

No. 616,824.

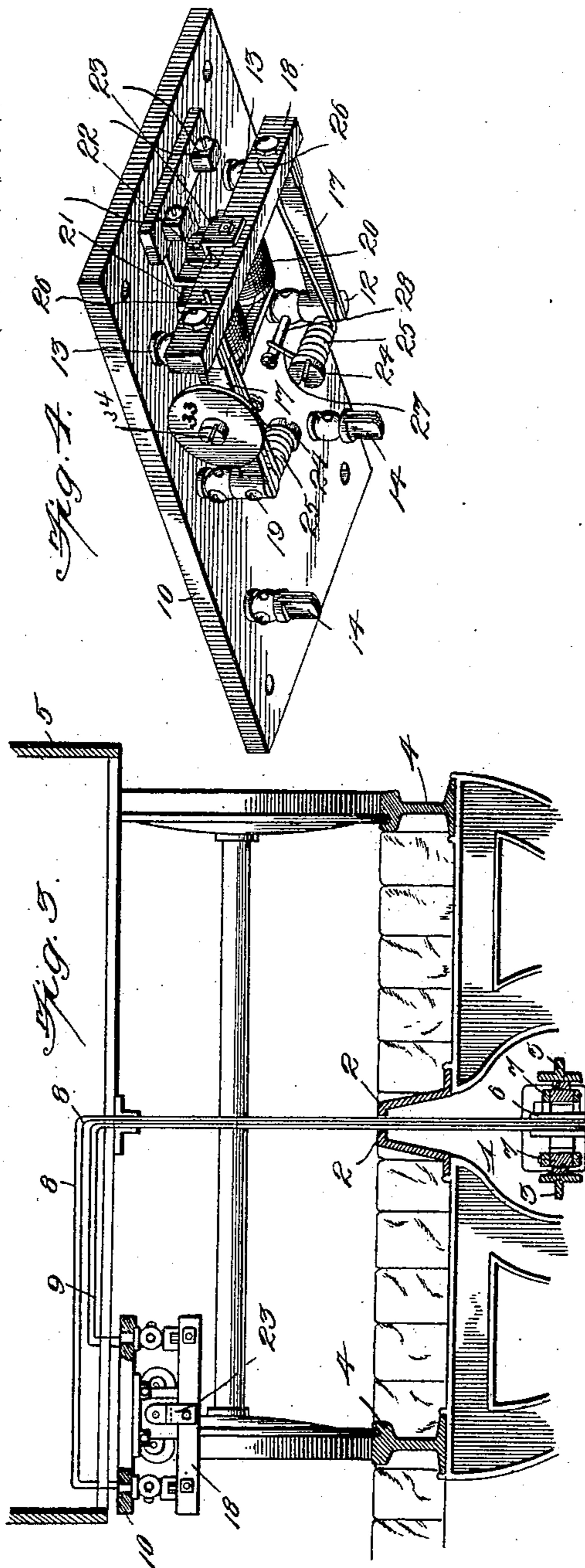
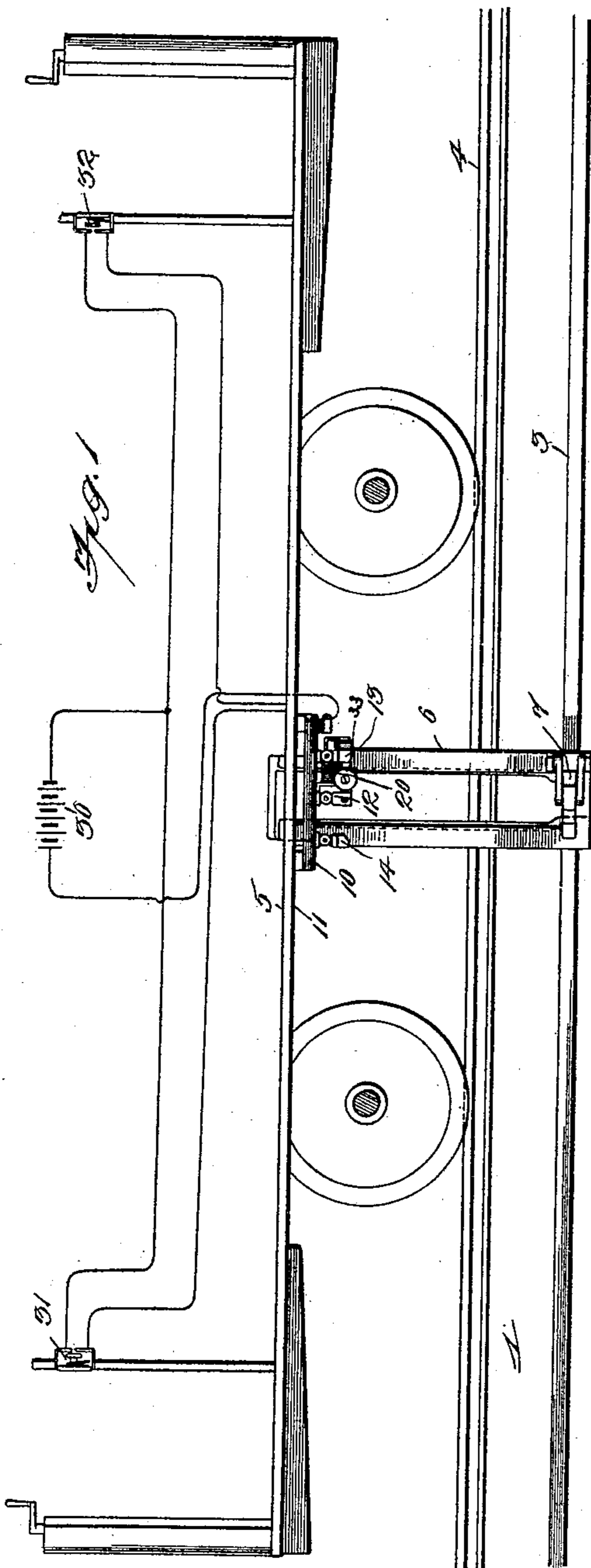
Patented Dec. 27, 1898.

