M. G. NEWBOULD.

AUTOMATIC CUT-OUT FOR ELECTRICAL CONDUCTORS.

APPLICATION FILED JUNE 19, 1908.

991,634. Patented May 9, 1911.

FIG. 1.

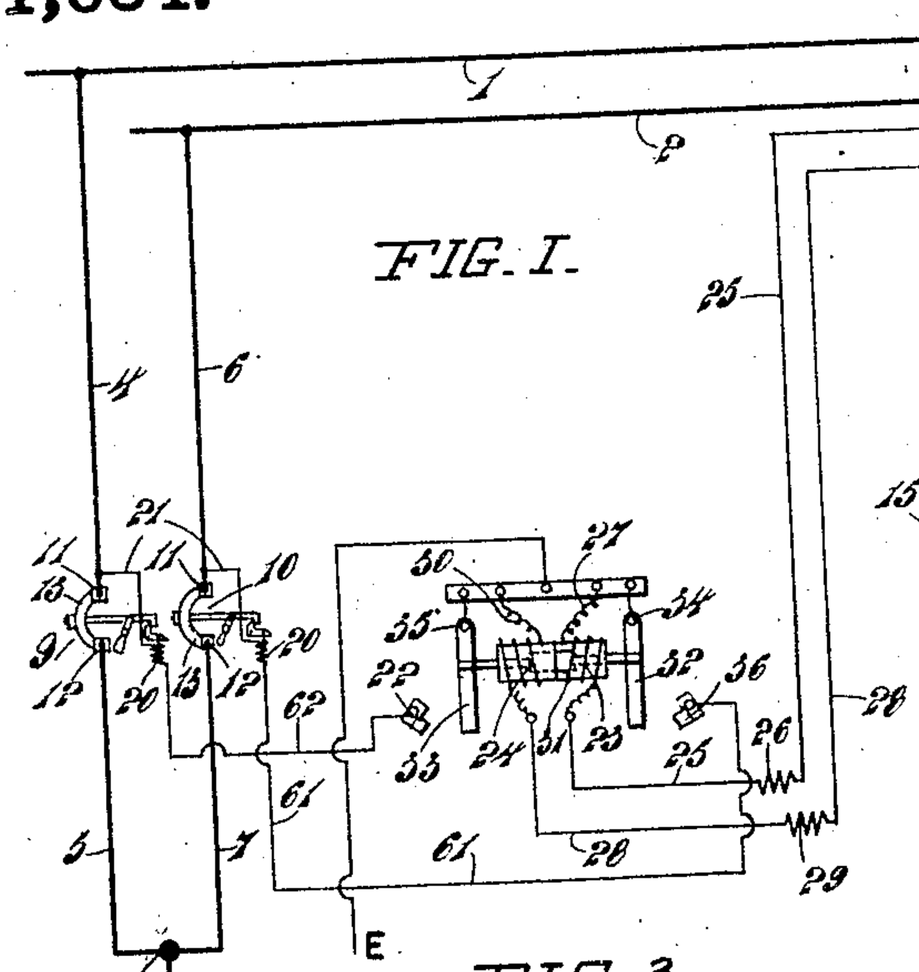


FIG. 2.

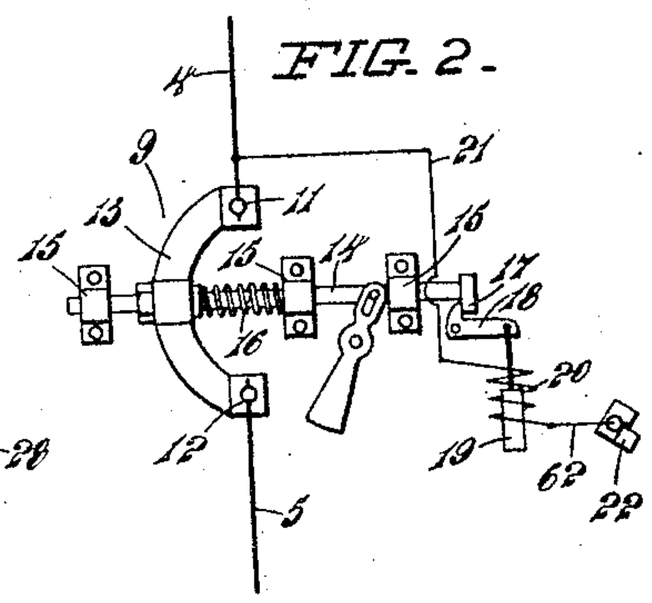


FIG. 3.

