(No Model.) 3 Sheets—Sheet 1.

C. J. VAN DEPOELE.

ELECTRIC RAILWAY.

No. 467,448. Patented Jan. 19, 1892.

Fig. 2.

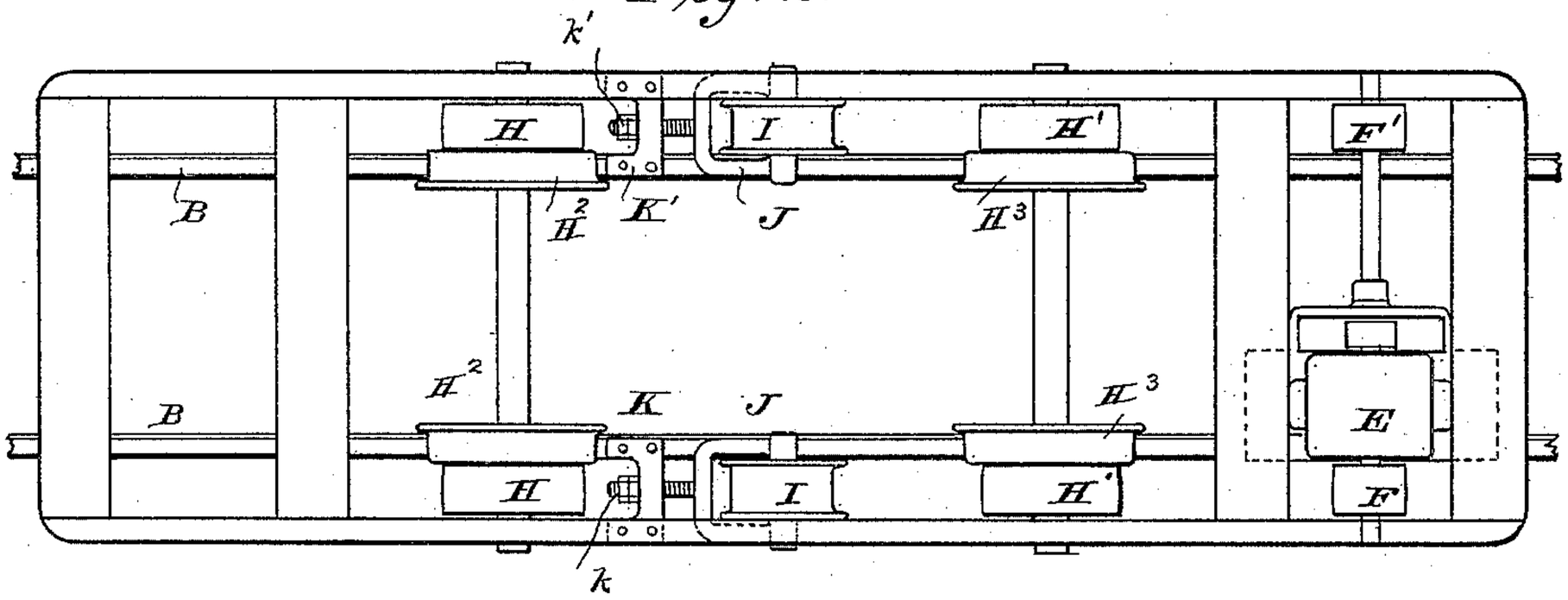

Fig. 1.