F. H. CHAMBERLAIN & G. B. COLEMAN.
UNDERGROUND ELECTRIC RAILWAY SYSTEM.

(No Model.)

(Application filed Dec. 2, 1897.)

2 Sheets—Sheet 1.



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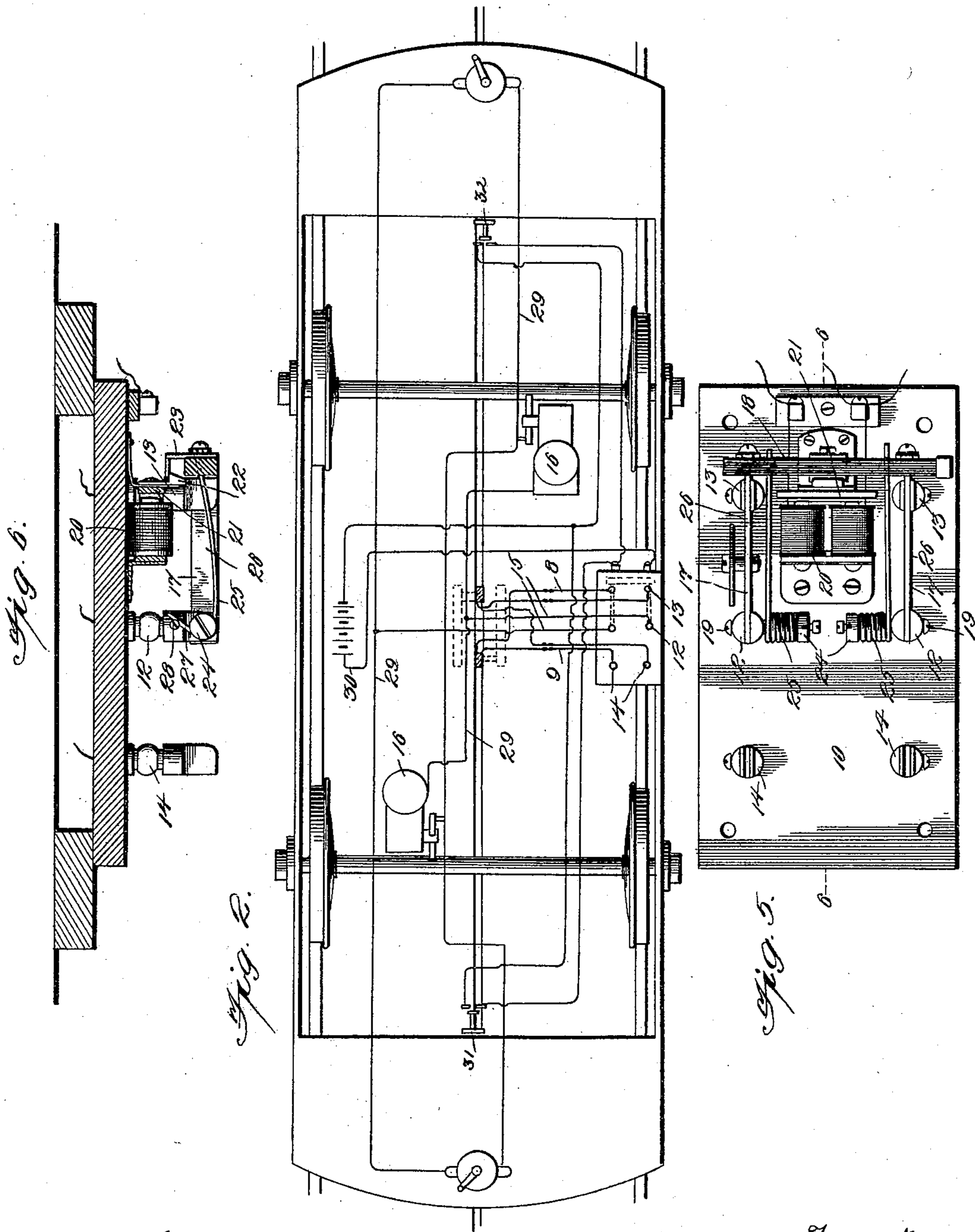
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UNITED STATES PATENT OFFICE.

