(No Model.) 2 Sheets—Sheet 1.

R. B. WILSON.

ELECTRIC RAILWAY SYSTEM.

No. 542,512. Patented July 9, 1895.

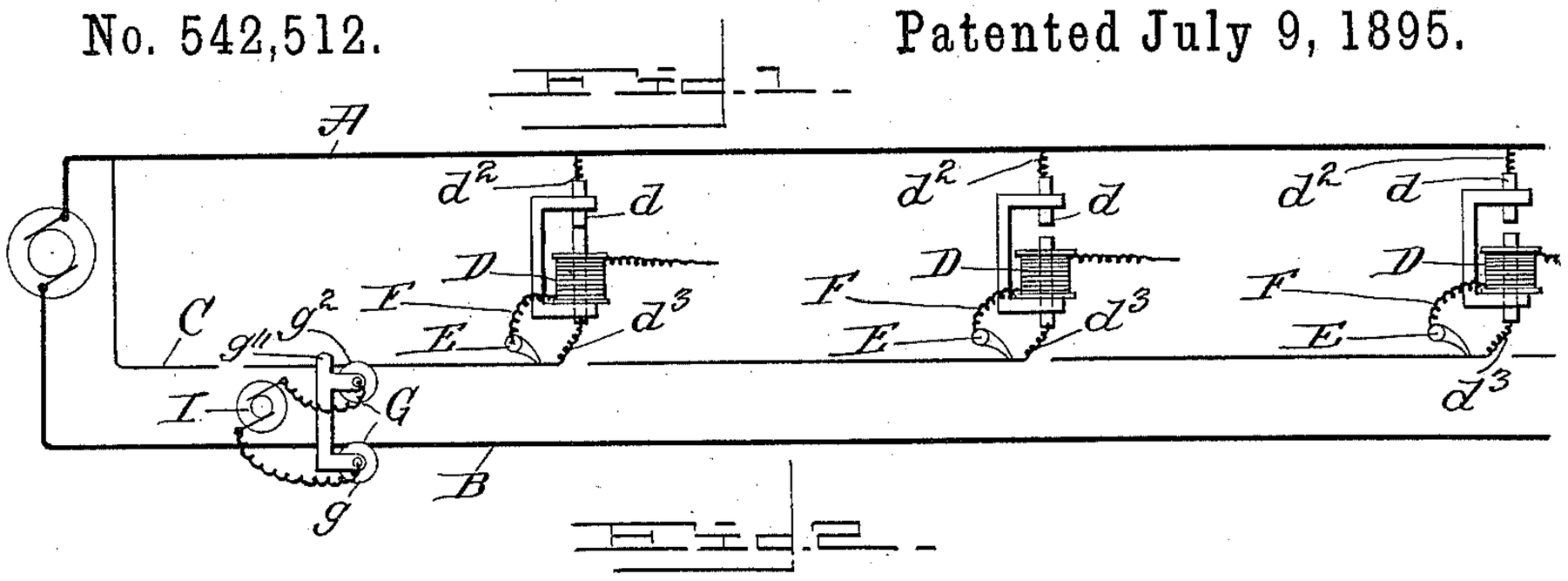
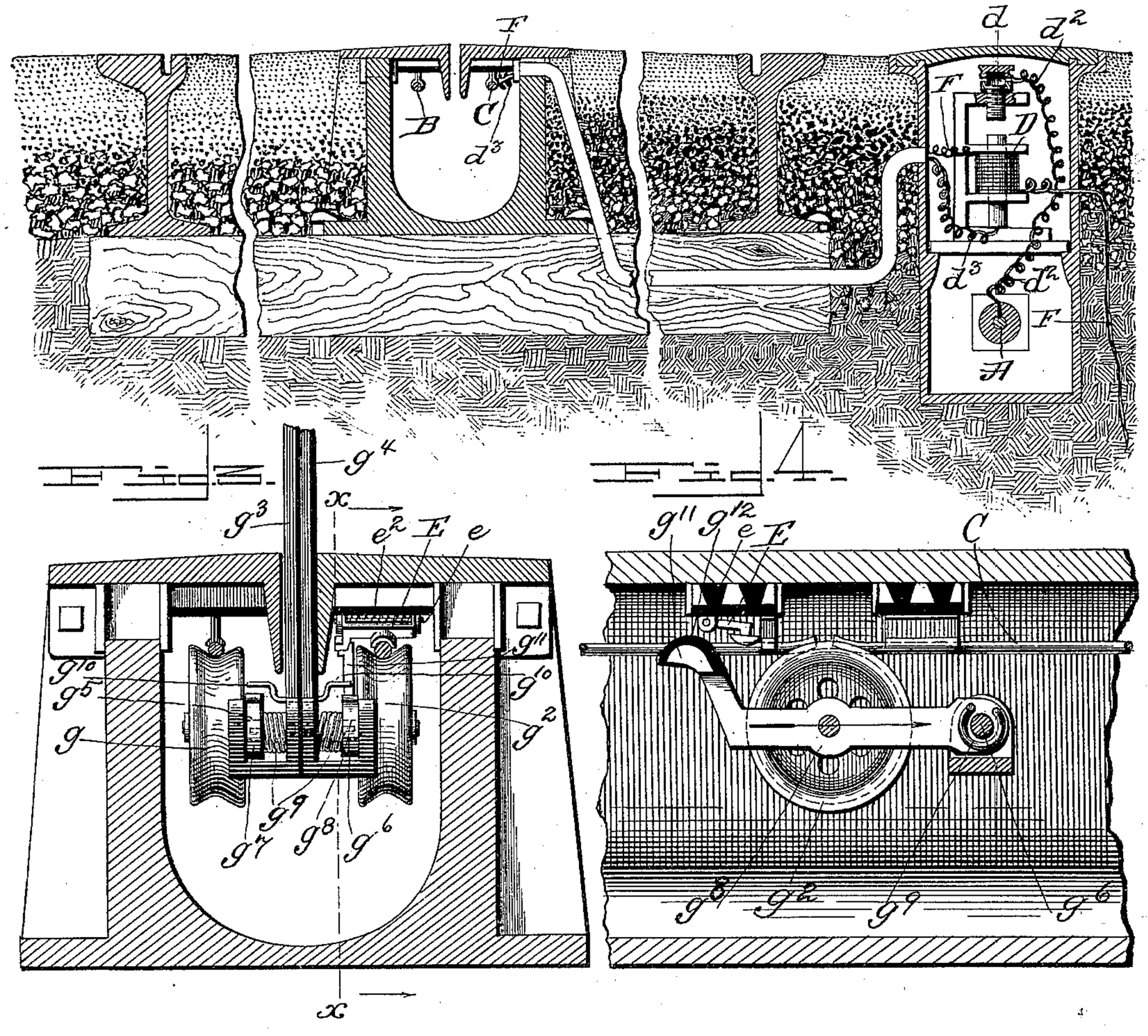