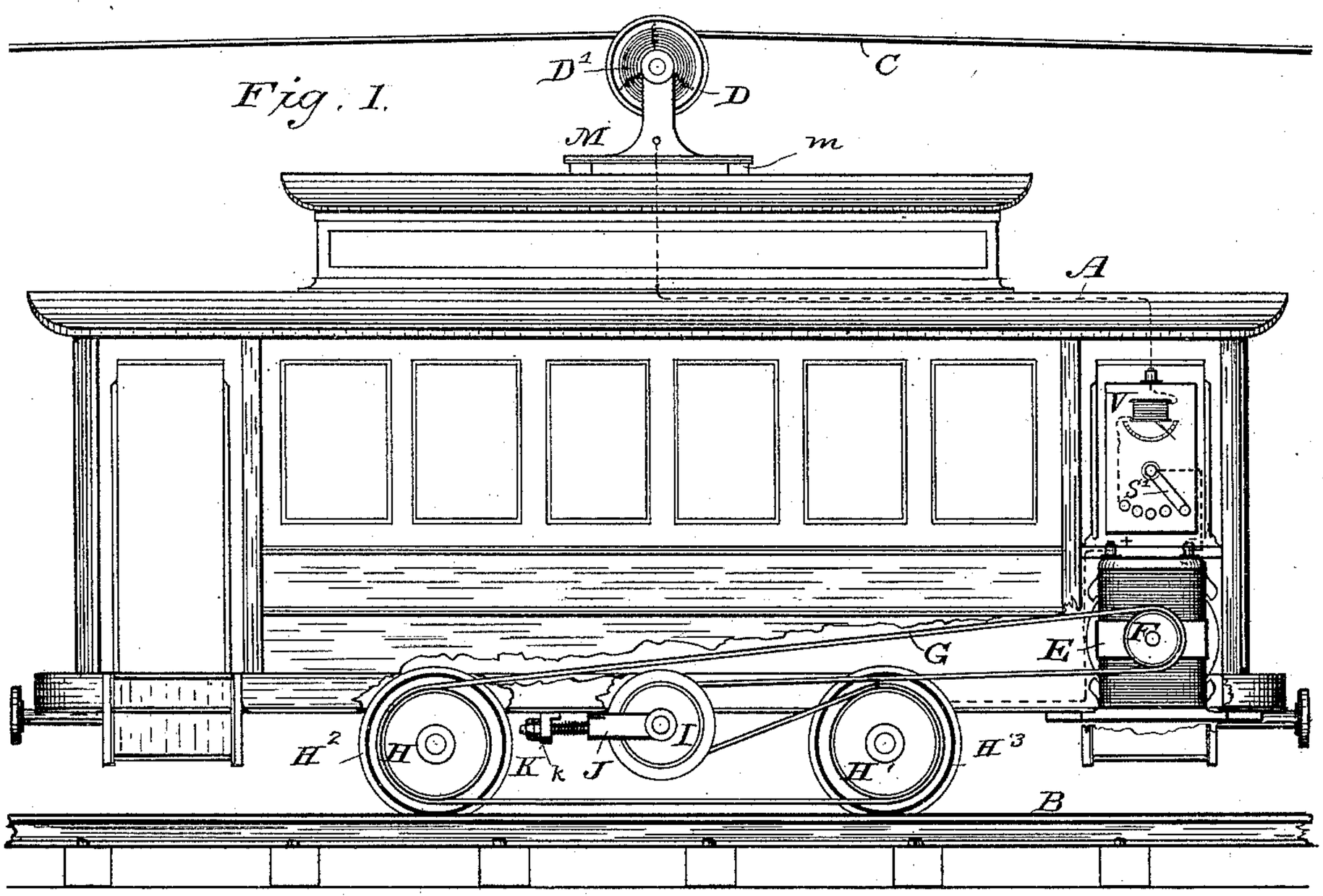

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Fig. 10.

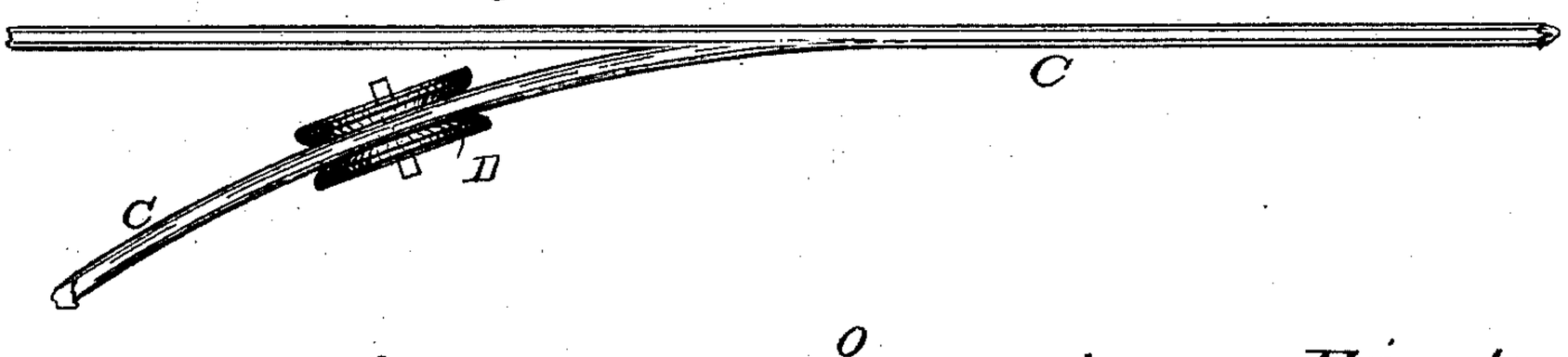

Fig. 3.