FREDERICK H. CHAMBERLAIN AND GRIFFIN B. COLEMAN, OF WASHINGTON,
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UNDERGROUND ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 616,824, dated December 27, 1898.

Application filed December 2, 1897. Serial No. 660,567. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK H. CHAMBERLAIN and GRIFFIN B. COLEMAN, citizens of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Underground Electric-Railway Systems; and we do 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

Our invention relates to electric railways; and its object is to provide against the cessation of the operation of the motor carried by the car and the consequent stopping of the car caused by the burning out of the leads or conducting-wires running to the motor from the supply-conductors or by other accidental injury to said leads.

While our improvements have been devised with special reference to their adaptability to underground systems of electric railways and are illustrated in the accompanying drawings in connection with an underground conduit and a current-collector or plow traveling therein, it will be obvious to those skilled in the art to which the invention relates, after a reading of the following description, that the invention is also applicable to the so-called "overhead" systems, which employ a trolley traveling in contact with a suspended conductor.

Generally stated, the invention consists in the employment of a plurality of sets or pairs of lead-conductors between the main supply-conductors and the motor, in combination with a switch device for electrically connecting one or another of the sets or pairs of leads with the supply-conductors, the purpose being to provide ready means within the control of a motorman or other operative on the car for cutting out a pair of leads (after they are burned out or inoperative from other cause) and switching in a pair of auxiliary live leads, thus insuring a constant supply of current to the motor and avoiding stoppage of the car.

A further object of the invention is to provide, in connection with a plurality of leads

and a switch device, as above outlined, a visual signal or indicator to indicate to the car-inspector at the terminus of a line that the switch controlling the leads has been thrown, and hence that a pair of leads has been burned out and should be repaired.

The characteristic features of the invention, as well as their relative arrangement and details of construction, will now be fully described in connection with the accompanying drawings, which form a part of this specification and in which similar reference-numerals indicate corresponding parts throughout the several figures or views.

Figure 1 is a side elevation of a portion of an underground railway and car with our improvements applied thereto. Fig. 2 is a top or plan view of the same. Fig. 3 is a vertical transverse section on the line 3 3 of Fig. 1. Fig. 4 is a detail view illustrating the switch and its connections detached from the car. Fig. 5 is a reverse or bottom plan view of the switch, and Fig. 6 is a section on the line 6 6 of Fig. 5.

The numeral 1 designates the conduit, 2 the slot-rails, and 3 the rails or bars within the conduit, constituting the supply-conductors of the system.

4 indicates the rails of the track, upon which the car 5 travels.

The current-collector or plow 6 is suspended beneath the car and extends into the conduit, so that its shoes 7 will have a sweeping or wiping contact with the supply-conductors 3.

As is well understood in this art, the contact-shoes of the current-collector are electrically connected with the controller and motor of the car by lead-wires, which convey the current from the supply-conductors. Ordinarily a single pair of these leads is employed; but our invention contemplates the employment of two or more pairs of these lead-conductors, preferably two pairs, as shown in the drawings. These leads are designated by the numerals 8 and 9.