Fig. 2.



Witnesses
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(No Model.) 2 Sheets—Sheet 2.

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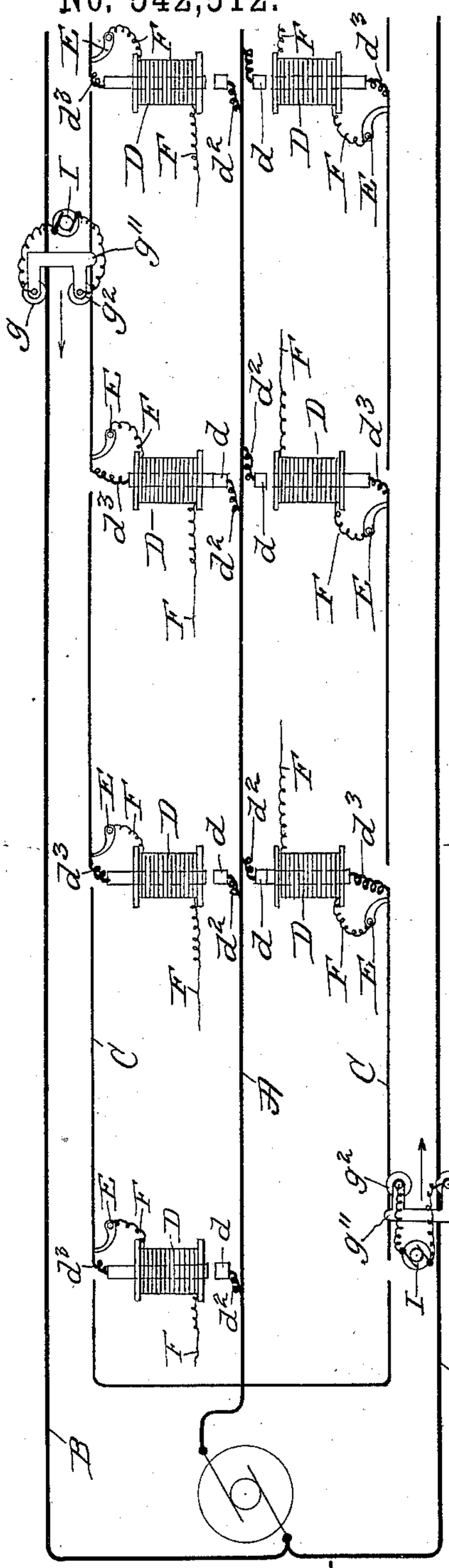

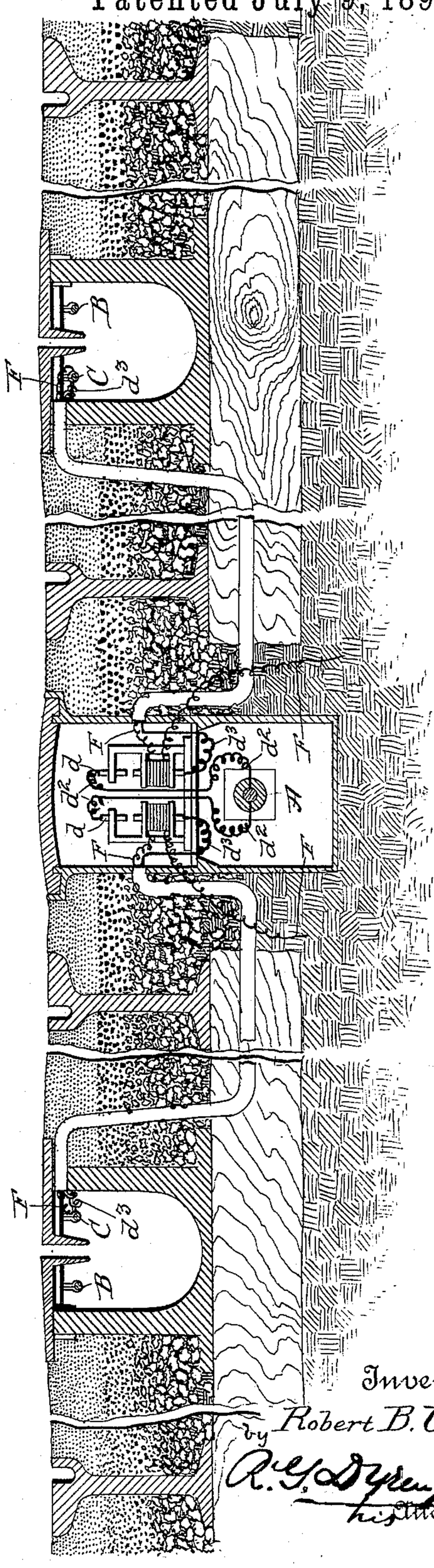

Witnesses
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UNITED STATES PATENT OFFICE.