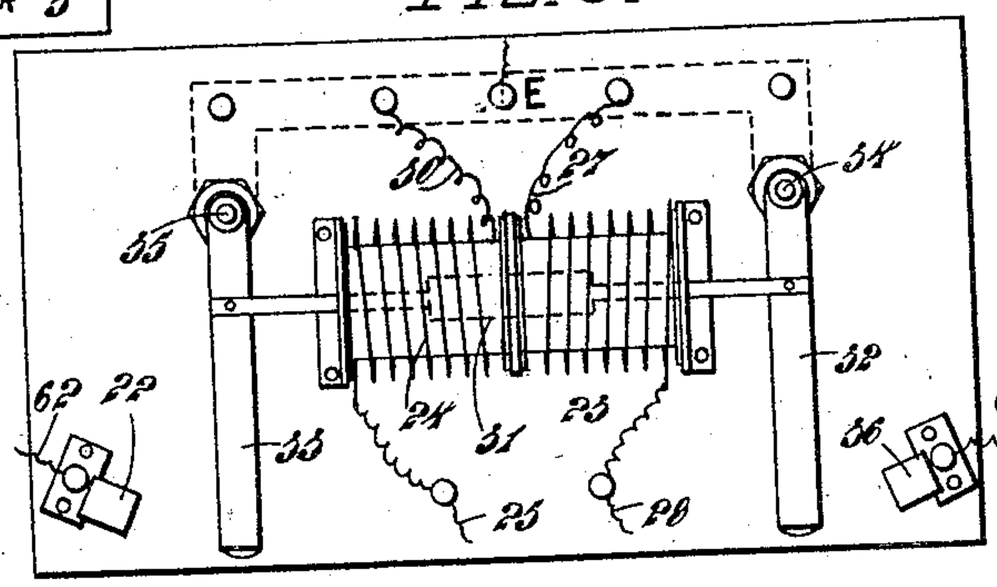
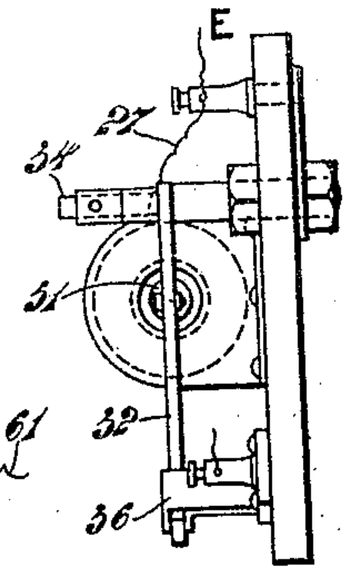


FIG. 4.