10 indicates a switchboard secured to any convenient part of the car-body—in the present instance to the under side of one of the side bars 11 thereof. Upon this switchboard 10 are arranged three pairs of binding-posts and contact-points 12, 13, and 14. The central pair 12 is connected electrically by conductors 15 with the motors 16, the pair 13 is

connected with lead-wires 8, and the pair 14 with the lead-wires 9. Upon the switchboard 10 is pivotally secured a switch comprising parallel metallic arms 17 and a cross-bar 18, of insulating material. The ends of the arms 17 are secured by pivot-pins 19 between the forks of the points 12, and the pairs of contacts 13 and 14 are forked, as shown, to receive the arms 17 of the switch. Upon the switchboard 10 is supported an electromagnet 20, and upon the board 10 in operative position with relation to said magnet is pivotally secured an armature 21, provided with a hook or lug 22, adapted to engage a catch 23, projecting from the cross-bar 18 of the switch and to hold the arms 17 thereof in electrical contact with the points 13.

Projecting from the inner sides of the central contact-points 12, in line with the pivot-pins 19, are two studs 24, around each of which is coiled a spring 25. The longer arms 26 of these springs extend through the cross-bar 18 of the switch, while their shorter free ends 27 are adapted to abut against two oppositely-projecting pins 28, projecting from the inner sides of the contact and binding posts 12 above the studs 24, but parallel to the latter. When the switch is in contact with the points 13 and engaged by the catches 22 and 23, the coils of the springs 25 are contracted, so that when the switch is released by the movement of the armature 21 the expansion of the springs operates to throw the switch into contact with the points 14, where it is held by the resiliency of the fork-arms of the points.

The wiring between the contact-shoes of the plow and the motors and controllers is the same as in other systems of this character, with the exception that the motor-circuit includes the switch-points 12 through the wires 29, and each pair of lead-wires 8 and 9 connects its contact-points 13 or 14 with the plow, the circuit from either pair of said contacts 13 and 14 being completed to the motor-wires 29 through the switch.

For the purpose of energizing the switch-magnet 20 we employ a local circuit, preferably supplied with current from a battery 30, carried on the car, although instead of using this local battery a current might be shunted from the supply-conductors through suitable connections. The local circuit from the battery 30 includes the magnet 20 and two circuit-closers 31 and 32, preferably located one at each end of the car and comprising an ordinary push-button. The sole office of this local circuit is to energize the magnet 20, and it will be apparent from the illustration in the drawings that this local circuit may be closed by the push-buttons from either platform of the car or from any convenient point within the car.

The operation of the mechanism is as follows: Normally the switch is in the position shown in Fig. 1 of the drawings, in contact with the contact-points 13. As long as the

leads 8, connecting these points 13 with the motors, are in working order the operation of the motors will be continued. If the leads 8 burn out or become "dead" through other cause, the motorman or other authorized person on the car pushes one of the buttons 31 or 32, thus closing the local circuit and energizing the magnet 20. The magnet attracts the armature 21, which disengages the catches 22 and 23 to release the switch and permits its spring to throw the switch into contact with the points 14 of the other pair of leads 9, thus shunting the current from the supply-conductors through said leads 9 to the motors, thus insuring the continuance of the operation of the latter without any stoppage whatever of the movement of the car and without any manipulation or mechanical coupling or uncoupling of the wires.

To some convenient part of the switch, preferably to the outer bar or arm thereof, is attached an indicator, which is shifted with the movement of the switch. We have shown this indicator as consisting of a disk 33, of metal, secured by a screw 34 to the switch; but of course any one of a variety of forms of indicator might be employed for the purpose. The indicator-disk is preferably painted in some bright color to make it more conspicuous to the eye, and its office is to indicate to the car-inspector or the employee at the terminus of the road that the switch has been thrown, and hence that one pair of the leads has been burned out. The normal position of the indicator with relation to the front of the car being known, it can be seen at a glance at the side of the car carrying the switch whether or not the position of the indicator has been changed, and hence whether or not the leads require repairs or renewal.

The lead-wires 8 and 9 preferably consist of sections connected together by metallic couplings 35, so that in case of accidental injury to the switch or its circuit the dead leads may be disconnected and live ones substituted by hand-coupling.

We claim—

1. The combination with the motor current-collector and supply-conductors of an electric car, of a plurality of interchangeable pairs of leads between the motor and supply-conductors connected to the current-collector, a switch for electrically connecting one or another of said pairs or sets of leads with the supply-conductor, and electrical means for controlling said switch.