ROBERT B. WILSON, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF TO JEREMIAH M. WILSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 542,512, dated July 9, 1895.

Application filed January 2, 1894. Serial No. 495,418. (No model.)

To all whom it may concern:

Be it known that I, ROBERT B. WILSON, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Electric-Railway Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to electric-railway systems, &c.

The object is to maintain a current to a section of a sectional conductor independently of a moving body along the sections; furthermore, readily to effect charge and discharge of the sections of a sectional conductor; furthermore, to prevent any appreciable loss of electrical energy by leakage, and, finally, to produce an electric-railway system in which the line-conductor or "line" shall present no live portions except at the car and for a short distance before and behind it, whereby danger of injury to man or beast, or of short-circuiting or grounding the current, is avoided.

With these objects in view the invention consists, essentially, in an electric system in which are comprised a main lead-conductor, a sectional conductor with sections of any desired length, and means or devices for making connection between the lead and the sectional conductor, each section having its own connecting means or device separate from any other, and the connecting device of each section being normally open and disconnected from the lead and adapted to be closed by a current of electricity from a preceding section, held closed by a current of electricity, through itself, and opened again mechanically. Furthermore, the invention consists in devices for achieving the results as hereinafter described and claimed.

In the present embodiment the invention is shown as applied to a railway system and an underground form thereof, but it may be applied with great advantage to other systems.

In the accompanying drawings, in which like letters of reference indicate corresponding parts, Figure 1 is a view in diagram of an electrical system, exhibiting application of the invention to a single line of track and showing the main or lead conductor leading from a dynamo, the sectional conductor, each section of which has its own separate device for making connection with the lead, and all connections being open but one; the moving body, the same having closed the connection in its passage from the preceding section to the one where it now appears by bridging the space between the sections, and the connection at this section being held closed by a current from the lead through the connecting device; means for opening the connection mechanically, and a return-conductor. Fig. 2 is a view in vertical cross-section, broken through to save space, exhibiting application of the invention to an electrical-railway system with single track and showing the main conductor insulated and in a conduit running parallel with the track, the sectional conductor in a conduit between the rails, and the device suitably boxed adjacent to the track for making connection between the lead and a section of the sectional conductor; also, the return-conductor in the conduit, this figure being a mere pictorial representation of the subject-matter shown in diagram in Fig. 1. Fig. 3 is a view in vertical cross-section with interior movable parts in elevation, showing the current-collector and a portion of the switch mechanism and the connecting device. Fig. 4 is a view in longitudinal section with parts in elevation, showing the sectional conductor with current-collector bridging the space between two sections and its arm to act for opening the connecting device mechanically. Fig. 5 is a view in diagram exhibiting application of the invention to a double line of track, but showing otherwise the same as is displayed in Fig. 1; and Fig. 6 is a view in vertical cross-section, broken through to save space, exhibiting application of the invention to an electrical railway system with a double track, showing the same parts as those displayed by Fig. 2, but with arrangement of the lead-conductor and connecting device between the tracks, there being no detail of construction or of operation shown in this figure or in the preceding one, which is novel beyond what is herein claimed as applicable

to the other figures of the drawings, the invention being the same as exhibited in the other drawings, with merely further and better illustration thereof.

In the drawings, A and B represent two conductors, the former constituting a lead from a dynamo or other source of electricity and the latter a return thereto or a discharge to ground, the conductors to extend along the track of the railway.