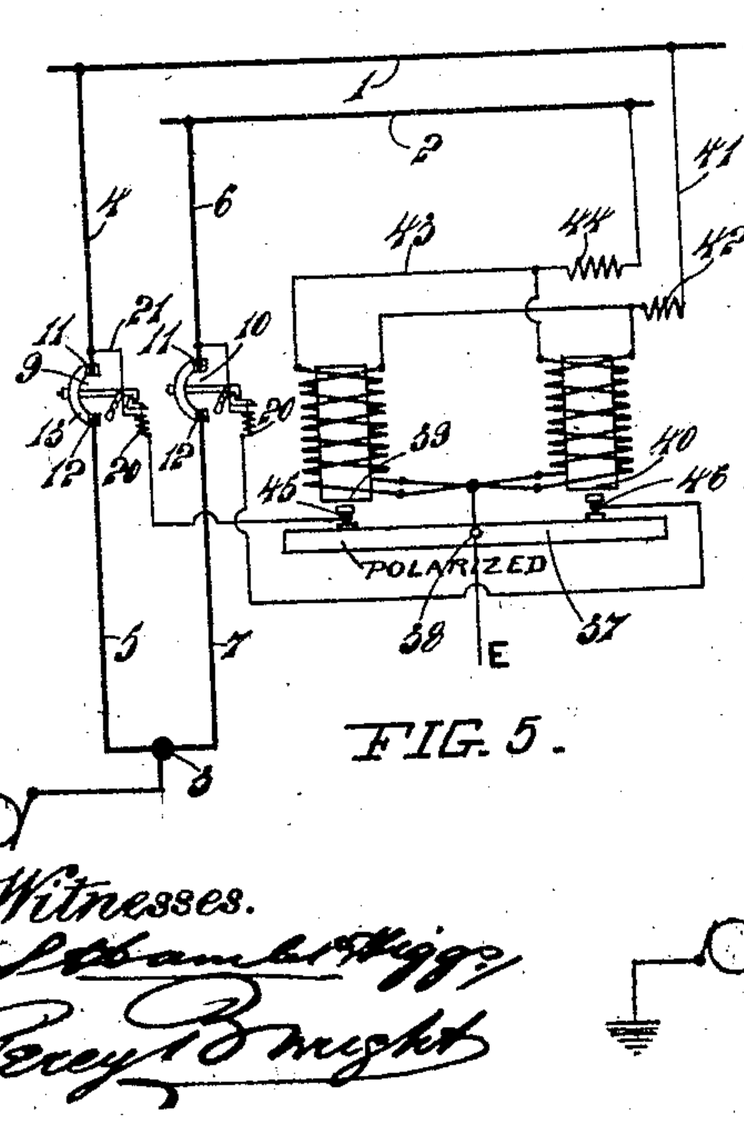


FIG. 5.

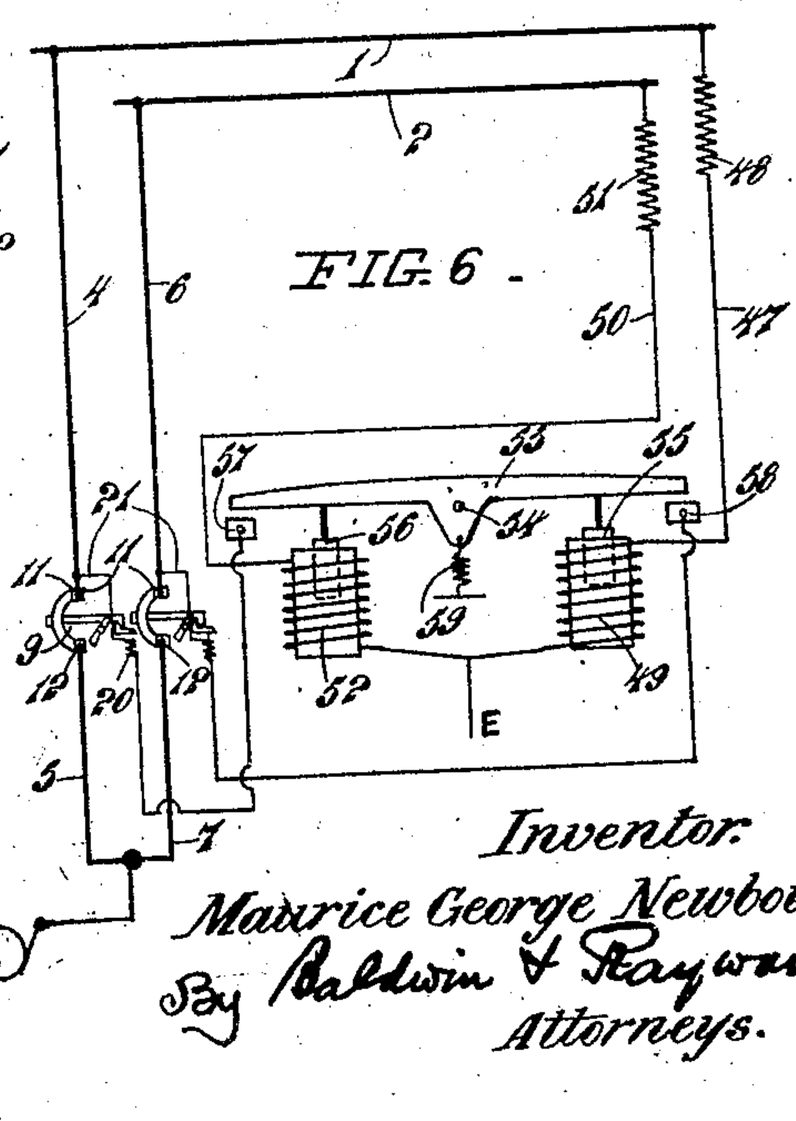


FIG. 6.