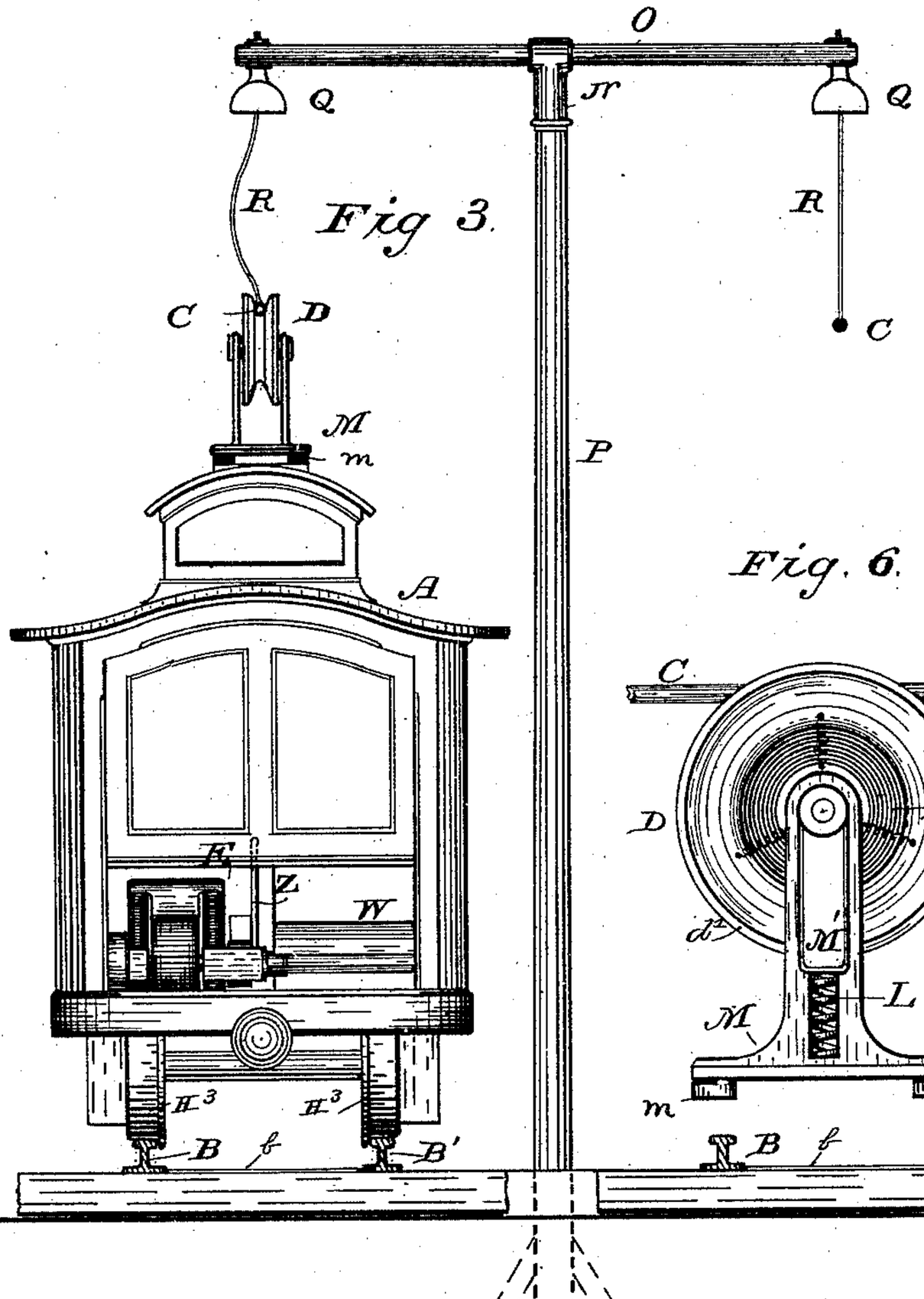

Fig 4

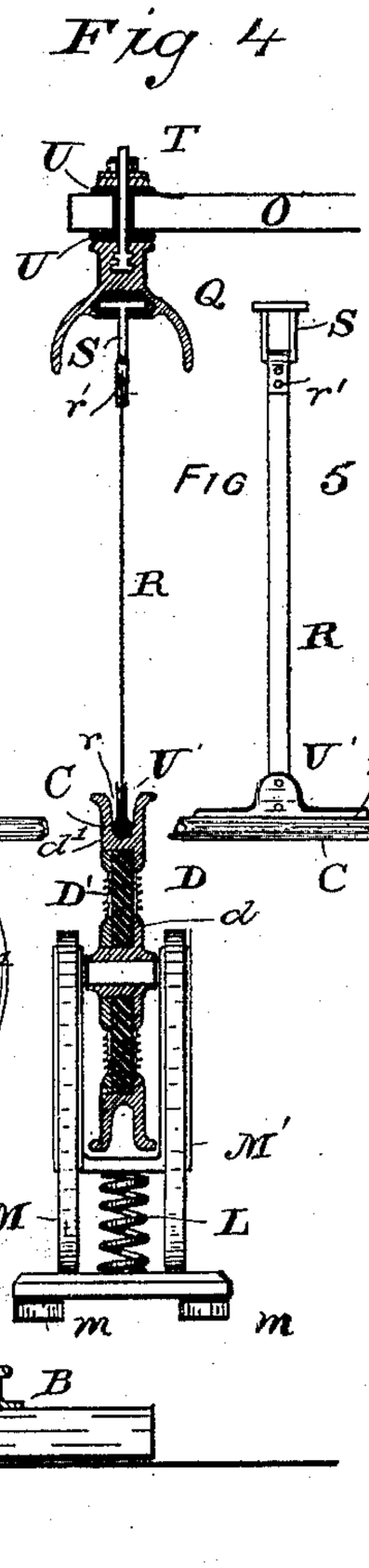

Fig. 6.