2. The combination with the motor current-collector and supply-conductors of an electric car, of a plurality of interchangeable pairs or sets of leads between the motor and supply-conductors connected to the current-collector, a spring-controlled switch for electrically connecting one or another of said pairs or sets of leads with the supply-conductors, and electrical means for releasing said switch.

3. The combination with the motor current-collector and supply-conductors of an electric

car, of a plurality of interchangeable pairs or sets of leads between the motor and supply-conductors connected to the current-collector, a spring-controlled switch for electrically connecting one or another of said pairs or sets of leads with the supply-conductor, and electrical means for releasing said switch, comprising an armature, an electromagnet and an electric circuit.

4. The combination with the motor current-collector and supply-conductors of an electric car, of a plurality of interchangeable pairs or sets of leads between the motor and supply-conductors connected to the current-collector, a spring-controlled switch for electrically connecting one or another of said pairs or sets of leads with the supply-conductor, and electric devices comprising an armature for engaging the switch and holding it against the action of its spring, an electromagnet for attracting said armature to release the switch, an electric circuit which includes said magnet, and a circuit-closer carried by the car.

5. The combination with the motor current-collector and supply-conductors of an electric car, of independent interchangeable pairs of leads between the motor and supply-conductors connected to the current-collector, a spring-controlled switch, and electrical means within the control of a person on the car for releasing said switch to cut one pair of leads out of circuit with the supply-conductors and throw another pair of leads into circuit with said supply-conductors.

6. The combination with the motor current-collector and supply-conductors of an electric car, of independent interchangeable pairs or sets of leads between the motor and supply-conductors connected to the current-collector, a switch carried by the car, and connections between said switch and the pairs of leads, an armature adapted to engage said switch, a spring for retracting the switch, an electromagnet for attracting said armature, and a local circuit including said electromagnet, and having a circuit-closer adapted to be operated from the car for energizing said magnet.

7. The combination with the motor and supply-conductors of an electric car, of a current-collector adapted to travel in a conduit below the road-surface, in contact with the supply-conductors, lead-conductors from said collectors to the motors arranged in independent interchangeable pairs, a switchboard carried by the car, contact-points on said switchboard for each pair of leads, a swinging switch on said switchboard adapted to contact with either pair of contact-points, an armature adapted to engage said switch and hold it in contact with one pair of said contact-points, an electric circuit including an electromagnet for attracting said armature to release the switch and a spring for throwing the switch when released into contact with the contact-points of another pair of leads.

8. The combination with the motor and supply-conductors of an electric car, of a plurality of interchangeable pairs of lead-conductors between the motor and supply conductors, a switchboard provided with independent pairs of contact-points, an electromagnet, and an armature, and a swinging switch comprising arms of conducting material, cross-bar of non-conducting material, catches for securing the switch, and springs for retracting the switch.

9. The combination with the motor current-collector and supply-conductors of an electric car, of two independent pairs of lead-conductors between the motor and supply conductors connected to said current-collector, one pair of said leads being normally out of electrical connection with the supply-conductors and serving as auxiliary or emergency leads, a switch carried on the car for cutting out one pair of leads and connecting the other pair electrically with the supply-conductors, an electromagnet and armature for controlling said switch, a retracting-spring for the switch, a local battery carried on the car, conductors from said battery to the magnet and a circuit-closer included in the battery-circuit.

10. The combination with the motor and supply-conductors of an electric car, of two pairs of lead-conductors from said supply-conductors, adapted to be used independently or interchangeably, a switchboard carried by the car, and provided with binding-posts and contacts for each pair of leads, and with binding-posts and contacts connected electrically with the motor, a switch pivotally secured to the switchboard-motor binding-posts and adapted to be thrown into electrical connection with either pair of the lead binding-posts, an electromagnet and armature on said switchboard, a catch for securing the switch detachably to said armature, a local circuit for energizing said magnet, and a spring for moving the switch when it is released from the armature.

11. The combination with an electric car, of a plurality of pairs of lead-conductors, a switchboard having a pair of contact-points for each pair of leads, and an independent pair of contact-points connected to the motor, and a switch comprising arms of conducting material pivotally secured to the switchboard, and a cross-bar of non-conducting material, oppositely-projecting studs, coil-springs secured to said studs, pins against which the free ends of the springs bear, and means for securing and releasing the switch.

In testimony whereof we affix our signatures in presence of two witnesses.

FREDERICK H. CHAMBERLAIN.
GRIFFIN B. COLEMAN.

Witnesses:

F. O. MCCLEARY,
JAS. L. SKIDMORE.