energized in multiple; and a circuit-controller operated by said magnet-coils and arranged to be moved from its pick-up position to its hold-up position when both of said coils are energized in multiple and arranged to be held up when one of said coils is excluded.

10. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil.

11. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil, said circuit-changer being controlled by said magnet-coils.

12. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil; and a circuit-controller operated by said magnet-coils.

13. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil; and a circuit-controller operated by said magnet-coils.

14. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil, the movement of said circuit-changer to the position which excludes one coil being initiated when both of said coils are energized in multiple; and a circuit-controller operated by said magnet-coils.

15. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coils and when it is in its other position it connects said coil in multiple with the other coil, the movement of said circuit-changer to the position which excludes one coil being initiated when both of said coils are energized in multiple; and a circuit-controller operated by said magnet-coils and arranged to be moved from its pick-up position to its hold-up position when both of said coils are energized in multiple and arranged to be held up when one of said coils is excluded.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM H. LANE.

Witnesses:
NICHOLAS N. GOODLETT, Jr.,
R. J. HEWETT.

Corrections in Letters Patent No. 815,961.

It is hereby certified that in Letters Patent No. 815,961, granted March 27, 1906, upon the application of Willian H. Lane, of Westfield, New Jersey, for an improvement in "Electrical Devices and Circuits," errors appear requiring correction, as follows: Line 97, page 1, the hyphen between the words "danger" and "signalling" should be stricken out, and line 100. the hyphen between the words "clear" and "signalling" should be stricken out; lines 10 and 15, page 2, the commas after the words "moving" should be stricken out; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of April, A. D., 1906.

[SEAL.]

F. I. ALLEN,
Commissioner of Patents.

and when in its other position it connects said coil in multiple with the other coil, the movement of said circuit-changer to the position which excludes one coil being initiated when both of said coils are energized in multiple; and a circuit-controller operated by said magnet-coils and arranged to be moved from its pick-up position to its hold-up position when both of said coils are energized in multiple and arranged to be held up when one of said coils is excluded.

10. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil.

11. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil, said circuit-changer being controlled by said magnet-coils.

12. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil; and a circuit-controller operated by said magnet-coils.

13. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil; and a circuit-controller operated by said magnet-coils.

14. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coil and when it is in its other position it connects said coil in multiple with the other coil, the movement of said circuit-changer to the position which excludes one coil being initiated when both of said coils are energized in multiple; and a circuit-controller operated by said magnet-coils.

15. The combination of a magnet having two multiple coils on the same core; with a circuit-changer connected with one of said coils and so arranged that when it is in one position it excludes said coils and when it is in its other position it connects said coil in multiple with the other coil, the movement of said circuit-changer to the position which excludes one coil being initiated when both of said coils are energized in multiple; and a circuit-controller operated by said magnet-coils and arranged to be moved from its pick-up position to its hold-up position when both of said coils are energized in multiple and arranged to be held up when one of said coils is excluded.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM H. LANE.

Witnesses:
NICHOLAS N. GOODLETT, Jr.,
R. J. HEWETT.

Corrections in Letters Patent No. 815,961.

It is hereby certified that in Letters Patent No. 815,961, granted March 27, 1906, upon the application of Willian H. Lane, of Westfield, New Jersey, for an improvement in "Electrical Devices and Circuits," errors appear requiring correction, as follows: Line 97, page 1, the hyphen between the words "danger" and "signalling" should be stricken out, and line 100. the hyphen between the words "clear" and "signalling" should be stricken out; lines 10 and 15, page 2, the commas after the words "moving" should be stricken out; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of April, A. D., 1906.

[SEAL.]

F. I. ALLEN,
Commissioner of Patents.

Corrections in Letters Patent No. 815,961.

It is hereby certified that in Letters Patent No. 815,961, granted March 27, 1906, upon the application of Willian H. Lane, of Westfield, New Jersey, for an improvement in "Electrical Devices and Circuits," errors appear requiring correction, as follows: Line 97, page 1, the hyphen between the words "danger" and "signalling" should be stricken out, and line 100, the hyphen between the words "clear" and "signalling" should be stricken out; lines 10 and 15, page 2, the commas after the words "moving" should be stricken out; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of April, A. D., 1906.

[SEAL.]

F. I. ALLEN,

Commissioner of Patents.