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Fig 7

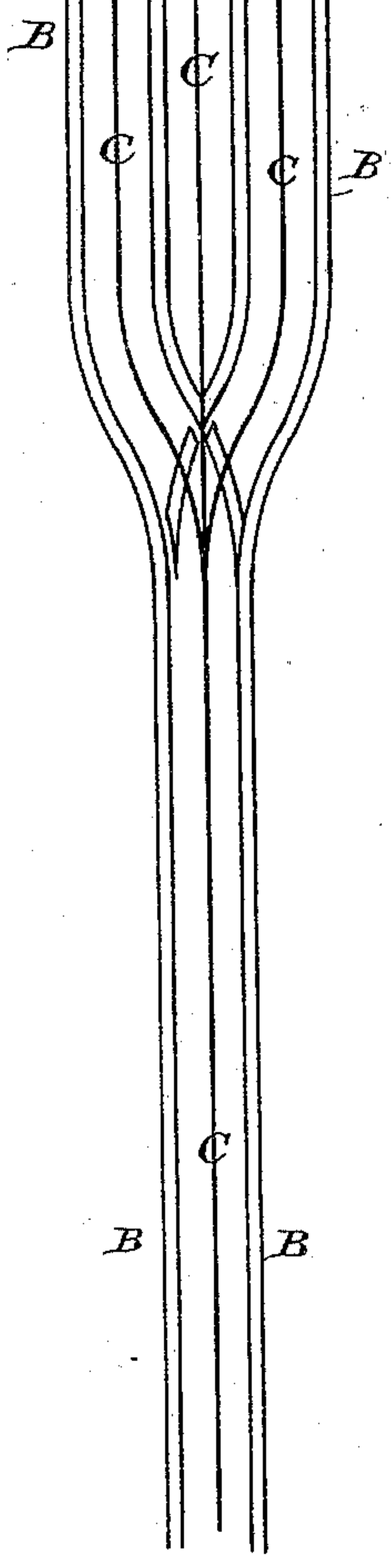


Fig 8.