Witnesses.

Inventor:

Maurice George Newbould.

By Baldwin & Hayward

Attorneys.

UNITED STATES PATENT OFFICE.

MAURICE GEORGE NEWBOULD, OF NAPIER, NEW ZEALAND.

AUTOMATIC CUT-OUT FOR ELECTRICAL CONDUCTORS.

991,634. Specification of Letters Patent. Patented May 9, 1911.

Application filed June 19, 1908. Serial No. 439,441.

To all whom it may concern:

Be it known that I, MAURICE GEORGE NEWBOULD, a subject of the King of Great Britain and Ireland, residing at Coote Road, Napier, in the provincial district of Hawkes Bay, in the Dominion of New Zealand, have invented certain new and useful Improvements in Automatic Cut-Outs for Electrical Conductors, of which the following is a specification.

In electrical tramway systems it is usual to employ a feeder cable, the current from which is fed to the trolley wires at convenient distances, the trolley wires being divided into insulated sections and the current fed to each trolley wire in each section independently.

My invention has for its object the cutting off of the electrical current in a section of trolley wire instantaneously upon a breakage of the trolley wire taking place, the unbroken trolley wire of the section as well as the trolley wires of the other sections of the system continuing available for traffic purposes.

In carrying out my invention upon a system in which two trolley wires are employed, I take off a corresponding current from each of the wires of a section and utilize these currents in opposition to produce equilibrium in electromagnetic apparatus. Upon the breakage of a trolley wire the equilibrium is immediately destroyed by the cessation of flow of one of the currents, and the remaining current operates a circuit breaker which cuts out the broken section of trolley wire.

The application of my invention will now be described by the aid of the accompanying drawing wherein:—

Figure 1, is a diagrammatic general arrangement of a section of an electrical tramway system to which my invention is applied. Fig. 2, a front elevation of a circuit breaker, Fig. 3, a front elevation of solenoid apparatus for carrying my invention into practice, Fig. 4, an end elevation thereof, Fig. 5, a diagrammatic general arrangement illustrating a modification, Fig. 6, a similar view illustrating another modification.

As two trolley wires are usually employed in modern tramway systems I illustrate my invention as applied to a two wire system.

Referring first to Figs. 1 to 4 inclusive. The trolley wires 1 and 2 respectively represent an insulated section of a tramway system. Current is supplied to the trolley wires from the feeder cable 3 by the leads 4, and 5, and 6 and 7, a circuit breaker 9 for trolley wire 1 being located between the leads 4 and 5 and a similar circuit breaker 10, for trolley wire 2, between leads 6 and 7. There are a large number of circuit breakers which can be used with my invention and in Fig. 2, well known and suitable apparatus is shown. The lead 4 is connected to the terminal 11 and lead 5, to the terminal 12. The bridge piece 13 normally closes circuit between the terminals and is fixed upon the end of the slide rod 14 which moves in guides 15, and has threaded upon it the spring 16. Spring 16 normally tends to project the bridge piece away from the terminals and thereby break electrical connection between them, but the slide rod is retained in its normal position by a projection 17 upon its end engaged by a pivoted trip-catch 18. The trip-catch is operable, to release the slide rod, by a core 19 within trip solenoid 20 which is excited by current passed through it by the shunt 21, one end of the shunt being connected to the lead 4 from one end of the section of trolley wire 1, and its other end connected by lead 62 to a contact piece 22 also shown in Figs. 1, 3 and 4, now to be referred to. The relay coils 23 and 24 are wound in opposite directions, the coil 23 being connected by lead 25, through a resistance 26, with the extreme end of the section of trolley wire 1 and by lead 27 to earth. Coil 24 is connected by the lead 28, through resistance 29, with the extreme end of the section of trolley wire 2 and is earthed by lead 30. The core 31 passes through the coils and is pivotally connected at its ends with the levers 32 and 33 respectively, the ends of the levers being pivoted respectively at 34 and 35, the pivot pins being earthed. The lever 33 when operated by movement of the core in one direction engages at its end with the contact piece 22, previously referred to, and the end of the lever 32, when operated in the opposite direction, engages with a similar contact piece 36 connected to a shunt wire 61 from the circuit breaker 10 which latter is precisely similar to the circuit breaker described in reference to Fig. 2. The coils and exciting currents are equal and the core 31 is therefore in equilibrium between them. Upon the breakage of a trolley wire the current ceases through one of the coils, the core is drawn over by the other