In the embodiment of the invention here illustrated an insulation-covered conductor A, being the conductor from the positive pole of the dynamo or the positive lead, is laid parallel with the road-bed of the railway, and an uncovered or bare conductor B, being the conductor to the negative pole of the dynamo or the negative lead, is held in a conduit in such position as to be engaged by a current-collector entering the same. An uncovered or bare conductor C, forming the "line," and composed of disconnected sections, with its initial section in constant electrical connection with the conductor A, is designed to be held by suitable insulated supports parallel with the conductor B. Between each section of the conductor C and the insulation-covered conductor A, is arranged a device by which, in connection with a current-collector, the section will be connected automatically with the insulation-covered conductor when a car reaches the section, and by which the section will be disconnected from this conductor when the car passes from the section, the car being propelled by an electric motor on it, through which the current passes from a section of the conductor C by the current-collector to the return-conductor B. These connections consist, essentially, of electro-magnets D and their armatures d, either one or both of which may be movable, permitting their being moved into contact with each other and of their being separated, conductor d^2 connecting the armature d with the conductor A, conductors d^3 connecting the cores of the magnets D with the sections of the conductor C, and conductors F, connected with the switches, wound around the cores of the electromagnets to provide means for energizing the same and then extending to ground. From this arrangement of parts it will be seen that the current is first from the dynamo by the conductor A to the first section of the sectional conductor C, thence through the current-collector to the return-conductor B back to the dynamo. The passage of the current through the motor on the car puts this in motion and it moves onward, carrying the current-collector G with it. As the current-collector comes to an interval between the first section of the sectional conductor C and the next it bridges the interval, making the first and second sections electrically continuous, and the current is then partly and perhaps mainly back to the dynamo by the conductor B, as before, but also by the second section of the conductor C through the switch E and conductor F, through the coil of the electromagnet D to ground, energizing the magnet and carrying its core to attract and make connection with the conductor d^2. The current will then be from the conductor A, also through the conductor d^2 and core of the magnet, and by conductor d^3 to the section, and thence again by the switch around the core of the magnet, keeping the magnet energized and holding the connection closed, so that the current thus from the lead continues as long as the switch is left in contact with the section.

The current-collector G extends down through the slot of a conductor and is provided with wheels g g^2, which come into contact, respectively, with the conductor B and the sectional conductor C, and are both electrically connected with a motor I on the car.

Vertical portions g^3 g^4 of the current-collector, which are insulated from each other, support shafts g^5 g^6, upon which are pivoted arms g^7 g^8, in which the wheels g and g^2 are mounted. The arms are given an upward pressure by the coiled springs g^9, wound around the shafts g^5 g^6, and by this means the wheels are in constant contact with the conductors. The upward movement of the arms g^7 g^8, in which the wheels g g^2 are mounted, is limited by the pins h^{10} g^{10}, extending outward from the vertical portions of the current-collector, whereby undue raising of the wheels is prevented.

The switches E are mounted on shafts e, upon which are placed coil-springs e^2 e^2, by which the switches are kept in contact with the sections of the conductor C, except when removed therefrom to demagnetize the cores of the magnets D and to break the connection between the conductors A and B, as described. The raising of the switches E from the sections of the conductor C is accomplished by an upward extension or projection g^{11} from the arm g^8 of the current-collector, which is so arranged as to come into contact with the switch immediately after the wheel first comes into contact with a succeeding section of the conductor C. The projection g^{11} is provided with insulation at g^{12}, so that possibility of completing a circuit through the arm from the current-collector, when the projection comes in contact with the switches, is prevented.

In the operation of the device the wheels g and g^2 of the current-collector being, respectively, in contact with the conductor B and the initial section of the sectional conductor C, and being electrically connected with a motor on a car, the car will move along, being impelled by electricity, a circuit for which is partially formed by the initial section. As the car moves along the wheel g^2 of the current-collector passes to a second section of the conductor C, bridging the space between the sections. Immediately upon the contact of the wheel g^2 with the next section a current will pass through the next section from the initial section to the advanced end thereof, at