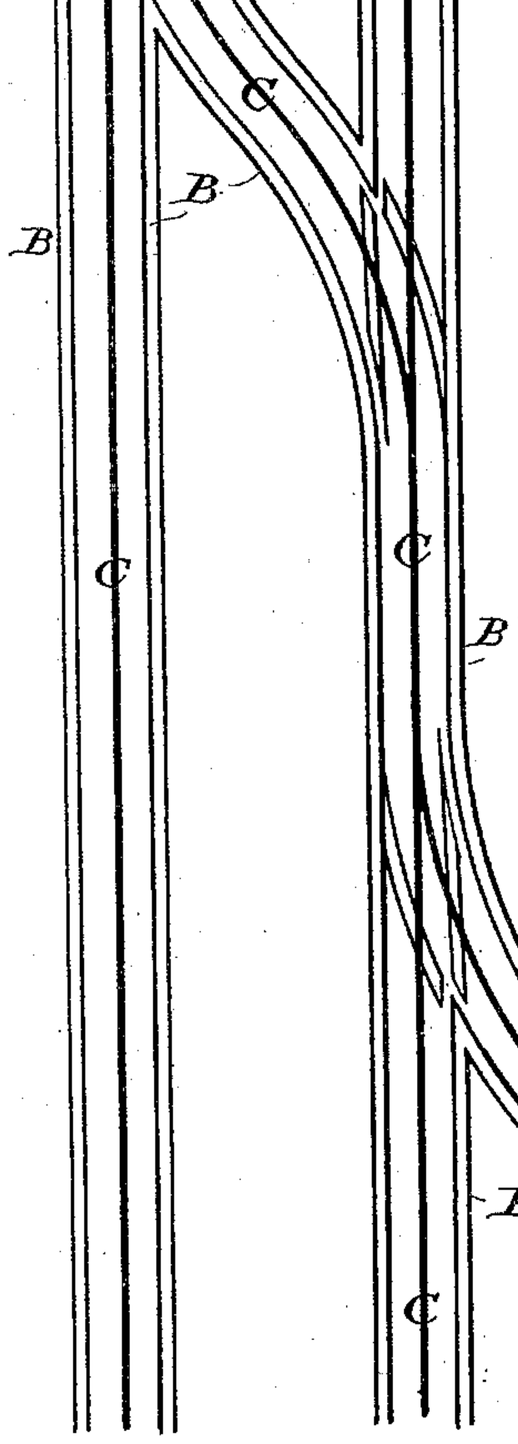
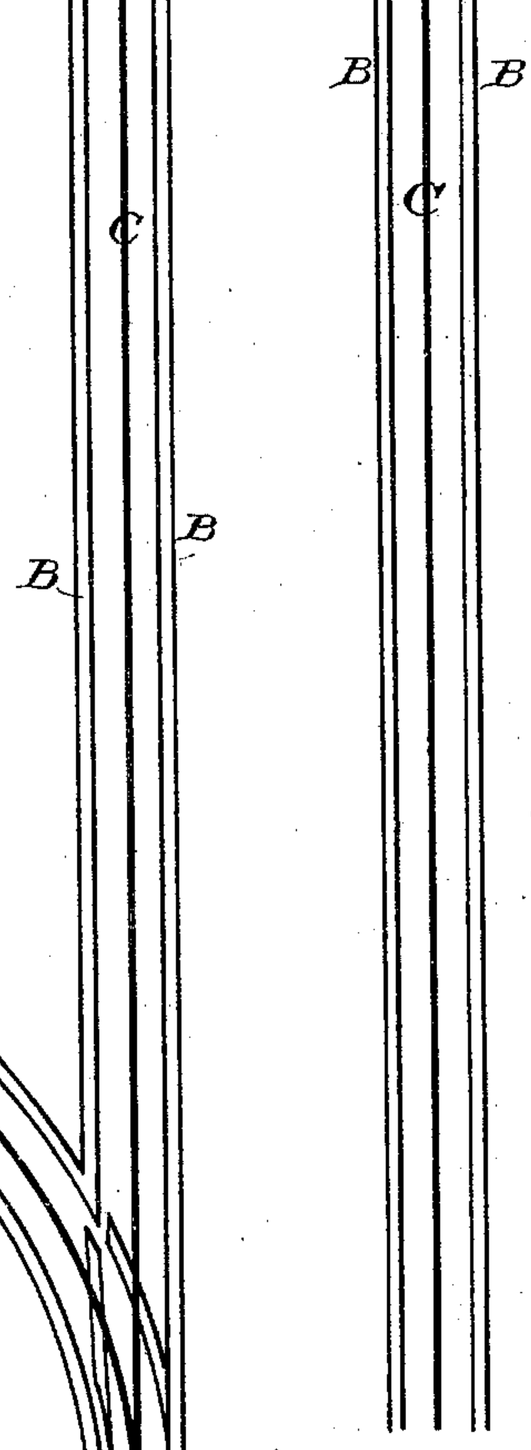


Fig 9.



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UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF CHICAGO, ILLINOIS.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 467,448, dated January 19, 1892.

Application filed June 22, 1885. Serial No. 169,410. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in an Electric-Railway System, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to new and improved means for constructing and operating electric railways; and it consists in the mode of applying the power of the electric motor to the driving-wheels of the cars, as also the mode of conveying the electric current from the generator to the motor.