coil, and the lever upon that side earths the solenoid 20 of the circuit breaker (see Fig. 2) through the contact piece with which the end of the lever engages. The excitation of the solenoid releases the trip-catch 18 and the slide rod being free to move under operation of the spring 16 the bridge piece is moved from the terminals 11 and 12 and the current from the feeder cable to the broken trolley wire is immediately cut off.

Referring now to Fig. 5 which illustrates another modification: The trolley wires 1 and 2 are severally connected to the circuit breakers 9 and 10 in a manner precisely similar to that described in reference to Fig. 1, the same numerals of reference being used to indicate the same parts. The permanently magnetized bar 37 is pivoted at 38 and has one pole opposite to a fixed core 39 and the other pole opposite to a fixed core 40. A shunt 41 is taken through resistance 42 from the trolley wire 1 coiled around the respective cores 39 and 40, and led to earth. Shunt 43 is taken through resistance 44 from the trolley wire 2 coiled around the cores 39 and 40 in a direction opposite to the coils of shunt 41, and led to earth. By this arrangement the opposing currents produce magnetic equilibrium in the two cores, but when one current is cut off by the breakage of a wire, the cores become magnetized, one core having the like, and the other core unlike, polarity to the ends of the magnetized bar 37, to which they are severally opposed. The result is that the bar 37, being attracted at one end and repelled at the other, turns on its pivot 38 and makes contact, if vibrated in one direction, with the contact piece 45, which corresponds to contact piece 22 in Fig. 1, or if vibrated in the other direction with contact piece 46 which corresponds with contact piece 36 in Fig. 1. The circuit breakers are similar to that described particularly in reference to Fig. 2 and the contact pieces 45 and 46 are each in connection with the trip solenoid of one of the circuit breakers. Electrical connection between the feeder cable 3 and the broken trolley wire is therefore cut off immediately upon the bar 37 striking the contact piece.

Referring to Fig. 6. The shunt 47 is taken through a resistance 48 from the trolley wire 1 to a coil 49 and earthed. Shunt 50 is taken through a resistance 51 from the trolley wire 2 to the coil 52 and earthed. The equilibrium bar 53 rocks upon pivot 54 and carries, at one end, the core 55 which is within coil 49 and at its other end the core 56 within coil 52. When current is passing through both coils the cores are acted upon equally by the respective coils and the bar 53 remains horizontal. When, however, a trolley wire is broken one coil is instantaneously cut out and the other coil operates its core and turns the bar 53 on its pivot until one of its ends engages a contact piece in electrical connection with the trip solenoid of the circuit breaker of the trolley wire which has broken. The contact pieces 57 and 58 are respectively connected to the circuit breakers 9 and 10 which are precisely similar to that described particularly in reference to Fig. 2 and are therefore indicated by the same numerals and operate to cut off current from the respective trolley wires 1 and 2. A tension spring 59 connected to an extension from the bar 53 prevents the bar from oscillating too readily.

Equilibrium in the electromagnetic apparatus may be obtained by employing similar coils excited by equal currents or if different coils are used a corresponding differentiation is made in the currents by which they are respectively excited.

I claim—

In an electric tramway system, two trolley wires, two shunt wires each taking an independent current from the trolley wires, two stationary cores, two electromagnetic coils surrounding each core and so wound as to neutralize each other, so that each of said cores is normally in a state of magnetic equilibrium, connections between said coils and said shunt wires, a pivoted lever consisting of a permanently magnetized armature adapted to be operated by one of said cores when one of said shunt wires is cut out by the breakage of a trolley wire, contact pieces one for each end of said lever and adapted to be engaged thereby, and two circuit breakers, one connected to each of said contact pieces adapted to cut off current in the trolley wires, substantially as described.

Dated this 6th day of May 1908.

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

MAURICE GEORGE NEWBOULD.

Witnesses:
OLIVE RUTH CROLL,
ANNIE DOROTHY MCKENZIE.