which place the switch E is placed, and thence through the switch and the conductor F to ground, energizing the electromagnet D and causing it to attract its armature. When contact is made between the electromagnet D and its armature, connection is established between the conductor A, connection d^2, the armature d, core of the electromagnet D, connection d^3, one of the sections of conductor C, the current-collectors, the motor on the car, and the conductor B, thus completing the main circuit. As the current-collector passes from a section, the projection g^{11} comes in contact with the switch E, mechanically raising it from contact with the section of the conductor C over which the current-collector has just passed, thus discontinuing the current through the conductor F and allowing the electromagnet to separate from its armature, breaking the main current at that point. The raising of the switch takes place immediately after the wheel g^2 comes in contact with the next section of the conductor C and the contact of the wheel g^2 with the section has furnished a current for operation of the electromagnet by which the main-line circuit is established for such section, the switch returning to its normal position then as the projection g^{11} passes from under it. The operation is repeated as the wheel g^2 of the current-collector comes in contact with each successive section of the sectional conductor, causing a current of electricity to pass through the sections of the sectional conductor successively, as the cars pass, and leaving all the sections except those with which the current-collectors are in contact dead.

By the arrangement of my sectional conductors and their connections with the main lead I secure for each section a current that is entirely independent of the current which operates the car, thereby preventing a loss of electrical connection with the main lead by any accidental breaking of the circuit that operates the car, (as by the disconnection of the trolley while the car is passing over the section or by stopping the car,) which must occur when the car-circuit alone is depended on to maintain the connection.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric railway system, a main lead conductor and a sectional conductor, each section of which has its own connection with the lead conductor, the connection being normally open and disconnected from the lead conductor and adapted to be closed by a current from a preceding section and thereafter to be kept closed by a current through itself direct to the return separate from and independent of any other connection, substantially as described.

2. In an electric railway system, the combination with a main lead conductor and a sectional conductor each section of which has its own connection with the lead conductor, the connection being separate from and independent of any other connection, normally open and disconnected from the lead conductor, and adapted to be closed by a current from a preceding section and thereafter to be kept closed by a current through itself direct to the return, of means of opening the connection mechanically by a passing car, substantially as described.

3. In an electrical railway system, a main lead-conductor and a sectional conductor each section of which has its own separate and independent connection with the lead-conductor, the connection including electro-magnet the core of which is normally disconnected from the lead-conductor and connected with a section of the sectional conductor, and the winding of which is connected with the section and to ground, whereby the core is closed with the lead-conductor by a current from the section around the winding to ground, energizing the core, and the core is held closed by a current from the lead conductor through the core to the section and back from the section around the winding to ground, and a mechanical switch adapted to break connection between the section and the winding by a passing car, substantially as described.

4. In an electrical railway system, a lead-conductor to connect with a dynamo or other source of electricity and extending along a railway, a return conductor or discharge, a sectional conductor, connections between the sectional conductor and the lead, the connections including electro-magnets and their armatures, one or both of which are movable and which are connected, respectively, to the several sections of the sectional conductor and to the lead, conductors connected to the several sections of the sectional conductors by mechanical switches, and wound around the electro-magnets, extending to ground, and a current-collector connected with a motor on a car and engaging the return and the sectional conductor and coming in contact with the switches, substantially as described.

5. In an electrical railway system, a lead-conductor to connect with a dynamo or other source of electricity, and extending along a railway, a return conductor or discharge, a sectional conductor, connections between the sectional conductor and the lead, the connections including electro-magnets and their armatures, one or both of which are movable and which are connected, respectively, to the several sections of the sectional conductor and to the lead, conductors connected to the several sections of the sectional conductors by mechanical switches and wound around the electro-magnets extending to ground, and a current-collector connected with a motor on a moving car, engaging the return and the sectional conductor, and having an upward extension coming in contact with the switches, substantially as described.

6. A trolley for underground electric railways, consisting of two vertical supports connected to the respective brushes of an electric motor, arms pivotally connected with the supports and provided with coil springs, wheels mounted on the arms, and pins whereby the upward movement of the arms is limited, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT B. WILSON.

Witnesses:
DAVID H. MEAD,
E. H. PARRY.