The following is a description of the system, reference being had to the annexed drawings, forming part of the specification.

Figure 1 is a side view of an ordinary tram-car arranged to be propelled by electricity, showing the mode of applying the power from motor to driving-wheels and the means of taking the current from the suspended conductor, also the current indicator and regulator. Fig. 2 is a plan view of the car, showing the disposition of the motor, the driving and driven pulleys, and means for tightening the driving-belts. Fig. 3 is an end view of the car, showing the electric motor, driver's seat, and a conductor-supporting post. Fig. 4 is a detail view, partly in cross-section, showing the suspending-insulator, the contact-wheel with spring-support, &c. Fig. 5 is a side view of the conductor and suspending device. Fig. 6 is a side view of the spring contact-wheel and conductor. Fig. 7 shows a single track with passing switch, showing the mode of placing the conductors over the straight and shunt tracks. Fig. 8 shows three different tracks and mode of conveying the current in shunting from one track to the other. Fig. 9 shows a straight track and its single suspended conductor; Fig. 10, sections of main and shunt conductors.

In the different figures similar letters indicate like parts.

As indicated in the drawings, A represents an ordinary tram-car.

B B are the rails and are used as one of the electric conductors, both being connected, say, to the negative pole of the generator and connected together at intervals, as by conductors *b*.

C is the suspended electric conductor, preferably of hard drawn copper and connected to the positive pole of the generator.

D is a grooved contact-wheel carrying the suspended conductor C.

D′ is a disk or web of soft rubber interposed between the hub *d* and tire *d′* of the wheel D to give lateral flexibility to the grooved metallic periphery thereof. The tire and hub are, however, electrically connected by means of a proper flexible conductor.

E is an electric motor by which the car A is propelled.

F and F′ are driving-pulleys upon the armature-shaft of the motor.

G and G′ are endless belts for transmitting power from the driving-pulleys F F′ to driven pulleys H H′, secured upon the axles of the carrying-wheels H^2 H^3 of the car.

I and I′ are tightening-pulleys for the belts G and G′.

J and J′ are forks in which the pulleys I and I′ are hung.

K K′ are supports or brackets attached to the car, through which the shanks *k k′* of the forks J J′ pass. The shanks *k k′* are screw-threaded and provided with adjusting-nuts at their outer extremities and are free to be moved longitudinally through their supports by the said adjusting-nuts. The tension of the belts G G′ is regulated, as desired, by setting the adjusting-nuts upon the shanks of the belt-tighteners.

M is a frame, within which is mounted the contact-wheel D.

M′ is a hanger or cross-head supporting the wheel D and moving in vertical ways in the frame M and sustained by a spring L.

N is a T-shaped casting mounted upon the post P and holding the cross-arm O.

P is one of the supporting-posts for the system of conductors.

P′ indicates the foot of post P, embedded in the earth or otherwise secured.

Q and Q′ are insulators for the conductors C and suitably secured near the extremities of the cross-arms O.

R R are suspenders for the conductor C.

r is an ear or clamp of suitable metal for sustaining the conductor C, being brazed or soldered thereto.

S S are staples of galvanized iron, either baked in the porcelain or glass insulators Q or afterward secured thereto by means of sulphur, as shown in Fig. 4, and *r' r'* are strips of leather or sheet metal secured to the suspender R and connecting them with the staples S.

T is a bolt or screw passing out of the upper part of the insulator for securing the same to the cross-arm O.

U and U' is insulating material, preferably soft rubber or similar substance, inserted between the cups Q and cross-arms O to better insulate the cups Q from arms O and posts P and at the same time to diminish the vibrations of the conductor.

S' is the switch-lever of an adjustable resistance in circuit with the motor.

V is a current-indicator in circuit with the rheostat.

W is the driver's seat.

Z indicates the operating-lever of a rotatable commutator-brush carrier, and is located in convenient proximity to the driver's seat.

The circuits of the system are as follows: From any suitable source of electricity the current is led by a proper conductor to both rails of the track, the rails being properly connected at their junctions, so as to have electrical continuity throughout their whole length. From the track the current passes by means of the car wheels and axles and by suitable conductor to one of the terminals of the motor and through the coils thereof, thence by the second terminal of the motor to switch-lever S' of current-regulator, from switch S' through any desired portion of the resistance, and through the current-indicator and thence by suitable conductor to the contact-wheel and suspended conductor, or vice versa.

To operate the car, the driver sits on the seat W, where he can handle the brush-shifter Z and also switch-lever S' of the current-regulator. As above stated, the motor transmits the power to the drive wheels or pulleys by means of two belts. In practice I find that good belts are perfectly satisfactory, being noiseless, and will have very little wearing effect upon the different transmitting parts, besides giving a flexible connection between the motor and the driving-wheels. The belts are made endless and are tightened by means of the arrangement shown in J and K. Further, in order to protect the belts from wet or snow they are incased by a suitable cover.

The system of suspended conductors is so arranged that switching from one track to another is easily accomplished either along the road, as in Fig. 7, or in the yards at terminal points, one motor-car not interfering with the other. The main suspended conductors are stretched continuously along the lines of track, and at each switch or shunt a conductor of same size is properly brazed to the main conductor and bent so as to follow the curve of the shunt-track, being thus connected from one main conductor to the other. It will readily be seen that a car entering the switch or turn-out will keep its conducting-wheel parallel with the center of the curve of the shunt, and that the conducting-wheel will lift up the conductor at the junction of the main and branch and finally raise the main conductor entirely out of the groove of wheel D, when the curved conductor will drop into said groove without breaking circuit, since the main conductor rises out of the groove of the contact-wheel gradually and the curved or branch conductor moves upward with the main. It thus becomes possible to do yard work as easily as with the ordinary steam-engine.

Fig. 10 shows the contact-wheel leaving the main for the shunt or curve conductor. The joint of the shunt to the main conductor is made long and gradual and the groove in the wheel is made wider at its periphery than at the bottom of the groove, thus enabling the wheel to accommodate itself to the gradual increase in the breadth of the joined conductors. The conductors are both slightly lifted up, while the wheel is pressed down until the wheel presenting itself parallel to the shunt-conductor its outside flange will pass under the main conductor and gradually receive the shunt-conductor in its groove, and so from one line onto the other.

In order to minimize the wear and strain upon the conductors and also as to always insure good contact, the contact-wheel D, instead of being mounted rigidly upon its frame, is suspended therein and held up by means of a suitable spring L. (See Fig. 6.) The upward pressure of the spring is so regulated as to insure a good contact in the highest plane of the conductor—that is, where it is held up by the straps R—and likewise to be pressed down when the conductor hangs low. This will prevent the conductor being bent under the passage of the wheel, thereby avoiding as much as possible the crystallization of the copper by bending. In order to prevent further vibration of the conductor, the wheel, as stated, is provided with a flexible web holding the rim and the hub together. To further deaden the noise of the contact D running upon the conductor C, the frame M is mounted upon rubber supports *m m*, &c. It will thus be seen that the connections between the car and the upper conductor are rendered as perfect as possible and that all the different movable parts are flexibly mounted, insuring the practicability of the system and a long life to the different parts. Even the insulating-cups are flexibly mounted upon the cross-arms, all tending to avoid vibration of the conductor. In case it is not practical to have the posts between the tracks, poles can be placed on either side of the street, carrying a cross-wire, from which the insulators are then suspended

by an elastic spring or some other suitable device.

To insure a good electrical contact between the track and the wheels of the car, all the axles are electrically connected together, and in case of a train of cars all are so connected between their axles and the coupling-pins that by simply coupling the cars they are all in electrical contact with one pole of the electric motor on the motor-car.

It often happens that in streets the tracks are covered with mud or other substances, which, when dry, interferes with the passage of the current. By connecting all the wheels and axles together I give more opportunities for the current to pass in one place if not in the other.

The use of the resistance in circuit with the motor is to regulate the strength of the current passing to the motor, especially at the moment of starting. The cars, as will be understood from the foregoing, are arranged to be run in multiple arc, so that whenever a number of cars are to be run at once as long as they are all running the current will divide itself evenly through the different motors. Let us now suppose that we have to start a car. The armature will be standing still, and consequently no counter electro-motive force will be present to prevent more current passing through the machine than that required when the motor is running, thus temporarily diverting the necessary current from the motors already running, so that whenever a motor is started a resistance about equal to the counter electro-motive force of the motor when it is running should be placed in circuit therewith. The resistance can be arranged so as to be introduced and withdrawn as called for; but this feature, as well as other matters herein referred to, but not covered by the appended claims, are included in a separate application, now Letters Patent No. 403,801, dated May 21, 1889.

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

1. In an electric-railway system, a suspended conductor in continuous contact with a vertically and laterally movable grooved contact, said contact carried by a vehicle and so arranged that it shall rise and fall with the varying level of the conductor during the motion of the car or vehicle, substantially as described.

2. In an electric-railway system having overhead conductors from which the current is taken to the motor, a traveling contact-wheel mounted flexibly upon its axis, said wheel being further suspended in a frame in which it is capable of moving up and down, being pressed up by means of a proper spring and pressed down by the weight of the suspended conductor, thus following the undulations of the same with an elastic contact, substantially as described.

3. In an electric-railway system, two conductors to the current, one being the rails of the track electrically connected together at suitable intervals, the other an overhead or suspended conductor, upon which a grooved contact presses from below, said contact being movable both vertically and laterally and mounted in a proper hanger carried by a vehicle and continually pressed up against the conductor by means of a suitable spring, substantially as described.

4. An electric-railway system comprising a plurality of tracks the rails of which are electrically connected together and connected to one pole of the electric generator, suspended conductors corresponding with the tracks and also all connected together and connected to the second pole of the generator, a system of electric-motor cars adapted to be run upon said tracks under said suspended conductors and carrying current-collecting devices engaging the suspended conductors, and connections from the contact devices to the motor-circuits and from said motor-circuits to the track and thence back to the generator.

5. An electric-railway system comprising main and branch tracks electrically connected to form one side of the supply-circuit, electrically-propelled vehicles moving upon said tracks and carrying current-collecting devices, and main and branch supply-conductors connected and forming the other side of the circuit and arranged above the track and vehicles and parallel therewith, so that the contact device carried by the vehicle will follow the line of the main or branch conductor when the vehicle moves from one to the other.

6. An electric-railway system comprising main and branch tracks electrically connected to one pole of the generator, electrically-propelled vehicles upon said tracks, a supply-conductor suspended above and parallel with each track, said conductors being joined at the points of divergence, and a grooved contact device carried by each electrically-propelled vehicle, said device being upwardly spring-pressed against and held into engagement with the under side of the suspended conductor parallel with the track upon which the vehicle is moving.

7. An electric-railway system comprising main tracks and branches from one to the other, said tracks electrically connected to form one side of the supply-circuit, a main supply-conductor suspended over each main or straight track and parallel therewith, branch conductors connected to the main conductors and arranged parallel with the branch tracks, an electrically-propelled vehicle, and a grooved upwardly-spring-pressed flexibly-mounted contact-wheel carried by the vehicle and engaging the conductor below which the vehicle is moving.

8. An electric-railway system comprising a plurality of tracks the rails of which are electrically connected to one pole of the electric generator, suspended conductors corresponding with and parallel with the tracks, connecting shunt or branch tracks, corresponding

connecting shunt or branch conductors, and electrically-propelled vehicles upon the tracks, making a downward contact therewith and carrying upwardly-spring-pressed grooved contact devices engaging the suspended conductors, said contacts adapted to move from one conductor to another, corresponding with the travel of the vehicle from one track to another.

9. In an electric railway, a system of suspended conductors hanging each over their respective tracks and electrically connected together from one track to the other by means of the conductors placed above the switch or shunt tracks, as shown and described, and a flexibly-mounted contact-wheel capable of moving up and down in a proper hanger under the action of a spring or its equivalent, forcing said wheel up against the suspended conductor, thereby conveying the current from the distant generator to the motor by proper intermediate conductors, as described, said current passing from the motor through the axles and wheels of the vehicles to the track back to the generator, thus completing the circuit between the generator and motor.

10. In an electric-railway system, the combination, with a moving motor, of a conductor situated above the motor and a contact carried by said motor and supported by springs arranged to allow vertical and lateral movement and to press the contact upward against said conductor.

11. In an electric-railway system, the combination, with a moving motor, of a conductor situated above the motor, a conductor beneath the motor, and contacts upon said motor, making an upward contact with the conductor above the motor and a downward contact with the conductor beneath the motor.

12. In an electric-railway system, the combination, with a moving motor, of a conductor situated above the motor, a contact carried by said motor, making an upward contact with said conductor, the rails of the track forming the other side of the circuit, and connections to the motor, as set forth.

13. In an electric-railway system, the combination of the tracks of the railway, a line or lines of conductors above said tracks and following the line of all said tracks, and electric motors, each making an upward pressure-contact with the overhead conductors and a downward contact with the lower conductors.

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

CHARLES J. VAN DEPOELE.

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